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*Volume 108, number 7. July 2019.*
*On the cover: Drywall Waste Block by Washington State University's Taiji Miyasaka and David Drake, an award winner in the 2019 R+D Awards; photo by Amanda Ringstad.*

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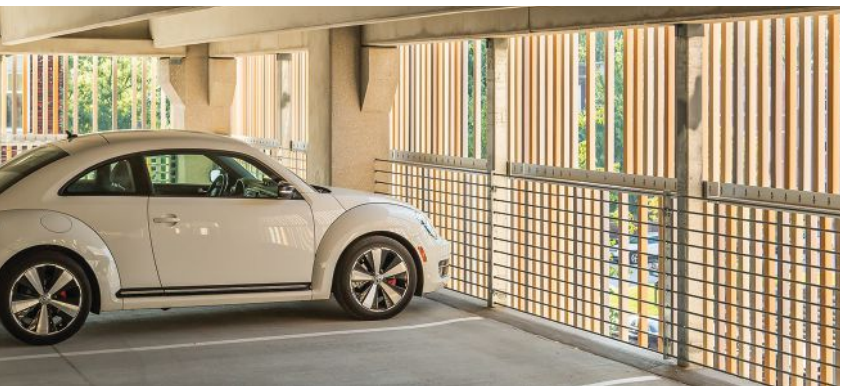

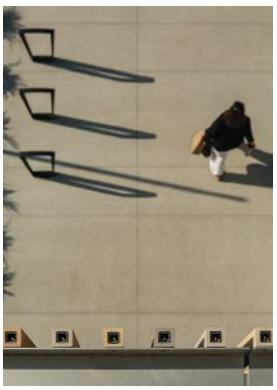


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Cade Museum for Creativity + Invention, Gainesville, FL  Installing contractor: Architectural Sheet Metal, Inc.
Architect: GWWO Architects  Photographer: hortonphotoinc.com  Profile: 7/8" Corrugated  Color: Galvalume Plus

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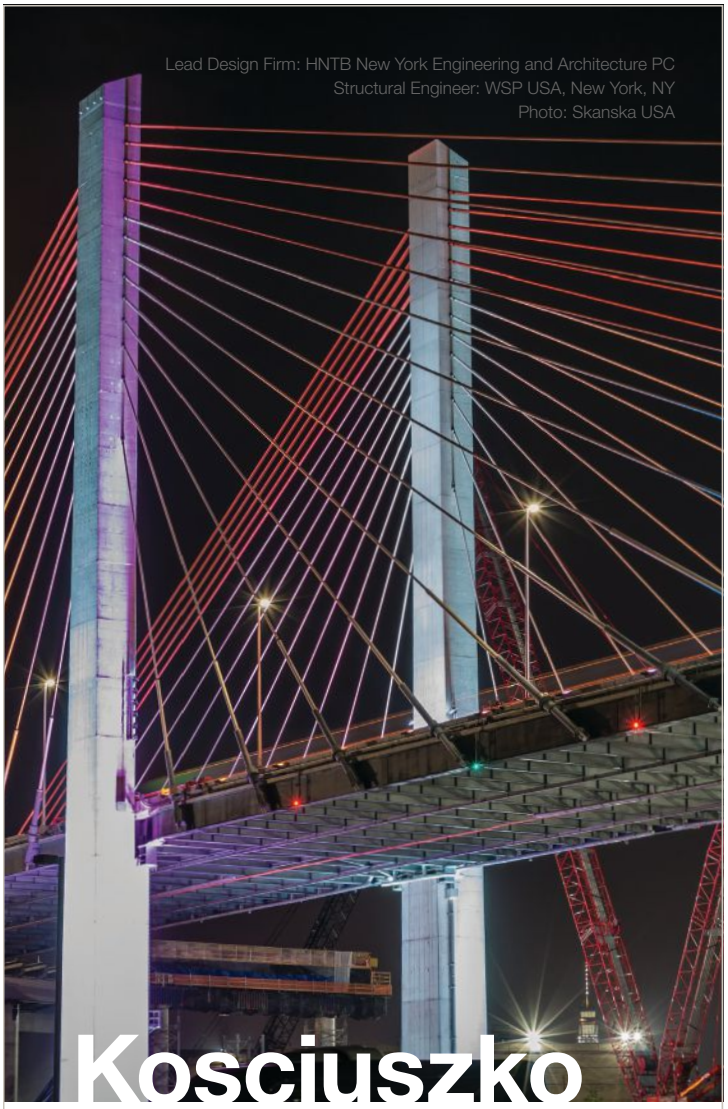

Lead Design Firm: HNTB New York Engineering and Architecture PC
Structural Engineer: WSP USA, New York, NY
Photo: Skanska USA

# Kosciuszko à Gogo

The design of urban infrastructure affects city life as much as the design of its buildings. That's why replacing the **Kosciuszko Bridge**—a notorious pinch point in traffic between Brooklyn and Queens—was a high priority for Governor Cuomo. With heavy lifting from **HNTB**, **WSP USA**, and **Skanska**, a striking cable-stayed span has risen where the outdated bridge once stood, ensuring New Yorkers may still have trouble saying its name, but they never have trouble getting home. Read more about it in **Metals in Construction** online.

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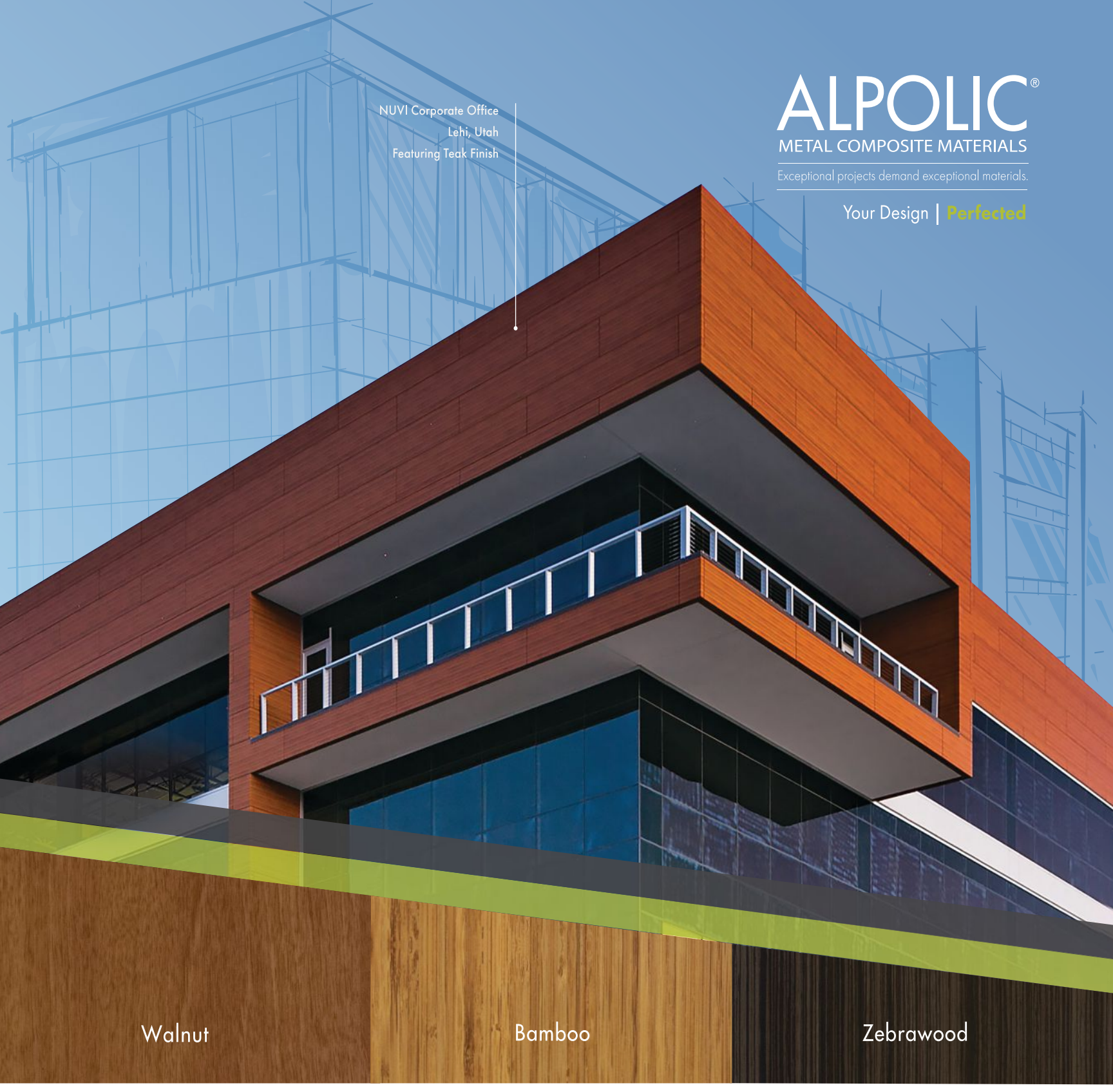


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GARY TODD

**In the Middle Kingdom**

Given the amount of work Anglophone architects do in China, one would think there'd be a surfeit of resources about Chinese architectural history. Unfortunately, geopolitics have inhibited English-language scholarship on the subject, leaving Westerners generally unfamiliar with a host of landmarks, such as the 13th-century observatory (shown) that Kublai Khan built at the base of Mount Song, in the Henan province. So the publication of *Chinese Architecture: A History* (Princeton University Press, 2019) by Nancy Shatzman Steinhardt of the University of Pennsylvania comes as a welcome introduction.

> *For more new books and exhibitions, go to bit.ly/exhibits-books.*

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**Living Lighting**

Lighting consumes 15 percent of energy worldwide and produces 5 percent of global greenhouse gas emissions, according to the U.S. Department of Energy. Such concerns have long motivated Boston-based Kennedy & Violich Architecture. The firm's latest effort, a collaboration with chemical engineer Michael Strano of MIT, utilizes foliage as the light delivery mechanism. The Plant Properties brownstone project (shown), now on display at the 2019 Cooper Hewitt Design Triennial, utilizes biocompatible, GMO-free techniques to transform live plants into a zero-energy light source. —BLAINE BROWNELL

> *For more information about plants that shine, visit bit.ly/brownell-triennial.*

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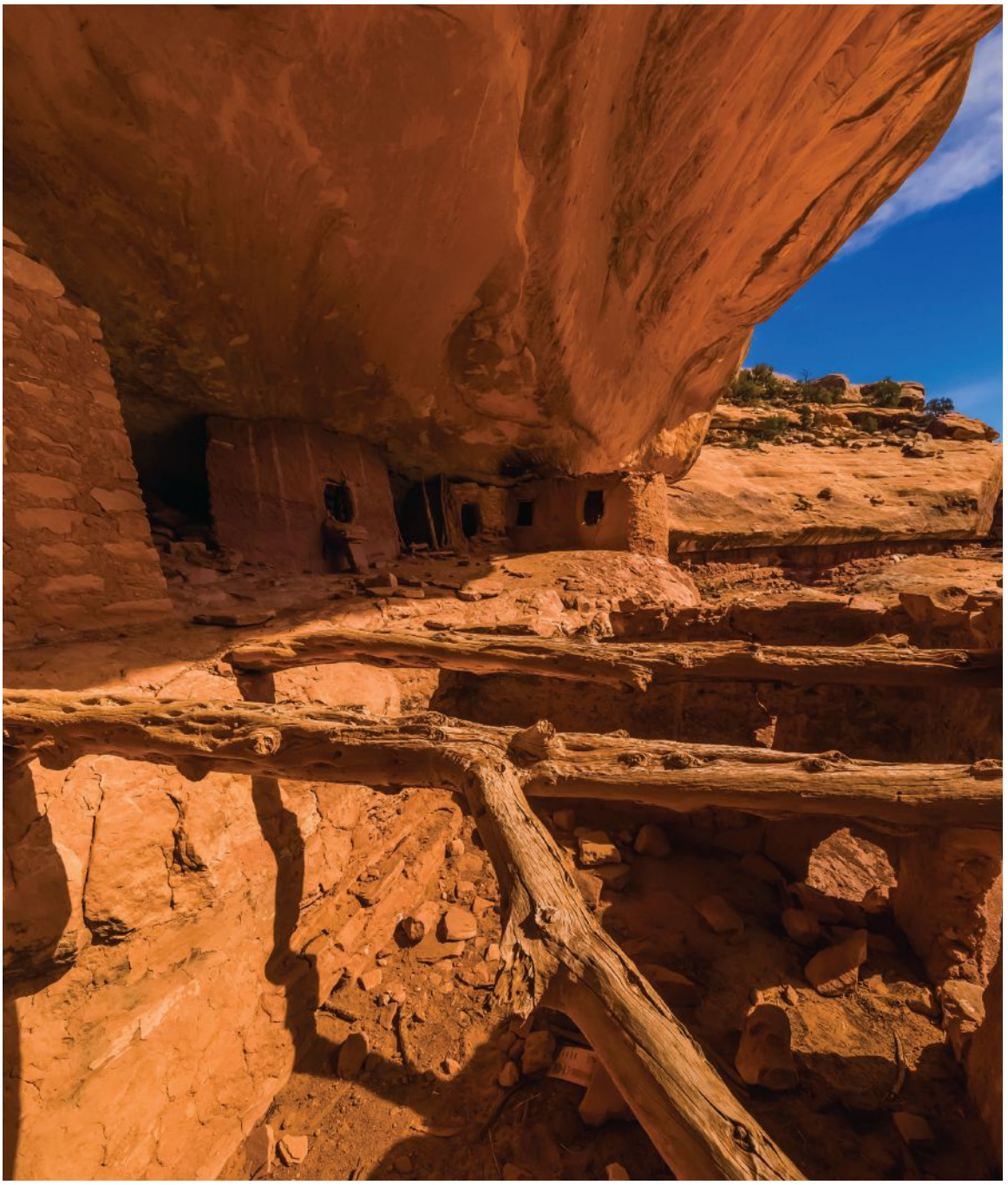

**Endangered America**

Native American cliff dwellings, trails, and petroglyphs dating back many millennia are spread across an 8,000-square-mile swath of the Colorado Plateau, in Southeast Utah. Yet only 70 square miles of it fall under any form of protection. According to the National Trust for Historic Preservation, thousands of artifacts and sites, such as the Moon House ruins on Cedar Mesa (shown), came under threat when the Trump administration revoked Bears Ears National Monument and "dramatically escalated leasing activity" in the area. The vast landscape is one of the Trust's 11 Most Endangered Historic Places list for 2019.

LEE RENTZ

> *To learn more about the 2019 America's 11 Most Endangered Historic Places list, visit bit.ly/2019-endangered-places.*

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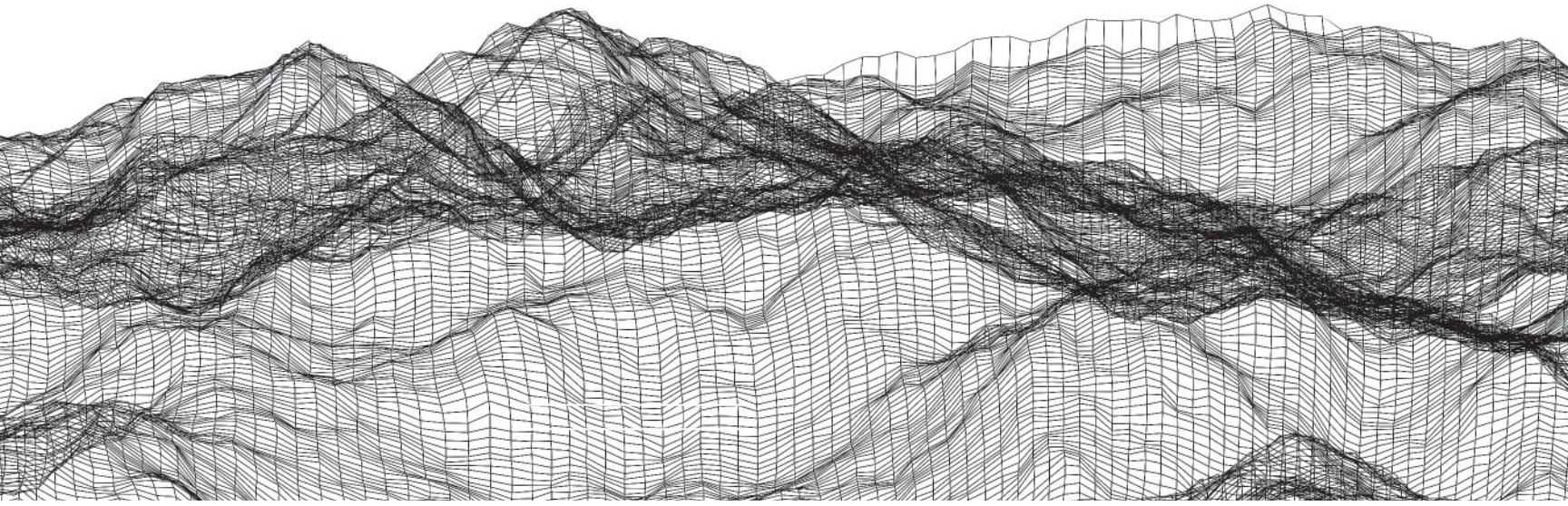

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# Best Practices: Implementing Pay Transparency

TEXT BY JEFF LINK

Salary transparency is gaining ground as a tool to boost equity, achieve pay parity, and build trust among employees. Here, architects and an organizational management researcher share advice on instituting a system for pay transparency.

**Know the Law**

The National Labor Relations Act of 1935 and laws in at least 10 states ban employers from penalizing employees for discussing their salaries with co-workers or inquiring about their colleagues' wages. These regulations are intended to support fair and equitable labor practices and reduce discrimination, as well as provide a legal framework for greater salary transparency.

Additionally, many emerging and prominent architects are promoting equity for women and other marginalized groups within their practices. "The notion of hiding that information is changing as the younger generation is gaining more leadership positions," says Juliet Chun, AIA, co-founder of the Girl Uninterrupted Project, a Boston-based research initiative that seeks to bridge the cultural gap between emerging and established designers in the profession. "The younger generation is more open to sharing information and it's less taboo."

**Organize the Numbers**

Mel Price and Thom White, co-founders of the 10-person Norfolk, Va.–based firm Work Program Architects (WPA), have utilized an open-book model of pay transparency since WPA's 2010 inception. At any time, employees can view an internal spreadsheet that lists salary, bonus, and benefit information beside an individual's name, along with monthly financial reports, invoices, credit card charges, and a profit-and-loss statement for the firm at large. The information is even shown to prospective job candidates who are asked to use it to propose a salary during their interview. "It develops trust and financial literacy," Price says.

Manit Rastogi, co-founder of Morphogenesis, credits his firm's 2.05-percent gender pay gap—in favor of women—to salary transparency, which he says also helps his 200 employees clearly envision their career paths.

> "The younger generation is more open to sharing information and it's less taboo."
>
> —Juliet Chun, AIA, co-founder, Girl Uninterrupted Project

The firm's system is highly formalized: 50 percent of revenue is assigned to employee salaries and bonuses, and a nine-person compensation committee, which changes every three years, apportions these earnings to staff. Pay ranges are determined by market standards at five seniority levels and are consistent across Morphogenesis' offices in Delhi, Mumbai, and Bengaluru, India. "Because there were no standards in this part of the world, we laid down our own," Rastogi says. "Anyone who comes to Morphogenesis knows exactly what they will earn [across] their career path."

**Be Proactive**

Anecdotal evidence suggests pay transparency is not widely practiced in architecture. "Firm owners have never been totally on board," says Peggy Deamer, an architecture professor at Yale University who also co-founded Just Design, an organization that recognizes design firms with ethical and equitable labor practices. "[They believe offering] pay transparency would mean [promoting] the expectation that everyone would go up to the highest salary, and that would increase wages. They'd lose money. Period."

But partners and owners may expect increasing pressure to adopt salary transparency as websites such as Glassdoor, PayScale, and Archinect's Architecture Salary Poll make it easier to share salary information publicly with little risk of social repercussions or professional censure.

Deamer considers this a blessing. "[T]here is a lot of wasted mental energy among employees about whether they are getting paid equal to what others are getting," she says. "A quick realization will come over the workplace once that becomes concrete. You remove the anxiety and paranoia."

> *For more advice on implementing pay transparency, visit bit.ly/ARPayTransparency.*


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# Detail: Goede Doelen Loterijen Metal Foliage

TEXT BY TIMOTHY A. SCHULER

Like a tree canopy twinkling with metallic leaves, the underside of the skylight-studded roof of the Goede Doelen Loterijen's (Dutch Charity Lotteries') new office features 6,840 polished-aluminum ceiling tiles designed to send dapples of daylight below. Supported by six branching steel columns, the 43,270-square-foot roof covers the 85,000-square-foot building and entrance plaza in Amsterdam, inviting the public to engage with the architecture.

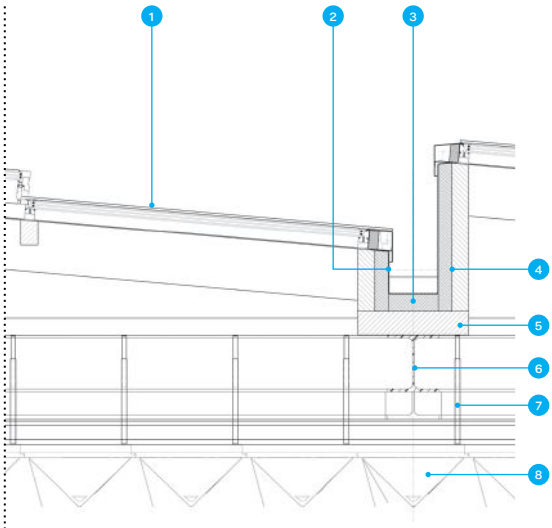
"We wanted the roof, which is visible everywhere, to be recognizable and a symbol of the GDL," says Saartje van der Made, a partner at Benthem Crouwel Architects, which has offices in Amsterdam and Düsseldorf, Germany. The roof does more than offer shelter from the elements, she notes. "By adding a layer under the roof, the so-called 'foliage,' we prevent too much warming in the summer and [create] an ever-changing play of light."

The architects began with sketches and then used a laser cutter to explore the look and feel of the canopy's tiles, or leaves, through scale models. Those models became vital as the team began contacting manufacturers to assess the design's feasibility, says Benthem Crouwel building engineer Cees Zuidervaart. Representatives from the Rotterdam, Netherlands, office of Hunter Douglas "came up with a solution based on an existing ceiling system, in consultation with their development department," Zuidervaart says.

The reflective tiles are made of 95 percent recycled aluminum and 5 percent corrosion-resistant, high-quality aluminum alloy, according to Hunter Douglas. Each tile measures 2 feet square and is cut and bent to curve downward at different angles, making four triangular leaves.

To create a repetitive yet variegated pattern, the architects designed seven tile types with varying degrees of openness. Groups of four tiles were then combined to generate 58 different ceiling panels, according to Hunter Douglas. Each panel is framed by an aluminum armature—finished in white so as to disappear into the sky overhead—and numbered to ease installation.

After two years of construction by Dutch contractor J.P. van Eesteren, the building opened in 2018 and earned an Outstanding rating in the BREEAM performance rating system, making it the most sustainable renovation in the Netherlands to date.

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6. Wide-flange steel beam
7. Aluminum armature for ceiling panels, sprayed with a white finish
8. Polished 2'-square aluminum tile (four per panel), cut and bent down; 2mm thick (exterior tiles) or 1.5mm thick (interior tiles)

THEA VAN DEN HEUVEL

> *To read more about the Goede Doelen Loterijen's high-performance and eye-catching roof, visit bit.ly/ARGDLmtl.*

# FUTURE *of* SHADE

Winners of the Future of Shade competition's Building Shade category explored the use of fabric in shade and building design with concepts that included new, sustainable uses for old structures.

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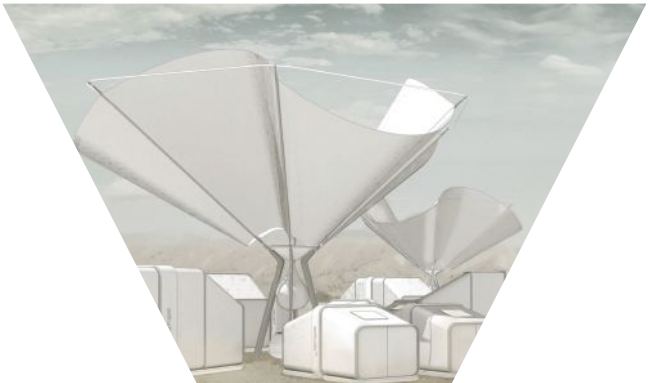

# Next Progressives: LAAB

EDITED BY KATHARINE KEANE

**Location:**
Hong Kong

**Year founded:**
2013

**Firm leadership:**
Otto Ng and Yip Chun Hang

**Education:**
*Ng:* B.A., University of Hong Kong (HKU); M.Arch., MIT; *Yip:* B.Arch., University of California, Berkeley; M.Arch., HKU

**Firm size:**
35 designers, engineers, makers, and sociologists

**Mission:**
We focus on spatial innovations that cultivate communities and sustain environments. Our designs explore the relationships among people, nature, and culture. Whether it is a space for home, work, play, learning, or leisure, we place interactive experiences at the heart of our design process. Cats, plants, and discarded wood receive the same level of care as human needs.

**Origin of firm name:**
LAAB stands for "A Laboratory for Architecture and Art." When we first started LAAB six years ago, art and architecture were very separate fields in Hong Kong. People tended to understand architecture as only high-rise buildings, and art as paintings displayed in the museum. Our vision for LAAB is to bring art and architecture together, as our work often lies at the intersection between the two. LAAB also builds on the English word "lab," which evokes the drive for experimentation and innovation. The Chinese translation of "lab" rhymes with the Chinese characters for the word "realization." By using LAAB, we hope to convey our experimental spirit as well as our pragmatism to bring innovative, cutting-edge design to life.

**First commission:**
We designed our own residences when we first started. This prepared us to work on Small Home Smart Home, where we pushed the boundary of a transformable house that is only 309 square feet. We adopted the "form follows time" design philosophy and engaged time as a critical design element. With bespoke mechanisms and smart systems, we crammed everything that the couple wanted: an American-size kitchen, a bathtub, a home cinema, a small gym, cat-friendly spaces, and a lot of storage. The video of the project went viral, with more than 1 million views on LAAB's YouTube channel.

**Favorite project:**
We know we are supposed to name an architecture project, but our favorite project is actually LAAB itself. Our studio comprises people from diverse backgrounds: architecture, interiors, product design, engineering, and even sociology. When you have a diverse team, it forces everyone to step out their comfort zones and ask questions that were once taken for granted. It pushes us to think critically and be mindful of the strengths and limitations of our own disciplines.

**Second favorite project:**
A series of urban interventions in the Victoria Dockside, a new cultural district in Hong Kong. Urban nature is an important concept throughout the project, and each design explores the relationship among people, nature, and culture in their own ways.

**On deciding to be an architect:**
*Ng:* I picked architecture over computer science because architects look cooler.

**Special item in your studio space:**
*Yip:* My Tokyobike; *Ng:* A coffee machine—our colleagues have become experts in making latte art

**Favorite destination for architecture:**
*Yip*: Kyoto, Japan; *Ng*: The Setouchi islands in Japan

**Favorite place to get inspired:**
*Yip*: The bathroom

HENRY T.C.

> *To learn more about LAAB and its work, visit bit.ly/ARLAAB.*

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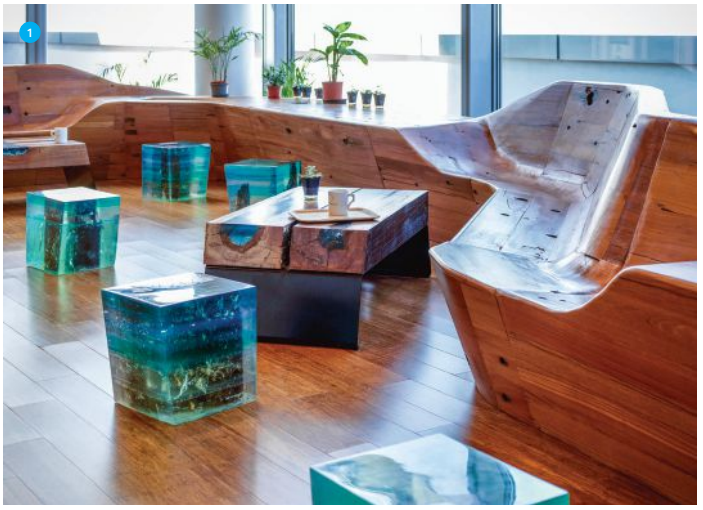
**Next Progressives:**
**LAAB**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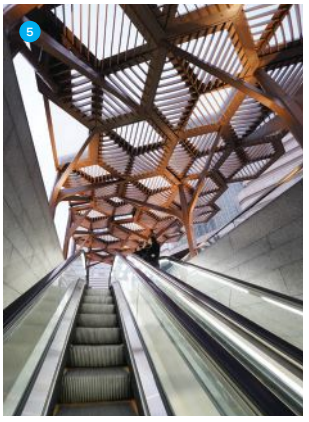
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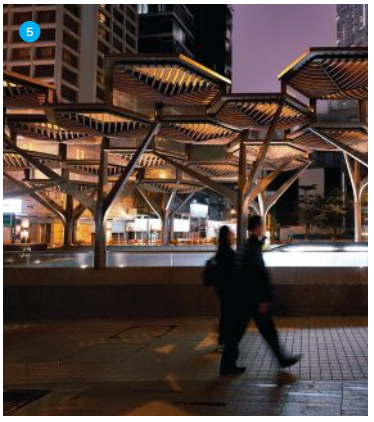
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1: JONATHAN LEIJONHUFVUD; 2, 4, 5, 6, 7: COURTESY LAAB; 3: STUDIO UNIT

**1.** LAAB used 100-year-old wood collected from a demolished pier in Hong Kong to fabricate tables, benches, stools, and "ocean cubes," which the designers preserved in blue resin for T-Park, an environmental educational facility. **2.** The exterior of the Harbour Kiosk in Hong Kong comprises 49 mechanized timber fins that transform the façade into an awning when the food vendor tenant opens for business. **3.** Light enters the Garden Restroom through a translucent façade clad in timber fins. Inside, a curvilinear wall provides privacy. **4.** The F22 Foto Space art gallery features both explicit and subtle nods to photography, including a brass circular stairwell that LAAB painted in black with the expectation that the metal would eventually be revealed as the paint wears off. **5.** Located in the Tsim Sha Tsui neighborhood of Hong Kong, the Salisbury Treescape features clusters of hexagonal forms that create a canopy over the Mass Transit Railway station. **6.** The 309-square-foot Small Home Smart Home, located in Hong Kong's Central District, synchronizes components that can be tucked away or removed based on the needs of the space. **7.** The interactive Colourscape plaza in Hong Kong creates a whimsical landscape, "visually blurring the interface between dream and reality, abstraction and clarity, image and movement," according to the firm.

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# Experience. Innovation.

## Great Lakes Center for the Arts In Harmony with the Local Environment

When the Great Lakes Center for the Arts opened last year in Michigan, the $25 million facility featured state-of-the-art equipment, including digital sound technology that is found in only a few theaters across the country.

Further enhancing the sound quality are acoustical smoke vents manufactured by The BILCO Company. The facility, which is located in Petoskey, includes five smoke vents with both an STC and OITC sound rating that block outside noise to maintain the quality of the sophisticated sound system.

The acoustical vents are commonly used at concert halls, theaters and other venues that require limited noise from the outside. The vents also protect property and aid firefighters in bringing a fire under control by removing smoke, heat and gases from a burning building. The vents allow air quality and visibility to be maintained so that guests can safely exit the building and firefighters can enter.

"With the potential for more than 500 visitors for larger events, our team knew we would have a need for a dependable smoke ventilation system," said Jason Novotny, the lead architect for TowerPinkster, the firm that designed the building. "With this being a high-performing acoustical environment, we designed a separate structure for the performance hall from the remainder of the building. This was solely for acoustical isolation of building elements. The BILCO acoustical smoke vents became a part of this 'shell within a shell' with their acoustical sound reducing characteristics."

The Great Lakes Center for the arts is a 525-seat, 40,000-square-foot facility that is steps away from Little Traverse Bay, an offshoot of Lake Michigan. The Center will host audiences attending performances for classical music, ballet, intellectual dialogue, comedy, country music, jazz, cinema, and more.

Novotny said the architectural team went to great lengths to develop a theme for the space that was highly influenced by local colors and textures. "We included aged copper, Petoskey stone, natural sedimentary rock, and of course, the beautiful blue waters of Lake Michigan," Novotny said. There is also a curvilinear wood ceiling which resembles waves and echoes the flow of the lake. There is also a large rooftop terrace with stunning views of Lake Michigan.

Photo: Brooksie Productions

Top: Smoke vents manufactured by The BILCO Company are engineered with powerful gas spring operators to open covers in snow and wind. Bottom: The Great Lakes Center for the Arts opened last year in Petoskey, Michigan, and will serve as a social and cultural hub for Northern Michigan.

"The color palette and design features intentionally reflect the beauty of Northern Michigan, with blues, sands, grays, copper and patterns and textures that evoke the water of Lake Michigan," said Jill O'Neill, Executive Director of the Center.

Besides the architectural splendor, technical components also distinguish the center. The theater designers, Fisher Dachs Associates and TowerPinkster, identified solutions that make the venue enticing for performers and patrons.

The multi-channel sound reinforcement system includes loudspeakers that meet the requirements of celebrity performers' technical requirements, and electronic architecture that allows acoustics of the venue to be optimized to meet the varied requirements of the wide range of programming.

This building adds a space for world-class performers to stop that did not exist in Northern Michigan," Novotny said. "It adds to the valuation of the performing arts community that was intended by the clients."

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# How to Specify: Impact-Resistant Curtainwalls

TEXT BY LINDSEY M. ROBERTS

A building's performance under attack is of utmost importance. Beyond retaining its structural integrity, it should also protect people from debris and air blast—a challenge made even greater with the prevalence of glazed curtainwalls in the current building stock. "[T]he goal is to protect the interior occupants [and] absorb that shock through the glass, into the [curtainwall] frame, and into the structural [components] of that building," says Andrew Dunlap, AIA, a principal and the building technology studio leader at SmithGroup's Detroit office. Along with the following considerations, specifying an impact-resistant curtainwall requires the design team to validate the system's ability to satisfy the particular parameters and requirements of a project.

Wayne L. Morse U.S. Courthouse, by DLR Group

TIM GRIFFITH

**Predicted Risk**

The architect and engineer should first enlist a blast consultant to establish the design loads based on the project's threat concern, says Jim Larkin, a senior associate at Dallas-based Curtain Wall Design & Consulting. For example, a courthouse at risk of vehicles carrying explosives would have different requirements than a mailroom, where threats might come in via packages. Ultimately, says Jessica Marquardt, AIA, a Seattle-based principal at DLR Group, "designing to a defined threat is key to specifying the right framing system."

**Glazing Thickness**

Thicker glazing is not necessarily better. "You don't want the glass to be so strong that the [entire] load transfers to the aluminum frame," Larkin explains. "The glass should break first."

**Lamination Type**

Laminating glass with polyvinyl butyral (PVB) will help keep shattered pieces together within the window light. Ionoplast is a stiffer option that "usually results in a reduced overall glass build-up thickness" if desired, says John Jackson, AIA, a senior project manager based in the Washington, D.C., office of engineering firm Simpson Gumpertz & Heger. Though PVB is more cost effective, Marquardt notes, ionoplast is "becoming more commonly specified for structural and security applications" due to its higher mechanical properties, which consequently strengthen the laminate.

**Glazing Method**

In dry glazing, a curtainwall system uses an extruded or preformed rubber gasket to limit air and water infiltration at the perimeter. Also called framing, dry glazing clamps the glass edges with a frame and then locks it in with mullions. In wet glazing, sealant is applied over a backer rod or glazing tape at the window light's edges. Dunlap typically specifies wet glazing with structural silicone glazing; in the event of a blast, the silicone will hold the light in its frame, which subsequently holds the broken pieces in the opening even upon impact. Larkin specifies a similar strategy: "You'll essentially glue your glass to the frame."

**Frame Type**

Blast-resistant "curtainwall frames and mullions … are often constructed with either extruded aluminum framing, hot-rolled steel framing, or a combination of aluminum and steel," Jackson says. Aluminum, Larkin says, can be extruded into many shapes and thicknesses, and is popular in factory-assembled or unitized curtainwalls. It is also lighter than steel, less susceptible to corrosion, and less expensive. Steel can resist higher blast loads than aluminum, offers greater fire resistance, and is common for site-assembled curtainwalls.

**Impact Testing**

Physically testing curtainwalls to ensure they can mitigate potential debris is vital. "The testing protocol varies based on risk category, building type, and owner preference," Marquardt says. Several standards exist, including the American Architectural Manufacturers Association's *Publication 510, Voluntary Guide Specification for Blast Hazard Mitigation for Fenestration Systems.*

> *For more information about impact-resistant curtainwall specifications, including additional testing standards, visit bit.ly/ARH2Scw.*

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## ELIGIBILITY

Projects must have a client and a completion date after January 1, 2020. Judging will take place in November 2019. Winners will be notified in December 2019, published in the February 2020 issue of ARCHITECT, and honored at a ceremony in New York. For more information and rules and regulations, visit *paawards.com*.

## RECOGNITION

Winners will be featured in the February 2020 print issue of ARCHITECT with expanded coverage online at *architectmagazine.com.*

## HOW TO ENTER

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(Submission period opens in June 2019)

## DEADLINES

| | |
|---|---|
| **REGULAR** | November 1, 2019 |
| **LATE** | November 8, 2019 |

## FEES

| | |
|---|---|
| **SINGLE ENTRY** | $195 |
| **ADDITIONAL ENTRIES** | $150 |
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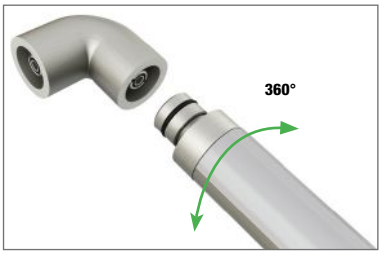


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# Opinion: Yes, People with Disabilities as Architects

TEXT BY KAREN L. BRAITMAYER, FAIA

Several years ago, an undergraduate student approached an academic adviser who worked with the university's architecture department. The student expressed an interest in architecture, but was quickly told he couldn't be an architect because he couldn't use his hands to draw with pencil and paper. He didn't challenge that verdict and left the adviser's office. As a person with a physical disability, he had likely faced similar dismissals before and decided to choose a more welcoming program.

As an architect with a disability, I am at a loss when I hear such stories—especially given the fact that technological advances have made being an architect less about drawing by hand and more about the ability to master computer applications.

I am also at a loss when I review diversity programs supported by architecture organizations and see only ethnicity and gender listed. I am at a loss when I see equity scholarships without mention of disability.

We can't readily point to current architects with disabilities as an example of success either. Why? Because we don't know how many practicing architects with a disability exist or who they are. Diversity data exists on other underrepresented groups, but professional groups within our community have not chosen to ask about our minority representation.

Yes, I have a stake in this issue. But here's my truth: I am passionate about good design. What is good design? Accessible design that allows all users to participate fully in the site experience.

In practice, great design is the product of a diverse team that understands the needs of people of all abilities. Today, a firm wouldn't dream of designing a project that serves the needs of a marginalized community without involving people from that community. Yet firms make decisions every day about inclusive design without the benefit of having professionals with different abilities share their expertise. I have seen outcomes soar with the input of talented people with a unique perspective. Simply complying with accessibility regulations doesn't provide the same level of nuanced design.

It has been almost 30 years since the passage of the Americans with Disabilities Act—the most impactful civil rights law that affects the work of architects—but people with disabilities have yet to be invited to the professional table. When I meet young people who have grown up with a disability, I am often struck by their problem-solving capacity: Years spent finding workarounds for everyday barriers develops creative muscle, and not tapping into this creativity is a loss for all.

It's time we name the real roadblock for students with disabilities considering architecture as a career: academic and professional stereotyping and discrimination, and omission from diversity programs in the industry.

In the name of great design, are we willing to intentionally shift our professional culture to provide significant outreach, accommodation, scholarships, and career support to prospective architects with different abilities?

Within the disability community, we often say, "Nothing about us without us." Those words communicate our desire to be active participants in the decision-making process. Now is the time to challenge our profession on this issue of inclusion. Together, we—AIA components as well as firms, architecture schools, and vocational centers—have the power to make this happen.

It starts with visibility.

As is true of all people historically discouraged from joining a profession for any number of reasons, seeing a person who "looks like you" doing a job can make all the difference. In this case, it might even give students with disabilities "permission" to dream of being an architect.

This is not hard. It's as easy as accepting the challenge of full inclusion, and then following through with outreach, scholarships, and support as if our profession depends on it.

*Karen L. Braitmayer, FAIA, is the founder and managing principal of Studio Pacifica, in Seattle, and winner of AIA's 2019 Whitney M. Young Jr. Award.*

DANIEL SHEEHAN

> *To read more opinion pieces by thought leaders in the design community, visit bit.ly/AROpinion.*

# THE 11th ANNUAL ARCHITECT 50

## Call for entries

### CATEGORIES

The ARCHITECT 50 is different from most rankings, which simply list firms by size or revenue, and instead is based on performance in these three categories:

**BUSINESS**
**SUSTAINABILITY**
**DESIGN**

### RECOGNITION

Winners will be featured in the November 2019 issue of ARCHITECT and online at *architectmagazine.com*. We list the Top 50 firms overall and in each of the three categories.

### ELIGIBILITY

All firms are invited to participate, so long as they have a U.S.-based office. Sole proprietorships are not eligible.

### HOW TO REGISTER

**VISIT AND SUBMIT YOUR INFORMATION**
> *architect50.com*

### DEADLINES

Check the website for an updated schedule. Surveys are expected to be released in early June and will be due at the end of July.

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ARCHITECT

# Residential: ISA

TEXT BY EDWARD KEEGAN, AIA

Brian Phillips, AIA, and Deb Katz, AIA, both principals at Philadelphia-based ISA, have dubbed the firm's recently completed 38-foot-tall single-family residence Tiny Tower. The 1,250-square-foot structure rises from a minuscule 12-foot-by-29-foot site in the city's Brewerytown neighborhood, and sits on a narrow thoroughfare where its neighbors are garages and off-street parking pads.

Philadelphia's grid dates to the late 17th century and includes many of these narrow secondary arteries that are akin in scale to alleys in other cities. But here, the petite streets have a tradition of small "trinity" houses that were built primarily for working-class residents in the 18th and 19th centuries. The classic trinity is two stories, plus a basement, with a single room per floor. Tiny Tower is a trinity on steroids: "We're doing a five-story version," Phillips says. "But it's very much in keeping with some of the old ways of building in the city."

The house has six levels of living space, including its rooftop deck, and received a building permit in an almost effortless 10-day process, since the unusual structure was designed as of right to Philadelphia's zoning codes. Two setbacks were required at the back of the property: The basement and first floor are set back 3 feet and accommodate a sunken garden; the three upper floors are set back an additional 3 feet.

Sinking the basement and first floor served several purposes: Overall building height was capped at 38 feet

Tiny Tower is clad in ATAS metal panels on the front façade, and Hardieplank on the sides.

SAM OBERTER PHOTOGRAPHY

**Project Credits**
*Project:* Tiny Tower, Philadelphia
*Client:* Callahan Ward
*Architect:* ISA, Philadelphia · Brian Phillips, AIA, Deb Katz, AIA (principals); Alex Gauzza, AIA (studio director); Matt Underwood (designer)
*Structural Engineer:* Larsen & Landis Structural Engineers
*M/E/P Engineer:* J+M Engineering
*Stair Fabricator:* En-Motion Design
*Size:* 1,250 square feet
*Cost:* $265,000

> *For materials and sources information, visit bit.ly/TinyTowerISA.*

ARCHITECT INTEL

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# LETTING THE SUNSHINE IN

## Daylighting strategies to enhance occupant performance and comfort as well as manage operational expenses.

**Daylighting is a powerful force.** When a building is properly daylit, occupants feel and perform better. The environment and the building owner's bottom line are healthier, too.

Harnessing this power requires careful design to ensure light is directed where it's needed and the building delivers the right thermal performance to keep occupants comfortable, meet building code requirements, and manage operational expenses.

This article offers tips to strike the right balance.

### BENEFITS OF DAYLIGHTING

Daylighting has climbed on building owners' priority lists, thanks to a growing understanding of its benefits.

"Research shows that, when a building has good daylighting, people perform better," says Richard Braunstein, vice president of research and development for Oldcastle BuildingEnvelope. "Students' test scores improve. Hospital patients go home sooner. Retailers' sales rise. In office settings, productivity increases."

Using daylighting sources can cut the electricity used for daytime lighting in half and reduce total electricity consumption by 13 percent, according to the U.S. Department of Energy. The energy needed for daytime cooling is lowered. And the savings come during daytime hours, when the demand for and cost of energy are highest.

Finally, projects seeking LEED certification can earn up to three EQ (Indoor Environmental Quality) credits.

### A HOLISTIC APPROACH

Daylighting should be discussed at the outset of planning, with the building owner, architects, engineers, and manufacturers all participating, says George Kolano, skylight sales manager for Oldcastle BuildingEnvelope. This enables a holistic approach to planning that encompasses everything from building orientation to how various parts of the building will be used and the daylighting options available. This helps ensure that the resulting design meets agreed-upon daylighting and performance goals while staying on budget and no one says "If only we had …" months later when making changes is time-consuming and costly.

### BUILDING ORIENTATION AND GEOMETRY

"Building orientation and geometry are vital," says Rick Wright, director of technical services for Oldcastle BuildingEnvelope. The building should take advantage of the sun's angles. Natural and built structures—such as overhangs, sunshades, fixed and movable exterior louvers, and silk-screened glass—can be used to limit glare and solar heat gain.

### COMPLEMENTING MOTHER NATURE

The team can then draw from a deep toolbox of products and systems to complement the building's positioning and geometry.

A seemingly limitless array of glasses, ceramic frits, and tints are available. Generally, low-e, high-performance, double-glazed glass provides a sufficient U-factor. Commercial projects are beginning to follow the residential market's use of two low-e coatings in the same double-glazed unit to enhance performance, Wright said.

In southern locales, a darker tint and reflective glass coatings will help manage solar heat gain. In the north, it may be appropriate to use a darker tint on southern exposures to help control summer cooling costs and a lighter tint on northern exposures to balance cooling costs and maximize visible light.

The choice of framing is also essential, Braunstein added. Effective thermal comfort, condensation resistance, and energy efficiency can only be achieved when the glass and framing solutions are in sync.

Reflected daylighting redirects light from one part of a building to another without causing glare or overheating. Options include installing light shelves on the inside of windows and including exterior sunshades or window overhangs with downward-facing reflective surfaces.

### PERFORMANCE MODELING TOOLS

Simulation apps allow architects to test daylighting system designs, helping to ensure that they will perform as expected. The architect enters details of the building's orientation, size, geometry, and glazing features. The app factors in location and weather patterns and predicts the building's daylighting and thermal performance. Any necessary design adjustments can then be made.

Daylighting enhances occupant performance and comfort and reduces energy consumption. Harnessing its power simply requires early planning by the broader design and construction team to tap into the array of solutions available.

Learn more at **https://obe.com/**

**Residential:**
**ISA**

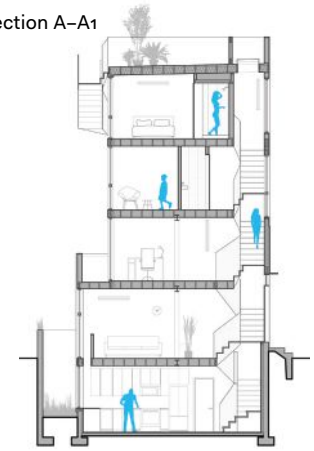
by zoning, so it was easier to fit the five interior floors within the available envelope by going down. The first floor is set three steps below grade, which separates the living room from the street. "And the basement kitchen is very much in the tradition of the trinity house," Phillips adds.

The layout is straightforward, with a single room per floor: The basement has the kitchen; the entry level the living room; the second floor an office; the third floor a bedroom and bath (that can serve as a powder room for guests); the fourth floor the master suite; and the whole structure is topped by a roof deck. How each floor is used can be mixed and matched to a certain extent, depending on the needs of the occupants, as the project was designed as a speculative development.

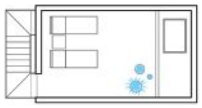
The most difficult programmatic challenge was locating the stair, and in the end, the team decided to put it at the front of the house. "It frees up the space," Phillips says. "Once you're past the stair, you get a complete room" on each floor. The folded plate metal composition is tight against the front wall—and visible, via windows, to the street. Perforated metal baluster panels help distribute natural light throughout the house.

Finishes are simple and bright: Walls and ceilings are clad in white-painted gypsum board, floors are lined with light-stained wood, and windows have metal-clad wood frames. The front and back façades are covered in

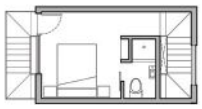
Section A–A1



Roof Plan

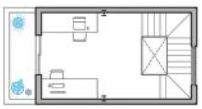


Fourth-Floor Plan

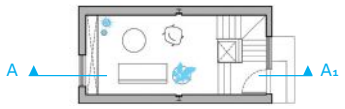


Third-Floor Plan

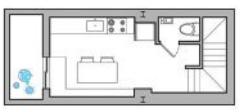
Second-Floor Plan

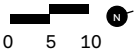


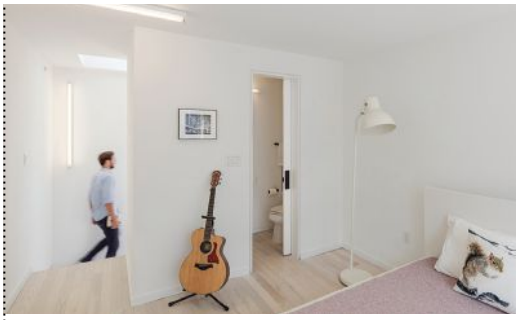
First-Floor Plan




Basement Plan





Fourth-Floor Master Bedroom

Second-Floor Office

First-Floor Living Room

Basement-Level Kitchen

SAM OBERTER PHOTOGRAPHY

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standing-seam metal siding, while the blind party walls—likely to be hidden by adjacent construction in the future—are clad in durable, inexpensive Hardieplank. And while the upper floors of the tower are conventionally wood framed (the basement structure is concrete), the extreme proportions required a structural flourish, which the architects exposed on the interior: a steel moment frame that helps carry the basement and first floors. “It’s like a big stiffener or a big flitch plate,” Phillips says.

Phillips notes that Tiny Tower isn’t necessarily a solution for affordable housing, since building taller does cost more. But similar houses can be “market tempering,” he says. “The difference between an 1,100-square-foot house and a 3,000-square-foot house is real, and the land cost is discounted due to its size.” Tiny Tower is an especially compelling prototype for infill housing and proof that overlooked sites can be opportunities for architectural ambition.



**1.** A custom metal stair by En-Motion Designs connects the floors at the front of the house; perforated metal baluster panels ensure that daylight from the front windows is still able to enter the living spaces. **2.** Gypsum board walls and ceilings in the main entry and throughout are coated in Sherwin-Williams paint, and are complemented by light Bellawood floors.

SAM OBERTER PHOTOGRAPHY

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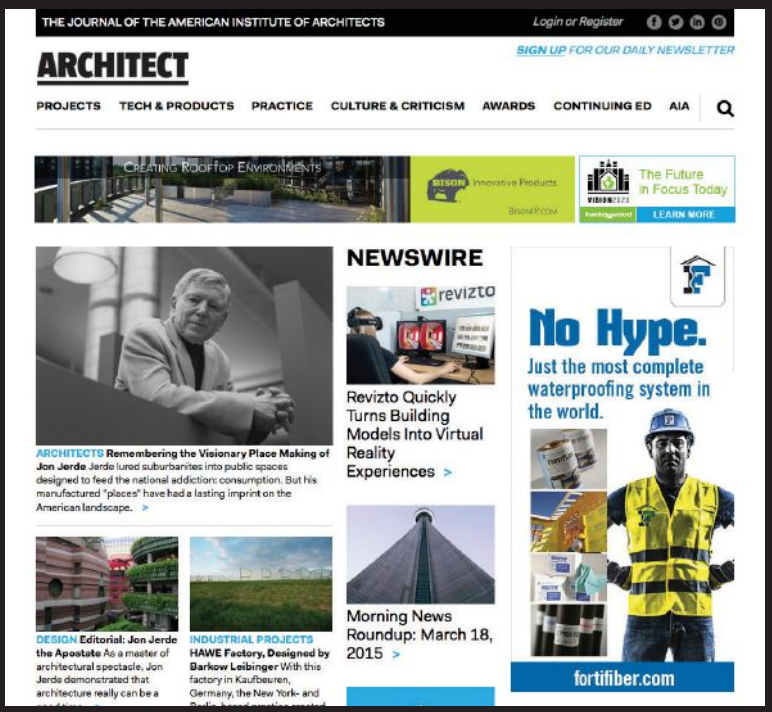


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2018 AWARD WINNER EAST LAWRENCE SUSTAINABLE HOUSE BY STUDIO 804; PHOTO BY COREY GAFFER

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# THE FUTURE OF SUSTAINABILITY AND GREEN DESIGN

## HEALTH, DAYLIGHTING, AND MATERIAL SELECTION

Presented by:

Construction Specialties

Zuckerburg San Francisco General Hospital. Photo Credit: Patrik Argast

### LEARNING OBJECTIVES

1. Analyze the current approach to green design as it relates to the health and well-being of occupants in the built environment.
2. Examine the physiological and psychological benefits of green design principles such as biophilia.
3. Compare and contrast the application of building materials that directly impact the health, safety, and wellness of the occupants.
4. Identify opportunities for building professionals to specify materials that contribute to indoor environmental quality and occupancy comfort.

### CONTINUING EDUCATION

**AIA CREDIT:** 1 LU/HSW

**AIA COURSE NUMBER:** AR072019-3

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### INTRODUCTION

It is well known that people spend more than 90% of their lives indoors, yet information on the ways in which design can impact quality of life and health has only recently begun to receive significant scientific attention. In the late 1990s, some researchers began to link stress levels to architectural dimensions. For instance, Cornell University researchers Gary W. Evans and Janetta Mitchell McCoy note the roles of stimulation, coherence, affordances, control, and restorative qualities in architecture and design and the ways in which they have the potential to increase or decrease stress levels in occupants.

Stimulation, which includes intensity, variety, complexity, mystery, and novelty all contribute to the functionality of a space and those who occupy it. On a basic level, a lack of stimulation can cause boredom, and an excessive amount of stimulation can lead to distraction. Evans and McCoy also claim that coherence, or "the clarity or comprehensibility of building elements," allow people to predict how a space is to be used. Similarly, "affordances" refers to the ways in which elements within a space are to be used. Ambiguity in either coherence or affordances causes occupants stress and can be disorienting or invoke negative reactions.

Control, too, plays a role in the built environment, and Evans and McCoy define it as "mastery or the ability to either alter the physical environment or regulate exposure to one's surroundings. Physical constraints, flexibility, responsiveness, privacy, spatial syntax, defensible space, and certain symbolic elements are key design concepts salient to control." A lack of control over one's environment can likewise lead to stress. For instance, stress can occur if occupants are unable to control the climate or lighting in a space or if occupants have insufficient space in which to perform tasks effectively.

It is equally important to have restorative properties in a space. Rather than contributing to stress, restorative properties can alleviate it. Evans and McCoy maintain that restorative design elements include "retreat, fascination, and exposure to nature." Not only can such features reduce stress, but they can also promote cognitive growth, healing, and well-being.

Despite having reached these conclusions, Evans and McCoy note that at the time of writing, little was known about "the potential role of interior design elements in human health." Their hope was to spark interest and provoke additional research on the topic of the built environment and human health.

## HUMAN WELL-BEING AND THE BUILT ENVIRONMENT

Since the 1990s, much research has been done on buildings and the ways in which they impact the environment. For instance, the green building movement began in the 1990s; however, green building performance has been overwhelmingly based on engineering standards and sustainable design, and the "human factor" has gone largely unresearched until more recent years. While energy savings were a key focus in the 1990s and early 2000s, issues such as daylighting, natural ventilation, and visual focus—all concerns that relate to occupant health and well-being—are currently at the forefront of research. Many researchers, architects, engineers, and designers have now begun to focus on the connection between indoor and outdoor spaces to promote health.

One such system that focuses on health and well-being when monitoring the performance of a building is the WELL Building Standard; it measures what LEED does not, and the two bodies complement one another in striving for sustainability and green building. Rather than assessing a building for its use of resources or the impact on the environment as LEED does, WELL "monitors the features of the built environment that impact human health and well-being through air, water, nourishment, light, fitness, comfort, and mind."[1] Randy Fiser, CEO of the American Society of Interior Designers, states, "WELL fosters a holistic formula for better health and wellness outcomes, leading to improvements in things like employee productivity, engagement, and retention."[2]

While the WELL Standard was only recently launched in 2014, the concept of humans' physiological and psychological need to connect with nature has been in existence since the 1980s. In 1984, sociobiologist Edward O. Wilson coined the term "biophilia," noting the bond between humans and all of nature. His theories have been expanded upon through the decades, and biophilia is now broadly defined as the achievement of the "long-term sustainability of restoring and strengthening the relationship between man and nature."[3] More specifically, the concept encompasses the following design categories: Biophilic Infrastructure, Sensorial Design, Biophilic Setting and Performance, Transportations Connectivity, Work-live-play Integration, and Green Space Place-making. These categories will be discussed in more detail in upcoming sections.

### Biophilic Design

Inherent in each of the categories and in modern interpretations of biophilia is the desire to utilize the human connection with nature to create spaces with greater social, environmental, and economic benefits. In an article for *Environmental Science*, researchers Jana Söderlund and Peter Newman summarize the socio-psychological benefits of biophilic design from decades of scientific studies:

- Improved mental health
- Reduced stress
- Attention restoration
- Increased wellbeing
- Decreased violence and crime
- Faster healing rates in hospitals
- Greater altruistic behavior

In order to achieve the benefits listed above, several biophilic design strategies can be implemented. For instance, green roofs or vertical greenery can literally add life to a façade and improve the aesthetics of a building and its surrounding environment. Additional benefits to incorporating green roofs or vertical greenery include aiding stormwater reduction without impacting areas set aside for public spaces, as well as helping to reduce water pollution. They can also reduce heating and cooling costs. Söderlund and Newman further note that vegetated façades can help reduce urban heat island effect, which can be defined as an urban area that is significantly warmer than surrounding rural areas.

### Economic benefits.

Other economic benefits of biophilic design that go beyond heating and cooling costs include reduced productivity costs in the workplace. Bill Browning, founding partner of Terrapin Bright Green, notes in "The Economics of Biophilia" that "today productivity costs are 112 times greater than energy costs in the workplace," and daylighting schemes in offices can "save over $2000 per employee per year in office costs."[4] Söderlund and Newman further substantiate Browning's claim, pointing to projects that incorporated internal skylights and plants as well as operable windows or windows that provided views of the outdoors. Views of nature can increase production and attention while reducing fatigue. In New York City alone, Browning notes that increases in productivity due to biophilic design can potentially contribute as much as $470 million in economic benefits.[5]

### Healing benefits.

In hospitals, by applying similar biophilic principles, employee productivity can likewise increase, and absenteeism is decreased. Söderlund and Newman claim, "Direct

> "Indeed, building and nature integration establishes a paradigm in the pattern of green building design, which performs as compensations for the loss of green space during urban development."
>
> Fei Xue et al.
> *Environmental Impact Assessment Review*

### GLOSSARY

**Affordances in Interior Design Elements**—ambiguity, sudden perpetual changes, perceptual cue conflict, feedback

**Circadian Rhythm**—twenty-four-hour cycle that determines when to perform certain tasks such as waking up, eating, and sleeping

**Coherence in Interior Design Elements**—legibility, organization, thematic structure, predictability, landmark, signage, pathway configuration, distinctiveness, floorplan complexity, circulation alignment, exterior vistas

**Control in Interior Design Elements**—crowding, boundaries, climactic and light controls, spatial hierarchy, territoriality, symbolism, flexibility, responsiveness, privacy, depth, interconnectedness, functional distances, focal point, sociofugal furniture arrangement

**Daylighting**—illumination of buildings by natural light

**Indoor Environmental Quality (IEQ)**—the quality of a building's environment in relation to the health and well-being of those who occupy the space within it. IEQ is determined by many factors, including lighting, air quality, and damp conditions

**Performance**—in biophilic design, what people can achieve with the least effort

**Restorative Qualities in Interior Design**—minimal distraction, stimulus shelter, fascination, solitude

**Stimulation in Interior Design Elements**—intensity, complexity, mystery, novelty, noise, light, odor, color, crowding, visual exposure, proximity to circulation, adjacencies

**Urban Heat Island Effect**—an urban area that is significantly warmer than surrounding rural areas

healthcare cost benefits can be calculated utilizing research regarding healing rates, anesthesia usage, and psychological benefits gained from the incorporation of biophilic design in healthcare facilities." Specifically, increased daylight and views of nature in patient rooms can reduce depression and pain while increasing the speed at which patients heal. Browning concludes that by reducing the length of a hospital stay by as little as 0.41 days through the use of daylighting and views of nature, hospital costs would be reduced by as much as $93 million in the US.

**Retail benefits.**

In retail spaces as in offices and hospitals, biophilic design can have a positive influence on well-being and economics. For instance, if a shop is located on a street with vegetation, it has been found that customers are willing to spend 25% more and travel further along the street. Inside a store that has incorporated greenery, employees and shoppers alike feel less stressed; employees are also more likely to offer better customer service, and customers are more likely to have a positive experience.

Overall, by incorporating nature, natural elements, or even patterns that mimic nature into design, the potential of spaces to enhance health and well-being significantly increases.

## DAYLIGHTING

One of the most powerful components of biophilic design is daylighting. At a basic level, daylighting adds to visibility. However, it can also help to regulate circadian rhythm as well as body systems and moods. With the right fenestration systems, daylighting can further increase ventilation and contribute to energy savings. In schools, daylighting can lead to higher test scores and has the potential to increase attention and decrease stress.

The selection criteria for effective daylighting strategies in any environment includes the following:

- Uniform light distribution
- Low glare
- Reduced energy costs
- Cost-effectiveness
- Safety/security concerns
- Low maintenance

These criteria should be applied when determining view windows, high sidelights with light shelves, wall wash toplighting, central and patterned toplighting, linear toplighting, and tubular skylights. It is important to keep in mind that lighting systems should be used in conjunction with one another in order to produce the best results.

**Sidelighting.**

Sidelighting permits daylight to enter a space through windows in vertical walls. Uniform lighting and glare are difficult to provide with this type of daylighting; however, design strategies can be utilized to minimize these effects. For instance, separate windows can be used for functionality, or to provide daylight at higher levels, and lower windows can be used to provide views.

Shading strategies, such as employing the use of opaque, translucent, solid, or louvered shading devices, can help to control glare and provide more uniform daylight. Climate and position of windows should be taken into consideration when planning for shading devices. Interior shading options, such as blinds, shade screens, and curtains are not necessarily as effective at minimizing solar heat gain as exterior shading devices; however, they are effective at controlling glare. In general, as opposed to blinds or louvers that are left completely open or closed, shading systems that offer changeable settings for different times of the day and year are most effective.

**Toplighting.**

Toplighting refers to windows in the ceiling plane and can only be used in single-story buildings or on the top floor of a multi-story building. Despite these limitations, toplighting provides for more even illumination and glare control. It allows for sunlight to be diffused through smaller windows and spread over a larger area. Horizontal and vertical glazing are both part of toplighting designs, and both receive different levels of sunlight depending upon the time of year and the direction the windows are facing.

To maximize the benefits of toplighting, openings should illuminate important vertical surfaces, and care should be taken not to cause feature walls to be shadowed. Spacing should also be taken into consideration when planning for skylights, as well as the potential location of HVAC and lighting systems.

While there are some louvered options to control the diffusion of light and reduce solar gain in toplighting systems, *CHPS Best Practices Manual* notes that a properly designed light well requires less maintenance and offers more control.

**Daylighting Principles**

For any application, basic daylighting principles should also be applied. According to *CHPS Best Practices Manual*, basic daylighting principles include adherence to the following directives:

> "Well-being is made tangible through the workspace—this isn't simply about work environments with better ergonomics or more comfort. We believe that a workspace can be a place where people actually leave healthier than when they arrive in the morning."
>
> Nancy Hickey
> Steelcase, Senior Vice President and Chief Administrative Officer

Moffett Towers; Custom Horizontal Sunshades mounted directly to the curtain call

- Prevent direct sunlight penetration into space
- Provide gentle, uniform light throughout space
- Avoid creating sources of glare
- Allow occupants to control the daylight with operable louvers or blinds
- Design the electric lighting system to complement the daylighting design and encourage maximum energy usage through the use of lighting controls
- Plan the layout of interior spaces to take advantage of daylight conditions

**Preventing direct sunlight penetration.**

Solar orientation, climate conditions, and shading systems should all be understood and utilized to provide the best daylighting. For example, direct sunlight is often too hot and creates too much glare to be desirable in interior settings. Daylighting, on the other hand, is when sunlight is diffused or reflected to create better illumination and to have less of an impact on the thermal activity within a space.

The first step in good daylighting considerations is the orientation of the building so that it allows for maximum daylight and minimal solar gains. When planning for windows, internal and external shading systems for sidelighting should be employed, and reflection strategies and glazing should be used for toplighting.

**This article continues on http://go.hw.net/AR072019-3. Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.**

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## QUIZ

1. People spend more than _____ of their lives indoors.
   a. 60%
   b. 77%
   c. 90%
   d. 95%

2. What contributes to the functionality of a space?
   a. Stimulation
   b. Intensity and variety
   c. Complexity, mystery, and novelty
   d. All of the above

3. The WELL Standard was launched in _____.
   a. 1990
   b. 2003
   c. 2014
   d. 2019

4. The socio-psychological benefits of biophilic design include which of the following?
   a. Improved mental health, reduced stress, and attention restoration
   b. Increased well-being
   c. Decreased violence and crime, faster healing rates in hospitals, and greater altruistic behavior
   d. All of the above

5. Daylighting schemes in offices can save over _____ per employee per year in office costs.
   a. $2,000
   b. $1,500
   c. $1,000
   d. $500

6. In the retail environment, biophilic design can encourage customers to spend up to ____ more.
   a. 15%
   b. 25%
   c. 30%
   d. 50%

7. Daylighting can do which of the following?
   a. Add to visibility
   b. Regulate circadian rhythm, body systems, and moods
   c. Increase ventilation and energy savings
   d. All of the above

8. "Sidelighting" can be described as
   a. Permitting daylight to enter a space through windows in vertical walls
   b. Referring to windows in the ceiling plane and can only be used in single-story buildings or on the top floor of a multi-story building
   c. The same principle as linear toplighting
   d. All of the Above

9. Sun shades have the potential to do which of the following?
   a. Permit designs to take on intricate patterns, sleek textures, vivid colors
   b. Incorporate LED lighting
   c. Contribute to the earning of LEED credits
   d. All of the above

10. The sun shades used in the Zuckerberg San Francisco General Hospital and Trauma Center helped contribute to an overall energy reduction of _____ for the new hospital.
    a. 20%
    b. 21%
    c. 22%
    d. 23%

# SPECIFYING FLUID-APPLIED COATINGS IN ROOFING PROJECT DESIGN

Presented by:

Photo courtesy of Neogard, a part of the Hempel group

## LEARNING OBJECTIVES

1. Analyze the various types of fluid-applied roof coatings as applicable to project and surface application needs.
2. Compare and contrast the advantages and applications of fluid-applied roof coatings.
3. Identify appropriate substrates and surface preparation techniques specific to fluid-applied roofing coatings.
4. Investigate how reflective roofing applications can be achieved with specifying fluid-applied roof coatings.

## CONTINUING EDUCATION

**AIA CREDIT:** 1 LU/ELECTIVE
**AIA COURSE NUMBER:** AR072019-4

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## INTRODUCTION TO FLUID-APPLIED ROOF COATINGS*

Though there are many different types of liquid roofing products on the market, this course is going to focus on those products that qualify as a roof coating. It is important to note that a liquid-applied roofing membrane or coating can itself be the exterior weathering surface, or it may be coated with another UV and weather stable layer.

The National Roofing Contractors Association (NRCA) draws a distinction between what is considered a coating and a liquid-applied roof membrane. According to *The NRCA Roofing Manual: Membrane Roof Systems—2019*:

*Liquid-applied roof membranes are constructed in place from a liquid resin and reinforcing material. The liquid resin is available as a one- or two-component product and is typically applied in two coats. Depending on resin chemistry, a catalyst or hardener may be added to induce the curing process. In most instances, a primer is required. Liquid-applied roof membranes are typically reinforced with polyester fleece or fiberglass mat that is set into the resin base coat. The reinforcing material provides the membrane's crack-bridging ability and much of its mechanical strength. Liquid-applied roof membranes may be surfaced with aggregate (e.g., sand, mineral, ceramic granules), coatings, or sealers. The liquid material cures to form a monolithic weatherproof membrane. Single-component resin eliminates the need for combining products at the job site. Two component materials require proper mixing at the job site and have a limited pot life after mixing.*

*The NRCA Roofing Manual also says: Liquid-applied roof membranes are more widely known to be used as waterproofing systems but have gained in popularity as roof systems, especially in reroofing situations. However, if a liquid-applied roof membrane does not have reinforcement, it typically is considered a coating system. A reinforced liquid-applied roof membrane is considered by NRCA to be a roof system.*

Therefore, a one or two coat liquid-applied roof membrane and a roof membrane with a weatherable topcoat can both be considered a roof system. A liquid roofing product with reinforcement such as fleece or other geotextile material is considered a membrane; if there is no reinforcement it is considered a coating. While reinforcement can be important to a roof system, it is worthwhile to consider the physical properties of liquid-applied roof coatings with and without reinforcement, as the physical properties can help determine what products are best suited to a specific application.

* The terms liquid-applied and fluid-applied roof coatings are often used interchangeably.

If there are multiple penetrations in a roof a fluid-applied coating can be a great choice, as the product is easily applied around the penetrations to form a seamless monolithic waterproofing barrier. Photo courtesy of Neogard, a part of the Hempel group

This image demonstrates one method of preparing a metal roof substrate prior to the application of a roof coating system. Photo courtesy of Neogard, a part of the Hempel group

### Benefits of Fluid-Applied Roof Coatings

Fluid-applied roof coatings can be applied as a new roof system on a new roof deck or in a maintenance situation as a re-roofing system over an existing deck. They have many benefits, but they are most commonly used to prolong the life of an existing roofing system whether it is an EPDM or TPO sheet membrane or another fluid-applied roofing system.

These systems contribute to the sustainability of the building structure by extending the life of the existing roof surface and preventing unnecessary roof tear off's, which contribute a great deal of waste to landfills. If properly maintained the membrane may never need to be torn off. Instead, a renewable coating can be reapplied every 5 to 15 years.

In addition, reflective coatings are often applied over darker colored or aged reflective existing roofs to help reduce energy costs. Fluid-applied coatings provide a seamless, monolithic surface that is fully adhered so that water cannot migrate beneath the surface. These coatings are lightweight, often less than 1/3 pounds per square foot, are self-flashing, and may qualify for immediate tax advantages based on prevailing tax code in your region related to energy saving building upgrades.

### Potential Substrates

When choosing a liquid-applied coating for your project, it is important to consider the existing substrate. Liquid-applied coatings can be installed over virtually any type of surface, from thermoplastic single-ply membranes such as PVC or thermoplastic polyolefin (TPO), to thermoset single-ply membranes such as ethylene propylene diene terpolymer (EPDM), or chlorosulfonated polyethylene (CSPE-Hypalon). They can also be installed over metal, concrete, built-up roof (BUR), modified bitumen (MB), or spray polyurethane foam (SPF).

## SURFACE PREPARATION FOR SUCCESSFUL APPLICATION

While fluid-applied coatings can be applied over almost any substrate, it is important to note that surface preparation is critical for their success and longevity. Fluid-applied coatings are not to be installed over failed or failing roofs. Deficiencies such as blisters, wrinkles, and ponded water conditions must be repaired, as a clean, dry, sound, and secure

## GLOSSARY

**LIQUID-APPLIED ROOF MEMBRANE**
Constructed in place from a liquid resin and reinforcing material; a reinforced liquid-applied roof membrane is considered by NRCA to be a roof system.

**INFRA-RED (IR) ROOF SCAN**
Can help to determine if the roof is a good candidate for a fluid-applied coating, as they can identify problems that are not readily visible to the naked eye. Wet and/or damaged areas identified by an IR scan or core cuts must be removed and replaced with like insulation and coating.

**AROMATIC HARDENER**
Reactive component of a two component coating system with an amber to brown color. An aromatic hardener reacts with the resin side to produce a coating film that is not light stable and will yellow over time when exposed to sunlight or ambient light sources.

**ALIPHATIC HARDENER**
Reactive component of a two component coating system that is water-clear. An aliphatic hardener reacts with the resin side to produce a coating film that is very light stable and will not yellow over time when exposed to sunlight or ambient light sources.

**ONE-COMPONENT (1K) COATING**
Primarily moisture cured coating, meaning they react with atmospheric water in the form of humidity to form a polyurethane/polyurea coating. They have medium-to-high solids, can be aromatic or aliphatic, and are often used as a vapor retarder or breathable membrane depending on the specific formulation.

**TWO-COMPONENT (2K) COATING**
Mixture of resin and hardener, which react with each other and then cure. The cure is standard to fast and therefore requires care in mixing due to their limited pot life. Two-component polyurethanes have high tensile strength and resist mechanical damage. They can be either aromatic or aliphatic.

**MOISTURE CURE COATING**
Made in the coating supplier's facility by combining the two polyurethane components—a resin blend and an aromatic or aliphatic hardener—under controlled conditions in a reaction vessel. They are a relatively new class of coatings compared to other technologies and represent a significant step up in long-term durability, weatherability, and waterproofing.

**DRY FILM THICKNESS (DFT)**
Thickness of a coating as measured above the substrate after the coating dries. Thickness of a coating depends on the application and type of process employed. The dry film thickness can determine the longevity of the roof, as more mils equate to a longer life expectancy.

**COOL COLORED ROOFING**
Conventional roofing materials produced in pigments that have a high solar reflectivity and are minimally heated by the sun.

**ABLATIVE**
Aromatic polyurethane based roof coatings are ablative as they weather in the sun, which is claimed to be beneficial because the IR absorbing dirt that builds up on the surface can wash off when it rains, therefore keeping the roof lighter in color and more reflective.

surface is required prior to the installation of a fluid-applied coating.

An infra-red (IR) roof scan or core cuts can help to determine if the roof is a good candidate for a fluid-applied coating, as they can identify problems that are not readily visible to the naked eye. Wet and/or damaged areas identified by an IR scan or core cuts must be removed and replaced with like insulation and coating. Each substrate should be washed with a bio-degradable detergent and appropriate power washing or scrubbing equipment. Be sure to consult the manufacturer of the sheet goods to determine how long you should wait to install a fluid-applied coating over new sheet goods.

### Priming Substrates

While priming is not required on all surfaces, it can be a critical component to a successful fluid-applied coating installation. Primers are often used to enhance adhesion between the fluid applied coating and the substrate, as well as bind small amounts of dirt, seal porous substrates, and inhibit corrosion of metal substrates. Finally, primers are used to darken substrates to reduce small amounts of residual moisture, as the darker surface will absorb more heat and dry faster. Be sure to consult the manufacturer to determine whether or not a primer is required.

The surface must be exceedingly clean, and seams and penetrations must be properly prepared. Photo courtesy of Neogard, a part of the Hempel group

### Seam Treatment

For granulated cap sheets and some single-ply membranes, it is good practice, and sometimes even required, to pre-treat the seams with a layer of base coat and a reinforcement fabric before the liquid-applied system is installed. An additional flood coat may also be required to encapsulate the granules on the roof before building the liquid-applied system.

This was an old roof in need of resealing at Ft. Carson in Colorado. Photo courtesy of Neogard, a part of the Hempel group

Self-adhered flashing tapes may also be used for detailing penetrations and seams. Whether to use a self-adhered tape or extra base coat and reinforcement is typically the contractor's choice.

## SYSTEM SELECTION CRITERIA

System selection criteria is probably the most important discussion for a specifier, as there are many different types of liquid-applied roof coatings and choosing the right product for a project deserves careful consideration to avoid problems or premature failures. The liquid-applied coatings that we will cover here include aluminum, acrylic, asphalt emulsion, polyurea, silicone, SEBS, and polyurethane.

### Aluminum Coatings

Aluminum roof coatings are typically formulated with asphalt, aluminum paste, moisture scavenger, fillers, hydrocarbon solvents, and in some cases, fibers. The overall quality of aluminum roof coatings can be judged by the total quantity of leafing aluminum pigment content per gallon. While aluminum roof coatings are relatively easy to install and provide good sun protection to the existing roof membrane, they come with very limited warranties, no real waterproofing capacity, minimal solar reflectance, and must be regularly maintained every two to three years in order to function properly.

### Acrylic Coatings

Acrylic coating systems are based on acrylic resin and are generally a latex-based system that cures by air drying. Acrylic coatings are amongst the easiest to apply. They are low odor, low cost, and have excellent color retention, as well as UV and weather resistance with very good initial solar reflectance.

Multiple coats can be applied on hot days, but on the down side, they should not be applied below 50 degrees Fahrenheit or if rain or dew are imminent. Acrylic coating systems have low tensile strength and are not appropriate for high traffic areas or where ponding water is a problem. They are also not chemical resistant, cannot be applied in heavy mils, and have extended cross-linking time. However, when used appropriately, acrylics can greatly enhance the appearance of a roof.

### Asphalt Emulsion

According to the *Handbook of Accepted Roofing Knowledge (HARK) Manual*, asphalt emulsion is, "A mixture of asphalt particles and an emulsifying agent such as bentonite clay and water. These components are combined by using a chemical or clay emulsifying agent and mixing or blending machinery."

Emulsions are user friendly and provide good water resistance. However, they are also temperature dependent, cannot resist the high movement of modern buildings, have somewhat of an odor and require protection and reinforcement for superior longevity. They are also dark in color so they will cause the roof to heat up when exposed to sunshine.

### Polyurea Snap Cure Systems

Polyurea coatings are either solvent based or 100% solids, depending on the formulation, are typically two-component, and cure to form films with limited elongation and high tensile strength.

Polyurea coatings can be applied in heavier single passes up to 40 mils thick and can be applied to vertical surfaces with significant film build. Spray-applied base and top coats can be applied the same day, providing quick return to service with very durable physical properties and low VOCs. These coatings can be rained on or walked on often within minutes of application.

However, polyureas can have adhesion issues and suffer significant loss of physical properties over time due to UV degradation. Plural component equipment is very expensive and a good application is heavily dependent on the applicator, more than with other fluid-applied coatings. There is potential for an off-ratio mix if the equipment experiences issues, and there is significant overspray risk.

### Silicone Inorganic Coatings

Silicone is an inorganic coating derived from silicone polymer that is available in single or plural components. Silicone inorganic coatings

have high moisture vapor permeability and are classified as breathable coatings.

Silicones provide excellent weathering ability and UV resistance and retain their physical properties well. The biggest issue with silicone is compatibility with other coatings, as it will only stick to silicone and is therefore not a good candidate for re-coats. Granules may be added for abrasion resistance, mechanical activity, and aesthetics. Silicones have good initial solar reflectance, but due to their surface tackiness can pick up dirt from the atmosphere relatively quickly and lose reflectance.

### Styrene Ethylbutylene Styrene (SEBS)

Styrene ethylbutylene styrene (SEBS) is a single component elastomeric coating made from rubber polymer that cures when the solvent evaporates and leaves a rubber film. They offer excellent adhesion, high elongation at 600 to 800 percent, and are good in ponding water conditions. SEBS may be applied on a variety of substrates, but primer is only required on modified bituminous and BUR roofs.

SEBS are limited by low solids content in the 50 to 60 percent solids range, meaning they have a high concentration of solvents, which is required to reduce viscosity to a workable level. Additionally, they have a strong odor, high cost, and are difficult to apply in low temperatures or high humidity.

## POLYURETHANE COATINGS OVERVIEW

During the late 1930's, Otto Bayer pioneered the chemistry of polyisocyanates, a technology that led to the advent of polyurethanes for a variety of applications. Due to their ability to vary physical properties such as hardness, elongation, abrasion resistance, and modulus, polyurethanes are widely used in a variety of materials. These include foams for building insulation and seating, adhesives for construction and specialty applications, textile fibers for clothing and consumer products, thermoplastics for automotive and general industrial parts, and coatings for a variety of substrates and applications. Polyurethane coatings used in the building, infrastructure, and architectural markets, which we are discussing here, fall under this category.

**This article continues on http://go.hw.net/AR072019-4.**
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## QUIZ

1. A liquid roofing product with reinforcement, such as fleece or other geotextile material is considered a _____; if there is no reinforcement, it is considered a _____.
   a. Membrane, coating
   b. Coating system, membrane
   c. Roof system, coating
   d. Coating system, roof system

2. Which of the following is a benefit of fluid-applied roof coatings?
   a. Prolongs life of existing roof
   b. Reduces energy costs
   c. Lightweight
   d. Seamless, monolithic surface that is fully adhered
   e. All of the above

3. Which liquid applied coatings have high moisture vapor permeability and are classified as breathable coatings?
   a. Acrylic
   b. Asphalt emulsion
   c. Polyurea snap cure system
   d. Silicone inorganic

4. _____ polyurethanes are moisture cured and offer longer working life, while _____ products have a standard-to-fast cure time, limiting the window of opportunity when installing.
   a. Aliphatic, Aromatic
   b. Plural component, single component
   c. Aromatic, Aliphatic
   d. Single component, plural component

5. The solids content of polyurethane coatings is typically _____.
   a. Ultra-low to low
   b. Low to medium
   c. Medium to high
   d. High to ultra-high

6. Which of the following are used in traditional coatings to compensate for viscosity, flow, and curing?
   a. Catalysts
   b. Solvents
   c. Solids
   d. Flow and leveling agents

7. The long-term elastomeric properties of polyurethane based roof coatings are achieved by the use of _____ that do not leach out over time.
   a. Solvents
   b. Reactive resin components
   c. Hardeners
   d. Aromatics

8. Highly reflective colored roofs typically have an initial solar reflectance of _____, compared with around 0.10 for conventional dark steep-sloped roofs.
   a. 0.10 to 0.25
   b. 0.30 to 0.35
   c. 0.30 to 0.55
   d. 0.50 to 0.65

9. A single component elastomeric coating made from rubber polymer that cures when the solvent evaporates and leaves a rubber film is called:
   a. Acrylic
   b. Asphalt
   c. Styrene Ethylbutylene Styrene
   d. Silicone

10. What is a benefit of reflecting heat-generating infrared (IR) wavelengths of sunlight off a roof surface?
    a. Reduces the building cooling system energy load
    b. Lessens the expansion and contraction of the roof components and infrastructure, extending the life of the roof and reducing future leakage points
    c. Both A and B
    d. None of the above

## SPONSOR INFORMATION

# DESIGNING BUILDING SPACES THAT INTEGRATE BUILDING DESIGN AND THE OUTDOORS WITH OVERSIZED FENESTRATION PRODUCTS

Presented by:
WEATHER SHIELD. WINDOWS & DOORS

Shown here is a multi-slide door, which slides entirely out of the way for a closer, easier connection with the outdoors.

## LEARNING OBJECTIVES

1. Examine modern building design practices that encourage the integration of the outdoor elements that improve the well-being of occupants when specifying oversized windows and doors.
2. Explore oversized window and door products that enhance the integration of building design with the benefits of outdoor living.
3. Identify design considerations that building design professionals will use to incorporate building design with occupancy comfort and well-being.
4. Explore installation considerations and testing requirements necessary to protect occupants when specifying oversized windows and doors.

## CONTINUING EDUCATION

**AIA CREDIT:** 1 LU/HSW

**AIA COURSE NUMBER:** AR072019-2

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/AR072019-2 to view the entire CEU and complete the quiz. CEU courses are free of charge once you create a new learner account; returning users log in as usual.

## INTRODUCTION

Finding ways to bring the outdoors inside is a modern building design trend that continues to influence the specification process. Consumers' desire to blend nature with the built environment incorporates a desire to increase the amount of natural lighting and nature inside the home or commercial space. Research continues to evolve demonstrating the need for nature to be incorporated in the built environment, not simply as a luxury, but as an investment in health and productivity.[1] Mounting pressure for building and design professionals to not only meet LEED standards and current codes, but exceed them, continues to leverage the need for sustainability, green building manufacturing, and products that address the needs and wants of the consumer. Up until recently, it can be said that only luxury markets could afford the type of oversized windows and doors that permit the most amount of sunlight due to intricate design, complicated installation, and maintenance of oversized windows and doors. However, new products on the market are making this design and lifestyle trend more accessible and with more choices than ever.

## CONSUMER DEMAND FOR SHARED SPACE

Living away from nature is not what evolution intended for humankind; yet, as more people move to cities and urban sprawl takes over, that is exactly what is happening. These environments offer a more convenient, connected lifestyle, but the tradeoff can carry a heavy price. Limited access to the outdoors is associated with decreased mood, cognition, and health.[2] While most people agree that access to technology has more positive effects than negative, studies estimate that the negatives will outweigh the positives in as little as a decade.[3]

In recent years, society has evolved to be more isolated, disconnected, and dependent on digital interference.[4] Attention spans are down. Mental health is declining. Social skills are failing. More than two-thirds of people already live in urban environments where access to the outdoors is limited. Simply living in the city has been shown to cause higher rates of anxiety, boredom, mood disorders, sleep disturbances, and weakened immune systems. Being around boring or sterile environments like tall buildings, without access to nature, can even bring on socially induced ADHD.[5]

Humans are wired with the drive to experience the outdoors and be connected with nature. Before the industrial revolution, daylight was the primary and most useful source of light. People worked outdoors in a variety of job occupations, spending time inside typically involved the need to eat or sleep. However, that

Shown here is a floor to ceiling direct-glazed window providing unlimited access to sunlight and the outdoors.

all changed around 1800, when city factories attracted countryside dwellers. The typical workday then consisted of long working hours, air pollution, crowded tenements, and sunlight deprivation, which by itself led to a rise in physical ailments from Vitamin D deficiencies.

### The Importance of Sunlight and Access to the Outdoors

Since then, buildings have modernized and the overall population has put health and wellness at the forefront of legislative and building design priorities. New zoning laws and technology advancements have made buildings more energy efficient with a lower carbon footprint. Green or sustainable building design balances the need for energy efficiency and high-quality interior spaces. Traditional building design focuses on specifying products that provide occupants with more access to natural lighting. This concept of daylighting, or introducing ambient exterior light to a buildings' interior, has been proven to enhance the quality or enjoyment of interior spaces. Daylighting was the first step in recognizing the direct benefits of sunlight and blending the living outdoors with inanimate structures.

Some countries, like Finland, encourage citizens to get a minimum number of hours outside each month to prevent depression. Japan has medicalized many of its forests with walking trails designed to be therapeutic. Singapore requires all new skyscrapers to incorporate greenery into and onto the building itself to support a healthier, more active mental state when people are outside and engaging with nature.[6] Being outdoors activates most of the senses, like sight, sound, and touch, and encourages relaxation. On the contrary, being indoors dulls the mind—literally.

### Biophilia as a Design Standard

Stephen R. Kellert, professor emeritus, Yale University, and 2018 Biophilic Design Award winner, coined the term, "biophilic design," as a response to the growing needs in building design and the increasing lack of interaction with nature. Biophilic design addresses the need to create a relationship with nature within the design process. Beyond simply specifying design for health, safety and energy efficiency, biophilic design encourages building design professionals to think of design as an incorporation of six elements: environmental features, natural shapes and forms, natural patterns and processes, light and space, place-based relationships, and evolved human relationships to nature.[7]

The challenge is balancing the need to be connected to nature with the fast-paced, modern world in which we live. Enter the need for building design professionals to specify products to enhance occupancy comfort through nature. Buildings that provide easy outside access through windows and doors have a dual benefit: sleek, minimalistic designs increase the visual aesthetic for building occupants and owners and merging indoors with nature has a positive effect on occupants' health and wellbeing. When people can reconnect with nature, generally moods are more positive, the overall well-being is improved, people are more kind, and stress decreases.

## GLOSSARY

**Bi-Fold Door:** A folding door system made up of multiple door panels that fold along a central track like an accordion

**Biophilic Design:** A concept used within the building industry to increase occupant connectivity to the natural environment using natural materials, natural light, vegetation, nature views and other experiences of the natural world

**Direct-Set:** A sash-less window that does not open and features the glass glazed directly into the window frame

**Fenestration:** Design, construction, or presence of openings in a building, most notably the doors and windows

**Frame:** The surrounding outside portion of a window or door composed of the head at the top, the side jambs and the sill at the bottom

**Glazing:** The glass portion of a window or door; also refers to the actual process of installing the glass in a sash, frame or door panel

**Grilles:** Decorative pattern on a window or door consisting of horizontal and/or vertical bars that divide the larger sheet of glass into smaller panes; Grille types include simulated divided lites (SDL), true divided lites (TDL), grilles in the airspace (GIA), and wood removable grilles

**Hardware:** Locks, crank handles and hinges on windows and doors used to operate and secure them

**LEED:** Leadership in Energy and Environmental Design, is the most widely used green building rating system in the world. Available for virtually all building, community and home project types, LEED provides a framework to create healthy, highly efficient and cost-saving green buildings

**Low E:** Meaning low "emissivity"; "Emissivity" is a property that is unique to materials such as glass, which light can freely pass through; "low" describes the filtering out of the part of the light spectrum that transmits heat

**Multi-Slide Door:** A sliding door system made up of multiple panels rolling on a sill track and guided by a track in the head to create wide, uninterrupted views

**Sill:** Horizontal piece forming the bottom of the frame on a window or door

**Stacked:** When two or more window units are joined vertically

### Shared Space Movement

The shared space movement is a design trend borrowed from residential street design. The goal is to minimize the separation between spaces. The movement originated in Europe as a means to reduce traffic congestion on streets. In the Netherlands, where the shared space movement began, they referred to traffic as a guest, and the layout of streets should serve primarily a residential function—not motor

Shown here is a picture of Knock Knolls Nature Center in Naperville, Illinois—a space where occupants experience comfort, relaxation, and a nature in one space.

vehicle traffic. The UK defined shared space as a street design approach to reduce the dominance of vehicles.[8]

In building design, shared space aims to achieve a closer relationship between the built environment and the natural environment. The simple act of opening a door or window to let in sunlight or step outside is a key element in building design because of the clear link between nature and improved health. Building design professionals now must prioritize the integration of the built environment with the world outside.

## INTEGRATING BUILDING DESIGN AND THE OUTDOORS

One solution to integrating building design with the outdoors is more access to daylight through oversized fenestration products. An example is a large expanse of floor-to-ceiling glass with sliding panels that integrate the outdoors with the interior space. Other examples are clean lines and open floor plans that connect the inside of a building to the outside. More specifically, shared space in building design features windows and doors with narrow profiles, minimalistic design, and large expanses of glass for maximum viewing area.

The challenge has been achieving these views with large expanses of glass without sacrificing performance. Different styles of oversized fenestration products on the market today meet consumers' demands for minimalistic, integrated design with the building industry's requirements for energy efficiency, performance, and durability.

### Oversized Direct Set Windows

Contemporary window and door design continue to evolve with simple lines and more exposed glass. Unlike traditional windows that open or slide, direct set windows are meant to maximize views and lighting. The sash-less window that does not open and glazing set directly into the window frame are trademarked features of the product.

Oversized direct set windows can be floor-to-ceiling and have expanded from 60 to 70 square feet to allow for panoramic views. Direct glaze rectangular frames provide the larger, unobstructed views notable with these types of fenestration products. Curtain wall glazing systems are another solution to integrating indoors and outdoors. Drawing upon inspiration from commercial builds, an entire wall can be made into a seamless window.

### 90-Degree Corner Windows

Another option to increase natural lighting is to utilize unexpected elements, like corners.

## CASE STUDY

**Knoch Knolls Nature Center, Naperville, IL**

Located on a 224-acre natural site, at the convergence of the east and west branches of the DuPage River, is the 6,300-square-foot Knoch Knolls Nature Center. Developed as a home base for nature exploration and a model of sustainability, the design and construction teams, along with the client, Naperville Park District, were interested in trying innovative ways to conserve water and energy in the building and worked together to problem-solve any issues. The result is a beautiful building for the community that brings people closer to the natural environment.

As a nature center meant to enliven visitors' sense of wonder about the natural world and provide connection to local ecosystems, including the river and its culture heritage, the building was designed around the primary theme of 'celebrating water.'

A butterfly-shaped roof over the west end of the building gives artistic expression to the harvesting of rain that is collected in a 1,500-gallon rainwater harvesting cistern, located in the center of the exhibit lobby space. The water is recirculated to irrigate the plant life on the living wall in the atrium.

**Design Challenge & Solution**

The design for this LEED-Platinum certified facility features indoor and outdoor educational exhibits, two classrooms, public restrooms, photovoltaic panels, a deck overlooking a reshaped pond, and a green roof. As with any building, the windows play a large part in both efficiency and aesthetics. The Knoch Knolls Nature Center uses oversized direct set, awning and custom, triangle-shaped windows. The building design professionals originally specified aluminum windows but was convinced that the direct set aluminum clad exteriors and wood interiors would lend greater energy efficiency and provide the appearance of aluminum windows on the exterior with warm wood interiors that complemented the timber ceiling beams and other wood-centric design elements. With the goal of the classrooms to be 100 percent day-lit, the perfect source of light comes from the wall of glass created by oversized windows. The overall efficiency of the windows contributed to the LEED-Platinum certification of the property.

Knoch Knolls Nature Center, Naperville, Illinois

Shown here is a corner window, which provides a contemporary, sophisticated way to add more lighting and blend the interior and exterior spaces

Windows do not have to be located in traditional openings in the building envelope. 90-degree corner windows are a contemporary, sophisticated way to add more lighting and blend the interior and exterior spaces. These types of windows are low-maintenance, durable, and performance rated. They feature extruded aluminum exteriors that resist dents, scratches, and moisture. Modern corner windows are manufactured as a complete unit and can be made in heights up to ten feet. No longer do these have to be built on site.

### Bi-Fold Doors

Bi-fold doors combine an elevated visual appearance with high performance standards.

**This article continues on http://go.hw.net/AR072019-2. Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.**

## QUIZ

1. According to the course, more than _____ of people live in urban environments where access to the outdoors is limited.
   a. 1/3 b. 2/3
   c. 1/2 d. 1/4

2. According to the course, what was the first step in recognizing the direct benefits of sunlight and the blending of living outdoors?
   a. Daylighting b. Moonlighting
   c. Sun-light integration therapy d. Design with Light Intentions

3. Which type of design addresses need to create a relationship with nature during the design process while also specifying design for health, safety, and energy efficiency?
   a. Daylighting b. Biophilic design
   c. Sun-light integration therapy d. Fenestration

4. The shared space movement began in _____—where traffic was referred to as a guest and layouts served primarily residential functions.
   a. China b. United States
   c. Netherlands d. Mexico

5. Traditional windows _____ ; whereas, direct set windows are _____.
   a. Open or slide; floor-to-ceiling b. Close; wall-to-wall
   c. Glaze internally; glaze externally d. None of the above

6. Bi-fold doors can be specified up to _____ feet wide and _____ feet tall.
   a. 24; 10 b. 48; 8
   c. 30; 10 d. 10; 24

7. Through specifying oversized doors and windows, building professionals have the ability to improve:
   a. Energy ratings b. Occupancy mood
   c. Occupancy well-being d. All of the above

8. According to the course materials, a large format door system that folds on a central track like an accordion is called a:
   a. Multi-Slide Doors b. Biophilic doors
   c. Bi-Fold Doors d. Fan fold doors

9. Designers who want to specify exterior aluminum finishes should specify products that meet AAMA _____ requirements.
   a. 1800 b. 2400
   c. 2605 d. 3412

10. A microscopically thin, silver coating designed to reflect the sun's infrared light back outside is called:
    a. Low-E coating b. Ultra Glaze
    c. Insulation coating d. Fundamental glass

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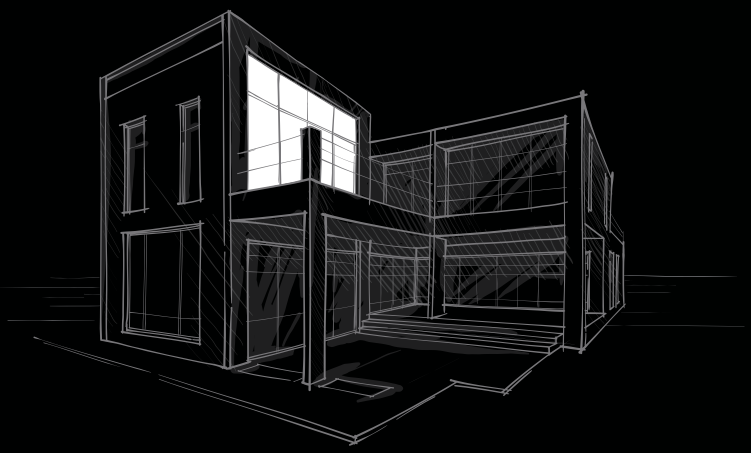

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# Building Social Resilience

**Grace Kim on how cohousing can improve your life.**

After practicing architecture for more than a decade, Grace Kim, AIA, decided to go back to school to study cohousing—collaborative communities where residents have their own homes and share common spaces and services. Today, Kim is one of the foremost experts on cohousing in the country, and gave a 2017 TED Talk on the ways in which the housing model improves social resilience and longevity. As a founding member at Schemata Workshop in Seattle, she designs cohousing developments all over the United States—and also lives in one with her family.

As told to Katherine Flynn

I got interested in cohousing in the early '90s, in architecture school. We had gone to study in London, and we had a guest professor that came down from Copenhagen who was sharing cohousing as an idea. At the time, I thought it was just another housing model. But it was around the time that it was being introduced in the U.S., and it's been an interest of mine since then. I realized in the subsequent decade that it was unusual in Western cultures. I went back to grad school, with the express interest of getting my head more into that project type. In 2004, I got a grant from the University of Washington to go live in Copenhagen for a few months, and I did some intense research in cohousing. When I came back, I started sharing my findings and got very involved in the national cohousing movement.

Not only am I an advocate for cohousing and design it, but I also live in it. While architecture can significantly impact the way that communities can get together and build more bonds, it's really understanding group process that will help make the group successful. I'll hear people say, "Oh, we do a lot of projects with community stakeholders and public agencies, we're used to doing charrettes, we're used to engaging people." But it's different. It's the same dynamic of designing a house for a couple—it's that level of care and meaning, but instead you multiply that to engage 10 to 20 households during the design process. There's going to be conflict, differences in opinion, in expectation—all of those things. I think for most architects, they can't imagine the level of complexity that adds to a project, both in terms of duration as well as the feedback they're expecting to get; not to mention the design process itself.

It's important to be humble and recognize that you might be the professional that they've hired to be the expert in designing buildings, but they are the experts of knowing how they want them to work. A phrase that I use often is "Use your ears and mouth proportionally." We have two ears; we have one mouth. We should listen and give folks a chance to tell us their story, and help them actively listen to each other while they learn this complex process of designing buildings. AIA

# AIANow

## These COTE Top Ten Winners Are Strengthening Their Communities

**Four COTE Top Ten awardees exemplify sustainable design and community value.**

Each year, AIA's Committee on the Environment (COTE) honors 10 projects that showcase bold and innovative design while also placing an emphasis on social, economic, and ecological value. Each structure has always been required to meet rigorous standards for performance data and post-occupancy lessons, but since 2017, the "Design for Community" metric has required each winner to benefit the public in an impactful way. We highlight four of our favorites below.

By Katherine Flynn

### Tashjian Bee and Pollinator Discovery Center

As part of the University of Minnesota's Landscape Arboretum in Chaska, Minn., the Tashjian Bee and Pollinator Discovery Center seeks to educate the surrounding community about the declining health of native pollinator species like honeybees and monarch butterflies. In the center's honey extraction room, community beekeepers remove honey from honeycombs using specialized equipment. Displays that use macrophotography of bees, butterflies, and flowers offer insights into the roles of pollinators in the larger ecosystem.

Centered around an original-to-the-site red barn, the design team, led by MSR Design, facilitated a series of community listening sessions that engaged arboretum staff, trustees, and neighbors potentially impacted by activity around the new development. A learning lab serves as a space for community and social events like weddings and family reunions, as well as more structured learning activities.

CREDIT: RICHARD BRINE

### Lakeside Senior Apartments

The AARP estimates that 51 percent of people over the age of 75 live alone, and the effects of isolation can take a serious toll on both mental and physical health. Communities such as Lakeside Senior Apartments in Oakland, Calif., are giving seniors a better alternative.

Located in close proximity to the recently redeveloped and now-thriving Lake Merritt urban park, Lakeside allows seniors to live independently for as long as possible. Designed by David Baker Architects, it provides 92 permanently affordable homes for low-income and special-needs seniors over 55, many of whom have been displaced or adversely affected by ballooning Bay Area housing costs. The design process involved tapping community stakeholders, prioritizing the solutions that would best serve Lakeside's future residents. Amenities like a rooftop community suite and a communal courtyard help support the social life of the complex. Stoops open to the sidewalk, connecting to the neighborhood.

CREDIT: BRUCE DAMONTE

CREDIT: NIC LEHOUX

## Daniels Building at One Spadina Crescent

This renovation and expansion of an academic building at the University of Toronto was designed with the goal of transforming a major urban node into a dynamic public space. The design process behind the reinvigoration of One Spadina Crescent, the historic home of the university's John H. Daniels Faculty of Architecture, Landscape and Design, included the surrounding neighborhood at multiple scales and points in the process. Several public forums, six student forums, and six forums with preservation group Heritage Toronto ensured that the project had its bases covered from both a preservation and community perspective. The larger community is now invited into an internal "street," a library reading room, and public lecture rooms. The entire renewed circle includes amenities for students and the public, with the intention of making the site pedestrian-friendly and minimizing reliance on cars.

Designed by NADAAA with Adamson Associates Architects and ERA Architects, the public-facing north addition (as well as the restored historic building) will be a critical piece of infrastructure in the years to come.

CREDIT: BENJAMIN BENSCHNEIDER

## North Transfer Station

Tasked with the job of processing 750 tons of waste, recycling, and compost per day from both commercial and self-haulers, Seattle's North Transfer Station meets the city's goal of lessening environmental impacts by placing waste processing in a north-central location convenient to the majority of the city's residents and businesses. However, situating the transfer station within an established residential neighborhood was an intricate process.

Project leads Mahlum Architects engaged the Seattle Design Commission, held public workshops, and facilitated open houses throughout the design process. By working with a stakeholder group that included immediate residential neighbors, businesses, and schools, Mahlum Architects was able to ensure that the final product included the four criteria deemed most important: protecting existing view corridors, including accessible gathering spaces like a playground and open lawn space, incorporating sustainable features like green roofs and the protection of existing street trees, site safety and Crime Prevention Through Environmental Design (CPTED) and other site safety features, and environmental concerns like odors and dust control. By facilitating an agreement between Seattle Public Utilities and two neighborhood councils, Mahlum Architects was able to ensure the best outcome for the city.

AIA Feature

# Battling a Flooded Future

**As flooding increases across the country, architects and policymakers are strategizing ways to contain the deluge.**

By Anthony Paletta

CREDIT: LAUREN NASSEF

Flooding, long dismissed as a problem that happens to someone else, has risen in our national consciousness over the past 15 years thanks to such names as Katrina, Rita, Sandy, and Harvey—a set of the worst houseguests you could ever imagine. Recent flooding has been driven by a variety of causes: hurricanes whose landfall wasn't in perennially threatened areas, as well as intense rains and snowmelt—manifestations of climate change and malign coincidence.

One linked fact is that flooding has afflicted far more than the usual geographic suspects, with New England and the Gulf Coast experiencing intense onslaughts. The impact has been highly destructive, and the only silver lining might be a greater awareness among architects and experts—and the public—of the need to take action.

Resilience, which until recently was represented by academics or the occasional forward-minded planner, is in the process of vaulting into mainstream consciousness as a result.

Illya Azaroff, AIA, founding principal at +LAB Architect PLLCs and a professor at New York City College of Technology (City University of New York), notes, "Before Hurricane Sandy, every time there was a resilience meeting, we all knew each other. Since then, I'm in meetings all of the time, and I don't know a majority of the people. That's a great thing." (Azaroff's #HurricaneStrong home in Breezy Point, Queens, is the subject of the 2019 AIA Film Challenge seed film.)

Among architects and policymakers, a more acute awareness of the risks of flooding is developing—not only because of its increased geographic dispersal, but also because flooding has started to serially outstrip the bounds of outdated flood maps in surges of Neptunian irredentism. While this is an obvious shock to anyone whose home or business has been deluged, it is often chased by a second one: the fact that no one will pay for the damages.

FEMA flood maps, which classify sites into different levels of risks, have been irregularly funded, and many homes and businesses within their current boundaries lack insurance anyway. Prospective changes to FEMA flood insurance policies could prompt considerable changes in the nature of future construction and repairs in vulnerable areas. Assessments to date have been based on comparatively broad classifications of risk; FEMA's Risk Rating 2.0 update, set to be implemented in 2020, will apply a finer-grained set of evaluations to individual properties, including the elevation of ground on the property, the elevation of a structure's first-floor distance to water, and potential rebuilding costs.

"If property ownership costs are going to dramatically increase, that will have an affect on architects and the kinds of buildings they design," says Rachel Minnery, FAIA, the senior director of resilience, adaptation, and disaster assistance at AIA. "Design is not the leader here, economic loss is."

When it comes to the work of influencing and guiding where to build, how to build, how to protect what's built, and how to reduce overall flood risks, architects have a vital role to play.

David Waggonner, FAIA, a principal at Waggonner & Ball who has been active with New Orleans flood planning, notes that architects are often merely responding to client specifications and may not have ultimately persuasive capacities, but that it is becoming necessary to take a stronger stance.

"Architects are needed," he says. "If we stay out of this, God help us."

## Storm-Related Ocean Flooding in Boston

There is no single way to foil flooding, and understanding the geographic variables is key. Some parts of New England, unexpectedly ravaged during Hurricane Sandy, feature safe land close to where any building is sited—even next to the ocean.

"The geologic structure of Connecticut is like the fingers of your hand; some of the geological ridges stretch out into the sea. You don't have to retreat out of the area; you just have to retreat upland to the ridges," says David Watson, FAIA, principal at EarthRise Design in Trumbull, Conn. This means that flood-vulnerable neighborhoods can migrate to higher ground nearby, possibly within the same town.

"Greenwich has done this [by allowing] developers to increase densities in safe zones and decrease densities in unsafe zones," he says. New housing is permitted in the flood plain if "dry access" is provided, ensuring accessibility under normal flood conditions. One usually doesn't need to go far to find portions safe from flooding.

There are some exceptions in New England that yield more difficult circumstances, however. "Boston is different," Watson says.

# AIA Feature

CONTINUED

"It's essentially built on a mud flat. [As a designer], I have to understand all water from above and below. Water comes from all sides, and it also comes from the ground."

Packing up and moving uphill is an easy theoretical recommendation, but it's not a realistic solution for several of the most historic neighborhoods in the United States, such as North End and Seaport, located in just such less-than-propitious spots. As Minnery notes, architects "can't overlook the cultural and historical significance of places that developed on waterfronts." Boston is undertaking a wide range of planning solutions, including surge barriers and shorefront zones.

The relative mercy of storm-related ocean flooding is that it is often brief. The trouble is that it can become incredibly forceful as it overwhelms urban water systems—especially when water pours down slopes in dense urban neighborhoods that funnel it into narrow corridors.

Azaroff says that his own historic red brick row house has a water retention capacity of 300 gallons. Graywater systems and green roofs, or even the act of rendering frequently small urban yards permeable, can make a considerable difference. The key is not holding water forever; it's holding it at designated points when existing systems are near capacity and safely releasing it under more normal conditions.

## Houston, City on a 100-Year Flood Plain

While Boston faces brief, sustained flooding risks, it's the nagging persistence of floodwaters that complicate planning in another location. Houston, which was battered by Hurricane Harvey in 2017, is perhaps the most difficult urban site in the country, given that there are no bedrock ridges: the majority of the city, and surrounding Harris County, rests squarely on the 100-year or 500-year flood plain. During Harvey, however, nearly three-quarters of all flood-damaged homes and apartment buildings were outside of a FEMA-designated flood plain.

The trouble is that there's simply no rapid way for this bathtub to drain. As Shawn Gillen, AIA, vice president of DFD Architects, notes, "In north Texas, FEMA's maps are based on terrible data. They show culverts and roads and bridges that don't exist, and others that exist weren't on them. In many locations, risks were known but ignored."

The risks of this lengthy inundation are different than those of short-term flooding, as in Boston, and call for different solutions. Water will erode around and under foundations, destorying them through upheaval or settling. It can be especially damaging to wooden framing, which can be ruined after several days of flooding.

Gillen took note of a widely circulated and shocking image of the La Vita Bella Nursing Home in Dickinson, Texas, where residents were inundated with several feet of water during Hurricane Harvey. After checking its location, he immediately discovered that the nursing home was across the street from a stream, a short distance from Dickinson Bayou. "It was in the flood plain," he says. "This was going to happen at some point. It should not have been a surprise."

Most homes can't escape flood risk altogether; they can only mitigate it, or address the distinction between dry floodproofing—in which structures are entirely impermeable—and wet floodproofing, which allows water to move in enclosed parts of a home's lower area, such as a crawl space, and then out when the water recedes. Last year, Houston increased required elevation levels for new buildings to be 2 feet above the 500-year flood plain, replacing a prior standard of 1 foot above the 100-year flood plain. Implementing this earlier would have protected 84 percent of the hundreds of thousands of homes that flooded.

Building above a flood plain can't always be accomplished just by piling up dirt, which will either get swept away by water or shift the problem to a neighbor. "If you want to raise your site, you're altering the hydraulics of everything," Gillen says. "If you bring your house up by 36 inches, you're going to flood the house next to you even worse."

The key is to elevate the building structurally, usually with concrete, steel, or stone, and to elevate living spaces, mechanical elements, and wood above this level. "All materials below the floor level have to be water resistant or super easy to replace," Gillen says.

The common practice of building homes on stilts, time-honored elsewhere, is mysteriously absent in American construction, but would make ample sense. In Southeast Asia, Gillen notes, buildings are designed to let the waters flow beneath them.

Waggonner, whose work in New Orleans in an exceptionally challenging deltaic condition resembled the challenges of Houston, says, "The good news is, you have an incredible ecosystem if you just use it." For decades, the philosophy of New Orleans was to pump and cover water, which ultimately proved work-intensive and unsuccessful.

"The earth is like our skin," he says. We put too many bandages on our skin, and [it] doesn't absorb anymore."

## A Recurring Problem

In some cases, the most sensible architectural solution is simply ceasing to build. AIA's Minnery criticizes the "substantial damage" standard in the National Flood Insurance Program (NFIP), which has administered all flood insurance in the United States since 1968. It's meant to assess when structures are simply in too risky an area to be reasonably repaired, but the trouble is that it establishes a bar that does not prevent repeat repairs to structures that are perennially flooded in significant ways.

"Unless it triggers substantial damage of over 50 percent, they'll just repair it over and over again," she says. "I've actually heard of structures that have gone through the process 10 times or more."

Roy Wright, former head of the NFIP, notes that one of the programs he encouraged was an "extreme repetitive loss" category to end payments for such serially afflicted properties. He stresses that these were a statistically small portion of cases, and that most of the program's problems were less individually dramatic, but systemically severe. According to Wright, the trouble is most often not those houses that flood every few years, but the homes that flood infrequently—and are likely to flood again.

Residents living in flood plains, and their bipartisan elected representatives, pose a substantial obstacle. "I don't think there is an appetite to deal with fundamental issues in the NFIP," he says.

Some homeowners in high risk areas simply don't have the resources to improve their homes, or the means to relocate. Flood risks are a hassle and expense for anyone, but failing to prepare is sure to be worse. Many at every stage of the process prefer to ignore the problem.

"There's a fear of data because there's this presumption of responsibility and liability," Minnery says. "It's the kiss of death to find out that your property has a flood risk." In many cases, faulty data in the past encouraged avoiding the issue, but with the increased occurrence of flooding outside of established flood areas and more accurate LIDAR and satellite FEMA mapping, there's a fresh and more accurate awareness of extant risks.

As EarthRise Design's Watson observes, "Before you sit down and build, you should figure out the worst thing that could happen to your site—and then think of something worse. There's phenomenal opportunity for innovation if you understand the risks." AIA


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CREDIT: LIZ MOSKOWITZ

The #HurricaneStrong home in Breezy Point, Queens, is the subject of the 2019 AIA Film Challenge seed film, *Designed to Last: Blueprint for a Better Home.*

## Showing, Not Telling

**Film and architecture collide to increase awareness about the value of design.**

By Kathleen M. O'Donnell

In 2014, AIA launched a large-scale awareness-building effort to educate the public about architects' impact on society. Five years later, the Blueprint for Better campaign has become an Institute-wide outreach and advocacy initiative that seeks to connect architects with the public. Through innovative partnerships with HGTV, the Architecture and Design Film Festival, *Wired* magazine, and Chicago Ideas Week, AIA has engaged a broad spectrum of individuals, from working architects to civic leaders and school children, encouraging them to design a Blueprint for Better together.

The AIA Film Challenge, now in its fifth year, is a prime example of Blueprint for Better's success, having yielded more than 240 documentary short films and hundreds of thousands of people's choice votes. Each summer, filmmakers and architects are invited to tell stories about the important design work happening in their communities. Winning films in recent challenges have explored affordable housing solutions in cities like Philadelphia and Los Angeles. Others have shed light on the need to save important cultural spaces and practices from Cleveland to Hawaii. Films submitted from around the world have demonstrated how design can overcome challenges related to public health, homelessness, climate change, preservation, and equity and inclusion.

But what about these films really speaks to viewers? As an audiovisual medium, film is the perhaps the only one that comes close to conveying the experience of the built environment. When vibrant imagery of the spaces we inhabit is layered with stories—first-person accounts from those encountering design problems and the architects working to solve them—the power of architecture can be understood in a new way.

The 2019 AIA Film Challenge seed film focuses on the #HurricaneStrong house in Breezy Point, Queens, which suffered damage during Hurricane Sandy.

# AIA Perspective

"Too often, the value of architecture is based on the brand recognition of the architect who designed it and the prestige of the critics that comment on it, rather than [how] the whole creation process—as well as the beauty of the building—affect society for the better," says Thatcher Bean, a film director at celebrated international nonprofit MASS Design Group. A 2018 AIA Film Challenge judge, Bean explores the intersection of design, social justice, and environmental sustainability in his films, reflecting the mission of MASS. He sees film as a vehicle for telling a holistic story of architecture and believes that the filmmaking process "brings value back to architecture by communicating the less often expressed social impact a building has."

The social impact of design is truly at the heart of the AIA Film Challenge. Last year's winning film *Past/Presence: Saving the Spring Garden School* depicted the transformation of a 90-year-old public school building in Philadelphia from an abandoned property into an affordable housing development for veterans. "I don't think of it as an architecture film. I think of it as a story," says filmmaker Cheryl Hess.

To tell that story, Hess focused her approach on the people involved in the project including architects from Kramer + Marks Architects, leaders from nonprofit HELP USA and the Philadelphia Housing Authority, as well current residents of the newly opened Lural Lee Blevins Veterans Center. "There's a wide range of ways you can use film and architecture," Hess says. "This building by itself without the residents and the people—I feel like it wouldn't have been nearly as interesting. It's a beautiful building, but as a work of art, the film wouldn't have worked on that level. You need the human element."

Participants of the 2019 AIA Film Challenge are working toward an August deadline. Marking the launch of the 2019 contest, a short documentary seed film, *Designed to Last: Blueprint for a Better Home*, highlights New York–based architect Illya Azaroff, AIA, who collaborated with federal agencies, experts, and building product manufacturers to design a new home capable of withstanding coastal disasters. The seed film is meant to serve as inspiration for other filmmakers.

As Blueprint for Better expands, AIA will continue to elevate such stories of architects and community leaders working together to create lasting change in the built environment. AIA

*To learn more or to participate in the AIA Film Challenge, visit aiafilmchallenge.org.*

CREDIT: GREG POWERS

## Designing for Resilience

**Why our skills will prove essential in creating climate change solutions.**

Every day, the impacts of climate change become more evident, which makes designing for resilience a more urgent issue in the architectural profession. The unique skills we have as architects, starting with design thinking, are essential to helping find solutions to mitigate the impacts of a rapidly changing climate, and the inherent danger to life and property that comes with it.

Unlike almost any other problem we will confront in the next 10 to 20 years and beyond, climate change requires a holistic approach that addresses the interdependencies among people, buildings, infrastructure, and the environment. Our training allows us to look for solutions and ways to mitigate climate change comprehensively and creatively, which we do every day.

But, more than our design and technical abilities, our commitment to better environmental stewardship is vital to reducing the built world's impact on the environment.

Our voice as experts at all levels of government is also essential. For our society to successfully address the challenges presented by climate change, architects have to go beyond our traditional comfort zone as trusted advisers and admired designers and become directly engaged in our communities as civic leaders and advocates for positive and lasting change.

For example, we should lend our voices and focus our talents to help achieve the emissions mitigation and reduction targets envisioned by the Paris agreement, which require that every aspect of a building's design, construction, and operation be retooled to reduce its carbon footprint, with the eventual goal of carbon neutral or carbon-zero buildings.

To that end, AIA is engaged in helping the profession lead in the four elements of achieving the Paris agreement's targets in the building sector: designing high-performance buildings; renovating existing buildings to meet high-performance standards, addressing embodied carbon in building materials and construction processes, and promoting renewable energy on-site and off-site.

We can advance those goals by making the business case to clients and elected and civic leaders for more sustainable design, and by pushing for quick and aggressive action that promotes carbon-smart building best practices and policies.

Our profession's commitment to responsible environmental stewardship is unmistakable. To date, approximately 550 firms have joined the AIA 2030 Commitment, which provides a way for architects to publicly show their dedication and track their contribution toward our shared goal of a carbon-neutral future. Those firm's designs achieved energy savings equivalent to the amount of carbon sequestered by 21 million acres of forest in just one year.

As policymakers and the public see the level and the results of our commitment to carbon-neutral design, our voice in the broader public policy debate becomes stronger. And that is vital.

Because, ultimately, designing for resilience is about more than good design. It is about articulate advocacy, informed by our unique expertise and rooted in our passion for a better, brighter, and fairer future through the power of design.

William Bates, FAIA, 2019 AIA President

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“All the artistic and architectural adventurers could not have foreseen this—the most powerful nation on Earth had created something that looked alarmingly like an architecture show.”

**The Rise (and Fall) of Trump’s Border Wall Prototypes** by Ian Volner

*The following essay was adapted from Ian Volner's* The Great Great Wall: Along the Borders of History from China to Mexico, *published by Harry N. Abrams in June.*

In October 2017, in a patch of desert down the road from California's Otay Mesa border crossing, I got my first glimpse of the border wall prototypes: eight towering monoliths, all of them 30 feet by 30 feet and varying only in tone and the occasional detail. Standing just in front of the Vietnam Era metal slats of the existing fencing, just a few yards away from the secondary fencing of the Bush era, the nearly identical structures did not resemble security systems of any kind, not individually and definitely not in the aggregate, ranging across the site in a regimented row with the mountains to the east and nothing behind them. All the artistic and architectural adventurers, the ones who had variously lampooned or reimagined the wall, could not have foreseen this—the most powerful nation on Earth had created something that looked alarmingly like an architecture show.

"This odd open-air architecture gallery," as then–*Los Angeles Times* critic Christopher Hawthorne called it, had an undeniable sway, a cumulative effect of looking at the slabs in ensemble over an extended period. What had begun vaguely as Executive Order 13767, commanding Customs and Border Protection (CBP) to pursue the "immediate construction of a physical wall," had produced this, a trial run. The designers of the individual protoypes were almost entirely construction companies, including Caddell, W.G. Yates & Sons, Texas Sterling, and KWR.

The chilling sublimity of the site was undeniable—and discomfiting. Mirroring the debate about anti-wall resistance art, there emerged in the wake of the prototypes' unveiling a new round of arguments about whether critiquing them risked validating them. "Is it inspired or irresponsible to call Donald Trump's wall prototypes 'art'?" That was the headline of a *Los Angeles Times* article written by the critic Carolina Miranda, who quoted local architect René Peralta: "It would be irresponsible, easy and lazy to consider it as an aesthetic object." No one had lavished this much attention on the fences that had been built in the mid-2000s; why the sudden interest now? To grant so much exposure to the prototypes—which were never likely to lead to a real wall—was to carry the administration's water, perpetuating the illusion of progress by raising their visibility.

#### Ranking the Prototypes, Aesthetically

Theoretically, of course, CBP intended the prototypes to be more than just prototypes. Over the next several months, they were subjected to a series of tests: Special Forces teams mounted assaults on the walls, assailed them with jackhammers and saws, attempted to climb them; analyses were made of the ease of construction and repair and of the soundness of the engineering. All of this was documented in a report, completed in February 2018, that San Diego's KPBS public radio and television station eventually obtained via a Freedom of Information Act request. Highly redacted, it left unclear the particulars of the testing process, though it did reveal that CBP had devoted inordinate energies to assessing one particular aspect: aesthetics.

A special team from Johns Hopkins University's Applied Physics Laboratory was commissioned to help devise a series of criteria that could determine which of the prototypes demonstrated the greatest visual élan. The report laid out the aspects under consideration:

*Color—hue, intensity, brightness, depth*

*Texture—look/feel of the physical surface, smoothness, roughness, shape, configuration*

*Pattern—large visual shape, arrangements, decorations*

*Wall top style—appearance of top of the wall, top in relation to rest of wall* [ … ]

*Apparent difficulty to breach/scale—difficulty to get past the wall, impenetrability*

*Provision of situation awareness—ability to understand activity near, around, by the wall*

The method used to assign scores in these criteria, CBP explained, was the "analysis of input from 72 participants on the aesthetics of each prototype"—interviews and surveys conducted with individuals in various fields. Many of these individuals did not see the prototypes themselves; rather, they were shown photographs and asked their impressions. While the authors concluded with a ranking of the aesthetic value of each design, which one was deemed most effective was among the blacked-out segments of the report.

As the document put it, "The effective use of aesthetic choices can make a design resonate with a target audience." Truer words were never spoken (at least regarding the wall). It was only unfortunate that the individuals who rendered aesthetic judgment on the prototypes were not obliged to see them in all their unnerving grandeur—though they were not the only ones who had stayed away.

Despite his repeated claims that he would be personally involved in the selection process, the president of the United States did not undertake to see his "beautiful" prototypes until four months after I did. The visit, scheduled for the afternoon of March 13, 2018, should have been the ultimate photo op for the publicity-obsessed politician: If nothing else were

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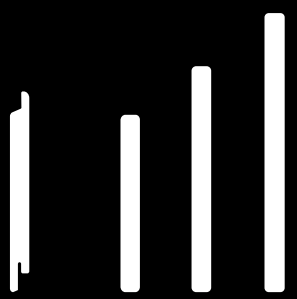


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ever to be built, the prototype tour represented a once-in-a-presidency chance to boast about something real, something tangible that emerged from all the administration's faltering efforts. But it was not to be.

Symptomatic of this White House's uniquely clumsy messaging strategy, the tour was effectively upstaged when, mere hours before it was set to begin, word reached media outlets that Secretary of State Rex Tillerson had submitted his resignation. His departure consumed the public conversation that day and for much of the week. So far as public awareness was concerned, the prototypes slipped beneath the waves.

That August, the Government Accountability Office (GAO) issued a report under the heading "Southwest Border Security: CBP Is Evaluating Designs and Locations for Border Barriers but Is Proceeding Without Key Information." While the title says it all, some of the study's more enlightening passages—the product of extensive interviews with Department of Homeland Security staff and review of agency records—were hidden in the dense document: that, according to the GAO, CBP did not factor in the costs of building on sloping terrain when assessing the prototypes; that the two proposed initial locations for the wall had been chosen without any prior study, almost entirely at random; that no documentation existed as to what and how exactly the agency intended to proceed with any future construction in the San Diego area.

#### Returning to the Site

I came back to Otay Mesa for the second time almost exactly a year after my first visit. It was October again, and by some conspiracy of the weather it had clouded over once more, giving the place the same subdued menace it had had the last time. The building site, now devoid of any press, felt doubly forsaken, while the prototypes appeared the worse for wear, the testing process and the elements having taken their toll. The monoliths were stained in places, bleached in others, their façades pockmarked. And there was one additional difference, more outstanding than the rest.

"It just happened a couple weeks back," said Agent Vincent Pirro, the CBP officer detailed as my escort. The Vietnam War surplus fence that had stood on the Tijuana border since the Clinton years had been replaced, just prior to my arrival, by a new line of beveled steel pikes topped by solid horizontal panels—some of the 124 miles of new and improved fencing approved by Congress, the closest thing to a wall the administration had yet managed to finagle. Ostensibly they marked an improvement over the earlier model, taller by far and not so weather-beaten, while their transparency made them, if not quite inoffensive, at

The prototypes in May 2018

HAYDN DENMAN

"A special team from Johns Hopkins University's Applied Physics Laboratory was commissioned to help devise a series of criteria that could determine which of the prototypes demonstrated the greatest visual élan."

least less obtrusive. The openwork structure had produced one other effect: The stray dogs that I had previously spotted roaming the dusty road on the southern side were now able to slip through the verticals, and several of them frisked at the feet of the prototypes. "They would get through before, too," said Agent Pirro. "Just dig under."

They weren't the only ones. Driving westward, following the track that runs between the primary fence (now the pikes) and the secondary barrier (the loftier chain-link model, born of the 2006 Bush-era law), Pirro pointed out a set of warehouses on the Mexican side directly adjacent to the Tijuana airport. He then traced his finger across a distance of a thousand feet to the American side: This was the length of just one of the tunnels that had run under the area and served the illicit drug trade. Since 2017, 12 such subterranean passages have been discovered in the sector, many as long as or longer than the airport tunnel; the primary fence, though improved, would still be of only limited utility against them. Continuing along the track, Pirro pointed to patch after patch on the secondary fencing where smugglers, of both human and material contraband, have vaulted the primary fence and cut through the chain link of the secondary. "They can do it in seconds," said Pirro; the perpetrators are so deft, and so brazen, that they can be spotted by CBP yet still slip away uncaught. The freshly installed slats might slow them a bit, but not much—in the little time they had been there, a few had already been damaged, and subsequent testing would prove they could be sawed through with common instruments.

#### Throwing the Prototypes Under the Bus

The wall had fallen before it was even built. Less than a month later, Senator Chuck Schumer and Representative Nancy Pelosi—set to become Speaker of the House again in the upcoming session—were summoned to the Oval Office. In front of the gathered press—despite Schumer's suggestion that they "debate in private"—their host insisted, as he had for months, on at least $5 billion in additional border-security


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funding, most of it for additional infrastructure, and proudly proclaimed his willingness to shut down the government. It availed him nothing; nor did the shutdown that followed, even when it became the longest in American history; nor did the purported concession, during the first Oval Office address of the administration, that the White House would be happy to accept a steel rather than a concrete structure, "at the request of Democrats." Given that no such request had been made, this last bout of lexical gamesmanship seemed especially pointless: At a single stroke, it simultaneously disregarded the proven failings of the newer steel fences, while officially throwing the much-ballyhooed prototypes under the bus.

On Jan. 25, 2019, the two-year anniversary of the executive order commanding the "immediate construction" of the wall, the second shutdown ended with no additional wall funding. With that, the federal purse strings were drawn closed for the duration of the 116th Congress. Minor improvements to current fencing there might be, and potentially a few dozen miles of new fences as well, but nothing on the order of what had been promised, or even what had been built under the previous administration. While declaring an emergency to fund the wall remained a presidential prerogative, the long delay in making such a move, as well as the uncharacteristic sheepishness with which it was finally debuted in February, was a good augur of its likely course: stymied in courts, whittled away by future congressional action, thwarted by landowners and protesters and bureaucratic mismanagement.

Not to say that that, or anything else, will alter the determination of Donald Trump to build it. The economic and cultural divide that had brought him to power, and the existential angst that accompanied it, are still present, and his reelection will hang on his ability to fill his sails once again with those same winds. If he fails, his prototypes will stand as a monument to that failure, so much sound and fury signifying nothing; if he succeeds, they may yet portend a new political order for the U.S., a future cast forever into shadow by huge slabs of concrete.


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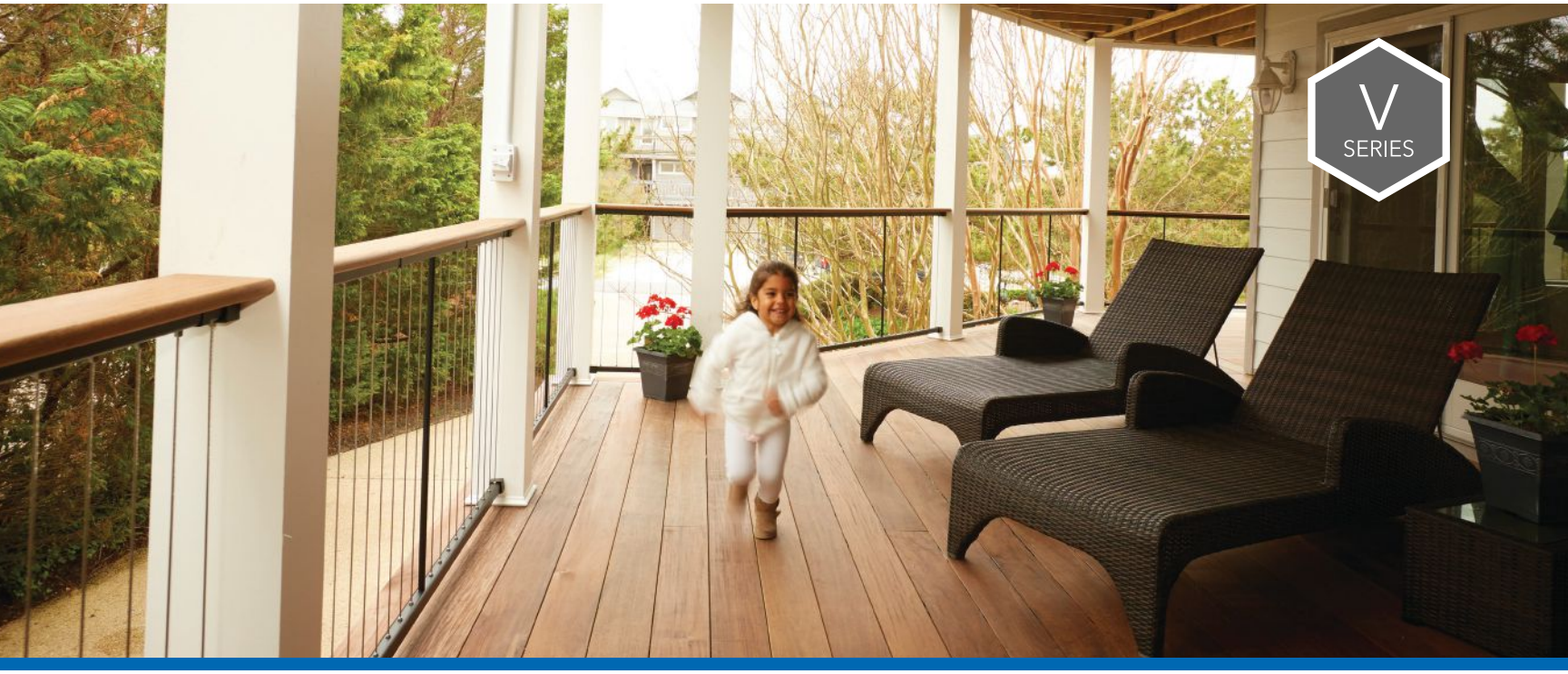


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“Can Miami stand its ground, and what will it look like if it does? How will the city and its built environment evolve?”

**Miami Confronts Rising Seas** by Reed Karaim

Oh, Miami, America's tropical fever dream. The city along Biscayne Bay has been half a fantasy since at least the 1950s, a raffish, pastel-colored, Art Deco, bikini-clad vision of escape. Miami Beach, the smaller island city floating just across the bay, sits at the heart of this illusion, a stroll along South Beach promising a chance to briefly escape the harder edges of daily life.

Yet these two communities built on dreams are coming to grips with a reality some of the nation continues to deny: the impact of global climate change. On a spring day so perfect it seemed like it was conjured up by the tourist bureau, Reinaldo Borges, AIA, one of the region's earliest and most fervent advocates of the need to respond to rising sea levels, took me around downtown Miami Beach to see how the city is adapting to the new reality. We strolled down streets and sidewalks that have been raised as much as 31 inches in recent years to deal with the "sunny day" flooding that had been coming with the highest tides, water rising up through the porous limestone that forms the bedrock in Miami Beach and the larger city across the bay. "This used to be the elevation of the sidewalk," Borges says, pointing to what is now a sunken storefront operating out of a shallow half-basement. "This building needs to be replaced," he adds bluntly. A block or so farther down, he points approvingly to a newer Publix grocery store, which has gracefully incorporated a rise in elevation that lifts it above flood levels. "This is a good adaptation."

Adaptation. Resiliency. Evolution. I heard these words over and over again as I met with architects, urban planners, and city officials. One thing I did not hear is denial. "Those days of denial are over, at least here in Miami Beach," Susanne Torriente, chief resilience officer for Miami Beach, tells me.

"The debate now is not if we should do something, but what we should do," says Elizabeth Camargo, AIA, who heads the Resilience Recovery Task Force at AIA Miami, one of two different groups the local chapter has set up to deal with climate change.

If the debate is over, it's because the impact of climate change has already arrived in South Florida: increasingly severe storms, sunny day flooding, and rising sea levels—the ocean here has risen 8 inches since 1950, according to the nonprofit group SeaLevelRise.org. The worst lies ahead. By the end of this century, the seas breaking along the shore in Miami and Miami Beach could be as much as 81 inches higher, according to the National Oceanic and Atmospheric Administration. Even more modest estimates predict an increase of 3 to 5 feet by 2100.

The average elevation of Miami Beach is only 4.4 feet and parts of the city are as little as 2 feet above sea level. Most of Miami has an elevation of 6 feet, but several neighborhoods have elevations of 3 feet or less. And the Miami River, of course, runs through the heart of the city all the way to the Everglades. So you have a low-lying metropolitan area of 6 million-plus people on porous soil with a major waterway tying it to an ocean that is rising more quickly every decade.

And yet people keep building and buying here. Breathtaking modernist mansions dot the water's edge. Construction cranes hang in the downtown sky in Miami only blocks from the ocean. A word I did not hear during my visit, unless I brought it up first, was retreat. Neither Miami nor Miami Beach has zoned its low-lying or oceanside areas to prevent new construction.

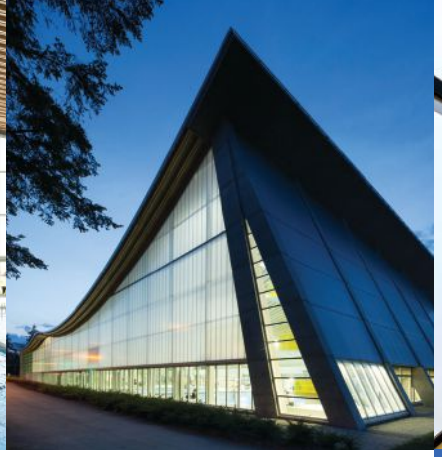
Sunny day flooding in Miami Beach

JOE RAEDLE/GETTY

Can Miami stand its ground, and what will it look like if it does? How will the city and its built environment evolve? The answers I heard involved solutions as mundane as better storm drains and as futuristic as a platform city.

#### "Learning to Live in a Water World"

In August 1992, after Hurricane Andrew ravaged Miami, causing billions in damage and leaving a quarter-million people homeless in Miami-Dade County alone, cities and counties in South Florida adopted some of the toughest building codes in the nation. They require buildings to be able to withstand winds up to 175 miles an hour, use shatterproof glass, and be built with straps to reinforce the connection between walls and roofs. But no one talked much about hurricanes during my visit, except in the context of storm surge. The rising seas are the focus. Among other things, they threaten to impair the city's drainage

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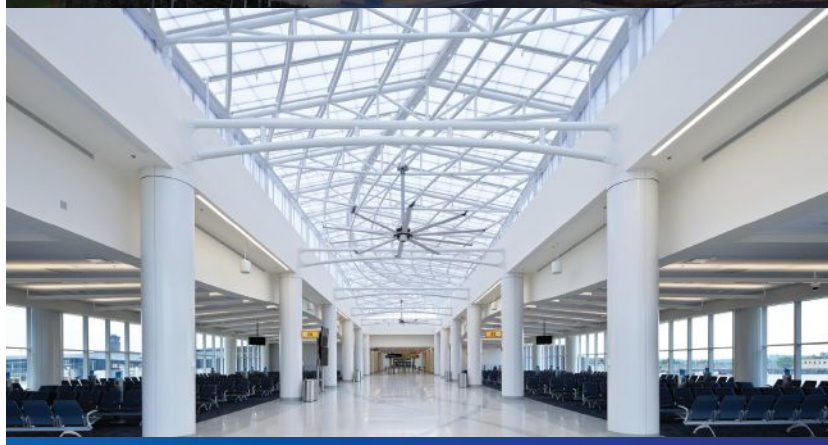



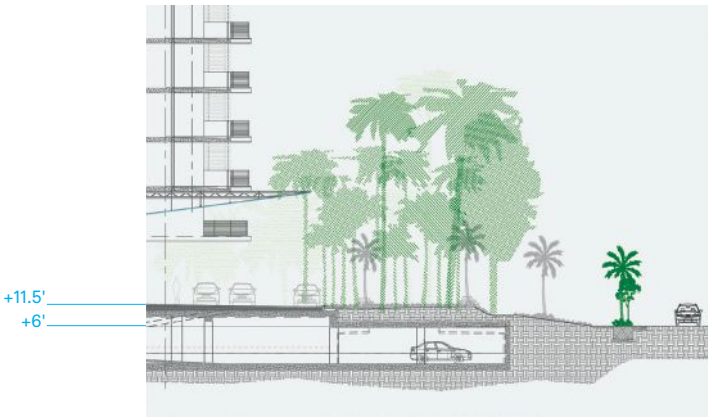


Jean Nouvel's Monad Terrace condominiums, which the architect elevated 11.5 feet above sea level

systems, particularly if gravity-fed, and lead to saltwater intrusion into the aquifer and the local water supply.

In other words, you can't just build a sea wall, or simply raise the streets and sidewalks and escape. Borges describes the necessary adaptation as "learning to live in a water world." Miami Beach, in particular, has "turned itself into a laboratory of climate adaptation," as a recent article in the Sierra Club's magazine put it. The island city, which covers just 7 square miles and has less than 100,000 residents, kicked off its efforts in 2013 under previous mayor Philip Levine, whose campaign for office included a TV commercial that showed him kayaking through traffic during a rainy-day flood, vowing to change things. The city initially focused on raising streets, sidewalks, sea walls, installing pumps, updating the drainage system, and adding areas of bioswale, where vegetation traps debris and pollutants from surface runoff.

But Miami Beach also changed its building code to encourage new construction raised above the future encroachment of the sea. The minimum elevation requirement is base flood plus 1 foot, but for every additional foot builders go above that—up to 5 feet—they get an offsetting increase in the city's height limit. "There's about half a dozen new homes that are taking advantage that," Torriente told me. Borges, for his part, endorses the value of changing building codes. "What I have experienced is when you codify things, it makes it a lot easier for the architect," he says. "You can say to the client, 'Look, here it is. This is what we need to do.'"

Borges, for instance, designed a senior citizens' center in Fort Lauderdale that incorporates a "split lobby" between the first and second floors so, if the waters eventually rise as predicted, the first floor can be sacrificed without causing operational problems. "The idea of treating the second story of buildings in a different way in water world is something we have to start thinking about," he says.

In Miami Beach, Jean Nouvel, HON. FAIA, elevated his Monad Terrace condominiums on the South Beach

waterfront 11.5 feet, raising even the parking garage above grade. A residence by Rene Gonzalez, AIA, on Prairie Avenue in Miami Beach is built on concrete stilts, lifting it safely above projected flood levels. The landscaping is designed for drainage, and the house even includes a retractable central stairway from the ground level to the living quarters, making it a safe harbor in the face of rising seas. Another Miami Beach residence, designed by Domo Architecture + Design, elevates the living quarters—and swimming pool—15 feet above grade.

In Miami, the Perez Art Museum, which sits only 75 feet from Biscayne Bay, won an award from the American Society of Landscape Architects for its resilient design. Elevated 10 feet above flood surge levels, the museum integrates a porous-floored garage and paths as well as rain gardens designed to capture water and funnel it back into the ground or the bay. Projects like these illustrate the potential for an architecture that keeps Miami and Miami Beach habitable even as seas rise.

#### Saving the City's Art Deco Heritage

Still, such extreme adaptations are not mandated by code or zoning requirements, and Borges and others I spoke to noted that many developers have no interest in the cost of building for ever-rising seas. There's a lot of business as usual. And as for existing buildings constructed before the threat of climate change, the solutions can be even more difficult. Miami Beach is now grappling with how to protect or adapt the Art Deco and Miami Modernist architecture in its historic districts, particularly the oceanfront buildings that give the city much of its whimsical, pastel-clad character. The issue is contentious, pitting preservationists

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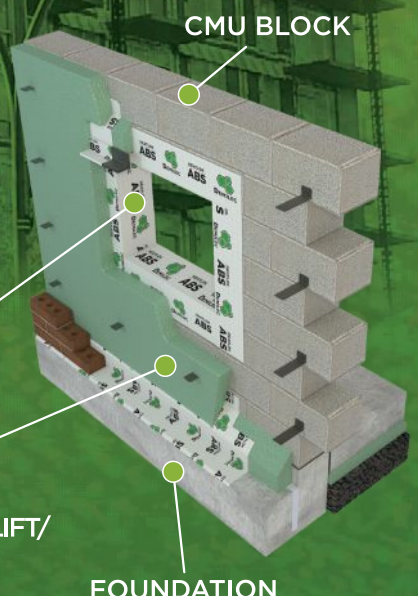


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against architects like Borges, who doubt the viability of adapting many of the historic structures.

Consider Camargo's 1949 house on a small residential island between Miami and Miami Beach, which has become more susceptible to flooding. She recently considered raising it, but the house has two different foundations and the soft soil can't handle the jacks anyway. Instead, the company she was working with offered to saw the first floor in half at the 4-foot mark and raise the top part of the house. "On top of that would be a whole new first floor," Camargo says. The cost was $300,000 and she would have lost cabinets and other custom work on the main floor. "In the end, it was simply too expensive and too impractical."

Despite these challenges, voters continue to support Miami Beach's approach. Last November, a $439 million general obligation bond measure on the ballot included significant money for resiliency. "It was put on the ballot and got overwhelmingly approved," Torriente says. "I think by close to 70 percent, so the residents of Miami Beach really have a desire to adapt and invest in their city."

Miami, on the other hand, is not as far along. In 2017, the city's voters approved a $400 million general obligation bond issue that included nearly $200 million to finance projects to build resilience against flooding and storm damage. But it wasn't until this March that the city broke ground on the first project, located in Fair Isle, a low-lying bayside neighborhood. It will raise roadways and include the construction of a drainage system and, in a second stage, a new stormwater pump station. In April, the city also finally approved an update to its zoning code allowing the same height variance as Miami Beach. Critics have blamed political division and inertia for the slower pace of Miami's effort, but in truth, it faces a larger, more difficult challenge. During a visit to the office of Jane Gilbert, the city's chief resilience officer, a map on the wall highlighting low-lying neighborhoods vulnerable to flooding—some of the most threatened are away from the ocean—illustrated the extent of that challenge. "In Miami we have water coming from all sides," Gilbert says.

The city is in the earliest stages of several other resilience projects that they hope to have completed in two to three years. I visited two of them with Shawna Meyer, AIA, a professor at the University of Miami School of Architecture who heads AIA Miami's Sea Level Rise Task Force. Jose Marti Park along the Miami River, a quiet, gently rolling green space, is prone to tidal flooding. The plan is to re-engineer it to minimize flooding in the surrounding neighborhood while enhancing waterfront access. Gilbert says no decision

has been made on what that will entail, but standing in the park, it seemed as if the open space could be adapted to temporarily hold tidal overflow and provide a respite from neighborhood flooding without overly damaging its recreational value.

Brickell Bay Drive, located along the city's waterfront, is a different case, one that gets to the heart of the challenge Miami faces. Brickell, which is Miami's financial district, has also become a popular, high-rise residential neighborhood, and the city envisions building a linear park and a sea wall to mitigate tidal and storm surges. "This is an area that's going to require intervention, but as you can see, this is [also] a place where a lot of investment has occurred," Meyer says, pointing to the towering condo buildings within shouting distance of the sea. Then she posed a crucial question, one that even a city committed to adapting to climate change will find difficult to confront: "So does anyone have the appetite to tell them that change has to occur?"

#### A Fluid Approach to Urban Design

The problem with a catastrophe happening in slow-motion is that it's hard to consider it a catastrophe. Even as public acceptance has slowly mounted in the 70-odd years since scientists first discovered evidence of climate change, the power of human denial remains as deep as the rising oceans. The only long-term solution to global carbon emissions has to occur at the international level and must involve the active participation of the U.S. Absent that, there is only so much individual cities can do. With all that Miami Beach has undertaken, Torriente admits the city's plans are only designed to carry it through midcentury. "We feel the criteria we have in place will take us to 2055 to 2060 and that next generation will have to take us that next step," she says.

Gilbert says the same about Miami. In a way this makes sense: To take concrete steps today for the worst possibilities, if they end up not transpiring, could be a tremendous waste of resources; it could also leave oceanfront cities looking like beached fortresses out of some science fiction dystopia. And yet, in a place like Miami, where on a bright day the city's glimmering seafront towers seem to float on the crystalline waves, it's impossible not to think what if—what if the more extreme projections turn out to be true?

Meyer believes climate change necessitates taking a "fluid" approach to urban design that builds around ecological systems, rather than around "static environments defined by geopolitical boundaries" that defy nature. She points to the way smaller communities in the Mississippi and Louisiana deltas

are designed to accommodate the waterways that are a constant part of life.

Consider a proposal by Isaac Stein, a landscape architect who grew up in the Florida Panhandle and is now pursuing a master's degree from the Harvard Graduate School of Design. His senior thesis at the University of Miami's School of Architecture proposes transforming Miami Beach by restoring stands of mangroves on the lower bay side of the island, providing naturally absorbent barriers to storm surges, and creating canals where low-lying streets now run while raising other streets on stilts. Trams and bike paths would take up the traffic in what would essentially become Venice on Biscayne Bay.

Borges invites you to extend your imagination even further with his plans for a "platform city." He envisions a small prototype community of 6,000 to 10,000 residents living on platforms raised 75 feet above current sea levels—a solar-powered community that integrates sustainable features such as ocean farming and controlled indoor urban agriculture. Borges says he drew inspiration from Japanese plans for floating neighborhoods in Tokyo Bay. "How we will populate coastal cities in the age of climate impact [is the] most transformative modern day existential challenge to humanity," he says. "The way we look at design, urbanization, and densification needs to be reimagined. It's an opportunity for big thinking and great innovations."

Borges' proposal may seem overly fanciful, until you remember that seas continue to rise as we continue to fail to confront the underlying causes. I hadn't been to Miami or Miami Beach for several years before I visited for this story, and I had forgotten how beautiful they are, how the sun and the sea and the bright interplay between the two has been reflected in the character of the built environment. They have always been a kind of dream, a work of the imagination. The tragedy is that, barring an outbreak of global foresight and resolve, they are likely going to need a sustained act of creative imagination, on the scale Stein or Borges is envisioning, to survive.

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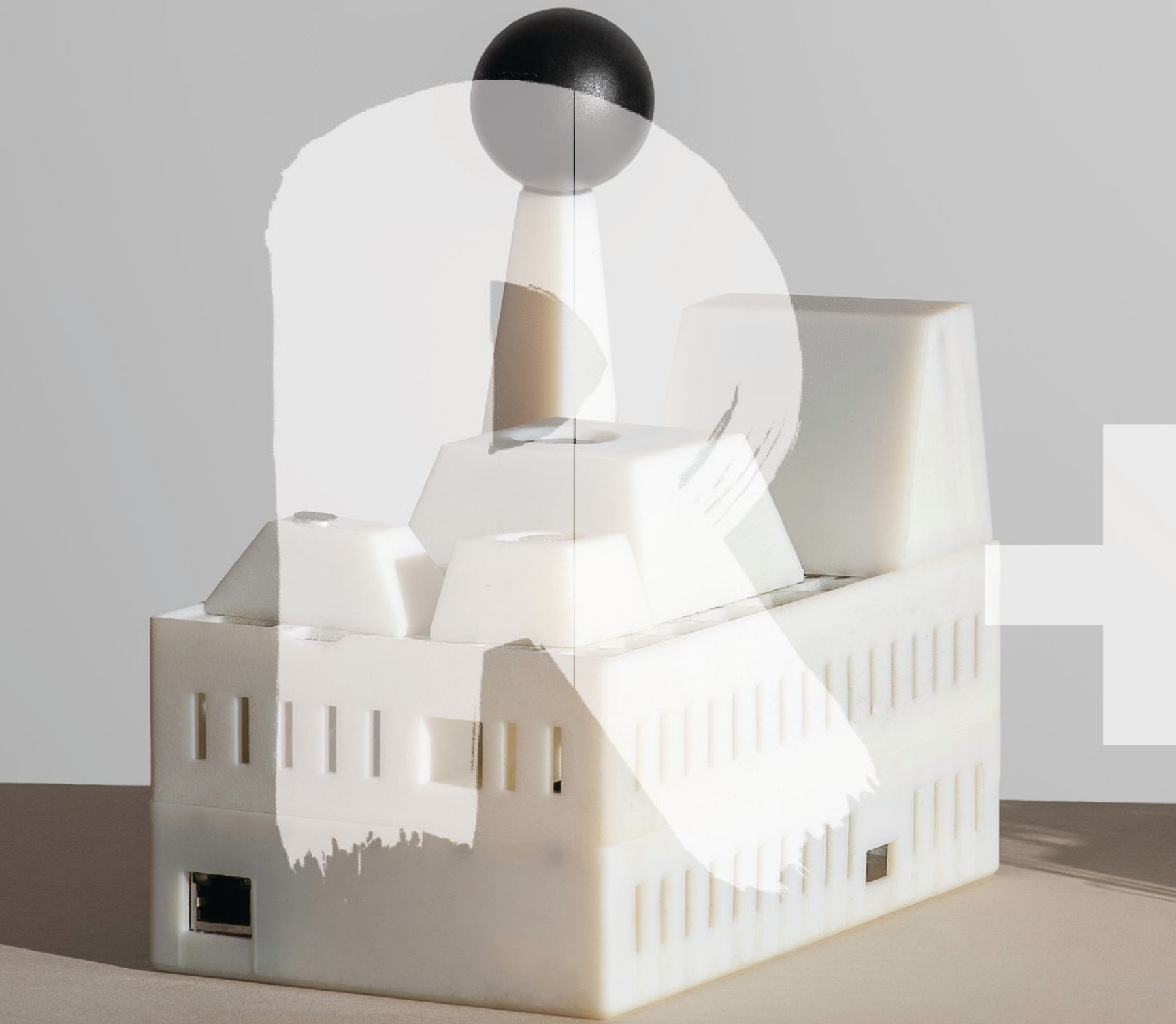
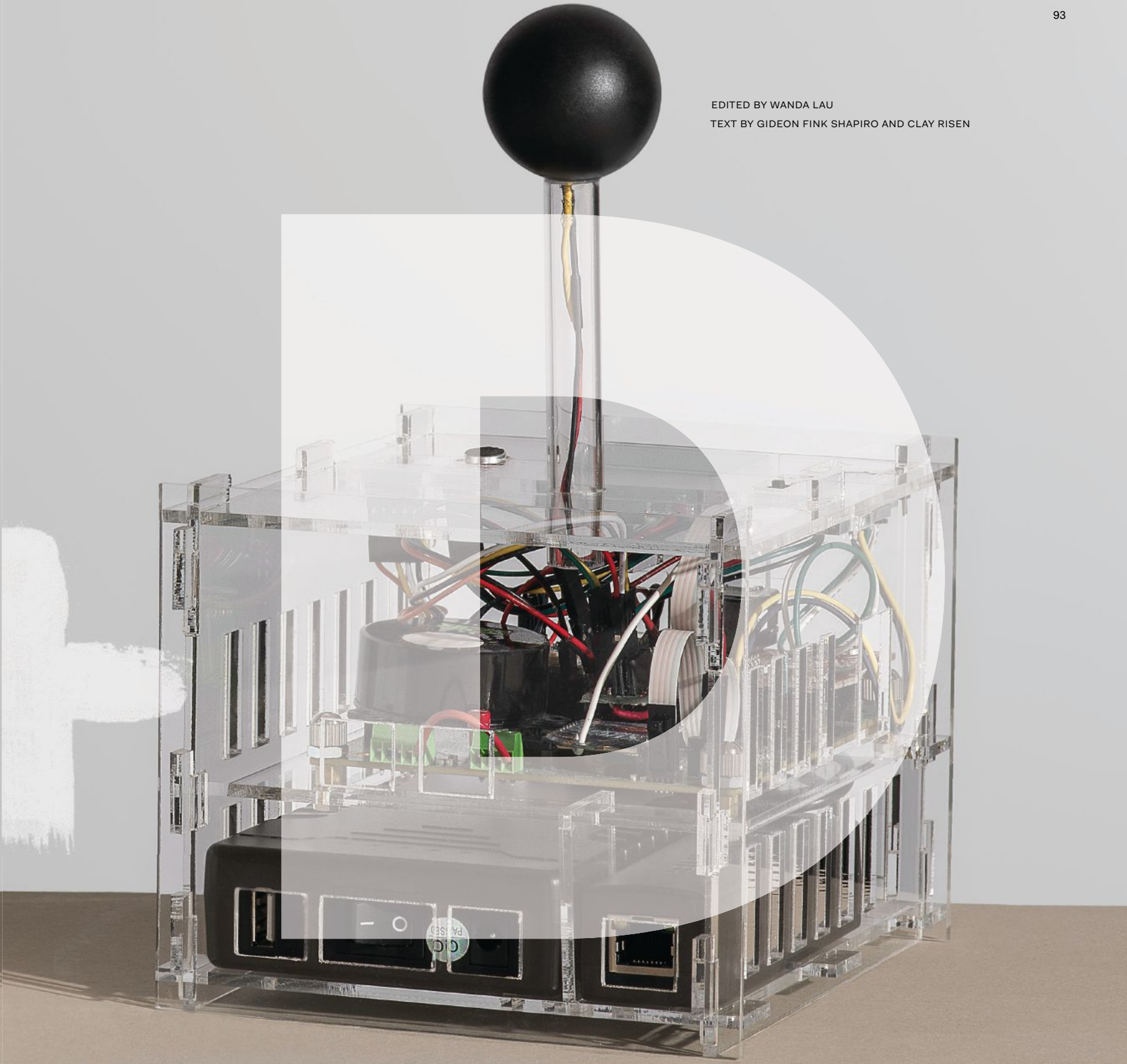


*Left to Right:* Early and current prototypes of LMN Architects' Post Occupancy Data Device

AMANDA RINGSTAD

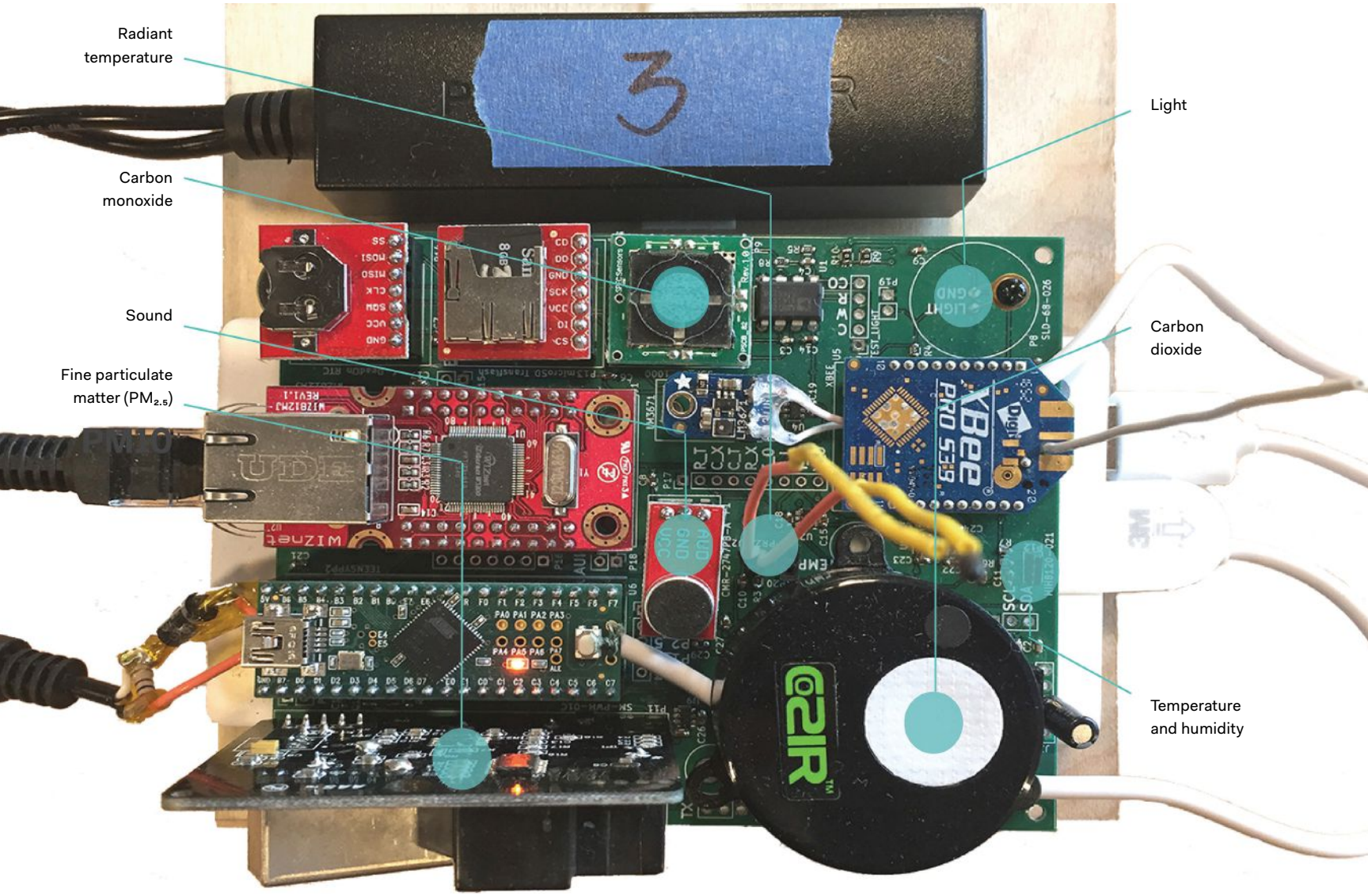
EDITED BY WANDA LAU
TEXT BY GIDEON FINK SHAPIRO AND CLAY RISEN



Do we control technology or does technology control us? Never has that question seemed more apt than now. The use of computational design, digital manufacturing, and artificial intelligence, if mismanaged, can have frightening consequences, the implications of which society is just beginning to comprehend. But the jury for ARCHITECT's 13th annual R+D Awards was determined to accentuate the positive side of these advancements, seeking the best examples that "melded technology, craft, and problem-solving," says Craig Curtis, FAIA. ¶ The eight winners selected by Curtis and fellow jurors James Garrett Jr., AIA, and Carrie Strickland, FAIA, prove that designers can remain solidly in the driver's seat despite the frenetic pace of technological developments in the building industry and beyond. "Architects are anticipating the future, helping to shape it, and giving it form," Garrett says. "Moving forward, we are not going to be left behind. We are going to be a part of the conversation."

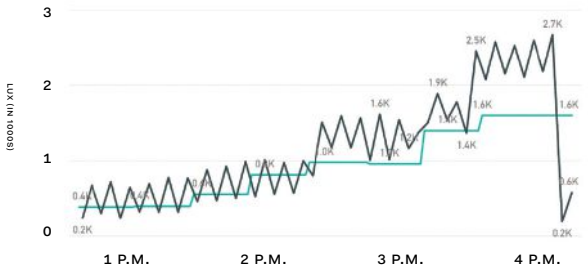
# Post Occupancy Data Device (PODD)

HONORABLE MENTION

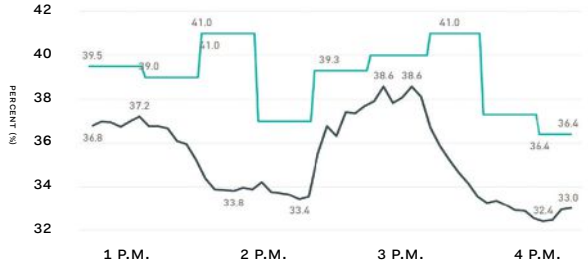


Although many architects profess interest in post-occupancy performance, only a handful have taken action to derive more reliable and sophisticated ways to gather data. Seattle-based LMN Architects believes its Post Occupancy Data Device (PODD) can become "the tool that is missing," by capturing how a completed building performs over the course of a day, a week, or a month. The firm's effort includes both hardware and software design. ¶ Each PODD unit packages wireless, networked instruments for measuring temperature, humidity, air quality, ambient light, ambient sound, and other environmental parameters. The adaptable, plug-and-play design allows for the exchange or addition of new sensors. LMN also designed open-source software to give users finer control of data collection by adjusting the frequency at which each sensor within each PODD takes a measurement. The device is envisioned as a complement to occupant surveys and the built-in data collection tools offered by some M/E/P systems. ¶ "We all understand the value of post-occupancy evaluations, but this would allow more people to do it," said juror Carrie Strickland. ¶ In PODD's inaugural field test, LMN deployed three units, each measuring 5 inches by 4 inches by 2 inches, over a three-day period in a student center recently completed by the firm. The devices recorded the ambient conditions of spaces that varied in size, lighting, and ventilation. With 12 units in operation at press time, LMN is planning to run two experiments for up to eight weeks "to see what the datasets look like over different time increments, and at what point we get diminishing returns," says designer Plamena Milusheva. ¶ The latest iteration of PODD's 3D-printed enclosure measures 6 inches by 5 inches by 4.5 inches and is transparent, inviting the curiosity of building occupants while protecting the sensitive equipment. "This prototype is going in the right direction," affirmed juror James Garrett Jr. ¶ LMN invests in time-consuming, nonbillable research endeavors for one primary reason, says partner Stephen Van Dyck, AIA. "The value is in our ability to improve our designs in the future—to make better buildings," he says. "When we don't see the tool we need, we think, 'Let's try to build it.'" —G.F.S.

Illuminance




Relative Humidity



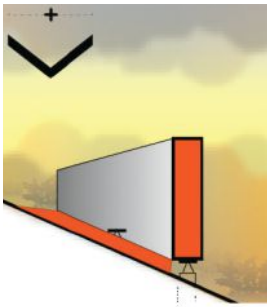

Handheld device
PODD

Sample Distribution of PODD Network Clusters

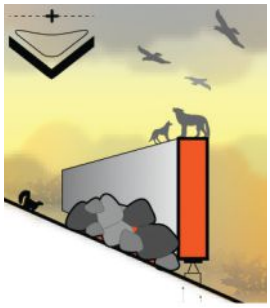
# Slide

HONORABLE MENTION

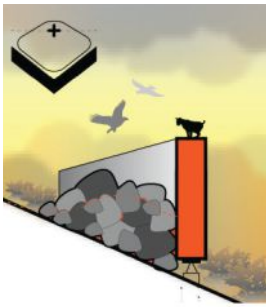
Install Intervention



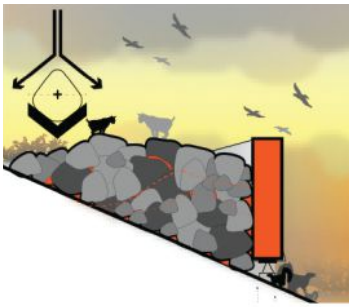
Post-Event: Years 1 to 5



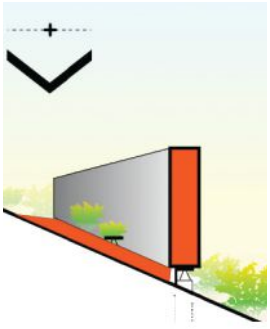
Post-Event: Years 5 to 15



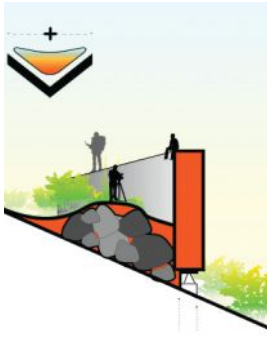
Post-Event: Years 15 to 20



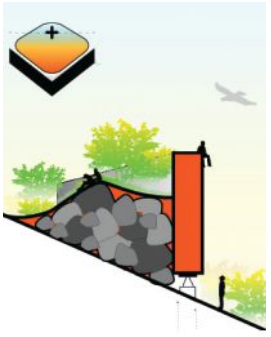
Install Intervention



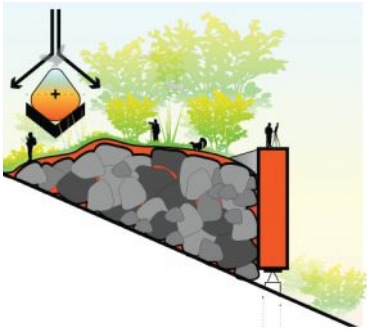
Evolution: Years 1 to 5



Evolution: Years 5 to 15



Evolution: Years 15 to 20



In Southern California, sea level rise is only one cause for concern. The region's increasingly disastrous cycle of drought, fires, and floods is another, with each phase bringing immediate dangers. Collectively, they contribute to catastrophic mudslides and erosion, particularly in the steep hillsides and canyons that run just north of Los Angeles. ¶ The conventional response of situating enormous catch basins at the foot of each canyon to catch debris is inefficient, environmentally unfriendly, and at the end of their 50-year life. Rather than rebuild them, Los Angeles–based Rios Clementi Hale Studios has proposed a different approach: Slide, a series of chevron-shaped, steel-frame gabion cages that anchor into hillsides. When the chevrons point uphill, the cages, filled with rubble for ballast, deflect and slow debris; when they point down, they act as miniature catch basins, slowly filling with dirt and rock. ¶ An array of these cages on a hillside creates "a game of Plinko," says firm principal and architecture studio director Gregory Kochanowski, AIA. "It works like a system, steering debris down the hill." While some debris will invariably make it to the bottom, the cages will at least interrupt the destructive snowballing of material—and change the shape of hills themselves. Over time, debris caught in the Slide basins will level out the steep topography, creating terraces from which vegetation will sprout and ultimately stabilize the eroding hillside. The terraces, Kochanowski notes, can also provide respite for firefighters struggling up the canyons' steep slopes to reach wildfires. ¶ Though still only a proposal, Slide is ingeniously simple, which appealed to the jury. "It's incredibly functional," says juror Carrie Strickland. "It doesn't seem like something that is cost-prohibitive, and it will be attractive." And with climate change already reshaping the world, rapidly deployable countermeasures—even in the concept phase—are welcomed. —C.R.

Canyon Strategy


Five years after the micro-basins are installed, Rios Clementi Hale Studios envisions a canyon transformed into a "landscape machine" that can handle debris flow and host new recreational, agricultural, and research opportunities.

1. Campground
2. Wildlife research
3. Geological research
4. Tree farm
5. Soil cropping
6. Firefighting station
7. Emergency staging
8. Walking path
9. Service road
10. Agricultural zone
11. Existing community

# Uplift Tech Cabinet

CITATION

RACHAEL PERRY

Minimalism at its best looks and feels simple, concealing its true sophistication. The sleek, intuitive Uplift Tech Cabinet by Bristol, Pa.–based Robern, a Kohler company, strikes this balance. "It is just a medicine cabinet, but it's the most beautiful medicine cabinet I've seen," said juror Craig Curtis. ¶ An update to an existing product, the cabinet features an illuminated, upward sliding mirror, defogging, cantilevered glass shelving, tamper-resistant outlets, integrated USB ports, and several handle finishes, including chrome and matte black. It also offers up to three light sources: the perimeter band of dimmable LEDs, which emanate a warm 2700K glow; a night light along the bottom handle; and illumination for the cabinet interior that switches on when the mirror is lifted. ¶ The biggest technical challenge was the addition of electricity and lighting to the sliding mirror, says Robern director of new product development George Wahlgren: "We had to make it safe and still make the door feel effortless … even with the added weight of the electrical components. We added ball bearings to achieve a smooth motion regardless of where the user touches the handle." ¶ The 27-inch-tall unit becomes 47 inches tall when fully opened. The electrified cabinet measures 48 inches wide; compact, non-electrified versions with interior lighting are available in 24-, 30-, and 36-inch widths. ¶ Thinking back to a recent multifamily housing project she worked on, juror Carrie Strickland mused, "I would swap out all the medicine cabinets, mirrors, and lights for this product in a heartbeat." —G.F.S.

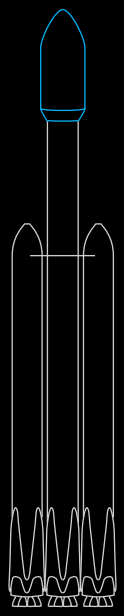
# Moon Village

HONORABLE MENTION


COURTESY SOM | SLASHCUBE GMBH

Space travel and exploration have fascinated generations of scientists and engineers, but architects are becoming mesmerized as well. In 2018, Skidmore, Owings & Merrill (SOM), the European Space Agency, MIT Media Lab, and MIT Department of Aeronautics and Astronautics formed a collaborative research agreement—sparked by shared mutual interests—to develop a vision for a permanent human settlement on the moon's surface. ¶ Beyond the obvious technical challenges is the human-centered design needed to make extraterrestrial living functional and tenable, notes Colin Koop, AIA, a design partner in SOM's New York office. For example, astronauts on hypothetical 500-day missions would need areas for fitness and recreation, and windows to enjoy views from the proposed 2-kilometer-square site on the rim of Shackleton crater at the moon's South Pole, where near-continuous sunlight would be harvested to generate electricity and grow food. ¶ Still in development, SOM's proposed system of habitation

Transportation
Mode Mock-Up

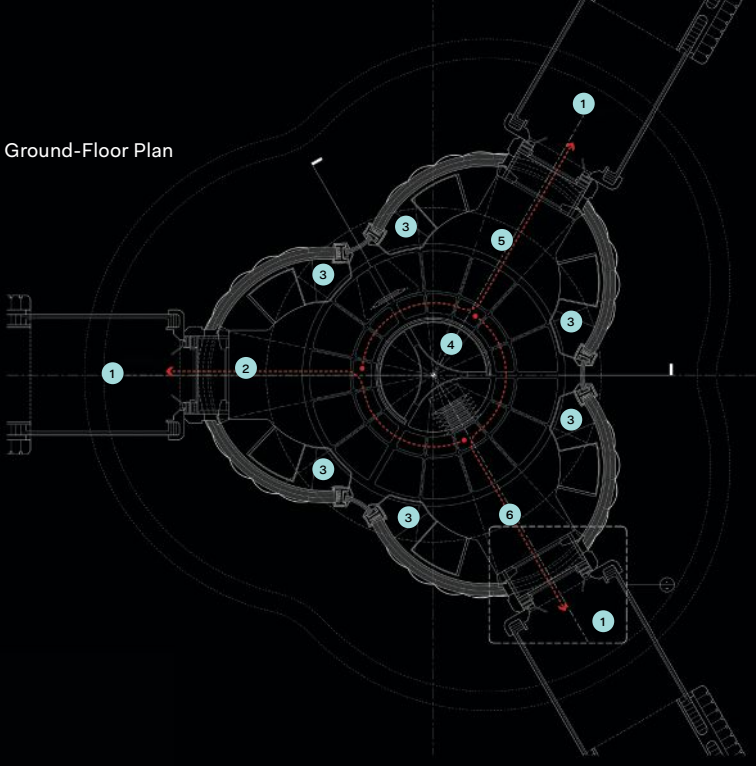


modules can cram into the largest rockets currently made by SpaceX and Blue Origin. After landing, the modules will employ inflatable-shell technology to double in volume to 25,000 cubic feet (approximately equivalent to a 30-foot cube). Multistory and amenable to many uses and configurations, the modules will be held upright by structural mesh and armored to withstand potential micrometeorite impacts. The envelope will also be packed with thermal insulation, radiation-blocking materials, and a liner to contain pressurized air. ¶ SOM envisions the modules connecting in three-cell clusters that can expand and link diagonally to form a hexagonal network on the site, dubbed Moon Village. "In case of any obstruction, the astronauts could still move from structure to structure without exposing themselves to solar radiation by stepping outside the enclosure," says SOM senior architectural designer Daniel Inocente, ASSOC. AIA. ¶ Now SOM is studying how to connect rigid components, such as airlocks and 3D-printed radiation shelters, to the inflatable shells. If prototyping and testing proceed as anticipated, Koop says, a fully functioning module could be launched in as soon as five years. ¶ The meticulous planning and rapid progress of Moon Village impressed the R+D jury. "This was well thought out and it captured my imagination," said juror James Garrett Jr. "It feels not far-fetched with the research that's gone into it." —G.F.S.

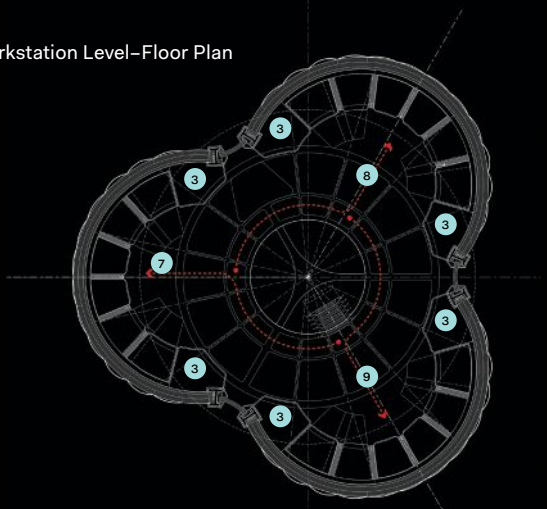
*Top:* The team designed the habitation module to be encapsulated inside the payload fairings of rockets currently made by SpaceX and Blue Origin.

COURTESY SOM | SLASHCUBE GMBH

Ground-Floor Plan

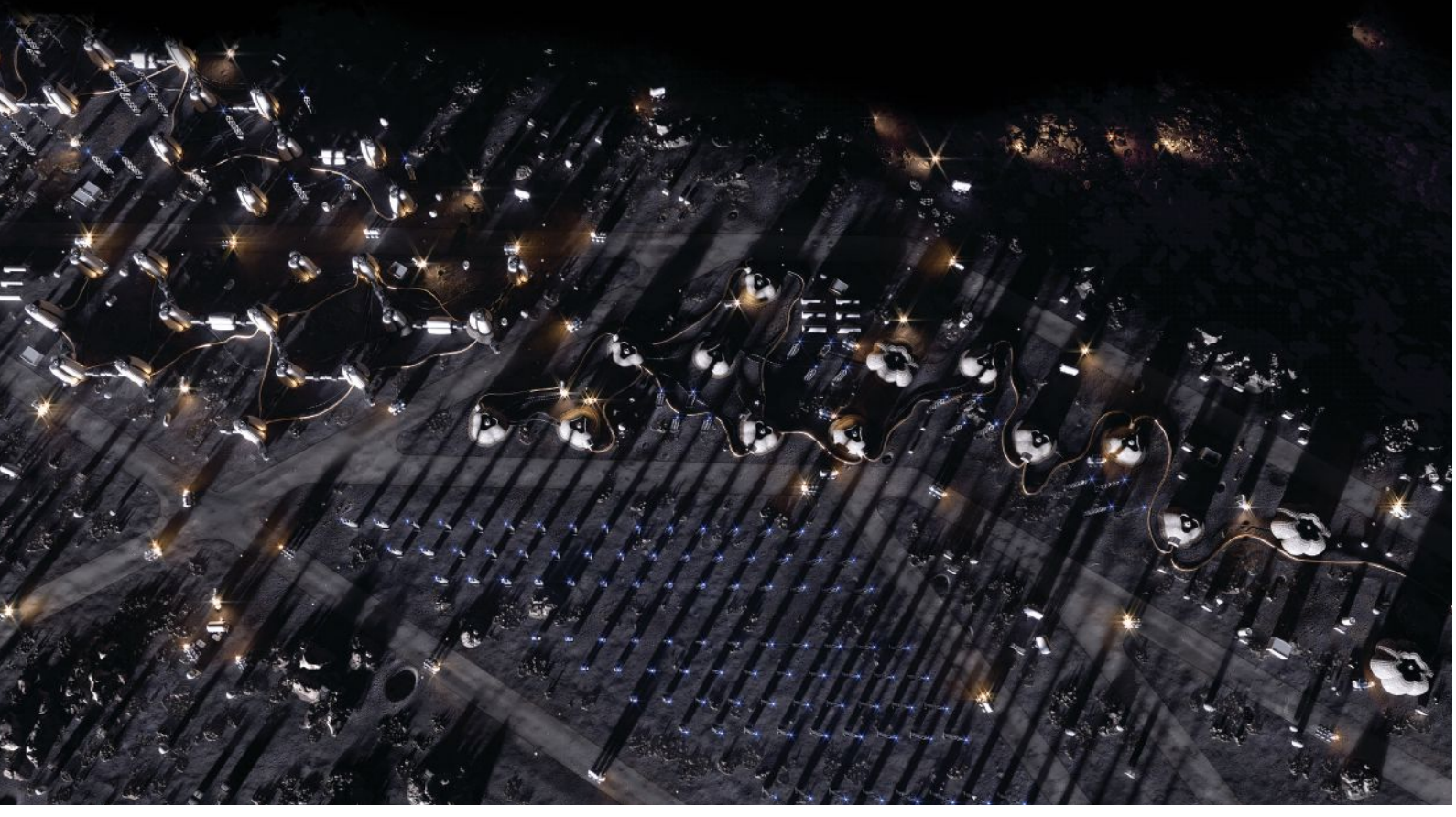



Workstation Level–Floor Plan




1. Airlock tunnel
2. Extravehicular activity suit and storage
3. Mechanical room
4. Vertical translation
5. Ward room and command control
6. Crew Health Care System and exercise
7. Workstations
8. Kitchen preparation and common utility room
9. Experimental laboratory and medical facility

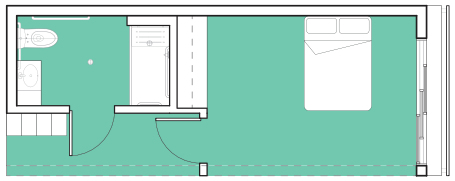
Moon Village Aerial



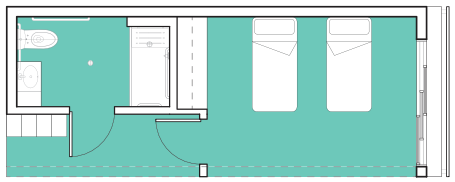
# Nest Tool Kit

CITATION

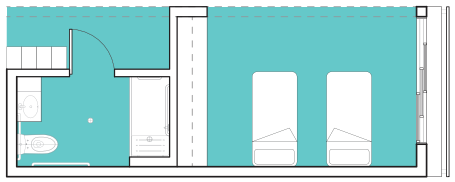
Blue Jay



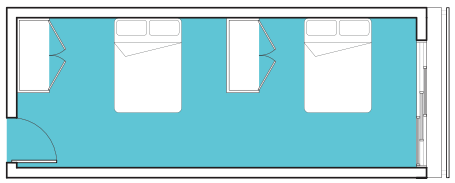
A1 One Bed



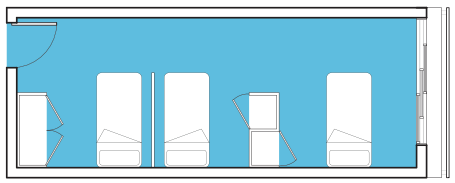
A2 Two Beds



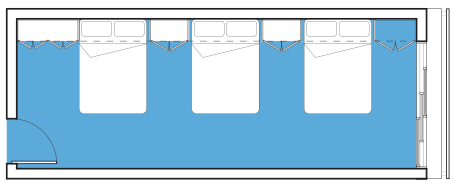
B Two Beds



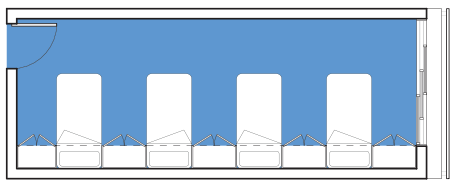
C Two Beds



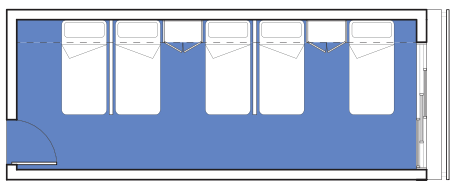
D Three Beds



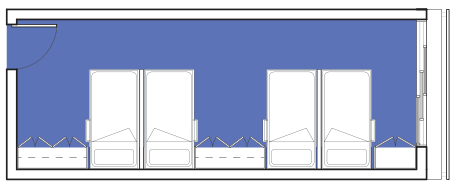
E Three Beds



F Four Beds

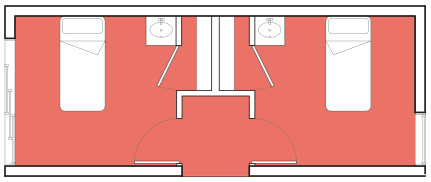


G Five Beds

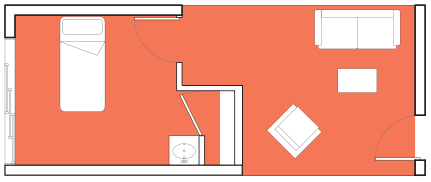


H Eight Beds

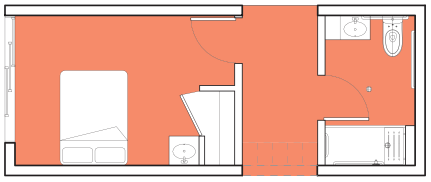
Dove



I Two Bedroom
(join with J and K)



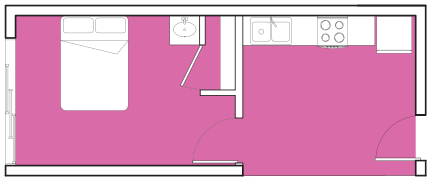
J One Bedroom



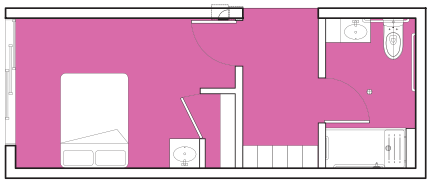
K One Bedroom

Osprey

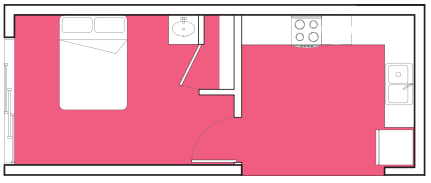
L Studio



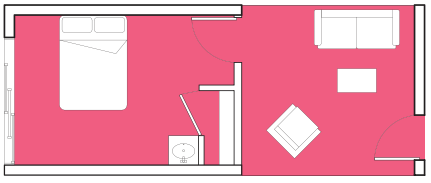
M1 Two-Bedroom Unit
(pair with M2)



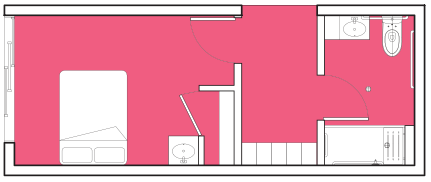
M2 Two-Bedroom Unit



N1 Three-Bedroom Unit
(join with N2 and N3)

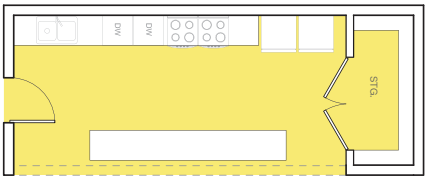


N2 Three-Bedroom Unit

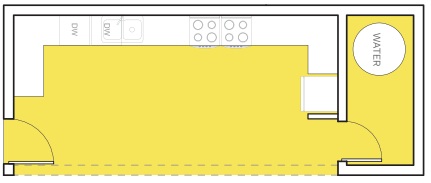


N3 Three-Bedroom Unit

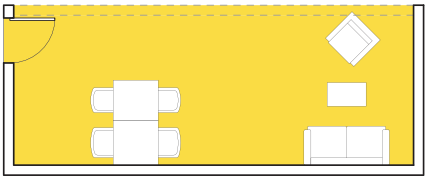
Shared Spaces



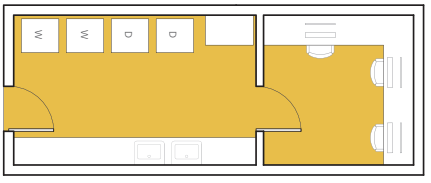

P1 Community
Kitchen (Type A)



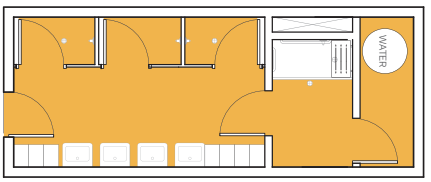

P2 Community
Kitchen (Type B)



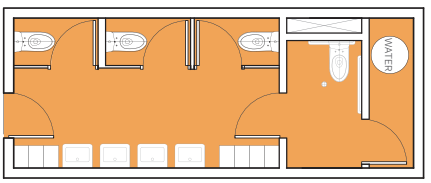
Q Community
Space



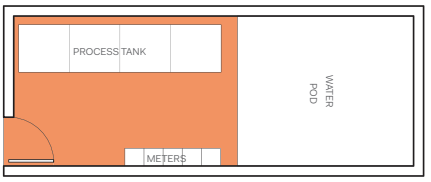

R Laundry Room
and Office




S Public Shower
Room (Unisex)



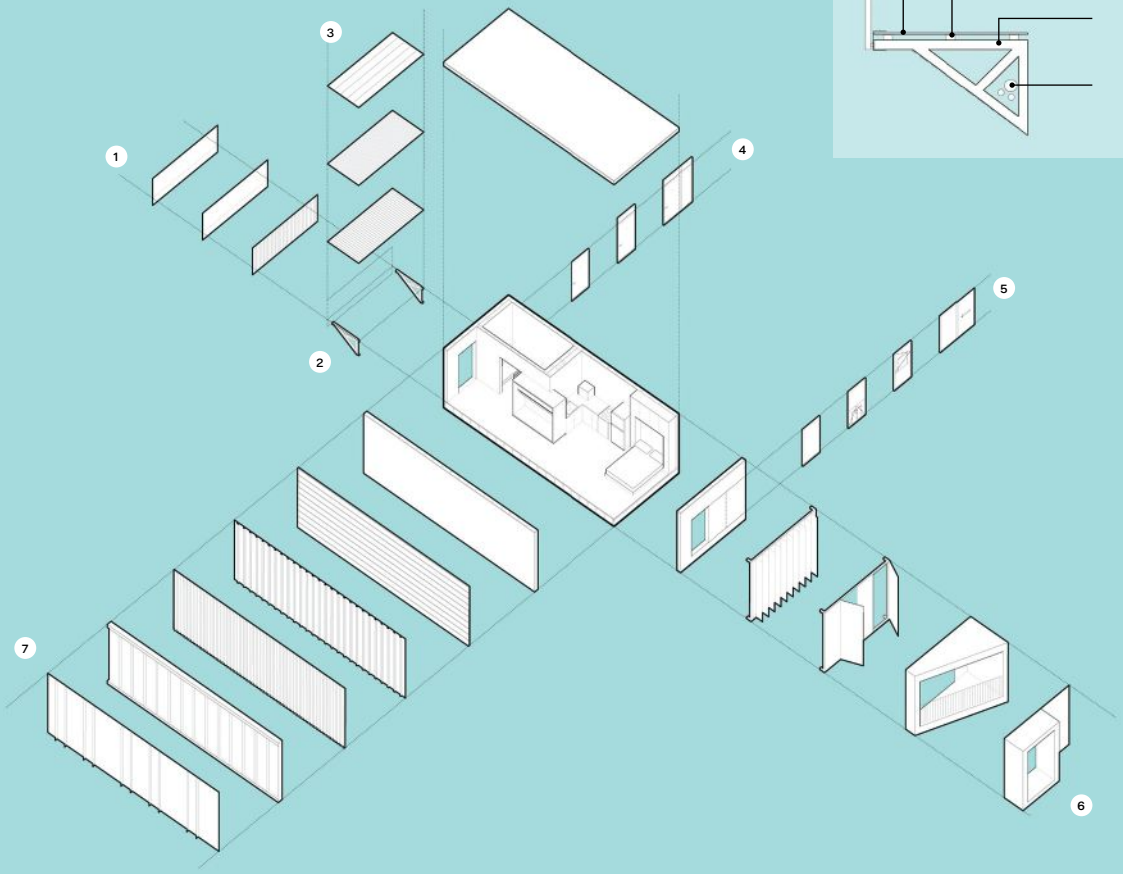

T Public Restroom




W Water Pod and
Electrical Room

Nest's scalable and adaptable kit of parts can be combined to create three housing types: Blue Jay for high-density shelters for temporary accommodation; Dove for permanent single-room-occupancy units with shared support spaces; and Osprey for long-term multifamily. The shared-spaces modules can slot into any housing type, and operate with or without direct connection to public utilities.

Building Envelope and Exterior Finish Options




1. Guardrail

Open metal pickets

Perforated metal

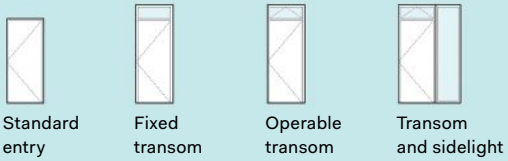
2. Balcony/Corridor



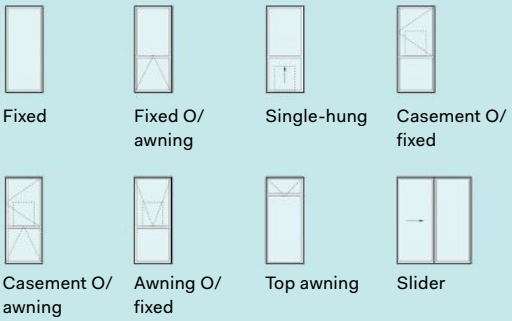

In 2016, Los Angeles voters passed a $1.2 billion bond to provide temporary or permanent shelter for up to 20 percent of the city's 50,000 homeless people. But virtually nothing has been done, thanks to the city's restrictive zoning laws and burdensome paperwork. ¶ "One of the biggest problems is not just building additional housing, but getting it to market," says Lawrence Scarpa, FAIA, whose local firm, Brooks + Scarpa, has been nationally recognized for its innovative designs of affordable housing. "There is a schism between what voters say they want, and what is actually happening." ¶ Rather than rail against red tape, Brooks + Scarpa and the Rialto, Calif.–based prefabricated housing manufacturer Plant Prefab developed Nest, a kit of mix-and-match affordable housing components that satisfy the city's zoning rules. ¶ Housing for the homeless is typically designed and built as one-off projects, often at a scale virtually guaranteed to draw opposition from neighbors, Scarpa says. With Nest, units can be built in large volume, but dispersed in small numbers across a wider swath of land, minimizing the risk for NIMBY backlash. ¶ Nest's basic units include residential modules such as dorm-style rooms, studio apartments, and single-family units, as well as service modules such as kitchens, shared bath and shower rooms, and common areas. Combined, the modules offer a variety of configurations suitable for different project types: a homeless shelter, a community center, an apartment building. The modules are sized to fit on the 50-foot-by-150-foot lots typical to L.A., and they are stackable up to five stories, with a

**3.** Exterior Walkway/Balcony

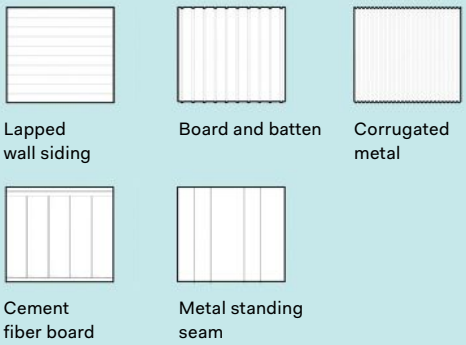

**4.** Entry Door



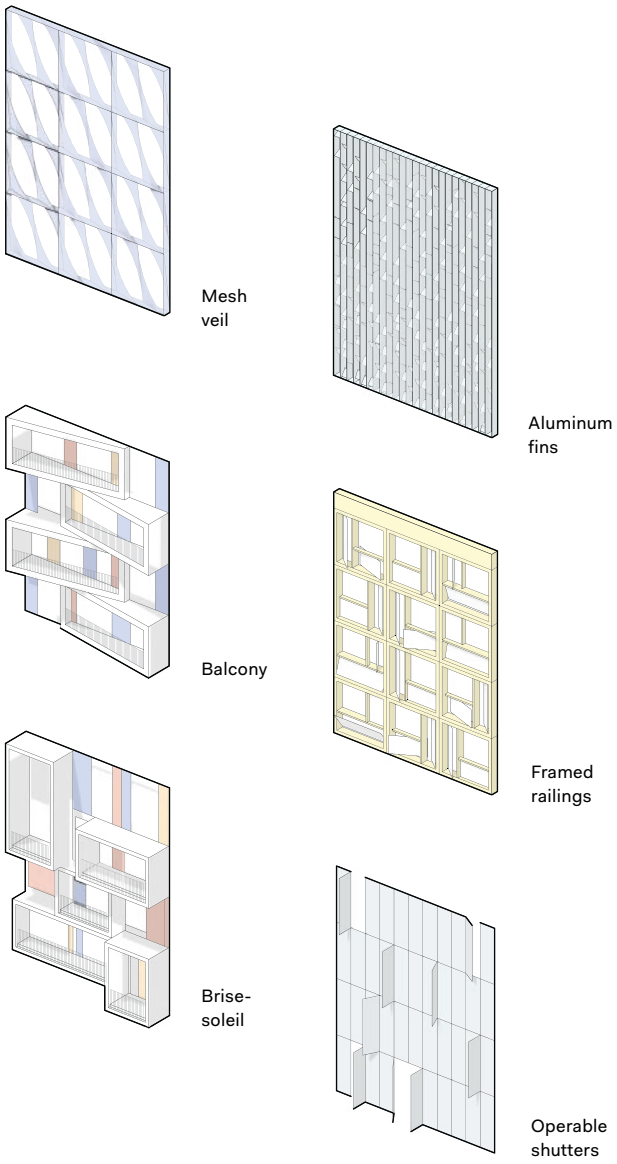

**5.** Window

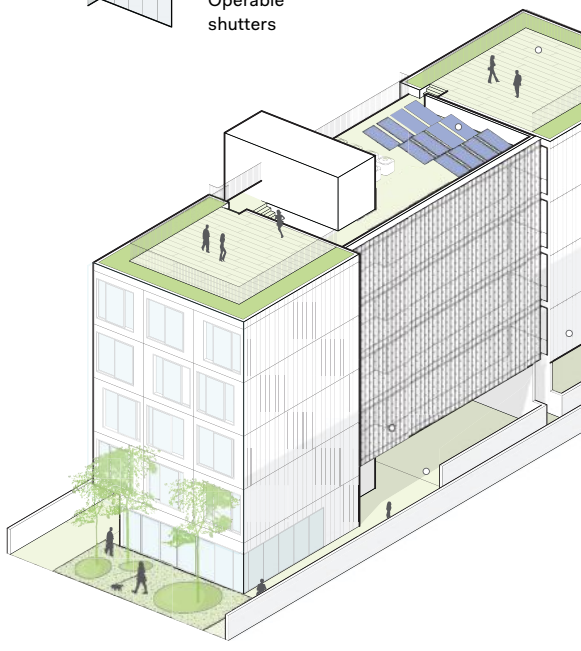



**7.** Wall Siding



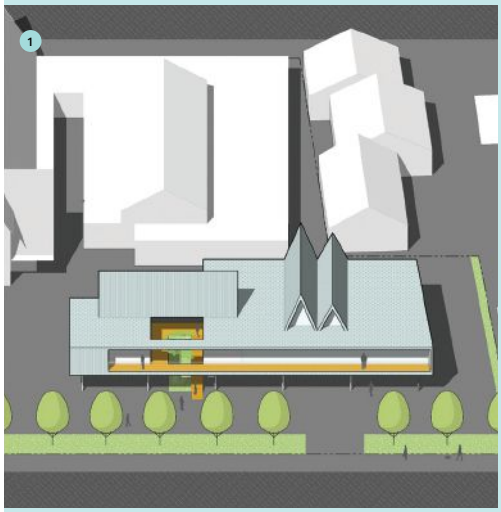
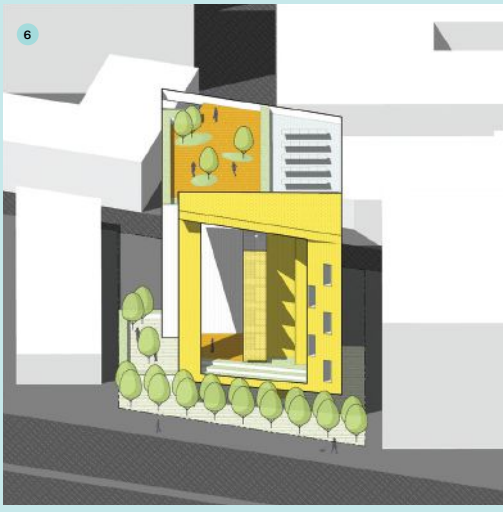

**6.** Modular Façade Options

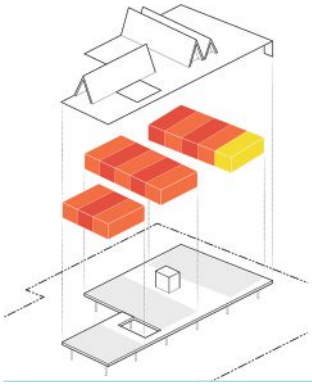


variety of prefab exterior finishes to create a unified aesthetic. ¶ Each module can be outfitted off-site with its own power generation and water collection systems, so the facilities can be self-sufficient and independent of many city utilities. As a result, a Nest project requires minimal paperwork, Scarpa says. "We took all the codes and worked between them." ¶ That level of deep analysis impressed the jurors. James Garrett Jr. found Nest to be "well thought out and something that could be the start of the next thing." ¶ Earlier this year, Brooks + Scarpa won a $1 million grant from Los Angeles County to develop a Nest prototype on an empty lot. If it meets expectations, expect to see more construction using Nest kits, says Plant Prefab founder and CEO Steve Glenn: "With Nest, we can actually get stuff out there." —C.R.

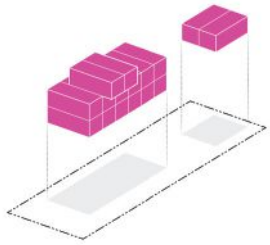
Deployment Examples by Zoning

| | Parking Lot | Infill | Mid-Rise |
|---|---|---|---|
| Residential Zone |  |  |  |
| Commercial Zone |  |  |  |



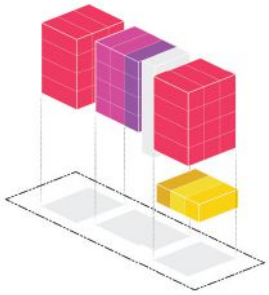
**1.** Congregate Home on a Residential Church Parking Double Lot

| | | |
|---|---|---|
| K | ×7 | 13 bedrooms + 8 bathrooms |
| I | ×5 | 1 community kitchen |
| P | ×1 | 1 laundry room and office |



**2.** Multifamily Housing on Low-Rise Residential Infill Single Lot

| | |
|---|---|
| M1×8 | 8 two-bedroom/one-bathroom units |
| M2×8 | |

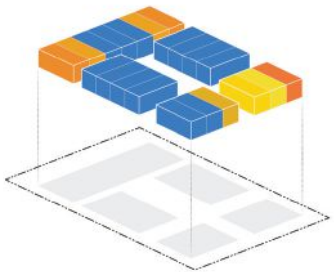


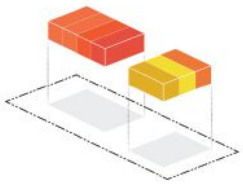
**3.** Multifamily Housing on Mid-Rise Residential Infill Single Lot

| | |
|---|---|
| N1 ×8 | 8 three-bedroom/one-bathroom units |
| N2 ×8 | 4 two-bedroom units with two bathrooms |
| N3 ×8 | 4 studios |
| M1×4 | 1 community kitchen |
| M2×4 | 1 community room |
| L ×4 | 1 laundry room and office |
| P ×1 | |
| Q ×1 | |
| R ×1 | |

**4.** Shelter on a Commercial Parking Parcel Double Lot

| | | |
|---|---|---|
| F | ×14 | 56 shelter beds |
| T | ×2 | 2 shared bathrooms |
| S | ×2 | 2 shared shower rooms |
| P | ×1 | 1 community kitchen |
| Q | ×1 | 1 community room |
| R | ×1 | 1 laundry room and office |
| W | ×1 | 1 water pod and electrical room |



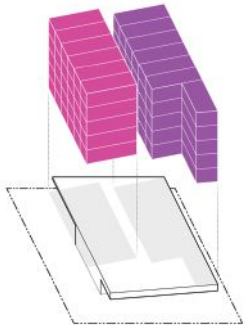


**5.** Single-Room Occupancy Housing on a Commercial Gas Station Single Lot

| | | |
|---|---|---|
| K | ×2 | 5 bedrooms and 2 bathrooms |
| J | ×1 | 1 community kitchen |
| I | ×1 | 1 laundry room and office |
| P | ×1 | 1 water pod and electrical room |
| R | ×1 | |
| W | ×1 | |

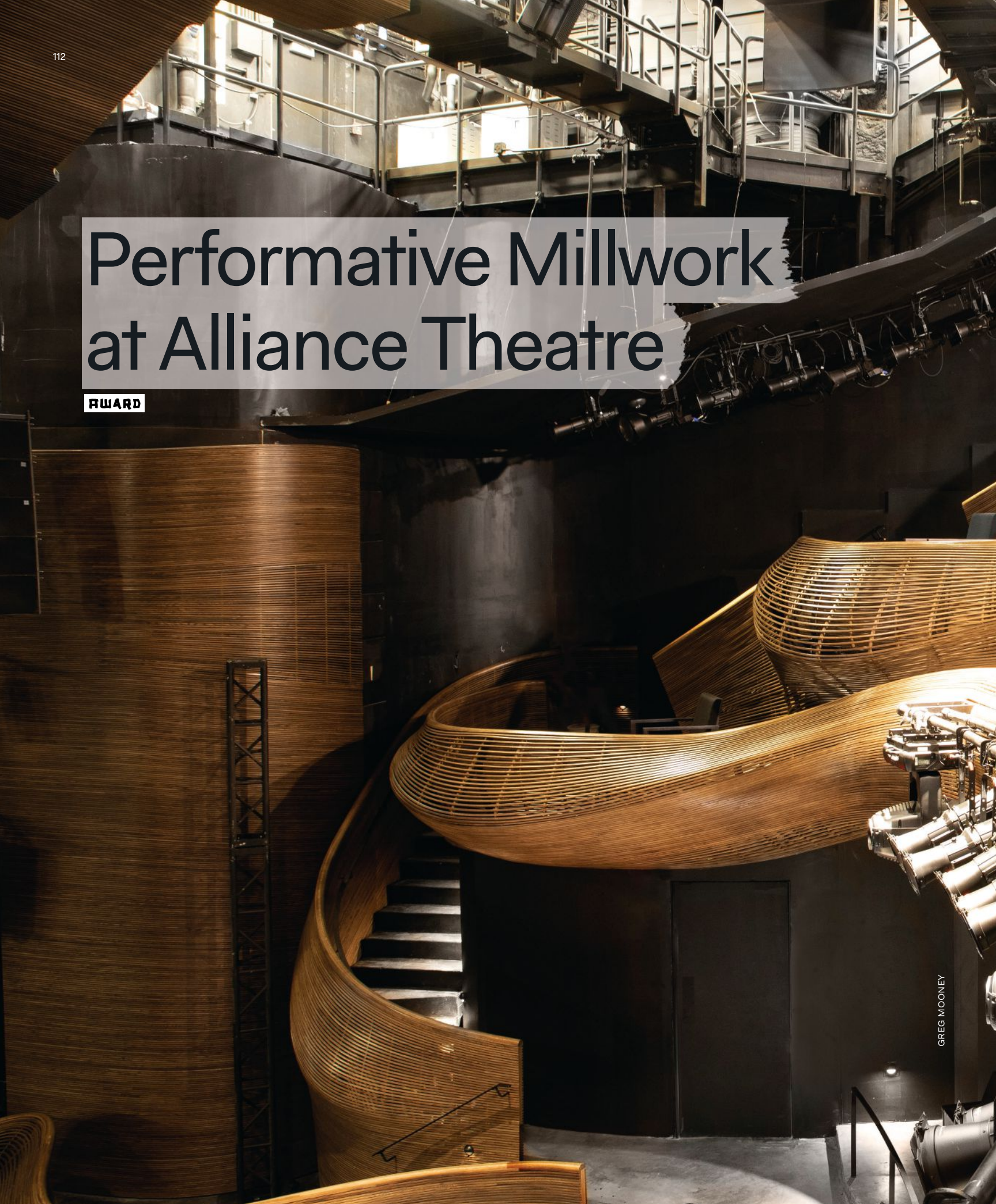
**6.** Multifamily Housing on Commercial Mid-Rise Double Lot

| | | |
|---|---|---|
| L | ×35 | 35 studios |
| M1 | ×15 | 15 two-bedroom/one-bathroom units |
| M2 | ×15 | 1 community room (not shown) |
| | | 1 laundry room and office (not shown) |
| | | 1 water pod and electrical room (not shown) |



# Performative Millwork at Alliance Theatre

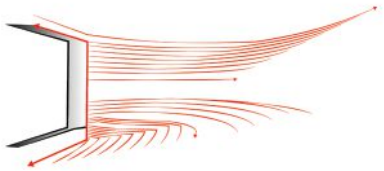
AWARD



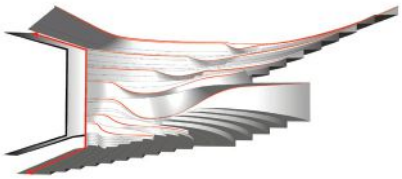
GREG MOONEY

The sculptural furniture and objects Brooklyn artist Matthias Pliessnig handcrafted from steam-bent wood had long captured the eye of Trey Trahan, FAIA. In 2015, when his firm, New Orleans–based Trahan Architects, was commissioned to renovate Atlanta's Alliance Theatre, he seized the opportunity to bring Pliessnig's sinuous designs into an architectural context. ¶ Not only would the custom-shaped and -positioned slats provide outstanding acoustics inside the theater, but steam-bending the wood would be more efficient than milling it on a lathe, which Trahan knew could be wasteful based on previous work with precision-milled wood. "I was fascinated with how one could go about the process of creating complicated shapes in a more ecological way," he says. ¶ The challenge here was how to scale the artist's handcrafted quality to outfit a 650-seat theater. After some iterating, Pliessnig and Trahan's team derived a technique to use steam to soften hundreds of reclaimed white oak slats,

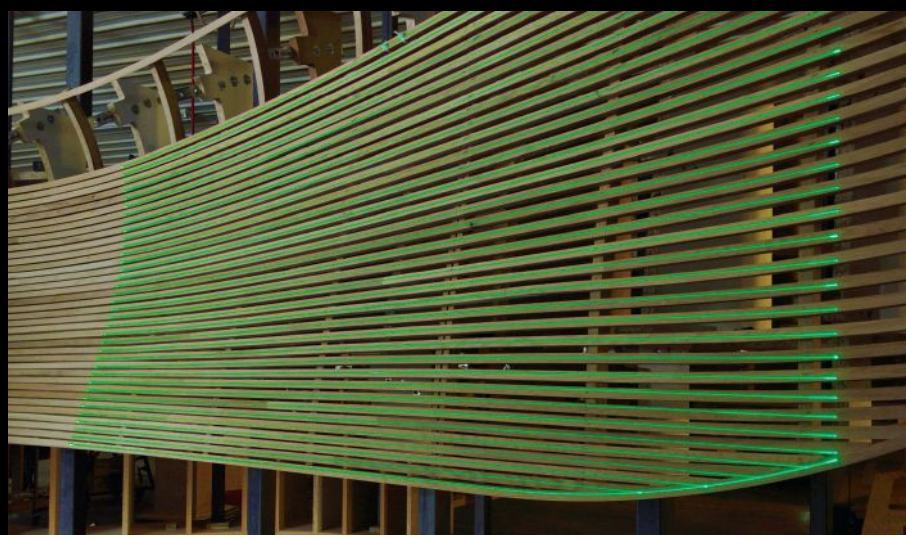
The design aimed to transform the previously separated balcony and orchestra levels into integrated seating and performance spaces.



each 1 square inch in section, and then bend them into place around the theater to create a serpentine surface along the theater's balcony railing and side terraces. ¶ To achieve Pliessnig's vision, Trahan collaborated with Plaistow, N.H.–based wood fabricator CW Keller Associates. Working in Rhino, the team devised a model that called for approximately 100,000 linear feet of wood slats placed around the theater. In locations where the acoustics needed a reflective surface, the slats were spaced close together; where absorption was desired, the slats were set further apart. Thanks to the model's accuracy and precision, CW Keller could specify the placement of each strand to a 1/32-inch tolerance. ¶ CW Keller's engineers then went to the shop and used the model to laser-project the exact location of each strand onto a wooden jig framework, which in turn was attached to a steel armature. The fabricators used a similar augmented-reality environment to install the completed framework panel in the theater itself. ¶ The wood strips are stained a rich, dark brown, enhancing the warmth and ambiance of the interior. "Over time, as audience members touch the surface, it will take on a beautiful patina," Trahan says. ¶ The result is human-scale, handcrafted millwork made possible with the latest 3D technology, which merges design, sustainable construction, and acoustical performance to challenge the relationship between a theater and its audience. "I want to just hug this thing and touch it," says juror James Garrett Jr. ¶ Alliance Theatre's leadership could not agree more. "The design," says the Jennings Hertz artistic director Susan V. Booth, "inherently unites each performance's audience into a fostered and connected community, and provides not [simply] a frame for the work we do, [but moreover] a graceful conduit for the work to land in the heads and hearts of those folks." —C.R.



Fabricating the steam-bent oak panels required a combination of traditional craftsmanship with laser scanning and projection. The augmented reality construction process placed Trahan Architects' scripted layouts into the real world, ensuring the accuracy of the millwork's form and placement.

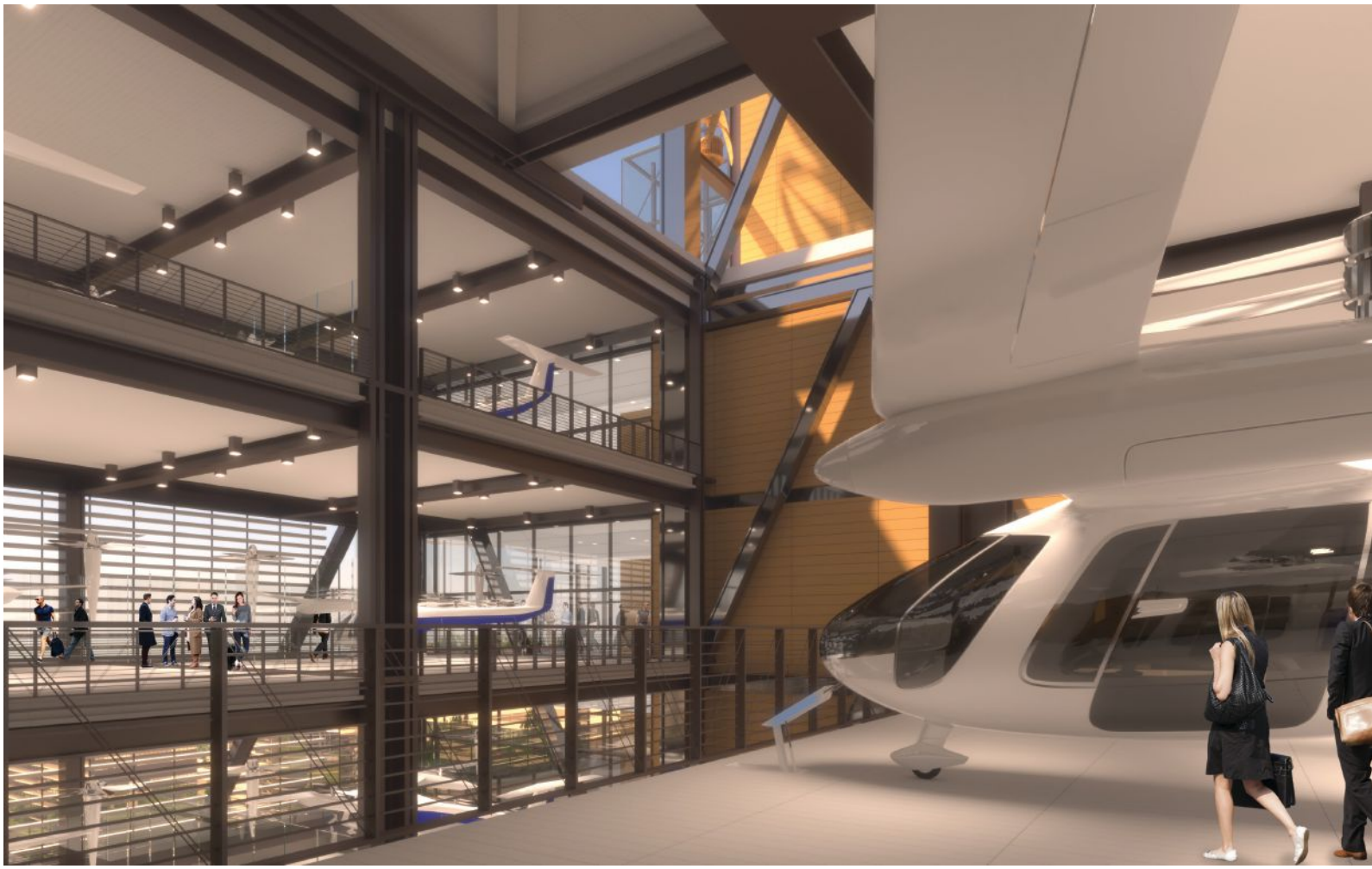


# Uber Sky Tower

CITATION

Flying taxis as the future of urban transportation may raise some eyebrows, but New Haven, Conn.–based architects Pickard Chilton and global engineering firm Arup are on board. ¶ In 2018, Uber announced a design competition for a mega-skyport—a facility capable of handling up to 1,000 five-seat electric helicopters every hour. The catch: It had to fit on a 3-acre site. ¶ Pickard Chilton and Arup's elegant solution caught the eye of the ride-sharing giant, which named it one of eight winners out of several dozen entries. To accommodate the required number of operations—or takeoffs and landings—the design team calculated that it would need six helipads, with room for 15 additional vehicles prepared for takeoff. To fit everything within the allowed footprint, the team created Sky Tower, a system of stackable helipad modules, each built around

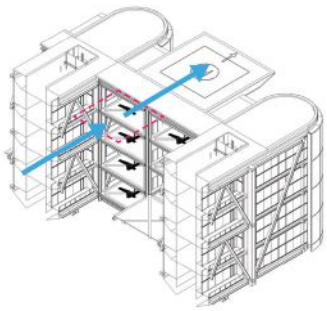

UBER



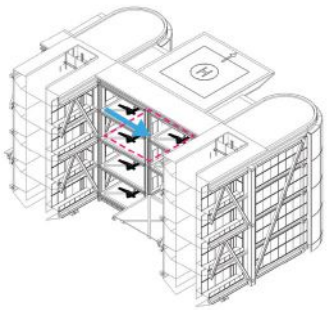
View of boarding area in a Sky Tower module

moving platforms. ¶ After a vehicle lands on a helipad platform on the topmost level of a Sky Tower module, the entire platform shifts to the side, making way for another platform where another incoming vehicle will land. The platforms cycle continually, conveying each landed craft down to one of the module's four lower levels, each of which accommodate four individual platforms. Once parked, vehicles are unloaded, serviced, and reloaded. Each platform then raises its vehicle back to the top level of the module for takeoff. ¶ Six of those modules, stacked two high and three across, can fit snugly on 3 acres and, moreover, can handle 1,080 takeoffs and landings an hour. ¶ Arup senior airport planner Byron Thurber and the design team envision Sky Tower as part of a network that can transport users from one side of an urban area to another—from, say, central San Francisco to San Jose. "It's like the old Pan Am helicopter service," Thurber says, which took passengers from Midtown Manhattan to John F. Kennedy International Airport in New York. ¶ Whereas the price of that service limited clientele to all but the wealthiest, Pickard Chilton and Arup say a Sky Tower network could create enough volume to introduce real economies of scale, making the cost feasible for more travelers—and, in the process, lessen demand on existing, overburdened ground transit. ¶ "I'm not 100-percent sure that this is ever going to happen or this is 100-percent plausible," said juror James Garrett Jr., "but I love the fact that we're thinking forward—we're dreaming forward—as design professionals." ¶ Pickard Chilton principal Jon Pickard, FAIA, says that a version of the compact helipad concept may be closer to reality than one might expect. Regulatory hurdles aside, he says, the technology exists to begin building a network of flying taxis and Sky Towers within five years. "This is going to happen," Pickard says, "and it is going to change our world." —C.R.

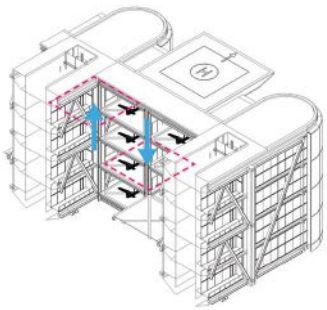
Shifting Operations Within a 20-Second Interval



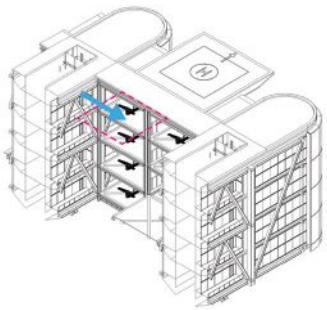
1. Departing aircraft shifts off platform; arriving aircraft shifts on (50-foot shift)



2. Platform with just-landed aircraft shifts to the side of elevator shaft (25-foot shift)

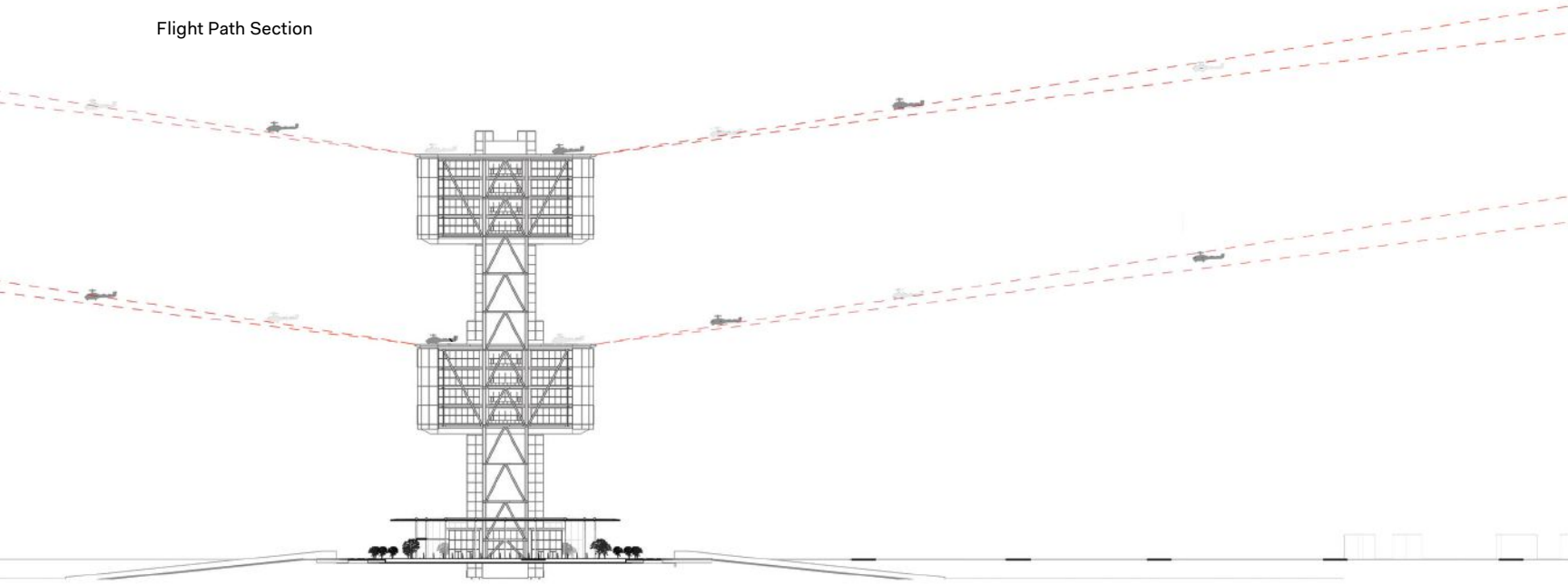


3. Platform descends while another platform rises to the top deck (28-foot shift)

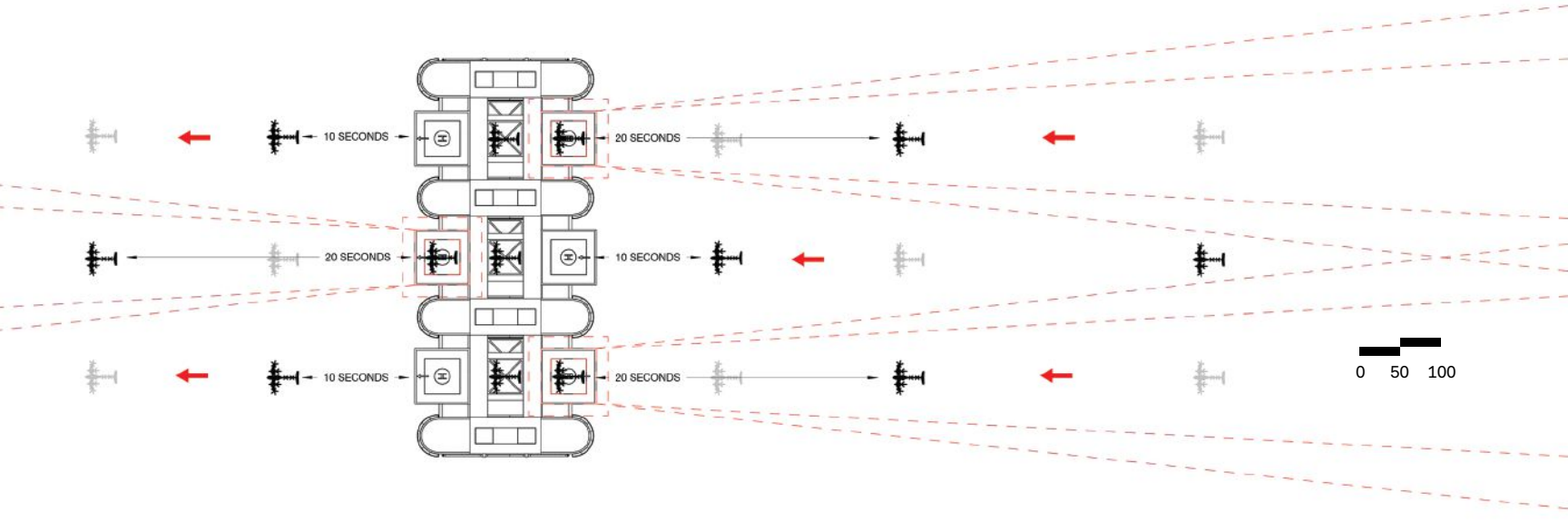


4. Platform on top deck shifts to the center for aircraft departure and then arrival (25-foot shift)

Flight Path Section

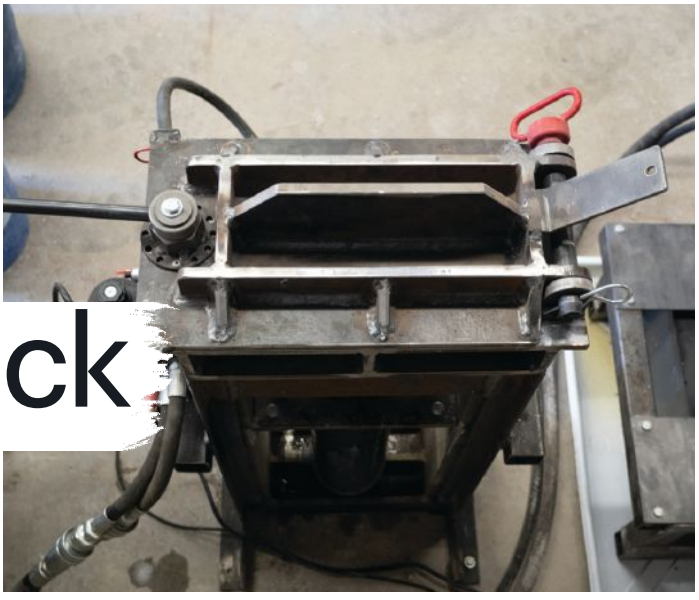


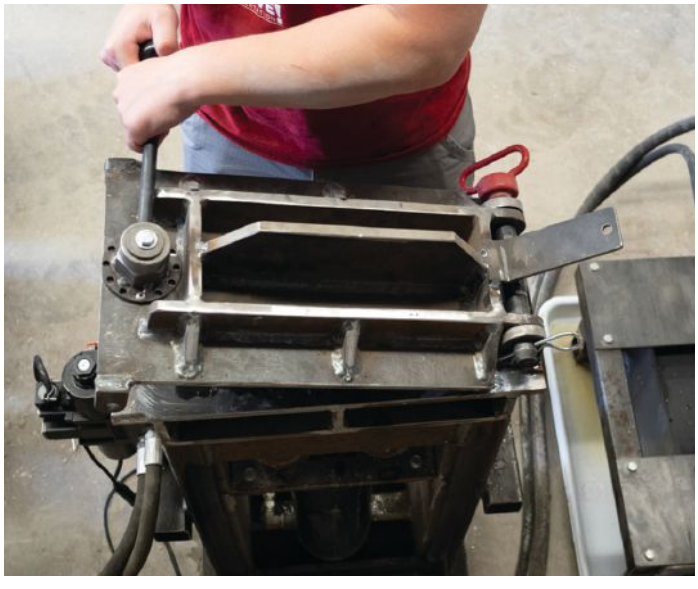
Flight Path Plan

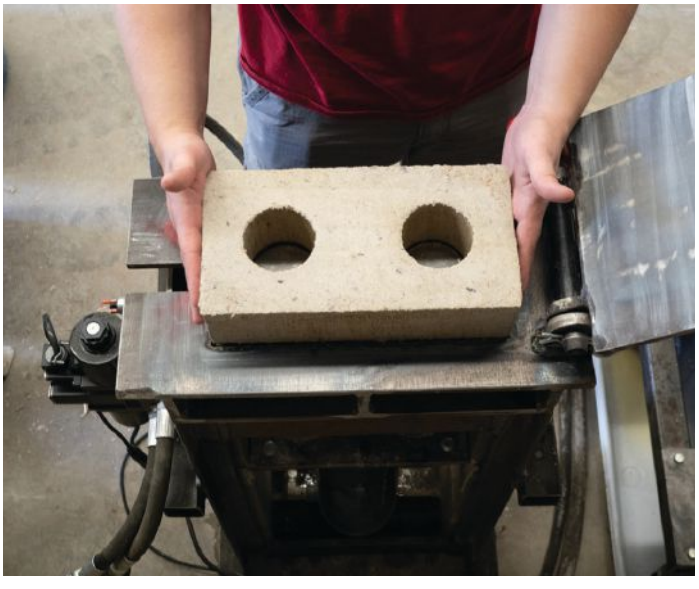


# Drywall Waste Block

AWARD







The pressing process for a drywall waste block can occur on-site using portable machines or off-site using existing machinery at conventional CMU plants.

The masonry block, a workhorse of modern construction, has been a target for innovation since the 1920s, when Frank Lloyd Wright built the first of his "textile block" houses to demonstrate the beauty of inexpensive materials. Its latest reinvention comes from Washington State University (WSU) courtesy of School of Design + Construction professor Taiji Miyasaka and adjunct professor and fabrication labs manager David Drake. The duo wanted to find a use for discarded gypsum drywall, which accounts for 10 million tons of landfill waste in the United States each year. ¶ "We realized that drywall scraps have little commercial value and are not recycled well," Miyasaka says. He and Drake hit upon the idea of making building blocks out of pulverized drywall, which they say is less expensive than other drywall recycling initiatives. Their technique is simple enough to be DIY, but also scalable with potential industry-wide impact. "We can produce hundreds of these blocks with equipment that could fit in the back of a pickup truck," Drake notes. ¶ Manufacturing a drywall waste block (DWB) entails the shredding of drywall scrap, acceptable straight from construction or demolition sites; the addition of water and cement; and compaction of the mixture into standard molds at high pressure. Even the paper facer of the drywall can go right into the mix, increasing the blocks' strength and insulation value, and saving on processing costs. ¶ The project drew enthusiastic responses from the jury. James Garrett Jr. said, "This is radically useful and radically simple at a time when so many products are trying to call attention to themselves by being unusual." DWB is "very inventive," Carrie Strickland agreed. "I could really see it be produced at a high level." ¶ Preliminary strength testing indicates that DWBs behave similarly in compression to conventional CMUs, but at half the weight. Even more remarkably, DWBs are excellent insulators, with an estimated R-value 10 times greater than that of their concrete counterparts. While DWBs could be produced with industry-standard CMU manufacturing equipment, the WSU researchers say, the production process could be mobile as well, allowing builders to recycle scrap on site or anywhere convenient. "You can set up a station where it's needed and then move it to another place," Miyasaka says. ¶ Next up for Miyasaka and Drake are a series of performance tests of full-scale DWB wall assemblies to ascertain R-values, strength, freeze-thaw behavior, and water absorption under different combinations of reinforcement, mortar blends, and insulated and uninsulated cores. At least one commercial manufacturer has already expressed interest. ¶ Juror Craig Curtis noted the project's significance as comparable to "the introduction of fly ash into concrete, which now is commonplace. … I honestly think this could become a commodity product." ¶ Still, the researchers acknowledge, introducing a load-bearing exterior block product to market could take a decade due to the extensive and requisite third-party testing to certify its safety and performance. Meanwhile, Miyasaka and Drake are exploring nonbearing DWB applications, such as interior wall cladding, flooring, and exterior hardscaping and seating, and have already produced several concept samples with different colors and textures. "It's not good enough to do a product that's cheaper or greener than existing products," Drake says. "You've got to do something that's both less expensive and higher performing." —G.F.S.

AMANDA RINGSTAD

## JURY

**Craig Curtis, FAIA,** is head of architecture and interior design at Katerra, where he helped launch the now 300-plus-person design division of the Menlo Park, Calif.–based technology company and oversees the development of its configurable, prefabricated building platforms. Previously, he was a senior design partner at the Miller Hull Partnership, in Seattle.

**James Garrett Jr., AIA,** is founding partner of 4RM+ULA, a full-service practice based in St. Paul, Minn., that focuses on transit design and transit-oriented development. A recipient of AIA's 2019 Young Architects Award, he is also an adjunct professor at the University of Minnesota School of Architecture, a visual artist, a writer, and an advocate for increasing diversity in architecture.

**Carrie Strickland, FAIA,** is founding principal of Works Progress Architecture, in Portland, Ore., where she is an expert in the design of adaptive reuse and new construction projects and works predominantly in private development. She has also taught at Portland State University and the University of Oregon, and served on AIA Portland's board of directors.

## CREDITS

**Post Occupancy Data Device (PODD), page 94**
*Design Firm:* LMN Architects, Seattle · Plamena Milusheva, ASSOC. AIA, Chris Savage, ASSOC. AIA, Kjell Anderson, AIA
*Research Partners:* Belal Abboushi; Affiliated Engineers · Lyle Keck, James McNeill, Geoff McMahon
*Fabricators:* LMN Architects, Good Measure Design, Prototron Circuits, Printed Circuits Assembly Corp.
*Special Thanks:* Scott Crawford, ASSOC. AIA, Sam Miller, FAIA, Wendy Pautz, FAIA, Osama Quotah, AIA, Shima Sahebnassagh, ASSOC. AIA, Stephen Van Dyck, AIA

**Slide, page 96**
*Location:* California
*Architect:* Rios Clementi Hale Studios, Los Angeles · Mark Rios, FAIA (creative director); Gregory Kochanowski, AIA (project lead); Brent Jacobsen, Jennifer Schab, AIA, Chris Torres, Catherine Schy-Reibel (project team)
*Landscape Architect:* Rios Clementi Hale Studios · Brent Jacobsen

**Uplift Tech Cabinet, page 100**
*Designer and Manufacturer:* Robern, Bristol, Pa. · Jason Mort (lead engineer); James DeHope (electrical and compliance); Donna Morgan (project manager); Linda Yang (lead designer); George Wahlgren (director, new product development); Danielle Burkhardt (product manager)

**Moon Village, page 102**
*Location:* South Pole–Aitken Basin, Shackleton Crater
*Client:* European Space Agency
*Architect:* Skidmore, Owings & Merrill, New York · Colin Koop, AIA (design partner); T.J. Gottesdiener, FAIA (managing partner); Neil Katz, AIA (architectural associate director); Daniel Inocente, ASSOC. AIA, (senior architectural designer); Georgi Petrov, AIA (structural engineering associate director); Kelsey Lange, ASSOC. AIA (structural engineering); Laura Gonzalez, ASSOC. AIA, Max Haney (architectural designers); Timothy Tai (junior architectural designer)
*Structural Engineer:* Skidmore, Owings & Merrill
*Academia Partner:* Massachusetts Institute of Technology · Jeffrey A. Hoffman (professor of the practice of aerospace engineering, Department of Aeronautics and Astronautics); Valentina Sumini (postdoctoral associate, Media Lab, Responsive Environments group)
*Special Thanks:* European Space Agency · Jan Wöerner, Claudie Haigneré, Piero Messina, Advenit Makaya, Marlies Arnhof, David Binns, Ina Cheibas, Aidan Cowley, Hanna Läkk, Brigitte Lamaze, Markus Landgraf

**Nest Tool Kit, page 106**
*Architect:* Brooks + Scarpa, Hawthorne, Calif.
*Project Team:* Brooks + Scarpa · Angela Brooks, FAIA, Lawrence Scarpa, FAIA, Arty Vartanyan, ASSOC. AIA, Heather Akers, AIA, Pieter Conradie, ASSOC. AIA, Micaela Danko, Jennifer Doublet, George Faber, Jeffrey Huber, AIA, Dionicio Ichillumpa, Iliya Muzychuk, Calder Scarpa, Eleftheria Stavridi, Fui Srivikorn, Yimin Wu; Plant Prefab · Amy Sims, Steve Glenn; Community Corp. · Tara Barauskas, Jesus Hernandez
*Architect of Record:* Brooks + Scarpa with Living Homes
*Technical Production and Fabrication:* Living Homes, Plant Prefab
*Interior Designer:* Brooks + Scarpa
*Structural Engineer:* John Labib + Associates · Fabio Zangoli
*M/E/P Engineer:* Breen Engineering
*Construction Manager:* Plant Prefab
*General Contractor/Fabricator:* Plant Prefab
*Lighting Designer:* Brooks + Scarpa

**Performative Millwork at Alliance Theatre, page 112**
*Location:* Atlanta
*Client:* The Woodruff Arts Center, Alliance Theatre
*Lead Design Firm and Architect of Record:* Trahan Architects, New Orleans, New York, Chicago · Victor "Trey" Trahan III, FAIA (design director); Leigh Breslau, AIA, (planning principal), Brad McWhirter, AIA (technical principal); Robbie Eleazer, AIA (design architect); Scott Melançon, AIA (project architect); Ayesha Husain, AIA, (BIM coordinator); Conway Pedron, Sarah Hussaini, James Babin, AIA (designers)
*Structural Engineer:* Uzun + Case
*Construction Manager:* Hogan Construction Group
*Life Safety:* Jensen Hughes
*Special Thanks:* Matthias Pliessnig (artist collaboration); CW Keller Associates (millwork fabrication); Theatre Projects Consultants (theater consultant); Talaske (acoustics); The Winstead Group (client representation); Faro Technologies (3D measurement, imaging, and realization technology)
*Photographers:* Greg Mooney, Hanley Wood
*Total Project Size:* 70,000 square feet
*Total Project Cost:* $23.5 million (including the Performative Millwork component)

**Uber Sky Tower, page 116**
*Location:* Los Angeles
*Client:* Uber
*Architect:* Pickard Chilton, New Haven, Conn. · Jon Pickard, FAIA (principal); Andrew Swartzell, Jonathan Aprati, AIA (associates)
*Structural Engineer:* Arup · David Farnsworth (principal)
*Aviation Consultant:* Arup · Byron Thurber (senior aviation planner), Eglantin Dashi (aviation planner)

**Drywall Waste Block, page 120**
*Project Team:* Washington State University, Pullman, Wash. · Taiji Miyasaka, David Drake (principal investigators); Fadil Zaky Ramadhan, Ping Fai Sze (research assistants)
*Funding:* AIA Upjohn Research Initiative Grant, Amazon Catalyst Grant, National Science Foundation I-Corps, Commercialization Gap Fund
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# Editorial: The Unsinkable Stanley Tigerman

Architecture lost a great champion last month. Stanley Tigerman, FAIA, died in his hometown of Chicago at the age of 88, after a long battle with chronic obstructive pulmonary disease. According to his wife and partner, Margaret McCurry, FAIA, the couple had celebrated their 40th wedding anniversary on St. Patrick's Day this year.

Few would argue with the description of Tigerman as the dean (or perhaps more appropriately, the godfather) of Chicago architecture, a position that he occupied *de jure* during his tenure as director of the architecture school at the University of Illinois at Chicago, and that he occupied *de facto* from practically the day he started his own practice (today known as Tigerman McCurry) in the early 1960s. A fiercely proud alumnus of Yale University, he spent his formative years in the Navy, at MIT, and with Skidmore, Owings & Merrill, early modernist George Frederick Keck, and other practices.

Tigerman's career and work evolved in contradistinction to the rigid, dominant strain of Modernism that Ludwig Mies van der Rohe and Bruce Graham of SOM were practicing and proselytizing in postwar Chicago. His famous 1978 photo collage, *The Titanic*, showed Mies' Crown Hall at the Illinois Institute of Technology upended and in the process of sinking into the ocean. Built projects of the period, such as the Anti-Cruelty Society Building (1981) in Chicago's River North neighborhood, with its basset hound entrance façade, equally exemplify his personal wit, erudition, and irascibility.

In 1994, Tigerman and designer Eva Maddox founded the Chicago-based nonprofit Archeworks, a public interest design incubator. Notable among his later works, the Illinois Holocaust Museum and Education Center (2009) in the Chicago suburb of Skokie gave expression to his Jewish heritage and love of history. Indeed, the latter portion of his life was characterized by such deep demonstrations of responsibility to Chicago, and to society as a whole.

Tigerman made his mark as a thoughtful practitioner and educator. But somewhat like the late Philip Johnson, he also delighted in playing the provocateur and power broker, advocating both publicly and behind the scenes for architecture and the architects he admired. Never afraid to reach out and touch the rich and powerful with a request or suggestion, he periodically, and quietly, moved mountains to help me when I served as curator of the Chicago Architecture Foundation (now the Chicago Architecture Center). Among a generation of famous architects not known for altruism, he actively promoted the careers of emerging local practitioners, among them Jeanne Gang, FAIA, and the late Doug Garofalo.

The last time I visited Tigerman's office, he showed off a full-scale mock-up of his headstone, an exercise in cubic geometry. Now he has been interred in Chicago's famous Graceland Cemetery, where he keeps company with a host of esteemed colleagues: his beloved adversaries Mies and Graham, and also David Adler, Daniel Burnham, Marion Mahony Griffin, William Holabird, William LeBaron Jenney, Fazlur Khan, John Wellborn Root, Howard Van Doren Shaw, and Louis Sullivan. Can you imagine a better way for the godfather of Chicago architecture to spend eternity?

*The Titanic*

STANLEY TIGERMAN

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