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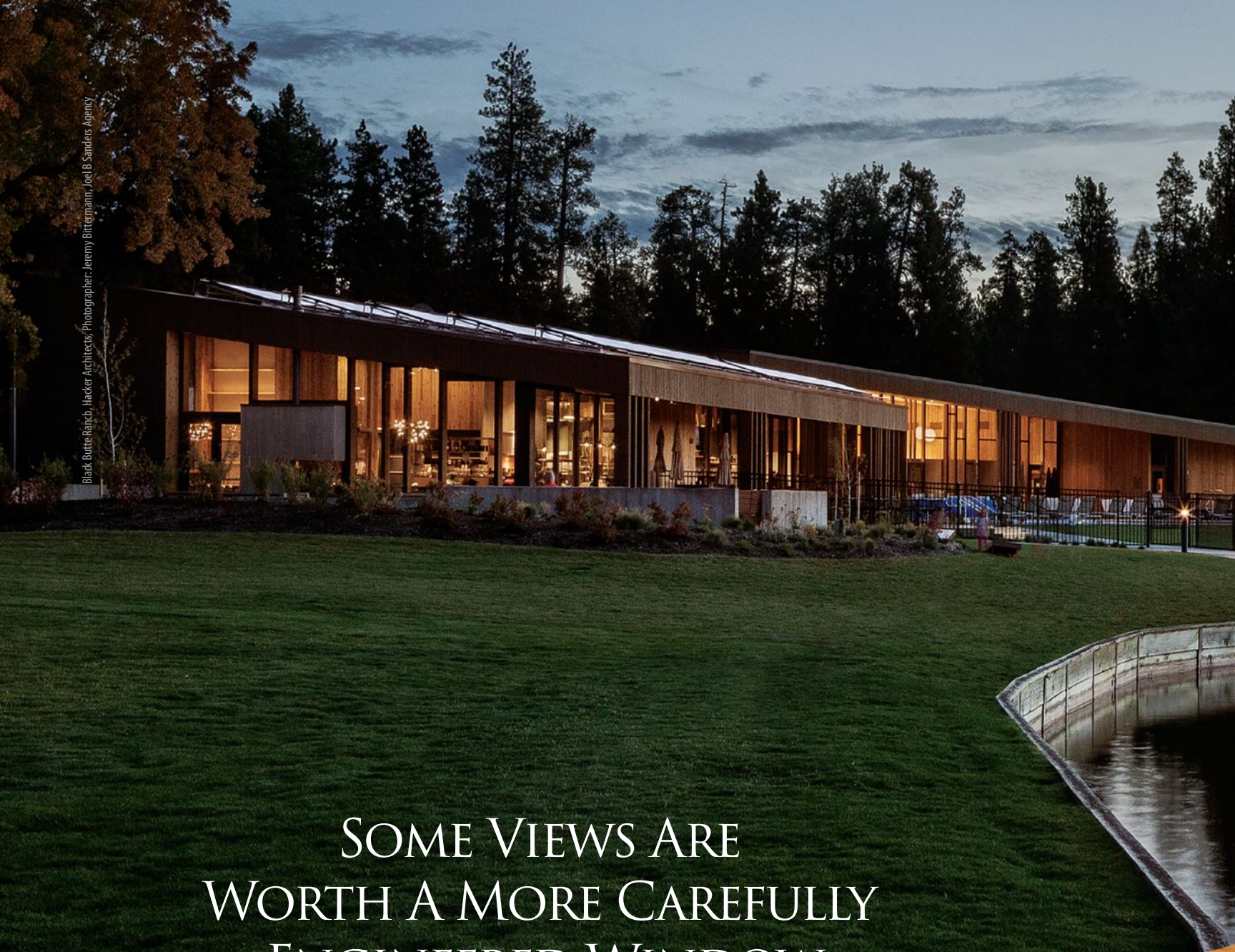

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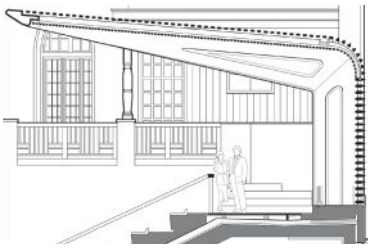

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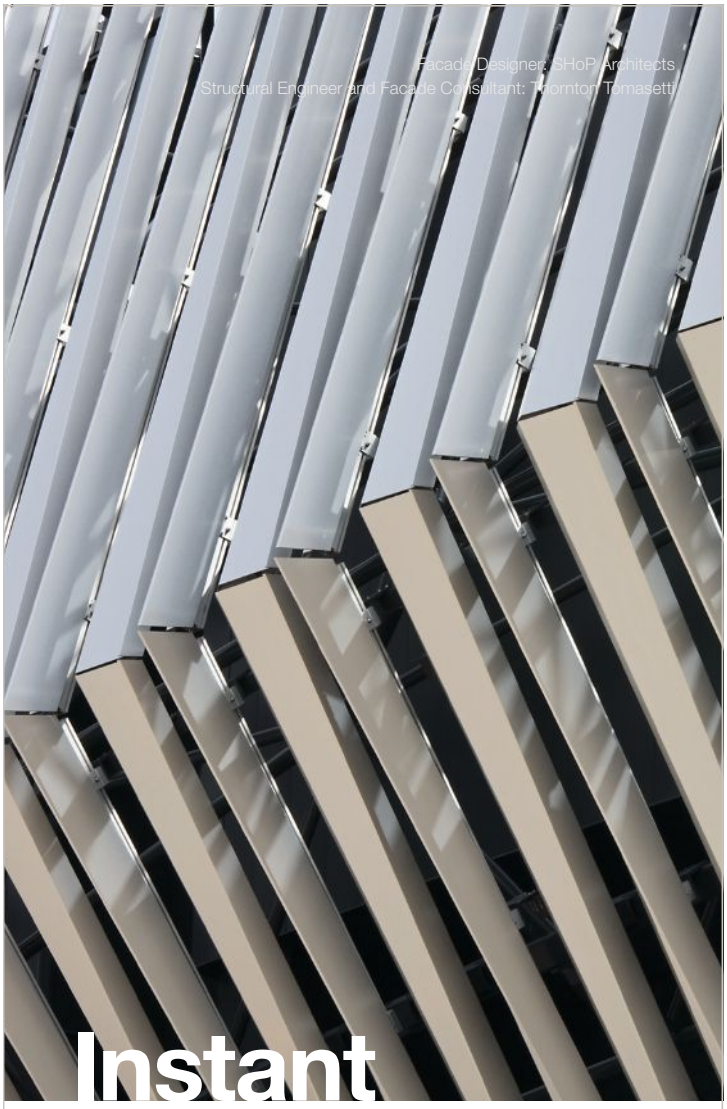

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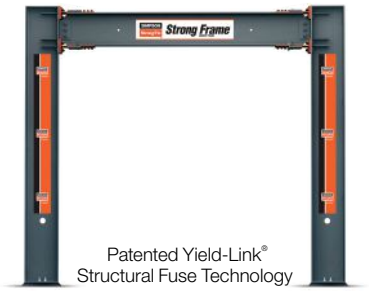

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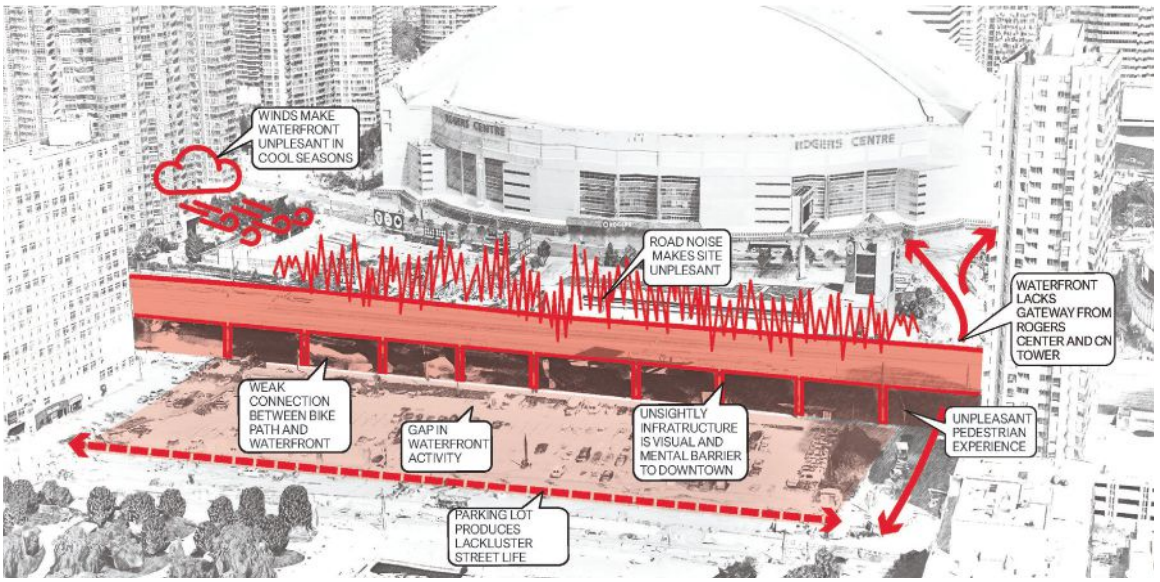

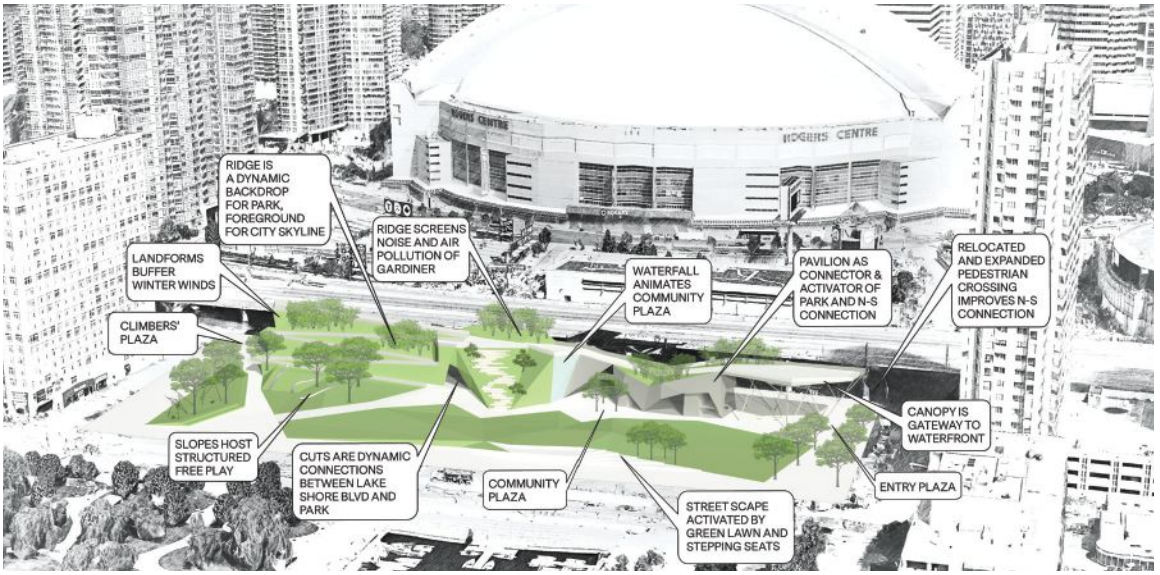

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An Olmstedian Bluff

On Oct. 9, Waterfront Toronto announced that Rees Ridge by Culver City, Calif.–based WHY Architecture and Toronto-based Brook McIlroy had won its competition to turn a parking garage on the city's Rees Street into an inclusive, sustainable, and resilient public space. According to WHY, the existing structure "will be transformed into a dynamic vertical garden that offers play, culture, and nature spread over an elevated landform for residents and visitors to enjoy." The sloping nature of the new park will not only give visitors a perch to gaze out at Lake Ontario but will drown out noise from the Gardiner Expressway behind it. —GREIG O'BRIEN

> *For more information and images on WHY and Brook McIlroy's winning Rees Ridge design, visit bit.ly/ReesRidge.*

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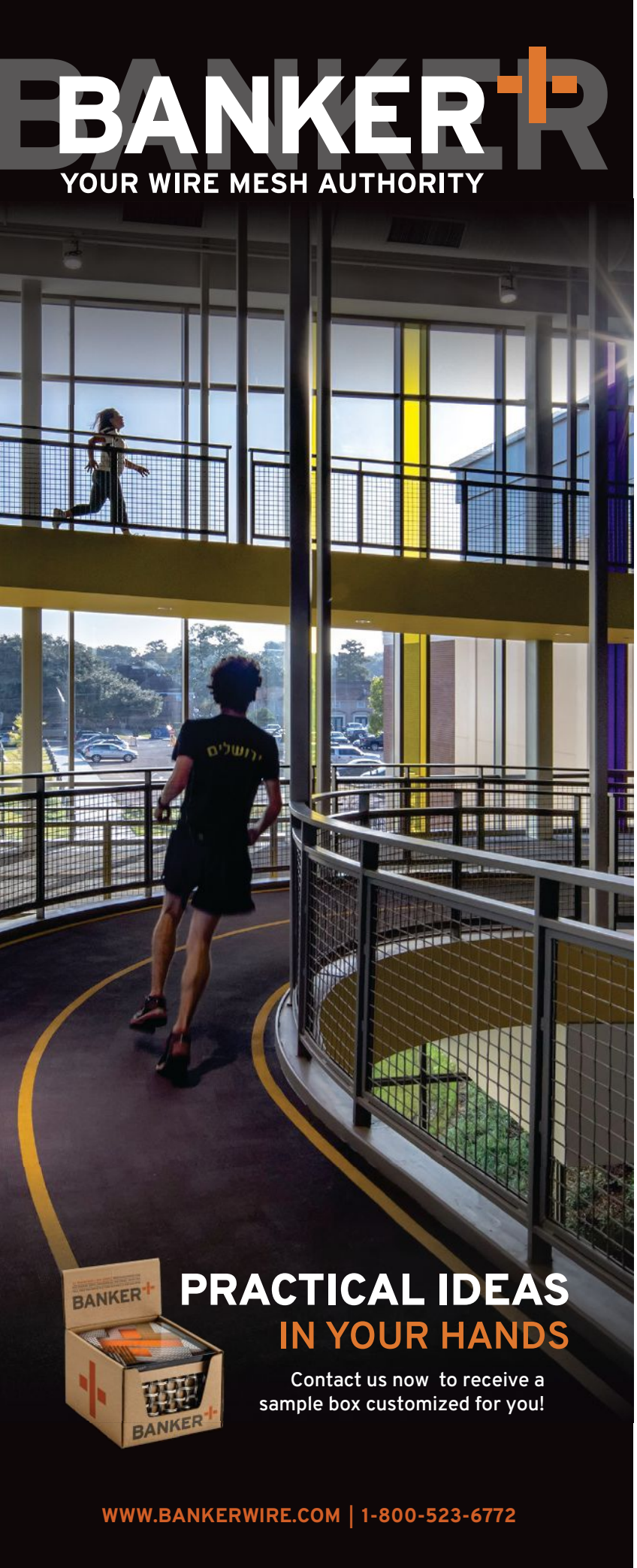

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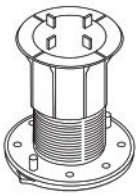

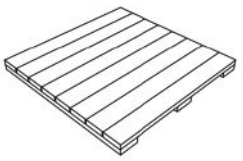

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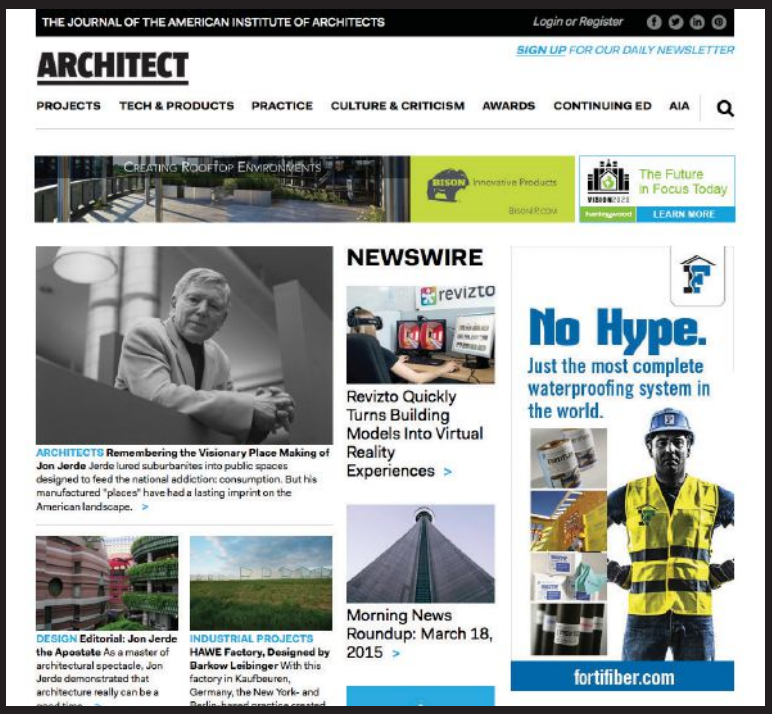

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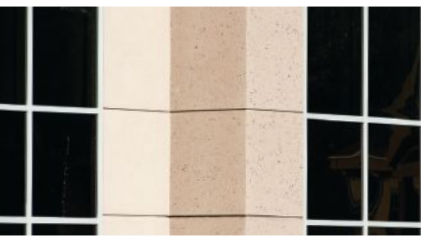
JEREMY BITTERMANN

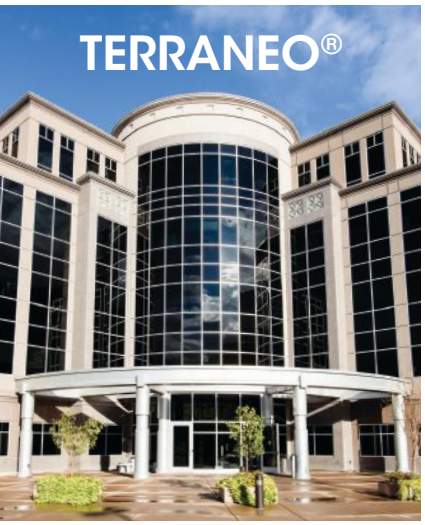
For All Those Who Served

On Saturday, Oct. 27, in Columbus, Ohio, while former Secretary of State Colin Powell and others spoke, the new 53,000-square-foot National Veterans Memorial and Museum hovered nearby. Based on a vision from late Ohio senator and astronaut John Glenn and designed by New York– and Portland, Ore.–based Allied Works Architecture, three concentric rings of structural concrete shape the museum and provide a unified location to honor the veterans from all of our country's conflicts. The museum also represents a step forward in the reinvigoration of the city's riverfront. —SARA JOHNSON

> *Read more about the museum's opening ceremonies at bit.ly/NationalVeteransOpening and see more images at bit.ly/NationalVetsMuseum.*

Meet the exterior cladding materials that are changing the way buildings are designed and built.





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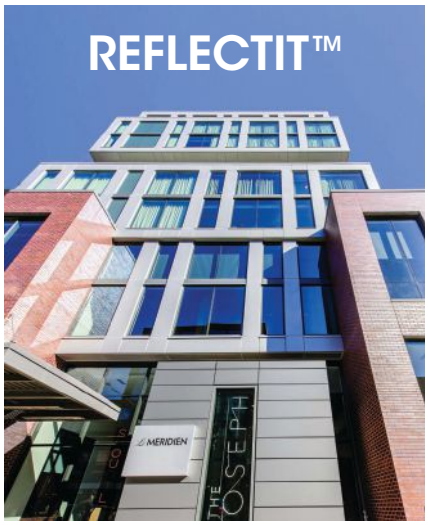

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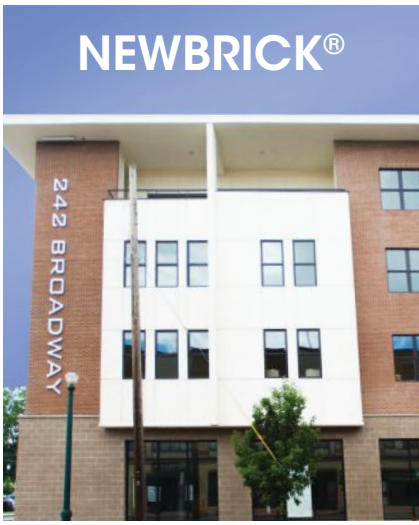

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How to Draw People the Architecture Way

New York–based MOS Architects' Michael Meredith, AIA, and Hilary Sample, AIA, say that, fundamentally, an architect's job is to draw buildings. But in their forthcoming book, *An Unfinished Encyclopedia of Scale Figures without Architecture* (MIT Press, 2019), Meredith and Sample also argue that the architect is responsible for drawing, painting, and/or digitally rendering the humans that might occupy their spaces. "It is impossible to represent architecture without representing the human," they write. "Even when the human presence is intentionally left out or is reduced to a faceless set of measurements, it haunts architecture in its absence." —KATHARINE KEANE

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> *Get a more in-depth sneak peek of Meredith and Sample's book, due out in January, at bit.ly/ScaleFigures.*

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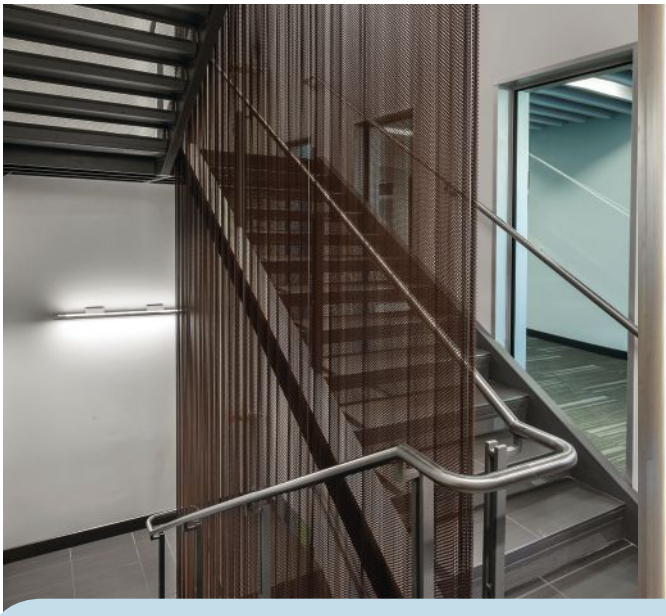

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Best Practices: Working with Interns (the Other Kind)

TEXT BY JEFF LINK

In 2016, the AIA stopped using the word "intern" to describe architecture school graduates working toward licensure, encouraging the profession to start using the term in its traditional application—for students working in an office while pursuing a degree. For firms, college interns can create a pipeline of talent while they gain the professional experiences necessary to advance their careers. Here, architects and a current intern offer guidance on how best to make the relationship beneficial.

Hire Wisely and Pay Fairly

Chicago-based dSpace Studio founder and principal Kevin Toukoumidis, AIA, invites students each year from top university architecture programs to apply for a paid summer internship at his firm, with wages typically starting at $18 per hour.

"We're not looking for someone who can just draft, sketch, or 3D model," Toukoumidis says. "We want someone who can write, ask questions, and give us critical input. Someone who has opinions and suggestions for how we can be better architects."

Through experiences matched to their interests and aptitudes, dSpace interns are assigned to roughly 10 small projects and two large projects. They work independently and also shadow the firm's design staff on a range of tasks that include developing schematic designs and renderings and preparing written materials for project bids and design competitions.

Aaron Forrest, AIA, co-principal at Providence, R.I.–based Ultramoderne, notes that it is easy to be captivated by a candidate's portfolio and overlook critical working habits or communication styles that might not be a good cultural fit. To counter this, Forrest recommends requesting and checking applicant references ahead of making any offers.

"Architects today are really good at putting together a portfolio, [but it's] a limited view of a person and their work," Forrest says. "You have to go out and find out who they are, how they work, and what they're good at."

Facilitate Real-World Experiences

Interns may be well-versed in architectural theory and fluent in the latest design software, but they often lack experience developing detailed construction documents and in speaking with clients. To teach and cultivate these skills, Jake Brillhart, AIA, founder of the eponymous Miami-based studio, gives his interns real-world experiences that can help them grow professionally and gain Architectural Experience Program credit hours. "One of our recent interns was adept at CNC fabrication and used a laser cutter to prototype furniture for us," says Brillhart, who is also a professor of architecture at the University of Miami. In exchange, Brillhart "let him sidecar on an apartment project in Miami Beach, doing interior drawings, meeting clients, and seeing how it comes together."

For Claire Wagner, a Rice University student pursuing an M.Arch. degree who spent the summer of 2018 interning at dSpace Studio, the opportunity to engage with junior and senior architects to develop a new interface for the firm's website and to design interior elevations and millwork details for a suburban Chicago residence left her thoroughly pleased with the experience. "An internship program like this … prepares you for the technical components of the profession you don't get exposed to in school," she says.

Designate a Mentor

The success of an internship ultimately relies on a mentor—someone in the office responsible for orienting an intern to the culture and habits of the firm, providing appropriate guidance on projects, and helping them meet assignment goals. At the start of her internship, Wagner was paired with Ethan Werkmeister, a dSpace Studio designer who works on residential design as well as marketing and information technology. "Right from the beginning," she says. "I felt it was a friendly, open atmosphere."

> "An internship program like this … prepares you for the technical components of the profession you don't get exposed to in school."
>
> —Claire Wagner, M.Arch. student, Rice University

> *For more strategies in developing a robust intern program, visit bit.ly/ARInternDev.*


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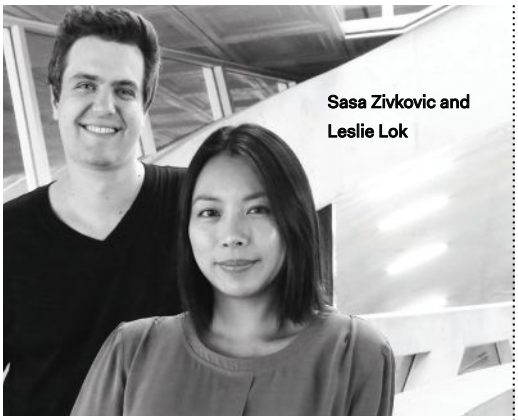

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2013

Firm leadership:
Leslie Lok and Sasa Zivkovic

Education:
Lok: B.A., Wellesley College; M.Arch., MIT; *Zivkovic:* Vordiplom, University of Stuttgart; M.Arch., MIT

Firm size:
Two to eight

Mission:
Hannah is an experimental practice that consequentially and unapologetically investigates, manipulates, narrates, recontextualizes, and breaks the rules of materially informed (and robotically constructed) architectures. Hannah's work advances and expands traditional building construction techniques by implementing new technologies and processes of making and addressing the subjects of construction, rapid urbanization, and mass-customized housing design.

Origin of firm name:
Hannah's work is first and foremost the result of a large team effort, which is why we did not give the firm our personal names. We love the palindrome, the broken symmetry, the alter ego potential, and the sound of Hannah.

First commission:
A modular dental clinic project in Leh, India, which we designed pro bono from 2014 to 2017.

Favorite project:
Our Corbel-Bacon Cabin, currently under construction in Ithaca, N.Y., is an experimental house for two people situated on a ridgeline with a spectacular view of the landscape. We are the clients and contractors, which enables us to radically explore new architectural ideas with the project.

The 3D-printed concrete base of the cabin explores and strategically manipulates corbeling to create form—a process inherent to the printer. The base is elevated from the landscape and contains a sink, storage seat, patterned floor, and working fireplace. We plan to construct a lightweight envelope out of irregularly shaped logs.

Second favorite project:
Our project Additive Architectural Elements—A New Robotic Brutalism is an exploration of the tectonics and narratives inherent to horizontal layer concrete 3D printing. It is both a theoretical exercise as well as a full-scale material exploration. Starting from a series of prototypical architectural elements such as doors, windows, columns, walls, floors, and ceilings, we developed strategies as to how the layering of concrete, the relentless 3D drawing of extruded lines of material, and the act of corbeling can suggest new strategies for building.

Special item in your studio space:
Cornell University Robotic Construction Laboratory's self-built, large-scale, open-source, three-axis gantry 3D printer called Daedalus, which we use to fabricate all of our concrete 3D printing projects.

Favorite place to get inspired:
We have long given up on such romantic notions. Inspiration comes (and goes) at the weirdest times, the strangest places, and the oddest occasions.

Design tool of choice:
Our hands

Best advice you've ever received:
Get a good photographer. Unfortunately, we don't always follow this very valuable advice because we can't afford a good photographer on all projects.

> *To learn more about the Hannah Design Office, visit bit.ly/ARHannah.*

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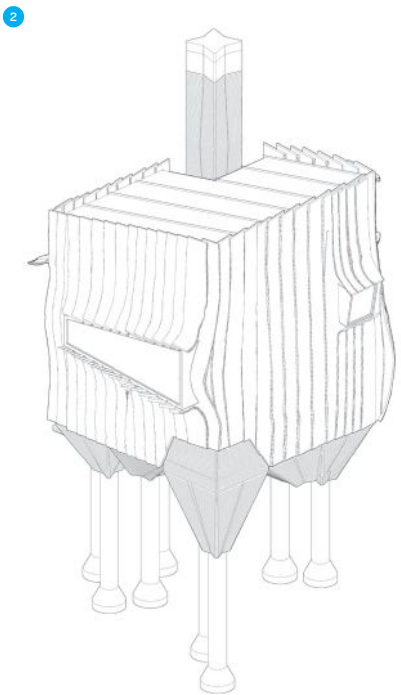
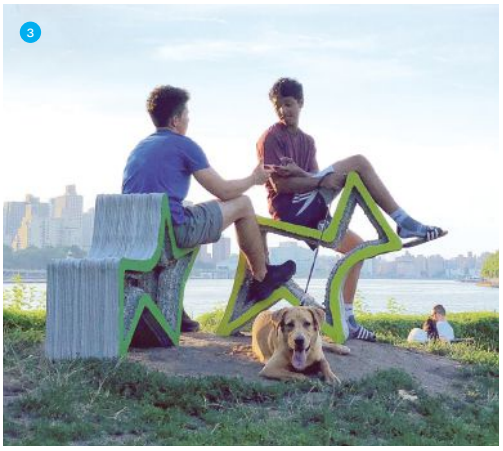
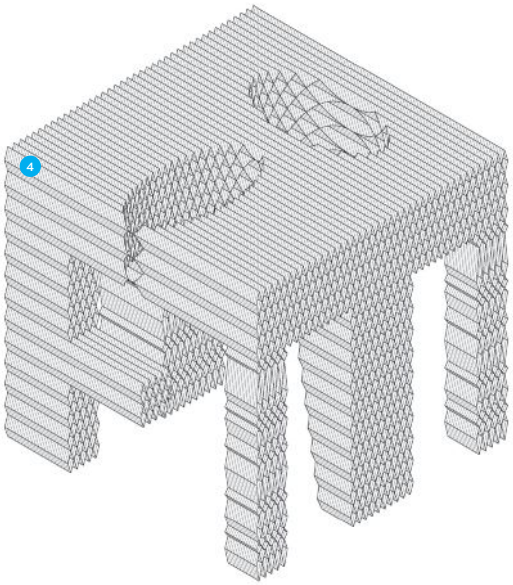
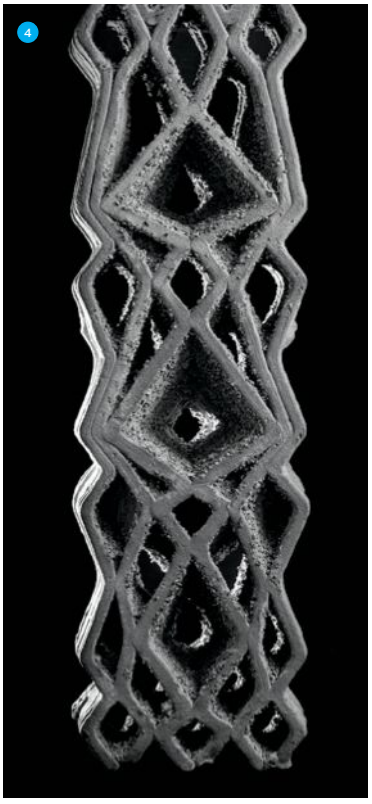
Next Progressives:
Hannah Design Office

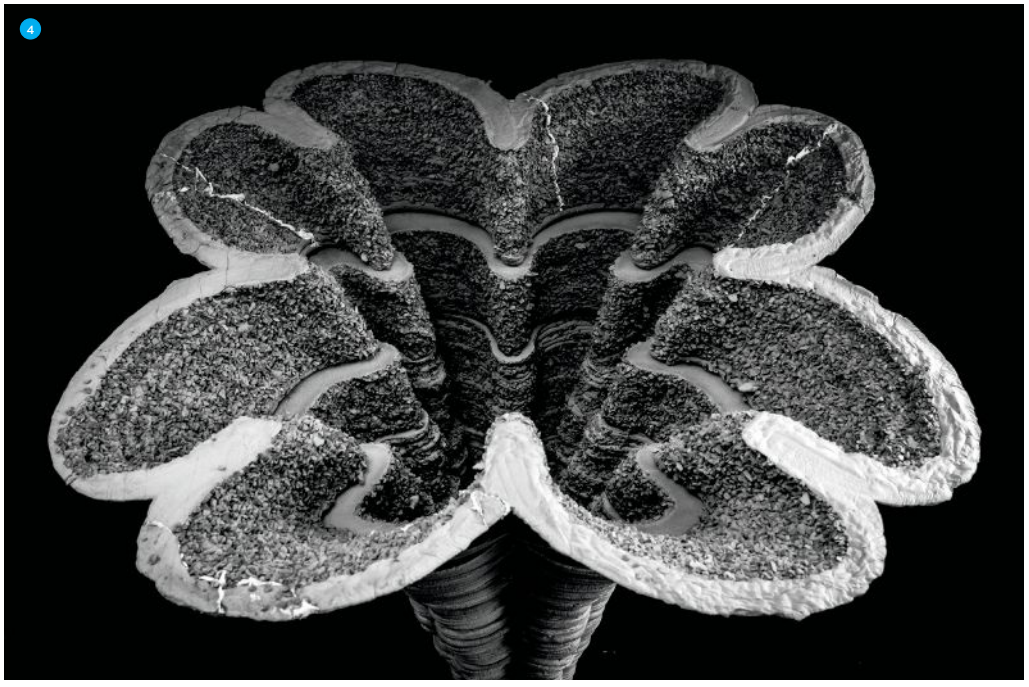


1: JEREMY BILOTTI; 2, 4, 5: COURTESY HANNAH; 2 (EXTERIOR): YUXIN CHEN









1. Located on the grounds of the WinSun architectural 3D printing facility in Suzhou, China, this 3D-printed concrete guardhouse prototype integrates furniture, shelving, seating, and even a bed.
2. When completed, the duo's Corbel-Bacon vacation cabin will occupy approximately 9 square meters and sit atop 3D-printed legs that will "adjust to the terrain."
3. Hannah's RRRolling Stones 3D-printed movable concrete outdoor seating system won the 2018 Folly/Function competition hosted by the Architectural League of New York. Twenty-five of the colorfully painted benches are currently located at the Socrates Sculpture Park in Long Island City, Queens, N.Y.
4. As part of their work at Cornell University, Lok and Zivkovic aim to answer the question, "What is the architecture of 3D-printed concrete?" with their Additive Architectural Elements research.
5. Constructed in 2017, the Ladakh dental clinic is composed of a modular concrete frame and lightweight honeycomb sandwich modules that are designed to be easily installed and perform like disaster relief pavilions.

Products:
The Architects' Gift Guide For Foodies

TEXT BY AYDA AYOUBI

Serving Platter, Heath Ceramics ($95)

Recommended by Lisa Iwamoto, co-founder, IwamotoScott Architecture, San Francisco

Designed and handcrafted in Sausalito, Calif., this minimalist, ceramic platter is "super durable and makes everything you put on it look tasty," Iwamoto says. Available in five colors (aqua shown). Microwave- and dishwasher-safe. *heathceramics.com*

Pobrecito (Po' Boy) Burnt Toast, Uno + Ichi ($46)

Recommended by Catherine Johnson, AIA, co-founder and principal, Design, Bitches, Los Angeles

Wheel-thrown in Los Angeles, this brown clay mug features a hand-drawn sad face "because most of us look like this before our morning coffee," Johnson says. Offered with a hand-glazed blue finish on the interior and handle. Can hold 10 fluid ounces. *uno-ichi.com*

Cutting Board Set L, Snow Peak ($55.95)

Recommended by Rebecca Rudolph, AIA, co-founder, Design, Bitches, Los Angeles

Made of birch wood, this multifunctional case "is perfect for space-minded adventurers—compact and functional with the attention to detail we admire," Rudolph says. Fits a chef's knife and doubles as a cutting board. *snowpeak.com*

Dampfwerk Pear Brandy, France 44 ($31.99)

Recommended by Julie Snow, FAIA, co-founder and design principal, Snow Kreilich Architects, Minneapolis

This German-style brandy is made from hand-selected Bartlett pears in a Minnesota distillery that Snow says makes "outstanding spirits to be enjoyed [with] friends and family." *france44.com*

Modusbox, Modus Studio ($392)

Recommended by Chris Baribeau, AIA, principal architect, Modus Studio, Fayetteville, Ark.

This portable, stainless steel grill and fire pit is made for people who want to enjoy the outdoors in style. "[It] is the perfect outdoor accoutrement," Baribeau says. Comes in a wooden box with two handles and a spatula. *modusstudio.com*

> *To see more gift ideas by architects and designers, visit bit.ly/ARGiftGuide18.*

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Opinion: A Call to Pause, Listen, and Learn

TEXT BY MONICA CHADHA, AIA

As architects, we often consider ourselves experts ready to answer questions as soon as they arise, regardless of how new we are to the project. But before we present *the solution*, we need to understand the issues and opportunities at hand. And to do that, we must ask the right questions.

In undergraduate school, I often felt lost in the fairly rigid Western educational system. When I needed to put pen to paper in studio, I didn't understand how I could conceive an entire building in isolation. In reviews, I couldn't fully wax poetic about my design concepts without understanding the people who would theoretically inhabit my project. I became more interested in how projects can arise from the input of diverse stakeholders. (Later, I would learn these ideas are rooted in participatory design.)

This desire to understand led me to spend a semester at Balkrishna Doshi's Vāstu-Shilpā Foundation, in Ahmedabad, India. There, I worked on a social housing concept that employed incremental development to match the needs of occupants; for example, a room used for commerce could convert into housing for an elderly family member. I realized that architects can serve clients better if their understanding of a project comes from research and firsthand experience, and if they understand both the conditions and social structures already in place.

So how do you pursue an unconventional design path at a time when architecture with a capital "A" is the foundation of our education?

We have many examples to draw from. Early pioneers, like Henry Sanoff, AIA, were defining alternative practice in the late '60s. The '90s saw a resurgence with Samuel Mockbee's Rural Studio and Stanley Tigerman, FAIA, and Eva Maddox, ASSOC. AIA's Archeworks, where I studied and later taught for several years. The Design Futures Council and the annual Structures for Inclusion conference are also valuable resources.

Over and over, opportunities arise to interact, understand, and create solutions together. Our challenge—our duty—is to take them on with open minds. The answer doesn't always have to be making architecture, but it should involve learning and creating from what is experienced.

This approach can lead us to become problem seekers and to opportunities to create, develop, and collaborate on what might become our next project. As a profession, we should use our skills to identity opportunities. We should use design as a tool to achieve *a solution*.

In recent years, we have worked closely with several victims of torture under the disgraced former Chicago Police Department commander Jon Burge to design a home for the Chicago Torture Justice Center. When we began the conversation, we weren't trying to design space—we were trying to understand needs. I could not have fathomed or articulated many of the needs and opportunities identified by the staff, survivors, and family members: "It's a place of healing." "It's a constant." "It's a place where people call each other brothers and sisters." These wishes, in turn, started a dialogue to design a place that could realize them.

Similarly, when we brought together Illinois Institute of Technology students, Chicago entrepreneurs, the Greater Englewood Community Development Corp., and community members for a charrette that explored possibilities for a local business accelerator, we heard a much broader range of needs than we could have anticipated.

I encourage emerging designers seeking to make a difference to look beyond the borders of traditional practice and to roles in government, teaching, and public service. I ask seasoned professionals in these fields to mentor, train, and support these ambitions.

And, more than ever, we need to apply the rules that most of us learned on the playground: Listen and respect others. Be kind and thoughtful. Look for similarities. Celebrate differences.

Monica Chadha, AIA, is founder and principal of Civic Projects, in Chicago.

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

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Architectural Lighting: Catch Up On Controls

TEXT BY ELIZABETH DONOFF

Lighting controls may seem like a straightforward topic, but in reality, it is one of the most complex aspects of lighting design, even when paired with the conventional light sources that prevailed prior to LEDs. Owing to its complexity are the basic protocols of how luminaires and system components "talk" to one another, the large number of system components, and potential ambiguities in the user interface.

Prior to LEDs' market dominance, the focus of lighting controls was often on energy savings. Control systems mostly involved occupancy sensors to turn lights off when a space was vacant, and dimming sensors and daylight harvesting to maximize the use of natural light during daytime hours.

Today, with LEDs' color-changing capabilities and advancements, lighting controls have a wider range of performance commands than simply on and off. "You are no longer controlling a single filament," says Lowell Olcott, product manager of controls and networking at Middleton, Wis.–based ETC. Occupants in both commercial and residential projects want a greater level of personal control to adjust lighting to correspond to specific activities at various times of day and night.

No matter the type and size of a project, a system's ease of use and affordability remain primary concerns of designers and clients. "The greatest challenge for designers when it comes to any lighting controls discussion is managing complexity," notes Brett Andersen, a lighting designer at Focus Lighting in New York. "There is a big difference between a feature or a capability that would be great to have and one that you absolutely need. The simplest lighting control system is likely the best for clients."

Keeping the system simple also aids the entire design team in defining the scope of work and the specification process. "It's important to specify products and systems from manufacturers that will be responsive and provide the best service," says New York–based Cline Bettridge Bernstein Lighting Design (CBBLD) president and principal Francesca Bettridge. "You have to be clear with the client as to who is specifying the system and who is commissioning it so that if troubleshooting is required at some point, it's clear to everyone on the project team who is responsible for this scope of work," adds CBBLD principal Stephen Bernstein.

The following lighting controls products provide a snapshot of the latest offerings on the commercial market that help architects and lighting designers address a variety of project types and client application needs.

Aria Wireless DMX System, Acclaim Lighting
Designed for solid-state outdoor lighting applications, the Aria Wireless DMX System provides a wide array of features in a compact footprint. The transceiver is encased in a die-cast aluminum gray housing, measuring 9.1" by 6.2" by 2.2", and functions as both the sending and receiving point. It also provides up to 15 channels at 2.4 GHz. The system consumes 3W of power, runs on 100V to 240V (or 277V at 50/60Hz), and utilizes an internal wireless radio with both mesh networking and signal routing optimization to ensure seamless DMX data reception. A 5-dB omnidirectional antenna allows for transmission up to 2,600' for line of sight and up to 300' between obstructions and walls.

Aria can also be used to make a direct connection to fixtures that have built-in receivers, such as Acclaim's Dyna Drum spot and floodlights. IP66-rated for wet locations, the system works within a temperature range of -40 F to 122 F. *acclaimlighting.com*

> *For more stories on architectural lighting technology and products, visit archlighting.com.*

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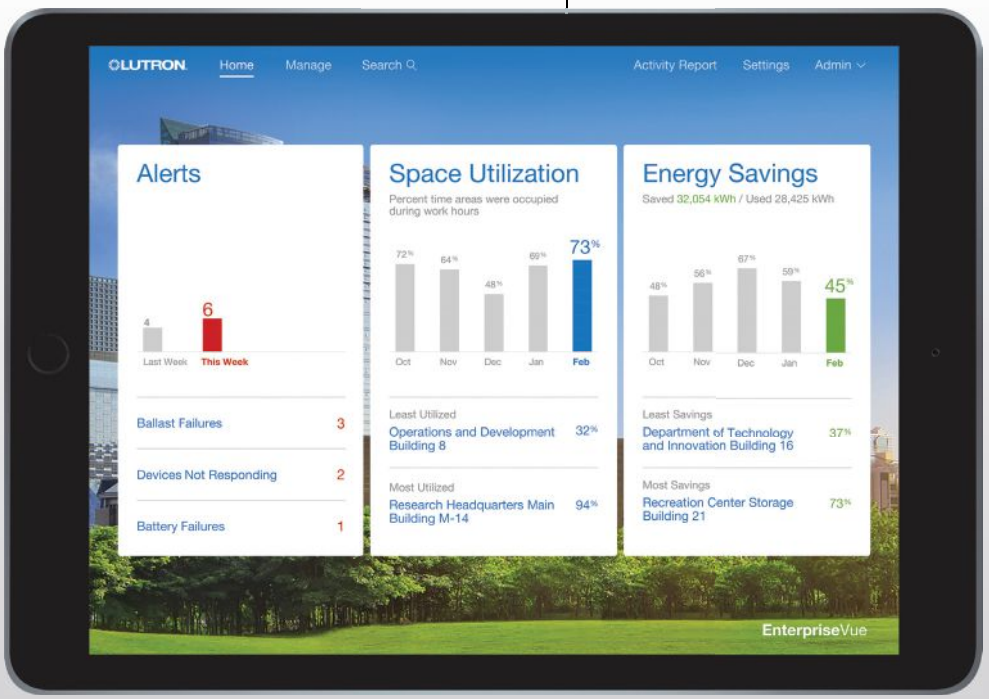

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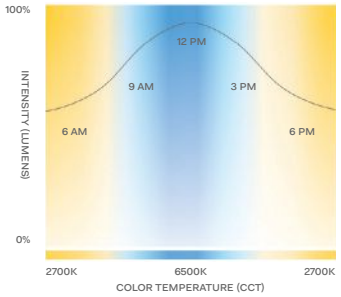
Architectural Lighting: Catch Up On Controls

Zūm J-Box Sensor Integration Module, Crestron Electronics
This new component for Crestron's Zūm commercial lighting system enables the integration of hard-wired occupancy and daylight sensors. It mounts directly to a 4"-square J-Box and communicates wirelessly with one or more Zūm dimmers, switches, and load controllers. It also enables the integration of ultrasonic and dual-technology sensors, and sensors for hallways, high-bay or industrial applications, wet locations, and outdoor installations. The module can be configured to work with motion-detecting sensors for occupancy or vacancy-only mode. For daylight harvesting, a single open-loop daylight sensor, photosensor, or photocell can be connected. For network control purposes, it appears as a native Zūm Mesh wireless device in the room, using peer-to-peer radio-frequency communication. The device is UL-2043 listed for installation in an environmental air-handling space. *crestron.com*

Encelium Edge, Osram
This stand-alone wireless management system caters to commercial spaces up to 10,000 square feet in which a simplified, code-compliant, energy-savings solution would be more suitable than a complex, networked, light management system. Designed for spaces with up to 100 nodes, the system features individual and zoned scene control and luminaire addressability; control of an entire circuit of plug loads (20A) at the receptacle level; and demand response controls for automatic light-level reduction. The system works with any manufacturer's zero-to-10V dimmable ballast or LED driver, and operates with a mesh network using Zigbee standards. Luminaires and control scenes can be reconfigured using the system's mobile app. The system complies with ASHRAE Standard 90.1-2016 and California's Title 24-2016. *osram.com*



SpectraSync, Hubbell Lighting
One of the newer control systems to address color-tuning technology, SpectraSync works with control systems from Hubbell or third-party manufacturers. Available in three different color ranges—dim to warm (2200K–3000K), tunable white (2700K–5000K or 2700K–6500K), and scheduled white (2700K–6500K), the software works with standard zero-to-10V dimming protocols as well as DMX and preset/scheduling through any lighting control system. The key feature of SpectraSync is its single-driver approach that allows occupants to adjust lighting preferences according to time of day and activity. When SpectraSync is paired directly with Hubbell Control Solutions' NX system, luminaires can be commissioned directly out of the box before installation, according to the manufacturer. *hubbell.com*

Unison Paradigm 4.0, ETC
ETC's Unison Paradigm energy management control system supports a range of facility lighting and building systems integration needs. Incorporating energy management, daylight harvesting, and occupancy sensing, the system works across devices from one or more manufacturers. This latest software release features options for monitoring peak, partial-peak, and off-peak consumption, including demand response for individual and group channels, or entire spaces when the system receives notification from a utility. The software also calculates energy usage for all equipment loads, regardless of manufacturer. Version 4.0 provides enhanced support for tunable-white and color-changing luminaires. One Paradigm processor can support up to 62 stations and sensors, 18 touchscreens, and 1,024 circuits and parameters. *etcconnect.com*

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Residential: Open Architecture

TEXT BY KATIE GERFEN

When asked to envision how we should live in the future, it can seem glib for an architecture firm facing the realities of climate change to respond: Anywhere but here. But Beijing-based Open Architecture's Mars Case prototype—which envisions life in prefabricated micro-units on the Red Planet—is anything but fatalistic. It's not a suggestion that the change on Earth is irreversible and we need to abandon ship, but rather an attempt to reckon with humanity's current resource use, and to figure out how to modify it.

Mars Case was designed for the 2018 House Vision China exhibition. Started in 2013 by Muji art director and Tokyo-based Hara Design Institute designer Kenya Hara, the program invites architects to partner with a manufacturer to design and build a housing prototype that embodies their vision for how we should live in the future. This year's iteration, the first in Beijing, featured prototypes not only from Open, but also MAD Architects, Hasegawa, and Atelier Deshaus, among others.

For Open founding partners Li Hu and Huang Wenjing, AIA, the starting point for the Mars Case design started close to home. "One thing that interests me and concerns me at the same time, both in China and globally, is the environmental crisis, which also causes a social crisis," Li says. "We're just too greedy. We consume too much of everything and we have expanded our footprint endlessly." To look at how to curb that resource use, Li says, the questions that drove the

Mars Case prototype installed in Beijing at the 2018 House Vision China exhibition.

WU QINGSHAN

Project Credits
Project: Mars Case
Client: House Vision China, 2018 Beijing Exhibition
Design Architect: Open Architecture, Beijing · Li Hu, Huang Wenjing, AIA (principals-in-charge); Hu Boji (project architect); Qin Mian, Ma Meng, Li Mengru, Wei Wenhan, Sun Xuezhu (project team)
Product Engineering Consultant: Xiaomi Technology Co.
Lighting Consultant: Ruiguang Boying Lighting Laboratory (Hongri Lighting Group)
Size: 130 square feet
Cost: Withheld

> *To see more photos of Mars Case, visit bit.ly/MarsCase.*

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Residential:
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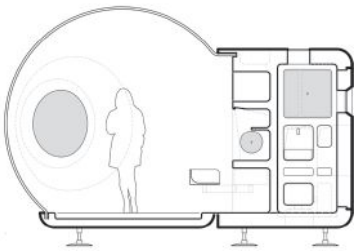
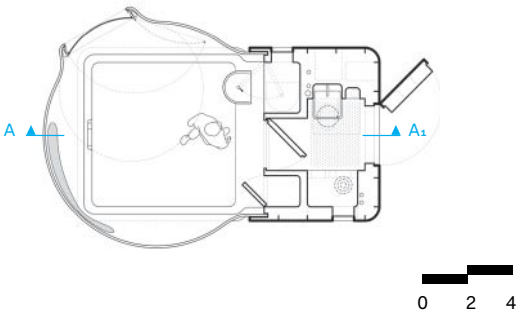
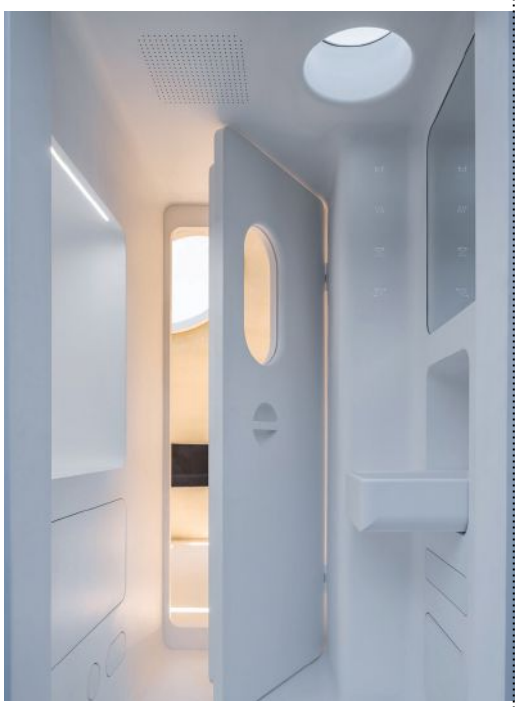
Section A–A₁



Floor Plan





Top: Systems module, with cooking and bathing areas.

Above: Living area, with desk and smart screen.

design of the project were: "How can we consume less? How can we be ultimately sustainable? How can we live small? How can we rethink everything?"

Mars Case is an aluminum cube that clocks in at a tiny 130 square feet—easily packed and stacked for transport—that contains all the creature comforts of home. The cubic systems module contains the services and appliances: a bathroom and shower, cooking facilities, and storage among them. Once in place on-site, one side of the cube folds down, deploying a near-spherical inflatable living module for sleeping, eating, and working.

Open's manufacturing partner in Mars Case is Chinese electronics manufacturer Xiaomi Technology. Li and Huang sought to partner with the company because its products have a "minimal style, but with a twist," Li says. "And they're all networked." Discussions with Xiaomi for the appliances in Mars Case envision a closed-loop system where waste from one appliance (heat from the refrigerator condenser, for example) fuels another (such as a water heater) in order to create a self-sufficient system that itself creates no waste.

Using Mars as a conceit for exploring how design can help combat climate change on Earth started as "a random thought" in a meeting with Xiaomi, Li says. But it resonated. "It's an attractive story—Mars is a hot topic. But if you push the idea of our climate crisis to an extreme, that is Mars. There are almost no resources and we have to live small just to move ourselves there," he says. "It gives you an extreme challenge to think about how you're going to live."

It's impossible to design a space-ready dwelling with just a few months lead time and an exhibition budget, so some of the design concepts remain just that. While the team had tested PVDF membrane for the inflatable living quarters (the same material used for inflatable bounce houses) and researched other higher-tech materials, the prototype installed in Beijing this fall featured a rigid resin skin that mimicked the translucency of the membrane. And while the design calls for a phase-changing rigid floor in that module that would become a soft sleeping surface at night, such surfaces are still the subject of materials research.

But reducing consumption, both of spaces and resources, makes the prototype something that Open hopes to continue to develop for use on this planet, Li says. "Imagine this is back on Earth. Basically, it's a very high tech, very compact trailer home," he says. "It has a huge market in America and can be the most idealistic affordable housing."

And Li feels acutely that the time to check humanity's approach to consumption, and to offer solutions, is now. "[Climate change] is a global crisis—nobody can walk away from this problem," he says. "We all have to do something in our own capacity to push the boundary. We don't have lots of time left to make things not cross a threshold that is irreversible, and to have disaster happen."

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Residential:
Open Architecture

1. The Mars Case prototype, shown above, was installed in a Beijing courtyard filled with red sand to mimic the Martian surface. When approaching the front door of the systems module, the rounded inflatable module beyond is hidden from view, emphasizing the small footprint. **2.** Windows built into the skin of the inflatable module would allow residents to have access to natural light and survey the landscape.

WU QINGSHAN

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SYSTEMIC INEFFICIENCIES OF THE CONSTRUCTION INDUSTRY

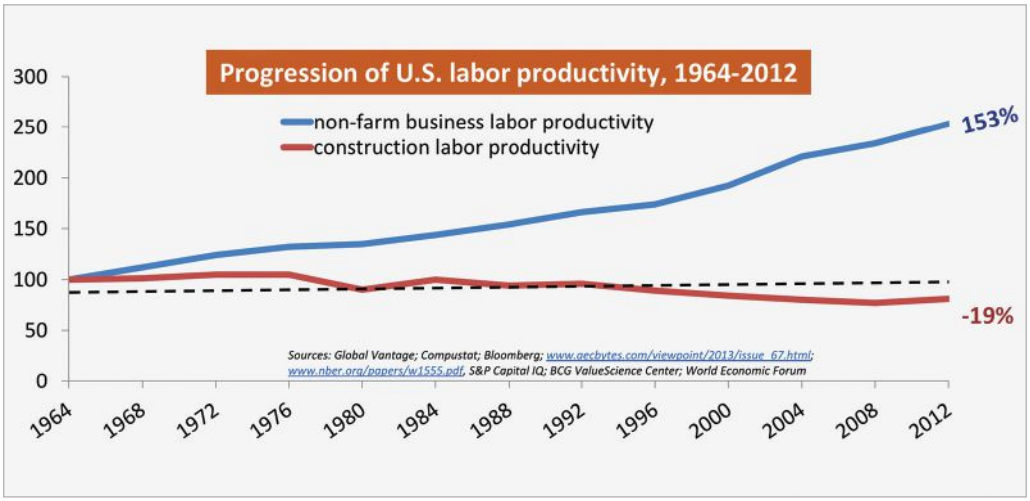
There are seven fundamental reasons why the construction industry is plagued with systemic inefficiencies. First, **building codes are complex**. The International Residential Code (IRC), International Building Code (IBC), and International Energy Conservation Code (IECC) are all referred to as model building codes that are updated every three years. However, state or local jurisdictions decide the building code for their region, are responsible for enforcement and have ultimate authority. Typically, states adopt some version of the model code, but most states are one to two cycles behind the latest edition. Even within a state, there are different wind zones, seismic zones, permitting agencies, and so on, so building code doesn't necessarily dictate consistent building requirements within a region. Code can be a patchwork quilt, even at the state level.

Next, consider the **role that builders, especially large ones, play in the homebuilding process**. Most view their business as a developer does. They buy land relatively cheap, build on it to increase its value (i.e., a home), then sell high for a profit. The actual building process is sub-contracted to many others, which leads to the next inefficiency. **The building process is fragmented and cyclical, as multiple trades must coordinate for successful execution**. The builder brings in multiple specialized trades, each responsible for their sub-component of the building process, but these sub-contractors aren't independent of one another. What the foundation contractor does impacts the framer, and what the framer does impacts all the trades that follow. Building a home is a choreographed dance, often with a builder who isn't actively overseeing coordination between the trades. **Also, most construction is custom or semi-custom, so repeatability is lacking**.

Another inefficiency is that the **limited use of production planning creates delays, change orders, and cost over-runs**. Gantt charts are a standard planning tool, but they aren't the 'be all and end all' to project management. Many software tools enable rigorous project planning, but they aren't employed very often.

What about incentives? You get what you reward, right? If the contractor maximizes his revenue by seeking change orders or making multiple trips to the jobsite, then that behavior will prevail. **Incentives should be created that are aligned with productivity**.

That brings us to the last point on the **shortage of skilled labor**, which has become a primary bottleneck for construction productivity. Insufficient skilled labor exists today, and little is being done to fill the pipeline. The last two generations of Americans (starting with the Baby Boomers) were told to set their sights on four-year college degrees as a prerequisite to enter the workforce. Now the infrastructure of vocational training needed to fill the skilled labor gap is lacking. In the recent past, we've been reliant on immigrant labor to fill the void, but that spigot is closing.



Construction productivity has been stagnant for decades, while other industries experience continual improvement.

DECLINE IN CONSTRUCTION PRODUCTIVITY

Productivity is a significant "pain point" in building and construction compared to other industries. Construction productivity has been stagnant for decades, while other industries experience continual improvement. The problems that stand in the way are structural and generally understood, as previously discussed. The chart above shows the progression of U.S. labor productivity from 1964 to 2012. As you can see, non-farm business labor productivity steadily climbed 153 percent over the period while construction labor productivity declined -19 percent.

Another significant issue is the boom and bust nature of the construction industry that leads to capital avoidance by construction firms. How will the fixed cost required to amortize a capital investment be paid while in a bust cycle? Added to this is the fact that approximately 50 percent of construction industry work is performed by small firms of less than 50 people that don't have the scale for significant capital expenditures. Labor intensive methods of construction are reinforced, and the only mechanism for cost reduction is to use less trained, cheaper labor.

A CASE HISTORY IN MASS PRODUCTION

Before Henry Ford cars were built inefficiently, but beginning in 1908 he revolutionized the automotive industry with mass production of automobiles. Henry Ford was able to mass produce the Model T because it was a repeatable unit. In all, more than 15 million Model Ts were built. The Model T production line had 84 assembly points. Through the mass assembly line, process production time was reduced from 12.5 hours to 93 minutes, with less overall labor. Through efficiencies of mass production, the price of the Model T went from $850 to $280.

The building and construction industry is ripe for disruptive change like Henry Ford brought to the automobile industry. Limiting customization to some extent will be a critical aspect of this disruption, just like it was for Henry Ford. The Model T was offered "in any color as long as it's black." We do have some choices with our cars today, but not many. Scalable mass production is achievable with repeatable units.

However, homes are very different than cars, and the comparisons aren't quite as simple when considered with greater granularity. Perhaps the most significant difference is that homes can't be built entirely in a factory. There's always a site preparation component. Another complexity is transporting a product that is orders of magnitude larger than a car over the roadway from the plant to the jobsite and installing it there. That being said, the construction industry has much to gain from moving more of their assembly and labor to a manufacturing plant.

TRANSFORMATION ENABLERS IN CONSTRUCTION PRODUCTIVITY

We are currently in a construction market that is ripe for radical change. A February 2017 McKinsey Global Institute study, "Reinventing Construction: A Guide to Higher Productivity," identified a combination of market forces in play that could enable a transformation in construction productivity:

- Rising demand and rising requirements
- Labor shortages or rising wages
- Entrants with new, disruptive business models
- Emerging technologies, materials, and processes

Rising Demand and Rising Requirements

The first transformation enabler, 'rising demand and rising requirements,' can be looked at from several different angles. First, residential construction is still in recovery from the great housing recession. Most economists believe the long-term sustainable build rate in the U.S. is somewhere around 1.5 to 1.6 million units. The industry is not able to meet this demand without the necessary labor to fulfill the build rate in an already constrained market.

Another metric is the numerous changes in residential and non-residential model energy codes over the last three decades. These changes have resulted in significant improvements to energy efficiency, but they present challenges to builders and developers. Pacific Northwest National Laboratory (PNNL) estimates that a structure built to current model code uses about 50 percent less energy for heating and cooling than it did 30 years ago.

There is an ongoing progression of code adoption. Code is not adopted or enforced at a national level. Instead, states must first choose

to adopt the model code, and then assume responsibility for enforcement. This results in a lag between model code development, and the implementation of that code into law. But, adoption rate is ongoing for both commercial and residential building code. In 2009 only four states had adopted the ASHRAE 90.1 - 2007 model code. Ten years later 44 states have adopted the 2007, 2010, or 2013 code. In addition, beyond-code programs such as Net-Zero and Passive House both have some momentum in the market.

What building envelope technologies are builders and developers going to use that will enable them to meet the most challenging energy codes in all climate zones?

The average age of construction workers has increased significantly over the past thirty years.and pavers.

Skilled Labor Shortages and Rising Wages

The second enabler is skilled labor shortage, a massive issue in the United States. The U.S. Bureau of Labor Statistics graph above demonstrates that the average age of construction workers has increased significantly over the past thirty years. The average age used to be in the mid-30s but is now in the low-40s. Where are the new entrants? According to an NAHB Housing Market Index survey, more than 80 percent of single-family builders are reporting labor availability and cost issues, while only seven years ago that number was in the low teens.

The Bureau of Labor Statistics' Employment Protections program believes that this labor shortage is not a bubble that will pass, but is instead a long-term issue. The Bureau predicts that over a ten-year period, between 2014 and 2024, the job category of construction laborer needs to grow 18 percent, about 2-1/2 times more than all other occupations to meet demand. Looking at this from another angle, the Bureau of Labor Statistics indicates that annual wages for residential construction workers are increasing at a current rate of 5 percent per year, while wages for private sector workers are increasing at a 2.9 clip. With reduced future reliance on immigrant labor and shortages of apprenticeship and vocational training programs, there is no silver bullet to address these issues.

Entrants with New, Disruptive Business Models

The third enabler is entrants with new, disruptive business models. There are numerous examples of startups approaching offsite construction with twists on the business model. Two high profile companies that have been in the press lately are Entekra and Katerra.

Entekra is a company focused on fully integrating design and engineering with the offsite and onsite manufacturing process, and have even trademarked this approach FIOSS™—Fully Integrated Offsite Solution. This is a successful offsite business model previously employed in Ireland, and now being replicated in the United States. Entekra emphasizes the importance of continuity between offsite and onsite operations, so there's not just a handoff of components at the jobsite.

Katerra is another high profile company that, according to press releases, has a lot of backing from Silicon Valley venture capital. Their stated expertise is taking efficient state-of-the-art manufacturing, logistics, and sourcing processes, and applying best practices in those disciplines to the homebuilding process. They consider themselves primarily a technology and manufacturing company seeking to reduce time and cost inefficiencies inherent to construction. Repeatable units, global supply chain, and mass timber are critical to efficient offsite manufacturing. At present, Katerra is mostly focused on multifamily projects and jobsite just-in-time (JIT) supply of structural components, mass timber, kitchen and bath components, and finish accessories.

The third example of a new business model is the numerous acquisitions of U.S. builders by Japanese companies with advanced experience in offsite manufacturing. Japanese homebuilders will account for about 10,000 U.S. homes in 2018. Prefab and modular buildings are very prevalent in Japan, and Sumitomo (acquired Mainvue, Gehan, Bloomfield, Dan Ryan, and Edge), Sekisui (acquired Woodside), and Daiwa (acquired Stanley Martin) all have significant experience in this type of home production. At present, they haven't moved to change the manufacturing processes of the companies they've acquired, but it will be interesting to see over time if they begin to import homeland practices into their U.S. businesses.

New technologies, Materials, and Processes

The fourth enabler encompasses new technologies, materials, and processes. First, consider technology that allows homeowners to enhance their home experience concerning convenience, maintenance, security, and

One manufacturer has developed technology to create a wall panel that has more components such as insulation and weather barrier incorporated into a structural wall panel that is built offsite.

efficiency. Smart homes offer wireless sensor network connectivity from the home to the internet. Lennar, the number one homebuilder in the U.S., partnered with Amazon to install Alexa technology in their model homes to create experience centers where people can use voice commands to control appliances and security devices. With their "Everything's Included" package Lennar plans to install Alexa devices in 35,000 homes this year. Automation is a point of attraction for homeowners and will change how we interact with our houses in the future.

Next, consider 3D printing and how it could create a level of automation at the jobsite that isn't possible today. 3D printing offers the potential for fast onsite building with the precision of robotic automation. It remains to be seen how 3D will change building practices globally or in the U.S., as this technology is vastly different from the way we build today.

The next two examples are a clear tie-in to offsite construction, as they provide shorter cycle times and enhanced productivity. Building information modeling (BIM) is a digital representation of the physical and functional characteristics of a project plan. 5-D BIM adds scheduling and cost to the spatial design capabilities of earlier generation 3D BIM. This enabling software package is a bridging tool that carries all the necessary functionality to connect the upfront design and engineering phase through the finishing activities at the jobsite.

One manufacturer has developed technology to create a wall panel that has more components, such as insulation and weather barrier, incorporated into a structural wall panel that is built offsite. This technology is designed for use in existing panel manufacturing plants that are already located throughout the country, taking advantage of existing infrastructure.

In summary, there are several underlying issues in the building and construction industry that create a need for innovative new technology and manufacturing processes. New offsite manufacturing processes and technologies are emerging that can enhance productivity and shorten cycle times.

THE OFFSITE CONSTRUCTION SPECTRUM

The term "offsite construction" refers to any process in which some of the building's elements are designed, fabricated, and assembled someplace other than at the jobsite, then transported to the site for integration into a finished structure. Some builders refer to this as "decentralized construction." Offsite is a continuum of practices that broadly fit into one of three categories: 2D Components, 2D Panelization, and 3D Modular. This spectrum of technologies involves increasingly greater content manufactured offsite and therefore greater efficiency at the jobsite.

This article continues on http://go.hw.net/AR122018-2. Go online to read the rest of the article and complete the corresponding quiz for credit.

QUIZ

1. Which of the following is a systemic inefficiency of the construction industry?
   a. Complex building codes
   b. Fragmented and cyclical building process
   c. Incentives that aren't aligned with productivity
   d. Shortage of skilled labor
   e. All of the above

2. True or False: Construction productivity has been rising for decades, while other industries experience growing stagnation.

3. True or False: Limiting customization will be a critical aspect of offsite construction, as scalable mass production is achievable with repeatable units.

4. True or False: More than 80 percent of single-family builders are reporting labor availability and cost issues, while only seven years ago that number was in the low teens.

5. Which type of offsite construction is described as a plug-and-play kit of parts?
   a. Components 2D
   b. Panelization 2D
   c. Modular 3D

6. In the side-by-side comparison of offsite and site-built construction, framing hours in the componentized home were reduced by _____.
   a. 22%
   b. 59%
   c. 78%

7. Which of the following is an offsite construction advantage?
   a. Eliminating days from of the production cycle
   b. Less jobsite theft
   c. Minimal jobsite waste and removal
   d. Less cutting and fitting at the jobsite
   e. All of the above

8. A recent survey of the Top 20 homebuilders in the U.S. suggested their panelization rate was at _____ percent and projected to grow.
   a. 10
   b. 20
   c. 30
   d. 40

9. True or False: Significant infrastructure already exists for component and panel manufacturing.

10. In Climate Zones 1–5 where a U-value of 0.060 (R-17) is required _____ polyisocyanurate with an integrated weather resistive barrier and _____ structural spray polyurethane foam insulation is used.
    a. 1", 1.5"
    b. 2", 2"
    c. 1", 1"
    d. 1", 2"

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As an innovation leader in the development of high-performance polyurethane foam, Covestro LLC enables architects, designers and building owners by providing real world solutions for built environment challenges. Covestro LLC develops polyurethane insulation solutions that enhance building efficiency, preserve structures and meet new energy codes with high performance and sustainability in mind.

Presented by:

BUILD WITH STRENGTH

PATHWAY TO RESILIENCE

LEARNING OBJECTIVES

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

1. Recognize the increased risks from natural hazards and how resilient construction can support long-term sustainability by addressing life safety and building functionality.
2. Identify approaches to mitigate the effects of natural hazards through both voluntary and mandatory strategies that include steps such as adopting updated building codes and high-performance standards, incentivizing disaster resilient construction and building with robust materials.
3. Underpin a community's economic vitality and safety through natural hazard mitigation, and encourage other potential incentives such as zoning benefits, accelerated permitting, rebates, and loan programs.
4. Demonstrate the importance of incorporating resilient standards in construction through enhanced building codes, fortified programs, and rating systems.

CONTINUING EDUCATION

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INTRODUCTION

For millions of people in the U.S., the consequences of natural disasters have become increasingly real, personal and devastating. According to the National Oceanic and Atmospheric Administration (NOAA), 2017 was the costliest year on record for natural disasters in the U.S., with a price tag of at least $306 billion.

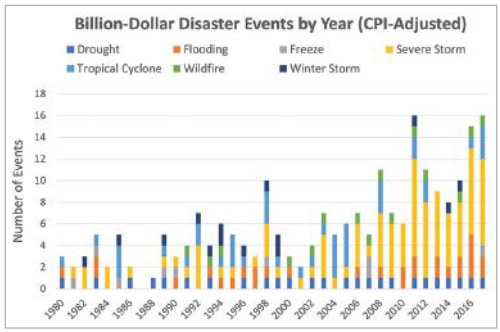
Hurricane Harvey broke a rainfall record for a single tropical storm with more than 4 feet of rain in southeast Texas matching Hurricane Katrina as the costliest tropical cyclone on record. Puerto Rico is still mired in the longest blackout in U.S. history after Hurricane Maria, and nearly 3,000 are estimated to have died in the storm and its aftermath. California encountered the most destructive and largest wildfire season ever. The Tubbs Fire in Northern California killed more than 40 people and damaged more than 5,600 structures.

Requests for federal disaster aid increased tenfold compared to 2016, with 4.7 million people registering with the Federal Emergency Management Agency (FEMA). These once-rare events are becoming more common and costlier according to NOAA. Hurricane Harvey's record flooding in Houston was the city's third 500-year flood event in as many years. Now, with the nation's attention on rebuilding the Carolinas after Hurricane Florence and the Florida Panhandle after Hurricane Michael, it's time to rethink the way we build to meet the challenge of the next natural disaster.

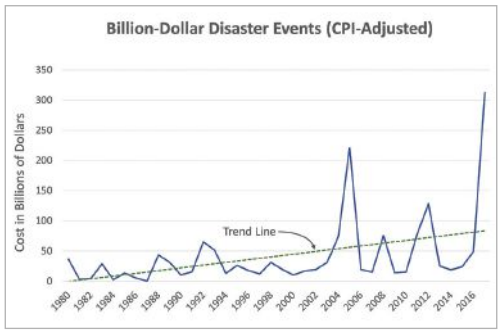
Disaster mitigation works and is cost effective. Spending time and money up front to reduce the likelihood of loss during a natural hazard event can provide significant benefits to building owners and communities, including lower insurance costs, higher property values, security to residents, maintaining a consistent tax base and minimizing the cost of disaster response and recovery. This article will offer a view on emerging risks and opportunities as human and economic losses from disasters increase, with the overarching goal of supporting and advancing resilience in future construction of buildings and critical infrastructure.

WHY ARE DISASTERS COSTING MORE?

In the last several decades, the population in the United States has increased and migrated toward the coasts, concentrating along the



Number of Billion-Dollar Disaster Events by Year. Adapted from NOAA.



Cost of Billion-Dollar Disaster Events by Year. Adapted from NOAA.

earthquake-wildfire-prone Pacific coast and the hurricane-prone Atlantic and Gulf coasts. Over 60% of the U.S. population lives within 50 miles of one of its coasts, including the Great Lakes. At the same time, wealth and the value of possessions have increased substantially. For example, while California's Los Angeles County accounts for only 2.5% and Florida's Miami-Dade County accounts for only 14% of their respective state's land area, they contain 30% of their state's property value. These changes in the concentration of population and property values are significant contributors to the increased human and property losses from natural hazards.

Disasters result not as much from the destructive agent itself but from the way in which communities are (or are not) prepared. Disasters happen when natural systems are disrupted by human development. In fact, there is no such thing as a "natural" disaster in the sense that losses caused by a hazard event are greatly influenced by the degree to which society chooses to mitigate against the hazard. When a disaster occurs, lives, assets, products and crops are lost; livelihoods are cut off; economic growth is curtailed or sent into reverse. It is apparent that there needs to be a significant shift in how we address natural disasters, moving away from the traditional focus on response and recovery toward an emphasis on resiliency, that is, preventive actions to mitigate the effects of natural hazards.

CASE STUDY: HURRICANES

The Brickell, Miami, Florida (pictured on page 1)

While The Brickell was being designed, Miami was recovering from the impacts of Hurricane Wilma. Many high-rise buildings suffered extensive damage and were out of commission for extended periods in this hurricane-prone area. The developer was willing to increase construction costs to realize long-term operability of the building. The 35-story, 586,000-square-foot office tower was designed to withstand the force of large projectiles, wind speeds approaching 300 miles per hour and storm surge. Integrating resilience was paramount and involved a reinforced concrete structural system that uses post-tensioned one-way slabs and beams, elevating portions of the ground floor above the floodplain, impact-resistant glazing systems, and multiple backup generators to maintain business and continuity for tenants. It cost an extra 6 to 8 percent to implement these resiliency strategies which was immediately recouped with more competitive insurance rates and lower operating expenses that amounted to $1 million in electricity savings. Additionally, with global companies concerned with business continuity across many time zones, high-profile tenants leased space in The Brickell faster than other nearby Class A office space. The Brickell also was awarded LEED Gold certification.

WHAT IS RESILIENCE?

The Urban Land Institute (ULI) defines resilience as "the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events." Addressing changes in the environment, whether the changes are natural or human-made, requires actions to mitigate their negative effects and adapt to those changes. If we identify resiliency, not solely as a state of preparedness for disaster (such as stocking up on food and water and having a plan in place to search and recover people in distress), but as a desired characteristic of a sustainable society, one that has more control of its basic human needs such as shelter, food, water, energy, communications and commerce, we can begin to see the relationship between resilience and sustainability.

For a community to be truly resilient, it must address all human needs to some degree, but the very basic of all human needs is shelter. This means designing buildings to resist hazards such as flooding, wind, sea level rise or wildfires and other hazards. For a building to be sustainable, one must consider the potential for future use and re-use and design for long service life with minimal maintenance costs. Otherwise, the environmental, economic and societal burden of our built environment could be overwhelming. A building that requires frequent repair and maintenance or complete replacement after a disaster would result in unnecessary cost, from both private and public sources, and environmental burdens including energy, waste, and emissions due to disposal, repair, and replacement.

Of course, it's one thing to describe resilience in generalities and another to design a building to mitigate natural disasters. There is significant guidance on reducing environmental impacts with green building codes and rating systems such as LEED, International Green Construction Code, Green Globes, among others. But the guidance for designing a building to adapt to and mitigate the effects of natural hazards are now only beginning to take shape.

STEPS TO DISASTER RESILIENCE

There are essentially two ways to approach disaster mitigation. There are voluntary programs where communities or building owners voluntarily reduce their risk of natural disaster through enhancements in structures, warning systems and education. The second approach is to install mandatory building requirements such that communities and building owners are obligated to design buildings and infrastructure to be more disaster resilient. The following are steps, combining both voluntary and mandatory mitigation strategies, to achieving disaster resilience:

1. Adopt Updated Building Codes;
2. Adopt High-Performance Building Standards;
3. Incentivize Disaster Resilient Construction;
4. Build with Robust Materials.

1. Adopt Updated Building Codes

A common misconception is that a new code-compliant building in the U.S. will be resilient against considerable damage after a major hazard event. This is not always the case. The building code sets standards that guide the design and construction of structures for minimum *Life Safety*, the first step towards resilience. However, maintaining the *functionality* of structures after a disaster

is also important, and building codes do not address functionality effectively. Sadly, special interests have convinced some state legislatures to reduce the stringency or limit the adoption of the latest building code.

To date Texas, Mississippi, Alabama and Delaware still do not have a statewide building code but pass the responsibility to the local jurisdictions to adopt the codes themselves. Florida, the state that faces more hurricanes than any other decided in 2017 to weaken its code adoption process. The North Carolina state legislature decided to placate homebuilders and update the building code only once every six years instead of every three. Builders claimed that weaker code makes it easier and cheaper to build in North Carolina, but new homes were ill-prepared for Hurricane Florence's high winds, storm surge, and rainfall. These states are not alone. Unchecked development remains a priority for powerful lobbyists, creating short-term economic gains for some while increasing risks for everyone else. As a result, the American public is footing the bail-out bill to the tune of $90 billion in disaster relief.

If we are to take people's vulnerability seriously, we must deploy—and insist on—much greater emphasis in mandatory code adoption. While the design community can provide some of the expertise, their voices are not being effectively considered on the planning and policy level. The missing element is participation among practitioners, the development community, and policymakers interested in public safety over economic opportunism.

2. Adopt High-Performance Building Standards

Buildings should not be a burden on their communities. They should have sufficient functionality after a hazard event and not place excessive demand on community resources such as emergency responders including fire, police, and hospitals. Communities with disaster-resilient buildings are more likely to be able to operate schools and businesses after a disaster. Stronger homes and buildings mean people will have places to live and work after a disaster. Less disruption for a community means robust commerce and consistent tax revenue.

Resilient buildings should consider a higher level of performance to protect property. Property protection means the building can withstand impacts and continue to provide its primary functions after a major disruptive event. The following are programs and standards aimed at incorporating resilient building techniques into construction to provide an optimum level of protection against a variety of natural hazards:

A. Enhanced Building Codes—Enhanced building codes can be developed and adopted through the building code appendices. The appendices are provided in the International Building Code (IBC) and the International Residential Code (IRC) to offer supplemental criteria to the provisions in the main chapters of the code.

After damaging windstorms in 2008, the Georgia Department of Community Affairs created the Disaster Resilient Building Construction (DRBC) appendices to the IBC and IRC, which form the basis for the Georgia State Building Code. The DRBC appendices offer an affordable, flexible, and simplified approach to improving resiliency at the local level. Local jurisdictions can adopt the complete appendices to improve building resiliency against flooding and high winds, or they can adopt select sections that apply to specific hazards in their geographic area.

Floods are the most frequent hazard resulting in disaster declarations. For those jurisdictions seeking to enhance their local floodplain management regulations, a compilation of flood-resistant provisions is provided in Appendix G of the IBC. Like the Georgia DRBC appendices, the provisions contained in Appendix G are not mandatory unless specifically referenced in the adopting ordinance. The appendix helps minimize the expenditure of public money in many ways: flood control projects; the need for rescue and relief efforts; prolonged business interruption; damage to structures; and ultimately, protecting human life.

B. FORTIFIED Programs—The FORTIFIED for Safer Living and Safer Business are programs of the Insurance Institute for Business and Home Safety (IBHS). The program provides enhanced design criteria relative to code minimum and the necessary construction and inspection oversight to ensure high performing structures that are truly disaster resilient. The IBHS is a not-for-profit applied research and communications organization supported by the insurance industry.

C. USRC Building Rating System—The US Resiliency Council (USRC) is a national organization dedicated to improving the sustainability and resiliency of buildings during earthquakes and other natural hazards. The performance-based USRC Building Rating System assigns one to five stars along the dimensions of Safety and Damage expressed as repair cost and Recovery expressed as time to regain basic function. Certified buildings are expected to perform in a manner that will preserve the life safety of the occupants, limit damage to repairable levels and allow functional recovery within a reasonable time period after a major seismic event.

CASE STUDY: EARTHQUAKES

Roseville City Hall Annex, Roseville, California

Photo credit: John Swain Photography / Clark Pacific

This four-story, 82,000-square-foot office building houses critical city services such as IT, public safety communications and fire administration. Integrated project delivery (IPD) methods were employed to meet a short timetable for occupancy. Utilizing a Precast Hybrid Moment Frame (PHMF) gave the architect flexibility in the design and met a tight construction schedule. The concrete structure was erected in just 38 days which provided plenty of time to finish the project in seven months. Also important for the city was reassurance that during an earthquake critical operations and services would continue. This project is the first to be rated and accredited by the USRC, achieving Platinum level certification. The structural system incorporates a high-performance moment-resisting frame that limits design level drifts to less than 1.25 percent. The system is designed to be self-centering after the seismic event eliminating residual drifts, limiting damage and providing for reduced recovery time. Other added benefits from an operational perspective include lower long-term maintenance costs, superior sound isolation/exterior noise suppression and approximately 30% less energy consumption because of the building's thermal mass.

D. REDi Rating System—The REDi (Resilience-based Earthquake Design Initiative) Rating System is a set of specific design performance criteria which aims to minimize building damage and promote contingency planning

for utility disruption and other threats to functional recovery. The success of the resulting design in meeting specific monetary loss and recovery time is demonstrated by performing a modified FEMA P-58 loss assessment developed specifically for REDi.

E. RELi Standard—The RELi standard is a point-based system recently adopted by the US Green Building Council (USGBC). It includes many LEED-centric credits along with risk mitigation credits at the building and neighborhood scale. The intent is to provide greater adaptability and resilience to weather and other natural hazards in the built environment as a compliment to LEED. USGBC is currently refining RELi to provide a comprehensive list of resilient design criteria.

3. Incentivize Disaster Resilient Construction

According to Munich RE, insurance companies took a $135 billion hit from natural disasters experienced around the globe in 2017. Half of all losses were in the U.S., and North America representing 83 percent of all insured losses last year. The three successive Atlantic hurricanes—Harvey, Irma, and Maria—cost major U.S. insurers at least $14.5 billion. This made it the costliest year ever for insurers.

Resilient buildings reduce the risks associated with property insurance. States can encourage building owners to build resilient structures by legislating insurance premium reductions to all policy-holders if they build to specific resilient design criteria. Alabama, Georgia, Mississippi, and North Carolina have enacted such laws. These states now require insurers to lower the cost of property insurance for building to the IBHS FORTIFIED standard.

Hazard mitigation increases loan security for lending institutions and decreases business interruptions and improved bond ratings for property owners and communities. Therefore, other potential incentives should be encouraged:

- Building permit rebates;
- Property tax reductions;
- Accelerated local permitting and inspection procedures for resilient properties;
- Zoning benefits, e.g., density or height bonuses;
- More-favorable developer agreements for the construction of resilient properties;
- Revolving loan programs.

QUIZ

1. True or False: 2017 was the costliest year on record for natural disasters in the U.S.
   a. True b. False

2. Since 1980, according to NOAA's chart, the number and cost of billion-dollar disasters in the U.S. each year are trending:
   a. Upward b. Downward
   c. Flat

3. What percentage of the U.S. population lives within 50 miles of one of its coasts, including the Great Lakes, where natural hazards are the highest?
   a. 20% b. 40%
   c. 60% d. 80%

4. Every state in the U.S. has adopted a building code.
   a. True b. False

5. Which of the following is a program of the Insurance Institute for Business and Home Safety to enhance the resilience of buildings?
   a. RELi b. LEED v4
   c. FORTIFIED d. USRC

6. Which resilience standard or rating system has been adopted by USGBC?
   a. RELi b. LEED v4
   c. FORTIFIED d. USRC

7. The following states have passed legislation requiring insurance companies to offer discounts to homeowners who build to the FORTIFIED standard:
   a. California, Oregon, and Washington b. Alabama, Georgia, Mississippi, and North Carolina
   c. New York and New Jersey d. Florida, Louisiana, and Texas

8. The following cities have adopted Fire Districts to restrict combustible construction:
   a. Boston and Houston b. San Francisco and Oakland
   c. Denver and Salt Lake City d. Chicago and New York City

9. Which of the following hazards kills more Americans than all other natural hazards combined?
   a. Hurricanes b. Floods
   c. Fires d. Tornadoes

10. According to NIBS, the overall benefit-cost ratio for natural hazards such as floods, storm surge, wind, earthquake, and wildfires is:
    a. 10:1 b. 4:1
    c. 8:1 d. 2:1

This article continues on http://go.hw.net/AR122018-1. Go online to read the rest of the article and complete the corresponding quiz for credit.

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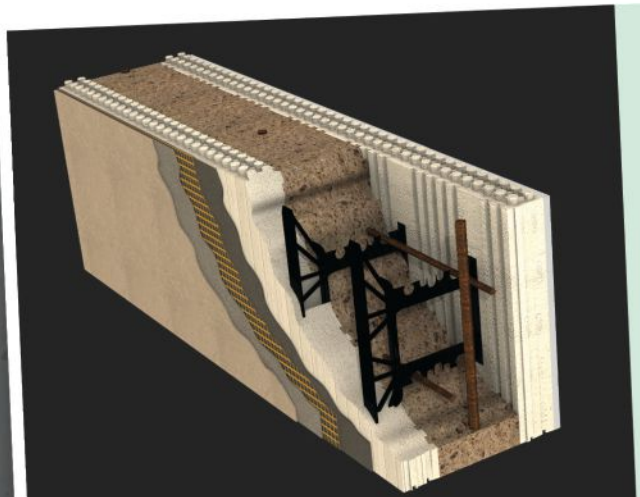

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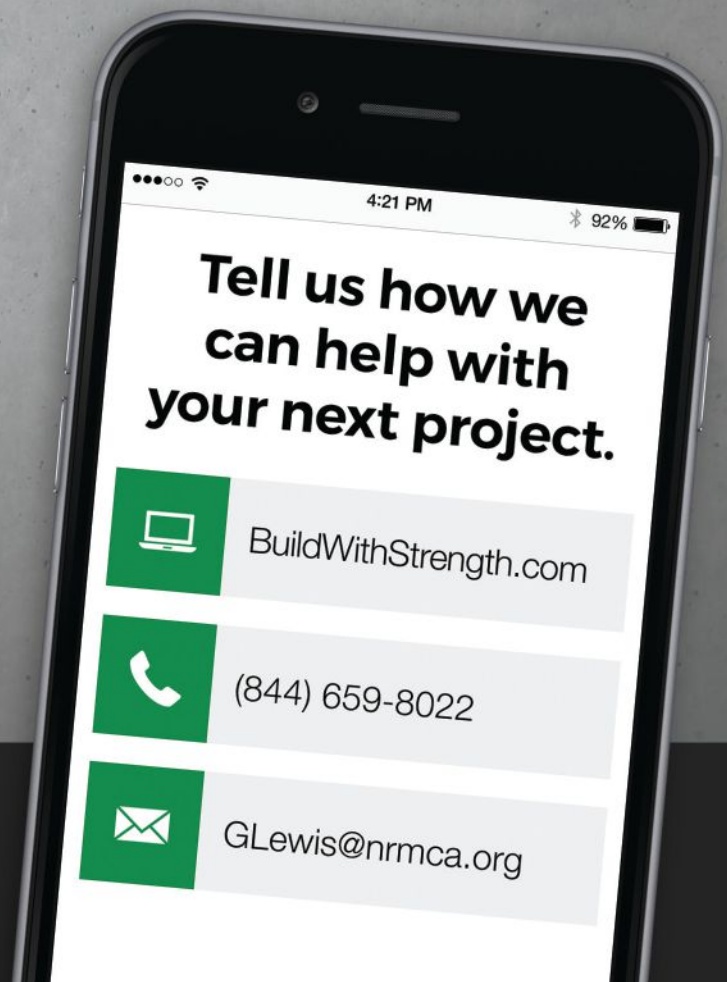

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HIGH-PERFORMANCE ARCHITECTURAL COATINGS FOR METAL BUILDINGS AND COMPONENTS

Presented by:
SHERWIN-WILLIAMS
Coil Coatings

Aria Resort & Casino, Las Vegas, Nevada

LEARNING OBJECTIVES

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

1. Explore the differences between coil and extrusion end-use applications, coating methods, and manufacturing processes.
2. Examine various coating components and their role in the coating system.
3. Identify industry standards relative to the performance requirements of coatings for metal building components.
4. Understand AAMA specifications for specifying the optimal coating for a metal building component or project.

CONTINUING EDUCATION

AIA CREDIT: 1 LU
AIA COURSE NUMBER: AR122018-3

Use the learning objectives above to focus your study as you read this article. To earn credit and obtain a certificate of completion, visit http://go.hw.net/AR122018-3 and complete the quiz for free as you read this article. If you are new to Hanley Wood University, create a free learner account; returning users log in as usual.

INTRODUCTION

Metal is one of the most widely used materials in architecture. Architects and designers continue to use metal in creative ways to achieve their design vision. A virtually unlimited number of aesthetic looks can be achieved using various metal panels and extruded aluminum profiles.

This course provides an overview of high-performance architectural metal coatings for exterior building products for building façades and roofs. There are two primary types of liquid coatings for these metal building products which are named by their coating method: Coil (pre-paint) and Extrusion (post-paint). Both options are applied in-factory and provide an extremely durable finish that retains its performance and aesthetics over time in exterior elements.

COIL COMPONENTS AND APPLICATIONS

Since inception in the 1930s, coil coatings have been utilized in a variety of industries ranging from architecture, agriculture, aeronautics, and myriad of other commercial, governmental, non-profit, and residential applications. To achieve such versatility in a finished product, there is a near-equal variety and combination of materials and coatings used.

COIL COATING USES

A wide range of building products and cladding are made from coil coated metal, including, corrugated, insulated, metal composite, and shingle-style metal panels as well as roofing applications such as metal shingle and standing seam. From an aesthetic standpoint, there are nearly unlimited design options. An extensive color palette is available including solids, metallics, special effects, and printed patterns. Because

Coil End-Use: Metal Roofing

coil coatings are formulated to be highly flexible and formable, manufacturers can create almost any panel or shape.

Additionally, the premium resins used in architectural coil coatings are very durable. They are formulated to protect against harsh UV rays, temperature fluctuations, humidity, and other natural elements that can cause coating degradation. They protect the metal substrate from corrosion and provide a long lifecycle.

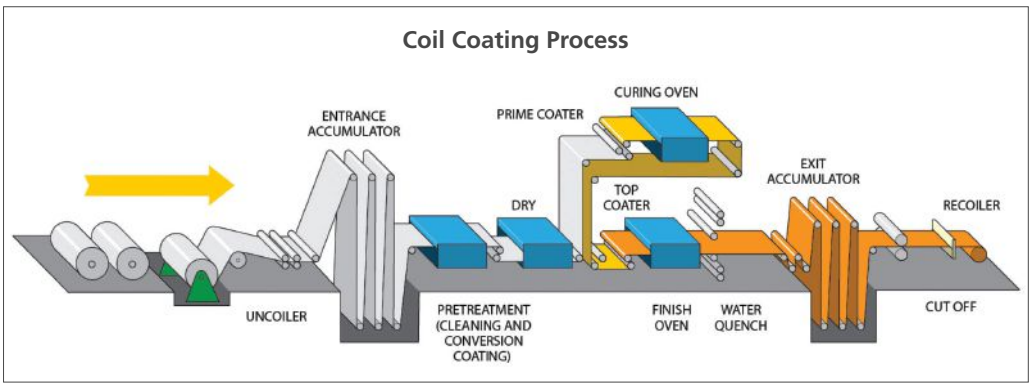
The coil coating industry is subject to stringent EPA standards, which the pre-paint process usually exceeds. Because the manufacturing process for coil coatings is highly controlled, environmental factors are minimized and even eliminated. In certain coil coatings facilities, as much as 98% of VOCs are captured. Abatement equipment burns the VOCs as fuel, saving energy, eliminating pollutants, and utilizing heat back into the manufacturing process.

DIFFERENCES BETWEEN COIL AND EXTRUSION APPLICATIONS

The two primary methods for coating metal buildings are coil coating, or "pre-paint," and extrusion coating, or "spray-applied." Both coil and extrusion coatings are applied in-factory and cured at high temperatures. In the pre-paint method, a coil coating is applied to a roll of metal then cut into flat pieces of steel, or aluminum before it is shaped into a building product. For example, a flat coil of metal can be coated prior to being formed into products such as metal roofing or panels. Conversely, an extrusion coating is spray-applied to the aluminum extrusions after it has been formed.

Both coil and extrusion coating methods offer a wide range of aesthetic options, sustainability benefits and long-lasting durability. The resin system in both coating methods provide protection against UV rays, and resistance to chalk, fade, and corrosion that protects exterior metal building products for decades.

Uncoated cold rolled steel coil.



COIL COATING PROCESS

The coil coating process takes place in large coil coating facilities that are typically the length of a football field or longer. The coating line is able to run anywhere from 50 feet per minute up to 800 feet per minute, making it a highly efficient process. The illustration below shows the various steps in the coating process.

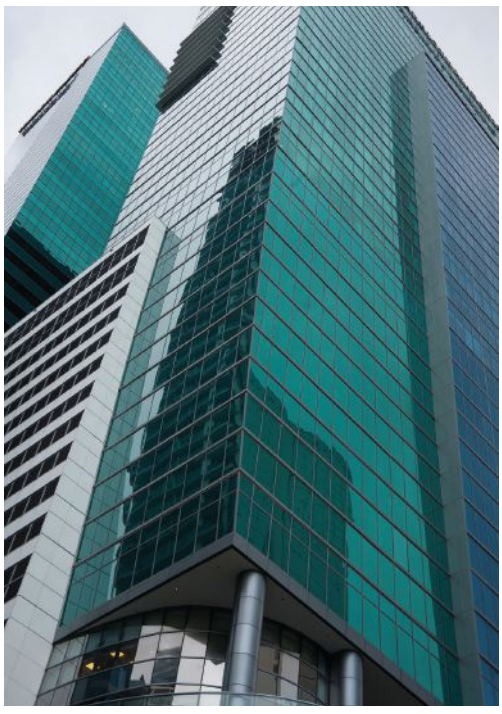
The coil coating process begins when a roll of bare metal substrate such as aluminum, steel, hot dip galvanized (HDG), galvalume or other substrates, weighing up to 40,000 pounds, is delivered from the manufacturer's rolling mill to a coil coating facility. The roll of metal substrate is called a "coil." The metal is then fed into a machine where it is uncoiled. In the pre-treatment process, alkaline cleaners, mechanical brushes, and fresh water rinses remove surface contaminants and the mill oils that were previously added to prevent corrosion during transit and storage. Then a pretreatment, or "conversion coating" is applied to the metal to add anti-corrosive properties and provide adhesion between the substrate and coating system.

After the pre-treatment process, both sides of the metal are coated with primer. As well as providing adhesion for the topcoat, primers promote corrosion resistance. After the primer, the color coat, which is often the topcoat is applied, providing the desired physical appearance and aesthetics; durability characteristics, including color and gloss retention; and physical properties, like hardness and flexibility. As the coated metal is recoiled and later formed into building products, the coating must resist cracking or chipping, and flexibility is crucial.

In conjunction with the topcoat application, backing coats, also known as backers, are applied to the underside of the metal. While backers are not visible on the final building product, they are necessary to prevent corrosion. Once the coatings have been applied, the metal is baked at a high temperature, typically between 400–500 degrees Fahrenheit to cure the coating. The coil is then recoiled and shipped to fabricators for forming.

EXTRUSION COATINGS

Aluminum extrusions can be used in a variety of building products, including curtain wall, skylights, window and door trim, louvers, entry canopies, and sunshades. Aluminum profiles are extremely lightweight, durable and recyclable making them an excellent choice for building applications.



Extrusion End-Use: Curtain Wall

To create extruded aluminum profiles, a solid block of aluminum, or billet, is heated to roughly 850 degrees Fahrenheit until soft. The aluminum is then forced through a die to make the shape specified for the end product. The profiles are then cut, stretched and go through an aging oven before they are ready to be coated.

Extruded Aluminum Profiles

The shaped aluminum is next hung horizontally or vertically. The paint line is designed to ensure the coating is applied to all angles, corners, or gaps of a product. For example, aluminum extrusion curtain walls, windows and door frames, skylights, sunshades, and perforated metal panels are best suited to a horizontal coating application. Vertical manufacturing paint lines, on the other hand, are designed for high-speed production of simple shapes. For instance, residential windows and doors have smaller parts that use this type of application.

To begin either painting process, extrusion parts are loaded on racks for pre-treatment cleaning to ensure coating adhesion. Any remaining moisture is dried in the oven. Next, the parts enter a series of application booths where spray guns on both sides of the part evenly apply primer and then topcoat. Similar to coil coatings, the coated extrusions then go through the curing process.

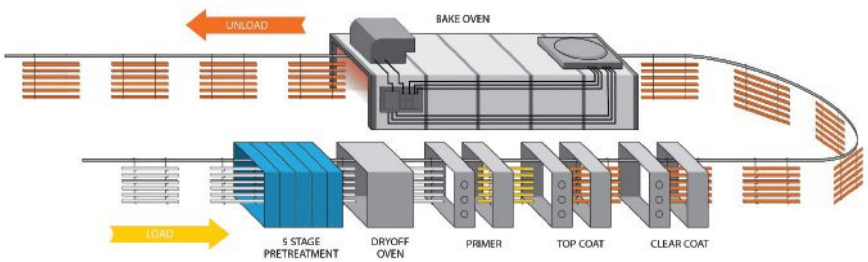
COATING SYSTEM LAYERS

Both coil and extrusion coating systems work to protect the substrate from corrosion and the harmful effects of weathering. There are several coating layers that work together to make up the overall coating system:

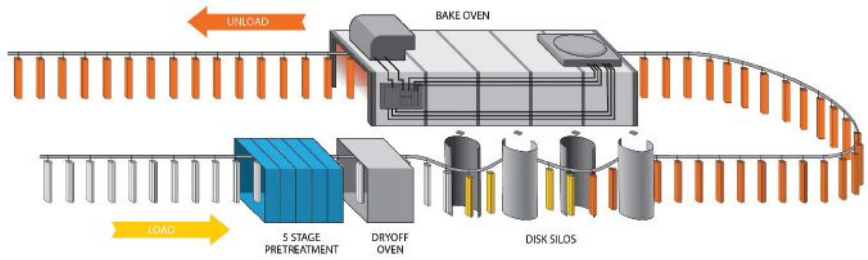
Primers: Primers are applied to properly pretreated metal and provide both protection and adhesion properties, allowing the topcoat to properly adhere to the metal substrate.

Backers: Backers are only used for coil coating systems and they provide protection and corrosion resistance for the underside of the metal that is not visible after construction. These are not applicable to extrusion because all sides of the extruded aluminum profile are coated.

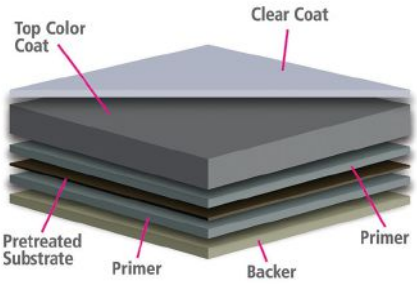
Extrusion Coating Process: Horizontal Paint Line



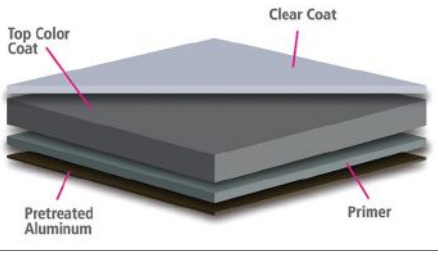
Extrusion Coating Process: Vertical Paint Line



Coil Coating System Layers



Extrusion Coating System Layers



Topcoats: Topcoats are a combination of resin, color pigments, and other ingredients that gives the coating system the majority of its performance and aesthetic properties.

Clear or Effect Coats: Specific coating systems may desire an effect coat for added aesthetic properties or require a clear coat for additional pigment protection.

While many layers make up architectural coatings, when applied they are thinner than a strand of hair. Despite being extremely thin, these strong and durable coatings have been formulated to stand up to the harshest exterior conditions that can degrade a building's color and aesthetic.

COATINGS COMPONENTS[1]

Most coatings are largely comprised of four principle ingredients: resin, pigment, solvent, and additives. The percentage of each ingredient changes depending on a coating's final application and desired color.

Resins

Resin is the binder holding the pigment to the substrate and adds the coatings durability, weathering resistance and anti-corrosive properties. It also allows for the curing process to occur while the paint is drying.

Pigments

Pigments are tiny particles of color that can be blended to create infinite varieties of color to suit the aesthetics of any application.

Pigments also hide the substrate as well as offer chemical resistance. Organic pigments made from petroleum compounds offer a natural, bright appearance but can be more susceptible to fading and weathering. Inorganic, or ceramic pigments, are made of metal and mixed metal oxides that have high resistance to color fade. Most high-performance coatings contain a blend of both organic and inorganic pigmentation. Specialty pigmentation including mica and metallic flake, color-shifting pigmentation, and other unique options can be used to achieve special effects.

When selecting a color, UV exposure and intended end-use should be taken into consideration. No matter how well a coating is made, however, certain colors are more affected by the environment than others, especially bright colors like yellows, oranges, and reds.

Solvents

Another key component of coatings is solvents. Solvents are the vehicle by which the solids are transported to the substrate, thinning the consistency of the mixture so that it can be properly applied. During the curing process, solvents evaporate while the resin adheres to the substrate.

Additives

Any number of chemicals can be added to the coating, usually in small amounts to bring special characteristics to it. Additives can be used for processing pigments within the film for flow and smoothness, regulating the rate of the cure, and enhancing the coating's hardness, gloss, mar resistance, and other performance attributes.

WEATHER TESTING COATINGS FOR METAL BUILDING COMPONENTS

UV exposure, moisture, humidity, high temperature, temperature fluctuations, and freeze/thaw cycles can all lead to chalking and color fade. Chalking is caused by a degradation of the resin system at the surface of the finish from harmful UV exposure. As the resin system breaks down, resin particles at the surface lose adhesion creating a white, powdery appearance that can be scrubbed off or mechanically buffed away. Fade, on the other hand, is caused by a breakdown of the pigment itself and can cause the color to lighten over time in most cases. Coating manufacturers must perform rigorous testing on an ongoing basis to ensure the long-term performance of the coating system to prevent these types of coating failures. The two primary methods of testing are long-term natural exposure and accelerated weather testing.

This article continues on http://go.hw.net/AR122018-3. Go online to read the rest of the article and complete the corresponding quiz for credit.

QUIZ

1. In which of the following coating methods is the metal painted before it is formed into products and building components?
   a. Coil coating
   b. Extrusion coating
   c. Both of the above
   d. None of the above

2. True or False: In certain coil coatings facilities, as much as 98% of VOCs can be captured. Abatement equipment burns the VOCs as fuel, saving energy, eliminating pollutants, and utilizing heat back into the manufacturing process.
   a. True
   b. False

3. To create extruded aluminum profiles, a solid block of aluminum, or _____, is heated to high temperatures until soft.
   a. Coil
   b. Backing coats
   c. Billet
   d. Resin

4. What are the four main elements to a topcoat?
   a. Pigments, Resins, Additives, Acrylics
   b. Pigments, Resins, Catalysts, Water
   c. Pigments, Resins, Solvents, Additives
   d. Pigments, Resins, Viscosity modifiers, Alkyds

5. The roll of metal substrate is considered a "_____," not to be confused with spring-like air conditioner coils.
   a. Resin
   b. Inorganic
   c. Mica
   d. Coil

6. True or False: Coating manufacturers are not required to perform rigorous testing on an ongoing basis to ensure the long-term performance of the coating system to prevent these types of coating failures.
   a. True
   b. False

7. A resin system with 70% PVDF (polyvinylidene difluoride) could be described as which category?
   a. Superior performance
   b. High performance
   c. Standard performance
   d. Average performance

8. True or False: While many layers make up architectural coatings, when added together they are thinner than a strand of hair making the coating very fragile.
   a. True
   b. False

9. According to the article, one method of testing architectural coating resistance to natural exposure is by maintaining a test fence with panels exposed at a 45-degree angle in an area of the country that has the ideal conditions for weather testing because of the intense UV exposure, humidity and salt spray conditions. In what area of the United States is this testing performed?
   a. Houston, Texas
   b. Savannah, Georgia
   c. South Florida
   d. South Georgia

10. Of the three AAMA specifications for coatings for metal buildings and components which one is the highest performing, calls for 20-year performance, and is most commonly used on high-rise monumental and high-end residential buildings?
    a. AAMA 2603
    b. AAMA 2604
    c. AAMA 2605
    d. Both AAMA 2603 and 2604

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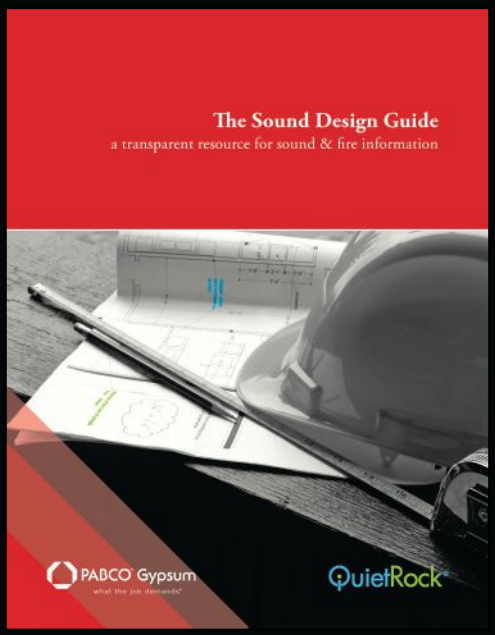

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Re-Evaluating "Community"

Architects and designers need to build a bridge between practice and community.

Julia Weatherspoon, ASSOC. AIA, is a Northern California native and recent participant in the AIA Design Justice Summit. Weatherspoon works as an architectural designer at Perkins+Will, a firm she was drawn to for its emphasis on diversity, inclusion, and social responsibility. Passionate about providing design services for underrepresented populations, she works to connect young designers with their communities in the transient Bay Area.

As told to Kathleen M. O'Donnell

I identify first as black, second as a woman, and third as a designer—not typically what people think of when you describe an architect. I believe—and think most people would probably agree—that this intersectionality of being a double minority has a huge influence on my identity, my experience, and the way I see the world.

Although there is this big push for diversity and inclusion in architecture, the profession is still largely homogeneous and not reflective of the stories and abilities of designers of color within the POC [people of color] community. When we have the skill set and education to understand problems and create meaningful design solutions, you also realize that we need to use our expertise to actively serve people in underrepresented communities.

There is a polarity in how we move through spaces professionally versus how we move through spaces personally. The people I interact with within my family and friends usually are not the same types of people I serve in a professional setting. When I go home—or volunteer with local community centers and schools—the spaces don't look like the ones we design professionally. Architecture is still very much an exclusive profession, and I want to work toward breaking down that barrier.

The lack of consideration for where we are focusing our design resources makes me wonder if we really value our communities. If we're not providing design services to protect the health, safety, and well-being of people who need it, are we really being good architects and designers? The onus is on the architect to push the envelope in terms of what we can provide in the built environment to elevate the human experience. We have to take a step back and think about not only what the client desires, but also advocate for what communities need, and how we can include them in the decision-making process.

Currently, many young people are converging on the Bay Area. I believe there is a lack of immersion and connection to local communities by the newcomers because most of them aren't invested in the Bay Area as a long-term living situation. I haven't seen much of a transplant community that is deeply rooted and engaged in local culture. AIA

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By Steve Cimino

PHOTOGRAPHY: MARQ MORRISON

A Revival in Hawaii

Presenting the AIA Film Challenge 2018 People's Choice Award winner.

Every year, the AIA Film Challenge highlights filmmakers and architects who team up to tell stories of inspiring and groundbreaking design. The 2018 People's Choice Award winner—as voted on by the public—was *Ka Hale: A Revival*, the story of indigenous architect Francis Palani Sinenci and his efforts to preserve ancient Hawaiian cultural practices.

In just 4 minutes and 52 seconds, filmmaker Marq Morrison and his cast explain the value of a traditional "hale," or house, and the need for future generations to embrace the old ways of life. Morrison's film reminds audiences that even as the world moves forward, time-honored methods of building have survived this long for a reason.

"Before transitioning into film, I studied architecture in college," Morrison says. "This project provided me with the first—and hopefully not the last—opportunity to combine my two passions, and I am honored to be recognized by AIA."

For more on the AIA Film Challenge, visit aiafilmchallenge.org.

To view a longer version of the winning documentary, visit KaHaleRevival.com.

AIAFeature

Will IPAL Make Licensure Easier or Education Harder?

At nearly two dozen schools, the pipeline just got a lot shorter—but no less rigorous.

By Katherine Flynn

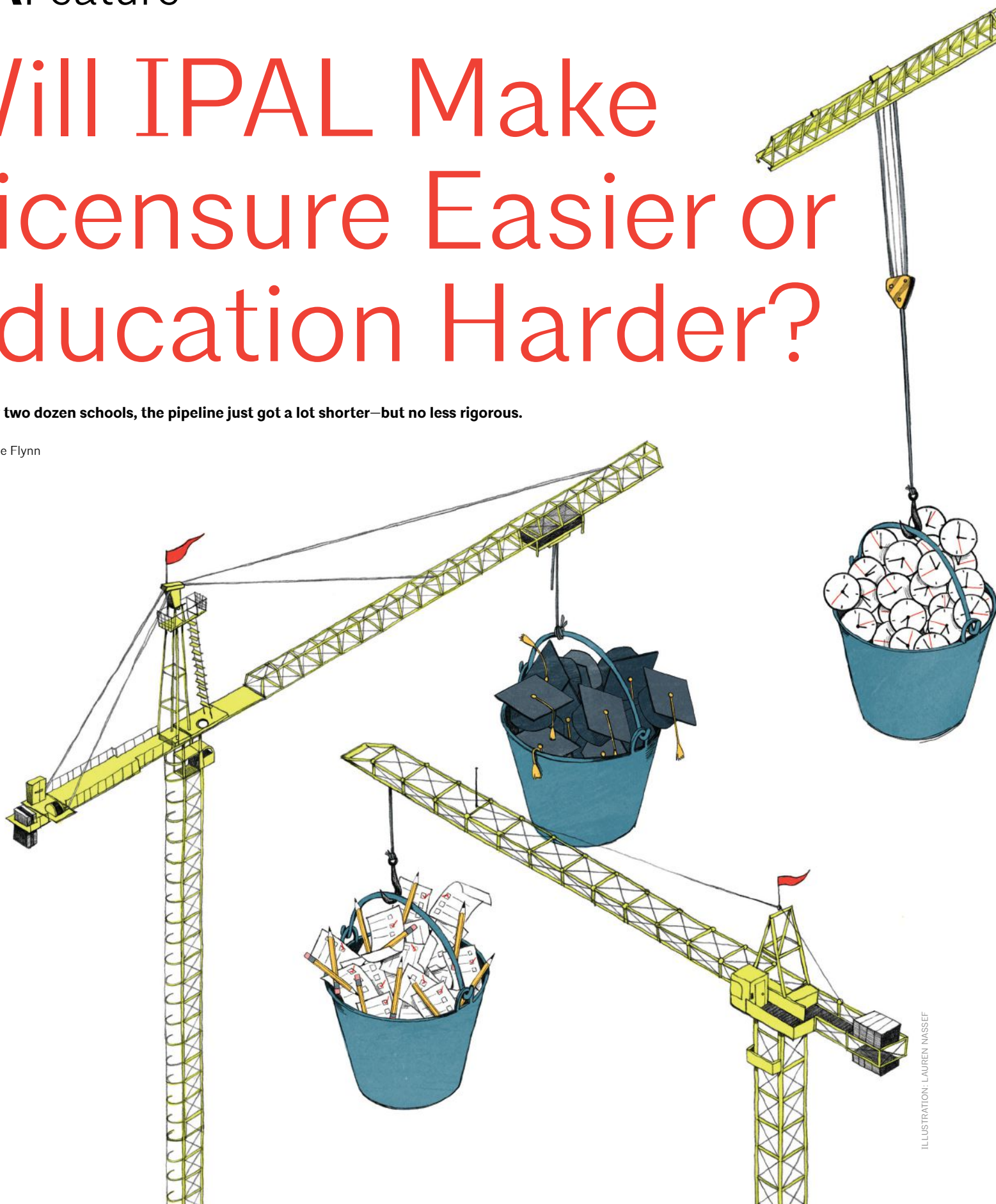

ILLUSTRATION: LAUREN NASSEF

The journey to becoming a full-fledged architect has traditionally resembled a long, slow marathon, encompassing three substantial hurdles: education, intern hours (over 3,000 of them), and rigorous exams. In 2016, the time to licensure for the average architect was 12.5 years from start to finish, according to the National Council of Architectural Education Boards (NCARB). Even without consideration for career detours or for personal or financial circumstances, the average architecture student can expect to become licensed somewhere around the age of 32.

In 2015, NCARB introduced a new program called the Integrated Path to Architectural Licensure, or IPAL, with the aim of breaking the process down into a series of shorter, if undeniably more intense, sprints. The goal of IPAL is to give aspiring architects the opportunity to complete their education and intern hours, and take the exams, in roughly half the time of the more traditional route. As of the end of 2017, there were just over 450 students enrolled in IPAL across 17 programs, with more programs expected to start in the 2018–2019 academic year, according to NCARB.

IPAL doesn't eliminate the requirements of licensure, NCARB and other advocates for the program point out, but rather it offers students a way to fulfill some of those requirements while they're enrolled in National Architectural Accrediting Board–approved architecture programs. The 21 programs that currently support or are developing ways to support IPAL have elected to offer students ways to fulfill Architectural Experience Program (AXP) hours—time in a firm—and sit for Architect Registration Examination (ARE) tests.

For the University of Florida's CityLab-Orlando, which offers graduate degrees in architecture, the potential for licensure with the completion of a four-year M.Arch. has been a major selling point, especially if a student is coming from a different career or discipline.

"If you look at the NCARB statistics, it would be almost seven years after they graduated before they would get their registration, and that's way too long for people that are changing careers," says Frank Bosworth, AIA, director of CityLab-Orlando's M.Arch. program. "This is a way to engage them in the profession and get them started in a reasonable amount of time."

But IPAL has been met with a degree of skepticism from traditionalists. "One argument was that, 'We're going to have to change our curriculum,' which doesn't actually have to change," says Marc Neveu, head of architecture at Arizona State University. Neveu, former associate dean of the Architecture School at Woodbury University in Los Angeles, was instrumental in implementing the IPAL program at Woodbury along with his late colleague, dean Norman Millar. "There was a perception that we were going to be teaching to the test, and that was, I think, a false argument."

The possibility of curricular reform aside, the introduction of IPAL into architecture's academy points to another kind of reform in American education: making the threshold to practice easier to cross.

"The interest that I had in the program was not necessarily the speed or the time to licensure," Neveu says. "Our hopes were that it would allow students of more diverse backgrounds to ensure licensure." A large percentage of Woodbury's student body consists of first-generation college students, with the demographics of the school closely mirroring those of Southern California.

"For us, the opportunity is really about people entering into the profession having more options—and having more opportunity—than if they weren't licensed," Neveu says. "I don't think the benefit is in the short-term; I think the benefit is really five, 10 years out." Typically, the highest rates of attrition on the path to licensure—especially for women and minority students—occur during the experiential learning portion, when a designer is working at a firm to accumulate AXP hours in a variety of subject areas, as dictated by NCARB.

Students Trapped in a Numbers Game

According to the AIA's most recent firm survey report, "The Business of Architecture 2018," women and people of color are still underrepresented in the architecture field, but the numbers are improving. Over the past decade, the share of women architecture staff has increased from 28 percent to 35 percent, and the numbers for minorities have increased from 22 percent to 27 percent. Among firm architecture staff overall, representation of racial/ethnic minorities is highest among emerging professionals on the path to licensure (38 percent) and non-licensed architecture staff (27 percent). The most significant proportional gain over the last decade is among emerging professionals on the path to licensure, where the share of racial/ethnic minorities increased by 11 percentage points.

"We think that students that are in the IPAL program will be able to realize a higher earning potential faster, and we think that's important for a variety of reasons," says Michael Armstrong, CEO of NCARB. "As we're talking in the architecture community about

AIA Feature

CONTINUED

underrepresented groups, the ability to get more quickly to a higher earning potential can make the difference as to whether you would stay in the profession or not."

Bosworth, of CityLab-Orlando, echoes this sentiment. "We feel strongly that women and people of color are underrepresented [in the profession]," he says. "One of the ways to ensure their acceptance and promotion is to get them to be registered architects when they leave school, so that they are not in a subjugated position."

What Does the IPAL Experience Look Like?

For schools where architectural education was already strongly linked to employment and hands-on experience at firms, the implementation of IPAL has not come as a drastic shift. Karen Nelson, dean of the School of Architecture at Boston Architectural College (BAC), which instigated IPAL in 2016 as part of its M.Arch. program and incorporated it into the B.Arch. program the next year, says that BAC students have always been required to achieve a certain level of competence in the workplace while getting their architecture degrees.

"The big change for us is not incorporating practice into our degree, but rather incorporating this opportunity to take the exams before one graduates," she says. All BAC students must complete 3,000 hours of work at a firm before being granted their degree. Each student is assigned a "practice faculty" member to oversee the experience that the student is gaining, and to coach the student in how to advocate for themselves to get the right kind of experience at their firms. IPAL has necessitated a more structured and intentional approach to that experience.

"It's about getting our students to be more mindful of practice and how they need to propel themselves through AXP, because we're holding conversations with them at many more points in the curriculum than we used to," says Nelson.

In a typical IPAL trajectory, both undergraduate and graduate students work part-time at a firm during the school year, full-time during the summer, and sometimes take a full calendar year off to accumulate enough AXP hours to be able to take the licensure exam before they graduate . Michael Germano, AIA, who finished his M.Arch. in May as one of the first IPAL graduates in the country and is now an architect at Cline Design Associates in Raleigh, N.C., says that sharing the experience, and the exam preparation, with other students who were facing the same challenges was a helpful part of the process for him.

"It was great that we had classmates who were going through the process at the same time, so we all had that study support group," he says. "Definitely, not having the exams to worry about after school is great."

> "It was great that we had classmates who were going through the process at the same time, so we all had that study support group."
> —Michael Germano, AIA

Skeptics Parse Architecture's Vocation from its Profession

Advocates of IPAL emphasize that it is meant to be an innovative option for schools, not a pedagogical imperative. "We believe that a mixture of classroom experience and field experience makes for a richer overall learning experience—that what you learn in the classroom can support what you're learning in the field in real time, and vice versa," Armstrong says.

Despite IPAL's intentions, however, some educators wonder how—or if—it will limit the latitude that many architecture students have to explore other disciplines and topics beyond architecture, but in service of a broad knowledge base.

"One of the sentiments articulated several years ago by faculty members and administrators at an Association of Collegiate Schools of Architecture [ACSA] forum focused on NCARB's proposal to initiate the IPAL program was the concern that this is taking a step toward vocational training and moving away from the broad aims of liberal education," says Brian Kelly, AIA, an associate dean at the University of Maryland's School of Architecture, Planning, and Preservation. "There's a notion that liberal education is important even in vocations, and there's more and more movement afoot today to do away with what are often referred to as 'frills' and get down to the bare minimum."

"It's a hard thing to sell, particularly to faculty who come from strong liberal educational backgrounds ... and then to have them being told that they're going to be teaching in a program that sounds vocational to them," Kelly says.

Nelson thinks that the trepidation about what IPAL means for the future of architectural education is unnecessary. "There's this fear that it will be a requirement in architectural education, which is silly," says Nelson. "Every school should go to its own strengths."

The central question about IPAL's viability is the same question about licensure's value. If a license to practice is about achievement, how does it stack up to other paths of advancement within the larger design industry?

"The value of the education, I think, is not only in that it leads to a license, which it can. The value is in the sense that it can open up opportunities," Neveu says.

Other proponents, however, like CityLab-Orlando's Bosworth, see licensure as the best way to ensure that aspiring architects can advance in their careers. "We made a real effort to change the culture of expectation from the degree to the license," he says. "So, the anxiety about completing school as quickly as possible is now transferred to completing the exam as quickly as possible. Everyone realizes now, after a couple of years, that what they're doing—in effect, while they're in school—is exactly what they're going to be doing after school if they don't get licensed."

A prospective architecture student has a range of ways to evaluate the kind of education that suits them. Resources like ACSA's Study Architecture (studyarchitecture.com) offer quizzes that recommend programs based on interests and aspirations. Once enrolled, an architecture student often has multiple tracks and program options within their schools, which have evolved over the last decade in response to design/build delivery methods, the proliferation of BIM (especially at large firms), and the potential of 3D printing for rapid prototyping. Architecture schools have also evolved over the past decade to address vexing issues like climate change and the affordable housing crisis. If IPAL's toe-hold on the professional pipeline is about getting students to market faster, it could also mean faster design responses—by licensed architects—to those urgent questions.

Neveu says that architecture students he has seen in recent years show an idealism that he finds admirable. "I can definitely tell the difference in students, even from 10 years ago," he says. "They want to change the world, and they think that they can change the world—which is pretty wonderful." AIA

AIAPractice

Innovation Isn't Optional

It's time for a more radical shift.

PHOTOGRAPHY: BLAINE BROWNELL

An art installation in Ann Arbor, Mich., featuring recycled plastic bottles. Designed by Brownell, it can also serve as an interior lighting system.

Blaine Brownell, AIA, is the director of graduate studies at the University of Minnesota School of Architecture (as well as being a contributor to ARCHITECT). He has published four editions of *Transmaterial: A Catalog of Materials That Redefine Our Physical Environment*, which emphasizes sustainability. As such, he has seen a distinct evolution in how architects engage with and deploy sustainable strategies. But are we moving fast enough to make the necessary impacts? "We need innovations," he says, "and we need them at ever-shorter intervals."

How has the materials and sustainability world changed in the years in between *Transmaterial* in 2006 and *Transmaterial Next* in 2017?

Over the last 10 years, there has been a great deal of development in integrating and advancing ideas like biomimicry and biodesign, and in areas like synthetic biology, genetic engineering, and bioinformatics. The author Kevin Kelly's prediction in the 1990s [that] "the made and the born would converge" is coming true. We're delving deeply into the components of life itself and—in a way—addressing life as a design project.

When it comes to architectural awareness, sustainability has grown a lot. I'm talking in terms of programs, protocols, and quantification: "Where are we? How do we measure what we're doing?" Public-interest design has found even more of a foothold; people are questioning the social implications of what we're doing, and there's a greater cognizance of the other 99 percent, so to speak. Clearly, there is much more of a social and environmental agenda than there was in 2006.

How is this knowledge and interest in sustainability being applied? Is there a change in how much it's acted upon versus how much it's talked about?

To the extent that architects have become more knowledgeable and have developed the necessary expertise to act, yes. LEED has been of great benefit as a first stage of sustainable awareness and practice; many architects have become LEED-accredited or know enough about sustainable design approaches. If you look at the 12 years since the first *Transmaterial*, there is significantly more information out there and better practices being adopted.

Yet at the same time, countries like the United States are struggling to meet climate targets. Simply put, if we don't pursue one-planet design, we won't be able to live on one planet. LEED has been great, but it's time for a much more radical shift. Maybe the U.S. Green Building Council will develop more radical approaches; maybe we will move into the regulatory realm versus the incentive realm. I think we're well past the time for pure carrot-based decision-making when it comes to our carbon footprint.

At some point we have to either do the right thing or fail. Businesses will collapse; communities will collapse. It will come to that. When you look at architectural practice today, even though it's come very far in terms of sustainable design, the needle has to move that much further.

It seems to have pervaded our general consciousness that a LEED designation means a "good" building. But it doesn't go far enough in a lot of areas, especially with the serious issues we're facing as a planet.

I feel like LEED suffers from generalities that my *Transmaterial* series suffers from when it comes to sustainable practices. What do I mean by that? I'll offer up this story.

In 2006 I gave a lecture, and someone in the audience followed up with a really great question: "Can the next book incorporate a quantifiable symbol for how green each material is? Something like one to five trees." A nice idea on paper, but then we entered into a deeper conversation about why that is difficult and potentially impossible. For starters, wherever you are in the world, if you're ordering a certain product, its environmental performance will vary. If you're shipping it across the world, that is different than if it's made locally.

We also, at the time of the first *Transmaterial* book, didn't have access to the tools to understand the carbon footprint or life-cycle assessment of these materials that we have now. The materials industry, mainly in the product sphere, has become much more sophisticated in terms of product life cycle. But there still remain questions like, "How do you determine a material's absolute performance?" This is either a holy grail or a black hole, depending on your point of view; we may never be able to fully determine it. But maybe we can develop necessary guidelines of some sort.

Say you have a single individual living in a 10,000-square-foot house that is made with the greenest materials, but it has a massive footprint in other ways, relative to one individual. Compare that to 10 people living in a modest, poorly performing house. The latter example could be more environmentally responsible. At some point, population and material flows have to reconcile and be interrelated.

When I'm creating a book of cool innovative materials, there's no reference. I have no idea how many people are going to use this material, or in what quantities. It's purely ideas. But in the case of LEED, or whatever comes after LEED, at some point we will have to incorporate notions of footprint. This is of real interest to me. All kinds of dangerous and provocative questions arise as a result, like material rationing and access. But it's the only way we'll get to our goal of having a sustainable planet. AIA

Steve Cimino

AIA

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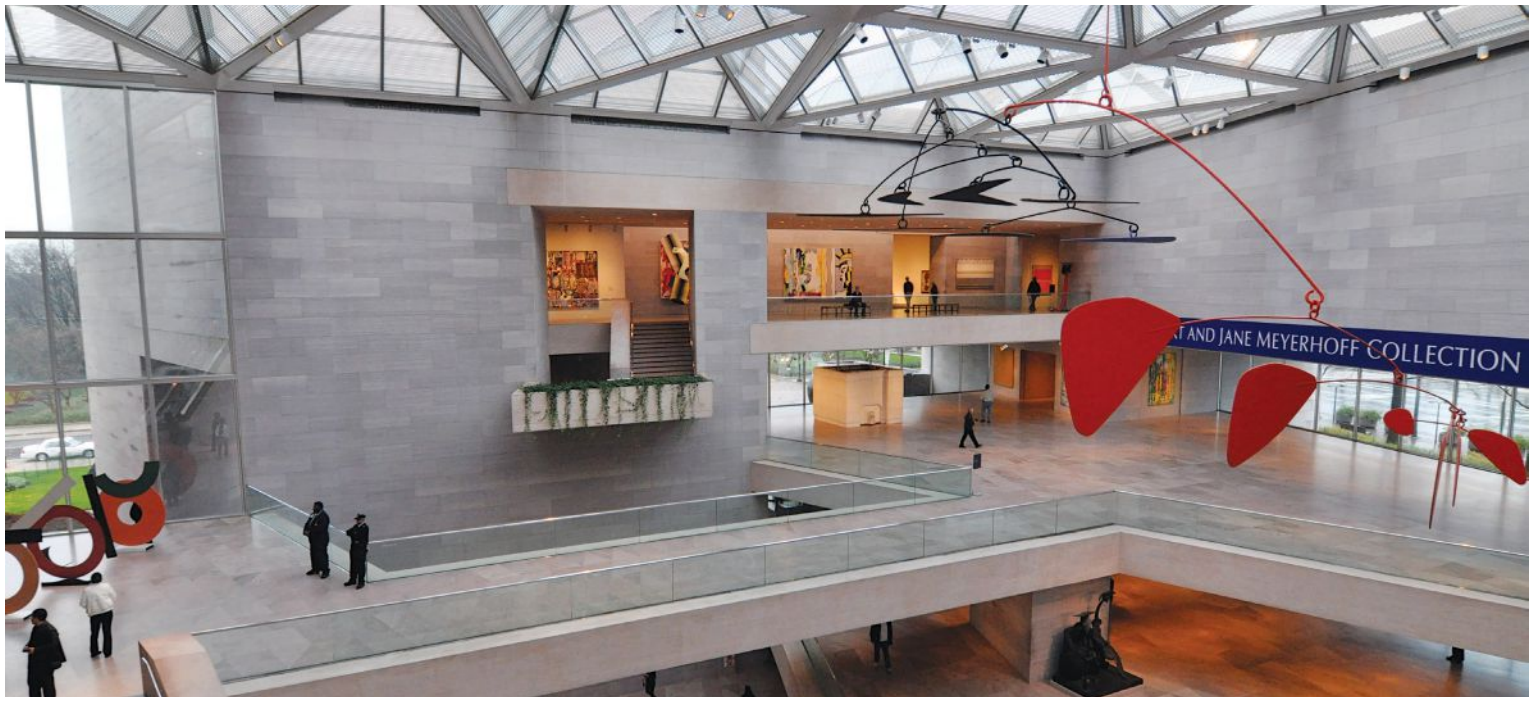

PHOTOGRAPHY: KEVIN HARBER

When visitors leave one exhibit in the National Gallery of Art East Building, they must return to the atrium before entering another one, generating a sense of exploration.

Marrying Form And Function

Forty Years Later, I.M. Pei's East Building Is Still a Masterpiece

There's no way to anticipate the capaciousness of the National Gallery of Art East Building—the sense of expansion you'll feel once you take your first steps past the low-ceilinged security checkpoint and into the central atrium. Architects have been employing this effect—leading people from a compressed space into an expansively open one—for centuries, but in the context of the multilevel galleries in I.M. Pei's 1978 jewel box, it feels new.

The East Building may be one of the most controversial museum buildings in America for its prioritization of form over function. While the atrium's high ceilings foster a sense of grandeur, detractors of the museum's design have pointed out that Pei left comparatively little space for the actual display of art, and that the space he did leave was disjointed and lacked a cohesive flow—a problem that the National Gallery addressed during a 2016 renovation.

It's hard to downplay the East Building's visual impact on the National Mall. Its north-facing side rises above its surroundings like the prow of a ship, its organizing visual theme of triangles echoed and repeated in every dimension. The Tennessee quarries that supplied the marble for the West Building were reopened to clad the newer addition, making for an aesthetic congruence between the sister structures.

More than anything, the design of the East Building is about a feeling—an embodiment of democratic concepts and Americans' relationship to their capital city and government, certainly, but more than that the pure tactile joy of being a place that feels as though it exists outside of time. "Like all successful buildings designed for public use, it is truly complete only when thronged with others like us, who, by entering, embark on a personal voyage of discovery," writes Richard B. K. McLanathan in his 1978 book *East Building, National Gallery of Art: A Profile*.

The East Building houses modern and contemporary art, progressing from Picasso and Matisse in the early 1900s all the way to contemporary pop art. When visitors enter the atrium, they are greeted by the largest mobile ever crafted by renowned 20th-century American artist Alexander Calder. The farthest-facing wall is defined by Color Panels for a Large Wall, a 1978 work by American artist Ellsworth Kelly. This expansive central space feels like a deep breath, a cathedral that absorbs sound and stays hushed no matter how many people occupy it at a given time.

The design of the East Building was no easy feat for Pei, of Pei Cobb Freed & Partners, who at that point in his career had already designed the John F. Kennedy Presidential Library and Museum in Boston and Dallas City Hall. His structure had to work in unity with the John Russell Pope–designed West Building, built between 1937 and 1941, and it also had to fit on the irregularly shaped, trapezoidal site that had been designated for that purpose in 1937, when the National Gallery was established.

Programmatically, the new building had two different functions: a museum for large traveling exhibitions and events, and a study center/office facility. Pei himself talked about the building's intended purpose as a "very important center for social and artistic life in Washington"—a tall order if there ever was one. Pei envisioned three flexible towers located around the central atrium designed to permit the exhibition of one large show, or several small shows, with the sense of intimacy of a much smaller museum.

The East Building was dedicated on June 1, 1978, by President Jimmy Carter and Paul Mellon, son of Andrew Mellon, the philanthropist who founded the National Gallery by donating his own art collection. By the time the museum's original iteration reached its 25th anniversary, in 1966, most of its original galleries had been filled. In the

AIADesign

following year, Mellon's children, Paul Mellon and Ailsa Mellon Bruce, offered funds for a second building to relieve some of the space constraints. The building's open, airy design was heavily influenced by then–National Gallery of Art director J. Carter Brown's fear of the anxiety felt by museum visitors when confronted with an overabundance of art.

Construction started in 1971, and seven years later the new wing opened to the public. Calder and Henry Moore, among other American artists, were commissioned to create original works. "The East Building inspired museums around the world to commission architectural projects that also sometimes competed with the art they were created to display," *The New York Times* noted in its 2002 obituary of Brown.

A major theme throughout the history of the East Building has been the push and pull between its form and its function. By 1990, enough people, including scholars, had remarked on the museum's prioritization of space over art that—according to University of Chicago art historian Neil Harris—Brown claimed he'd asked Pei's firm to make the exhibition spaces larger and the atrium smaller, and that Pei refused.

As it entered the second decade of the 21st century, however, the National Gallery took steps to address this issue. On Sept. 30, 2016, the East Building reopened after a three-year, $69 million expansion financed by federal funding and private donations that added 12,250 square feet of new spaces for art, including a roof terrace specifically designated for sculpture and new pathways through the building. Pei recommended a former colleague, Perry Y. Chin, to create the designs for the expansion.

The permanent collection now begins on the mezzanine level, which formerly housed special exhibitions, allowing the collection to be presented in chronological order. Finally, it seemed, the museum would become a place that prioritized experiencing art from close range, rather than from a distance.

The AIA recognized the East Building, and Pei's architectural contributions, with an Honor Award in 1981 and a Twenty-Five Year Award in 2004—the latter for passing "the test of time." That has to do with timelessness, but it also has to do with timeliness in the case of Pei's addition, which is to say that Pei's addition, through its expansion, continues to participate in contemporary debates about art, its display, and its experience. AIA

Katherine Flynn

AIAPerspective

PHOTOGRAPHY: GABRIELA MARKS

Everything, Everywhere, Everyone

Architecture exists in tension between its humanistic and tectonic dimensions. This has always been true, although the pendulum swings from era to era. At times, shifting cultural, social, economic, and environmental conditions compel architects to fundamentally reconstitute human circumstances. At other times, evolving means and methods, expanding demand, and even the pure joy of making push architects to reinvent the "how" of building. Today both forces are pulling at architecture with extraordinary power.

Hurtling at breakneck speed through an unprecedented technological revolution, it is easy to become engulfed in architecture's tectonic possibilities. We live in the age of iPhones and apps, and practice in the age of BIM and VR.

Architects are enthralled by the limitless opportunities of technology. But fascination with the new and now must not blind us to the most important, most urgent tectonic demand on architecture: arresting climate change. Through the Paris Agreement, our generation of architects has received a mandate to create carbon-free buildings, to retool everything about the way we design, construct, occupy, operate, maintain, and renew buildings.

The tectonics of architecture are not an end, but a means. Architecture serves human purposes. Today, those purposes are driving forward into uncharted territory just as rapidly as the technological revolution.

The astounding size of the global population, and the effects of our numbers, are the accelerants propelling today's humanistic dimensions of architecture. Scientists have termed this the "Anthropocene era," meaning that it is human impact that is defining Earth's current geological era. In addition, most people live in cities today, and by century's end, nearly nine in 10 will. For Earth, it is the Anthropocene; for people, the urban era.

Factors defining current human conditions were codified at the Habitat III summit into principles for global cooperation titled "The New Urban Agenda" and supported by 17 sustainable development goals. For architects, the agenda and its goals define a comprehensive global development framework that considers the well-being of all people.

Architects frequently opine about not being sufficiently understood, appreciated, and valued. Today, humanistic and tectonic revolutions define a relevance revolution for architecture. Nothing less than human destiny will be shaped by the urban conditions we create over the next generation. Nothing less than global climate and availability of sufficient resources to sustain life will be shaped by architecture's tectonic transformation.

Architects have been offered relevance beyond our wildest yearnings. Whether we sought it or not, the world now demands a fundamental reorientation to both the humanistic and tectonic dimensions of our craft. If we cannot or will not rise to address these challenges, others will. The 21st-century mandate for architecture is to reshape the world: everything, everywhere, and everyone. These are exciting and challenging times for architects. What will we make of them? AIA

Carl Elefante, FAIA, 2018 AIA President

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Special Section:
2018 Innovative Detail

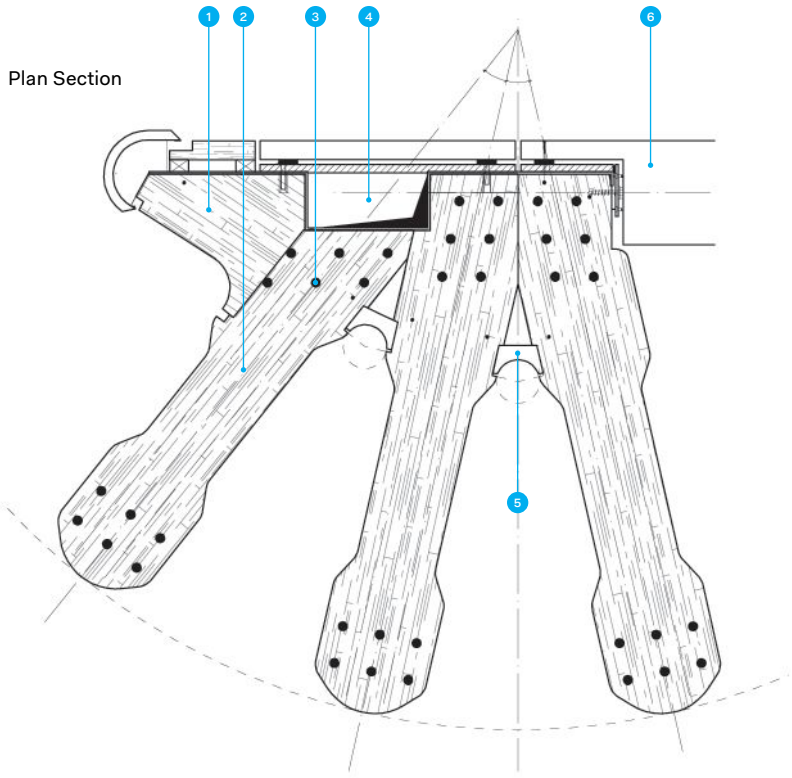
Thanks to the internet, it's easy to lose yourself in an infinite scroll of project photographs admiring a form here and an unexpected move there, without pausing to register the effort behind their execution. As more architects specify wood for its versatility, warmth, and sustainability, the brain trust of how it can be manipulated and pushed also grows—for those willing to learn. On the following pages are 12 details that aim to catch both your eye and your curiosity on how they came to be.

INTRO BY WANDA LAU
TEXT BY TIMOTHY A. SCHULER

NIGEL YOUNG/FOSTER + PARTNERS

Kulm Eispavillon Canopy Structure

Plan Section



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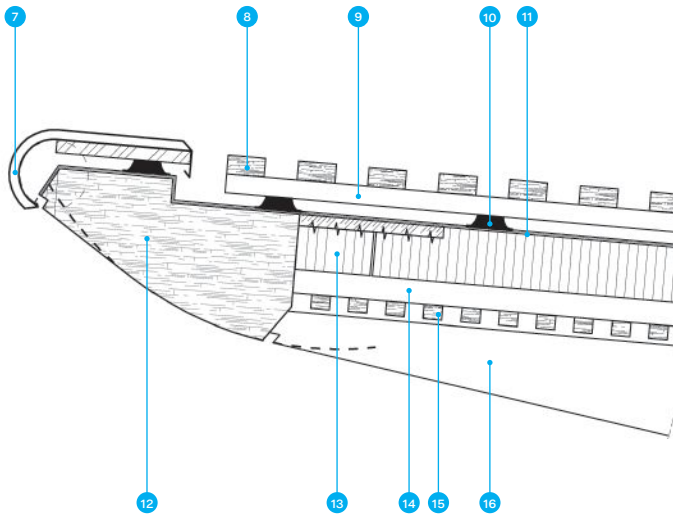


1. Spruce-and-larch glulam edge piece
2. Ash glulam column, 9.4" wide (typ.)
3. Ø28mm steel rods (typ.)
4. Drainage and services duct
5. Milled ash fitting to conceal joint between columns
6. Ash glulam end column
7. Copper flashing
8. 40mm × 80mm larch slat rainscreen
9. 40mm × 80mm larch furring
10. UV-stabilized polyamide spacer
11. Waterproofing membrane
12. Spruce-and-larch glulam edge beam
13. 4.7"-thick solid glulam panel, bottom surface painted black
14. 50mm × 60mm larch furring
15. 30mm × 40mm larch slat soffit
16. Ash glulam beam, from 43" deep × 9.4" wide to 6.3" deep × 7.1" wide

Lord Norman Foster, HON. FAIA, has worked at almost every scale imaginable, from porcelain demitasses to city master plans. Projects by his London-based firm Foster + Partners populates all corners of the Earth. And yet, it was a commission in the tiny Alpine hamlet of St. Moritz, in Switzerland's Engadin valley, that held the architect's personal attention for the past few years.

The project entailed the restoration and expansion of the Kulm Eispavillon (literally "ice pavilion," though it is more of a club geared toward winter sports). The building is part of the five-star Kulm Hotel, once the heart of this Swiss resort town where Foster resides part time and has built several projects, including the Chesa Futura apartments.

"I have lived in St. Moritz for many years, so it is very close to my heart," Foster says. "The old Eispavillon had been abandoned for many decades, and there was a great opportunity to revitalize Kulm Park by bringing the building back to life."

Built in 1905, the original two-story, Art Nouveau club has a storied past. Located on the edge of the 30-acre park just north of the hotel, it hosted the Olympic Winter Games in 1928 and 1948. For years, it served as a wintertime playground for celebrities, including Charlie Chaplin and Audrey Hepburn, but by the 1980s, the club was no longer the heart of the local social scene. By 1988, it was shuttered.

In November 2015, Foster + Partners was hired to revive the structure and add a contemporary outdoor event venue for use in all seasons. "I was approached by the owner, who asked for help," Foster says. "My suggestion was not just to bring it back to its original condition as an ice skating center, but to create a community focus by adding a small stadium and an enclosure linking an existing skating facility and restaurant."

Today, the club has been joined by a pair of timber pavilions, located just north of the Eispavillon. At just 580 square feet, the south-facing "sun pavilion" resembles a scale model of the 2,000-square-foot main pavilion. Though conspicuously modern, the pavilions' prominent use of wood and copper flashing recall the materiality of the original club. "There is a great tradition of wooden buildings in St. Moritz," Foster says. The pavilions' primary structure is made from ash harvested in Switzerland, while the curved edge beam and wood slats are made from larch, "a traditional local wood, which mellows beautifully with age," he adds.

For both pavilions, a round-edged, cantilevered roof is supported by glulam columns, V-shaped in plan, that splay into approximately 25-foot-long, inclined glulam beams, recalling both the surrounding mountains and St. Moritz's Gothic architecture. Each beam tapers in size, beginning at 43 inches deep and 9.4 inches wide where it meets the column to 6.3 inches deep and 7.1 inches wide. A larch wood-slat soffit attaches to a 4.7-inch-thick CLT roof panel, which is topped with a waterproofing membrane and then a larch wood rainscreen on the skyward side.

Initially, Foster + Partners had designed a more straightforward structure, one with beams perpendicular to the pavilion's back wall. Shortly before procurement, however, the design team devised the V-shaped pattern, which not only reduced the number of columns (from eight to six in the main pavilion) but also created a visually appealing plane with the cantilever listing up.

The late change in design required Foster + Partners to work closely with timber contractor Blumer-Lehmann, based in Gossau, Switzerland, to design and test new column–beam connections, which consist of concealed glued steel rods sized to accommodate heavy snow loads. More than 1 foot long and 1.1 inch in diameter, each rod is inserted into drilled openings in the structural members, glued, and then sealed with a timber button.

Among the more exacting components to fabricate was the curved edge beam of the roof eave. The beam comprises double-curved glulam pieces with radii as tight as 23 inches and wood laminate as thin as 0.1 inch. "Such parts cannot be planned with normal timber CAD programs," says Blumer-Lehmann's timber construction engineer David Riggenbach, project manager for the Kulm Eispavillon.

Instead, engineers in Blumer-Lehmann's free forms department use specialized CAD/CAM software to convert Foster + Partners' 3D models into a format ready for manufacturing. The components were then "precisely machined on all sides on a CNC machine to achieve a perfect fit for the assembly," Riggenbach says. Foster + Partners says such complexity was well worth the trouble, as it allowed the wood grain and lamination to follow the curve of the beam as well as eliminated the risk of an end-grain cut being exposed to rain and snow.

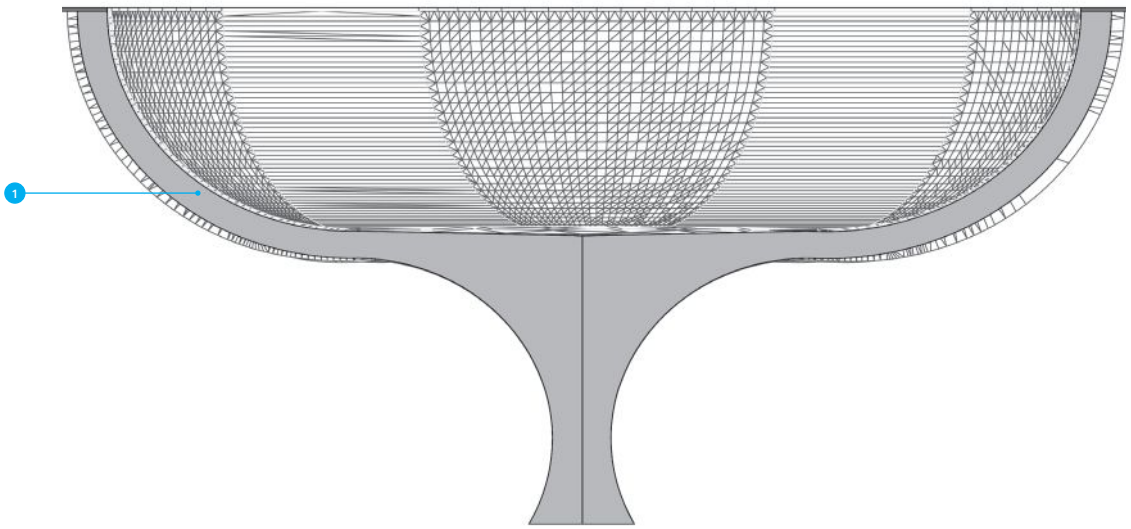
Fabrication of the pavilions took seven weeks, and their assembly just less than twice as long. According to the architects, the "extraordinary precision" of Blumer-Lehmann's timber engineering made assembly quite simple. The only challenge was the project's hard deadline: The new venue was scheduled to host the FIS Alpine World Ski Championships in early February 2017.

In spite of the frigid winter weather, the pavilion construction and club restoration were completed on time, reopening to the public for the first time in nearly 30 years.

Imbued in the architecture is a celebration of past and present, Foster says: "This started with a derelict structure but went beyond to create a new sense of place. I hope that people feel it to be friendly and welcoming, a new extension of the public domain."

NIGEL YOUNG/FOSTER + PARTNERS

Oslo Skatehall Timber Bowl



Skateboarding has flourished in Norway since its 11-year ban—instituted on the basis of safety concerns—was lifted in 1989. Oslo's skateboarders, however, lacked an indoor venue to use during the city's snowy, frigid winters until January 2017, when the 25,080-square-foot Oslo Skatehall opened.

Designed by Oslo-based Dark Arkitekter and Copenhagen, Denmark–based skate park–design specialists Glifberg-Lykke, the building comprises two adjacent rectangular volumes, both clad in aluminum panels perforated with a pattern derived from a Morse code translation of the 1978 law that banned skateboarding. Glazed entrances at the northeast and southwest corners offer porosity and connection between the outdoor skate park and the indoors, where more than 10,000 square feet of ramps and skate obstacles await.

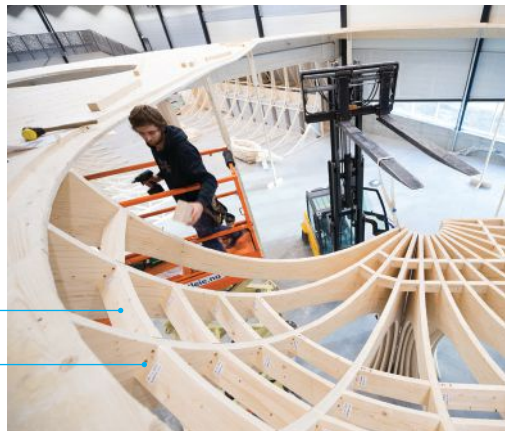
Developed with input from the local skate community, the obstacles serve all levels of skaters alike. "It was really important … that [the skate elements] wouldn't be designed by architects who don't really skate," says Arne Reisegg Myklestad, a partner and managing director at Dark Arkitekter.

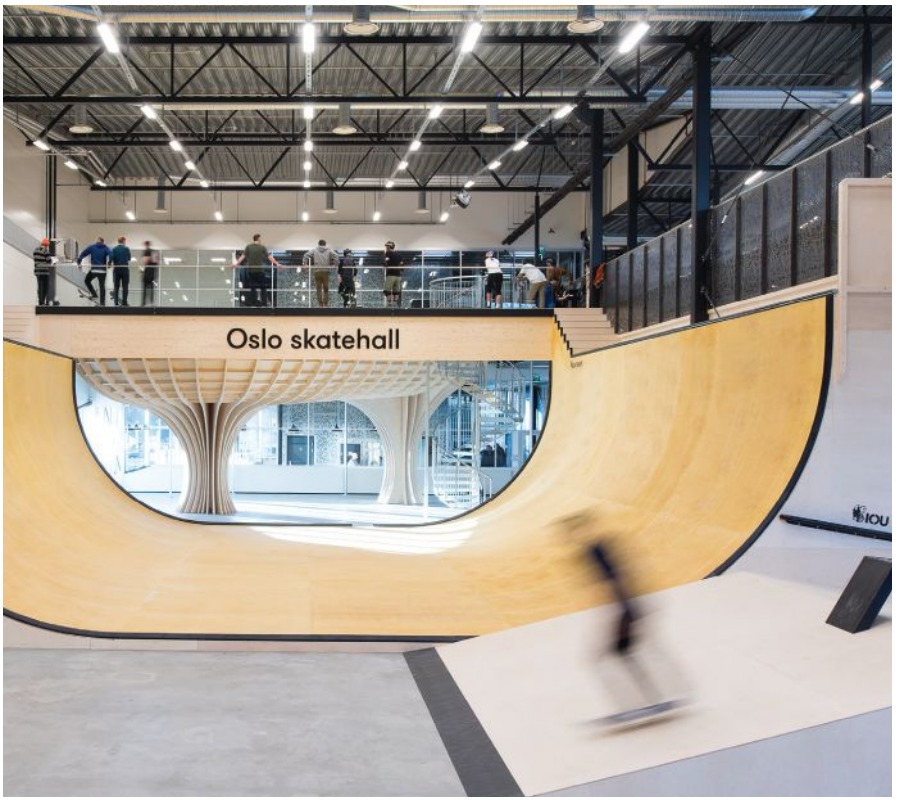
Architecturally, the *pièce de résistance* is the skatehall's wooden bowl, elevated to the mezzanine level to preserve connectivity and flow on the main floor—and to allow skaters to move between obstacles without getting off their boards, says Merete Hoff, the former Dark Arkitekter partner who served as the project architect and now works for the agency that developed the skatehall. With excavation cost-prohibitive, Glifberg-Lykke suggested lifting the bowl to the second-level mezzanine, which skaters can access via the half-pipe and a metal spiral stair.

Nearly 50 feet long, 7 feet deep, and 27 feet at its widest, the bean-shaped bowl is supported by two tree-like columns whose curvilinear branches stretch out and cup the bowl. Each column comprises a radial array of CNC-milled spruce-and-birch plywood ribs sourced from Germany, Austria, and Poland. The plywood ribs, which are 2 inches thick and up to 10 inches deep, emerge from the concrete floor as tree trunks that stand nearly 9 feet tall, and then branch out more than 27 feet to encapsulate the bowl. Circular steel baseplates both anchor the tree ribs to the concrete floor and cap the opening of the hollow trunks inside the bowl.

Interstitial lumber cross-members, carefully labeled with a position identification number and nailed between the rib branches, complete the lattice wireframe. The ribs tie into glulam wood beams that support the remainder of the mezzanine floor, which are supported by steel columns at the building perimeter.

For the bowl's smooth skating surface, workers cut two layers of 0.35-inch-thick birch plywood panel on-site, laid them inside the bowl, and screwed them to the ribs and crossbeams. At the lip of the bowl, they adhered a granite edge to the wood with





1. 2"-thick spruce-and-birch plywood
2. Dimensional lumber cross-members
3. Nails (typ.)
4. Circular steel plate (typ. 2)
5. 0.35"-thick birch plywood (two-ply) surface (not shown)

polyurethane glue, creating a smooth transition between the bowl and its surrounding platform. Although the other wooden skate elements inside the venue received a glazed finish, the bowl and its lattice structure were left exposed and unfinished as a nod to skaters' use of found objects and ad hoc environments.

To design the structure, Dark Arkitektur and Glifberg-Lykke also worked with IOU Ramps, a skate ramp builder based in Fürstenzell, Germany. With the building modeled in Autodesk Revit and the skate obstacles in SketchUp, the collaboration was remarkably smooth, Hoff says, particularly given that the design phase took just six weeks. The architects provided assistance on code compliance but left most of the technical detailing, such as the slope and curvature of the bowl's walls, to the specialists. "As an architect, you need to know a little bit about everything, but you're not an expert in the details," Hoff says.

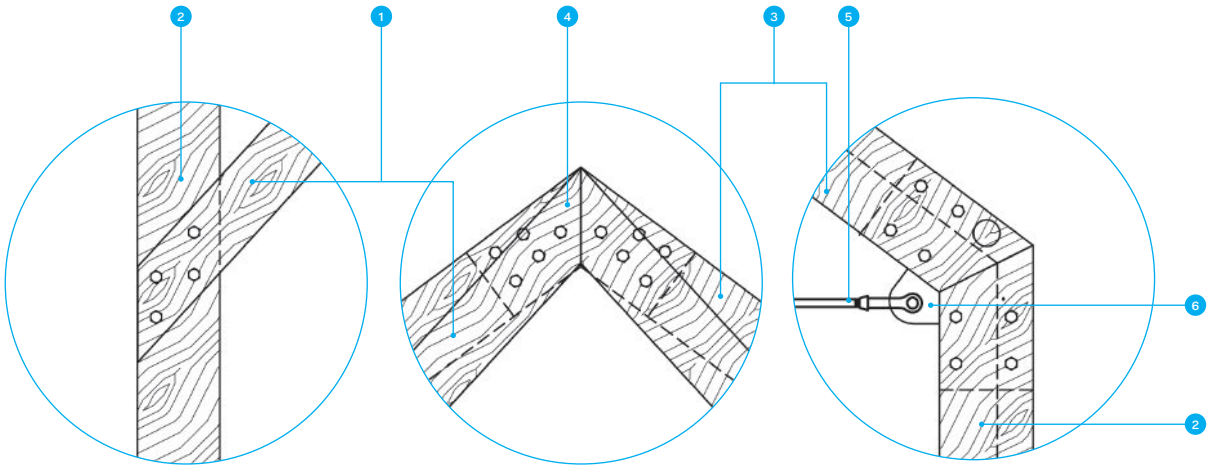
All told, the bowl took a three-person crew from IOU Ramps five weeks to assemble its approximately 1,100 structural components, totaling 6,200 lineal feet of wood.

Since the building's opening in January 2017, the timber bowl has become an iconic part of the skatehall's brand. "Visually, it's very beautiful," Hoff says. "It has an organic form that I think appeals to us as people." Serendipitously, the skatehall has also become a kid-friendly venue, with its open layout, abstracted trees, and adjacent café from which parents can watch their children.

The skatehall has been embraced by the skate community as well as by several groups that run youth outreach programs there. "The most fun part," Myklestad says, "is that the kids and the people who are using it are happy with it."

LEFT: FINN STÅLE FELBERG; RIGHT: KULTUR OG IDRETTSBYGG

Tashjian Bee Center Truss



To educate the public about the ecological plight of colony collapse disorder, which is threatening global bee populations, the University of Minnesota (UM) opened the Tashjian Bee and Pollinator Discovery Center on the bucolic grounds of the UM Landscape Arboretum in Chaska, Minn., in 2016. Designed by the Minneapolis office of architecture firm MSR, the 7,530-square-foot exhibition and education space, complete with outdoor beehives and a honey house, serves as the outreach facility for the university's Bee Lab, run by entomology and apiculture professor Marla Spivak, a MacArthur Fellow.

The metal-roofed, timber-clad building takes its cues from the 39-acre site, a former farmstead complete with a red barn and grain silo, and from agrarian vernacular architecture, characterized by features such as gabled roofs, exposed timber structures, and open interiors, says MSR founding principal Thomas Meyer, FAIA, the project's partner in charge.

Written accounts of the farm's early owner were also a touchstone. "[H]e was a beekeeper and had an orchard as well, so it was really meaningful that we brought bee education back to that site," says project manager and MSR associate Eric Amel, AIA.

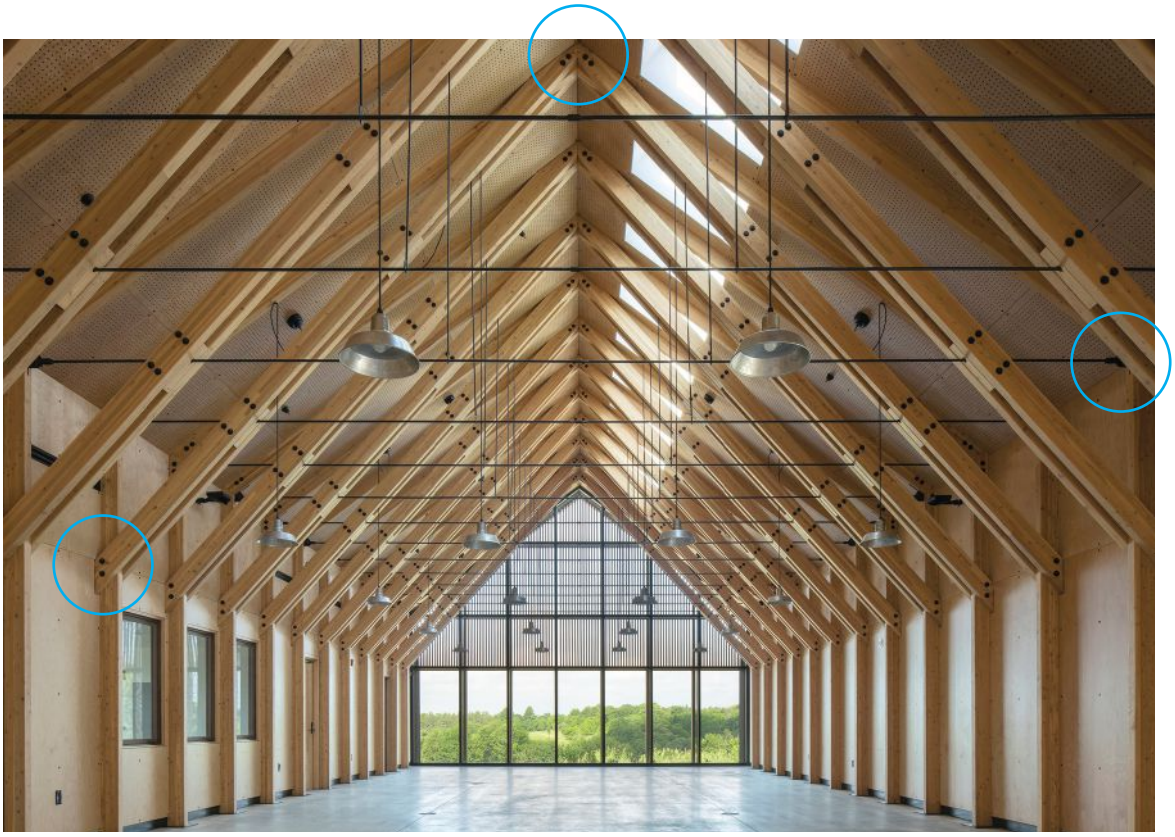
To create a hierarchical relationship between the new building and the existing barn—which Amel notes is "actually quite small"—the architects divided the former into two distinct masses: a single-story entrance and honey house, where honey extraction takes place, and two double-height wings, which contain a learning lab and exhibition gallery.

It is inside this gallery that an eye-catching series of 15 exposed glulam trusses draws visitors' eyes upward. The trusses, which each span 30 feet and collectively run the 60-foot length of the gallery, resulted from the architects' desire to expose the building structure and also imbue a sense of delicacy.

"We opted to go with thinner members and more of them, at somewhat of a premium, because of the loveliness of that rhythm," says Amel, who credits project architect and MSR associate Chris Wingate with the idea. "The frequency of those members made it sing."

Combined with the suspension cables of the space's metal light fixtures, the array of horizontal steel tension rods and angled wood trusses becomes hypnotic. "It also hints that the roof itself has two slopes," Wingate says, adding that the simple trusses' triangular form resulted from "lots of iteration" and modeling.

Supporting the roof decking, the truss's top chord—a single 3.5-inch-wide, 10.5-inch-deep glulam member—connects to a vertical glulam post of equal dimensions. Finalizing the triangle is the bottom chord, a pair of Douglas fir 2×8s, which attach to the posts 10 feet from the ground and angle sharply upward, meeting the top chord at the



1. 2×8 Douglas fir bottom chord (typ. 2)
2. 3.5" × 10.5" glulam column
3. 3.5" × 10.5" top chord
4. Steel knife plate
5. Steel tie-rod
6. Steel knife plate and connection

roof ridge. Wood blocking between the double chords refrains buckling, while a steel tension rod threaded through the blocking spans the width of the gallery, tying into a steel knife plate that joins the vertical truss member and top chord.

The trusses and their supporting glulam posts are spaced every 4 feet. These columns embed partially into the wall system, a Ray-Core structural insulated panel finished in the interior with plywood panels.

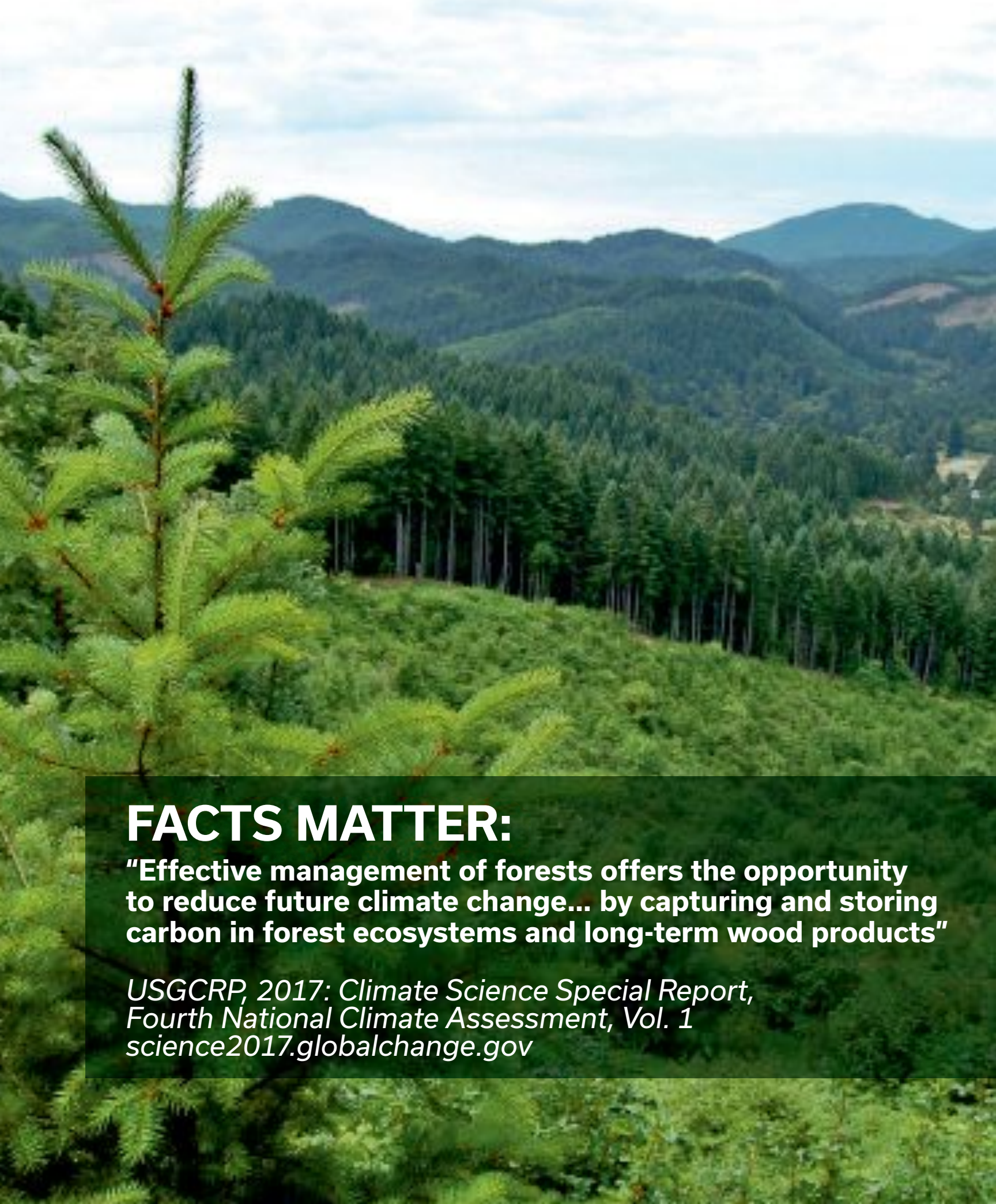
The architects worked hard to reduce visual clutter, concealing the fire suppression system behind the plywood panels and specifying a radiant heating and cooling system, thus removing the need for ductwork. And yet they chose to expose the majority of the structural connections in another nod to vernacular architecture. "Even the tie-rods, there's a connection in the middle," Wingate says. "It's one little additional element for that thin, black, horizontal line, which is necessary, but if it's done beautifully, it can add to the aesthetic of the space."

The timber for the project was fabricated by the Boissevain, Manitoba, plant of structural timber supplier Western Archrib, and shipped to Minnesota, where the trusses were individually erected by Loeffler Construction & Consulting, in Lakeville, Minn.

MSR's design team recalls the construction phase being relatively simple and straightforward, due in large part to the skill of the Loeffler team. "[T]hey saw this as a special opportunity to celebrate their craft and their skill set," Meyer says.

The architects, too, are proud of the center's craftsmanship and environmental performance. "[I]t is a kind of bellwether project for the future of sustainability," Meyer says. "A lot of buildings in the last generation are unnecessarily complex," but the near-net-zero-energy bee center "has a kind of modesty. It's not cheap, but the money that's spent on it is [spent] toward performance."

RICHARD BRINE



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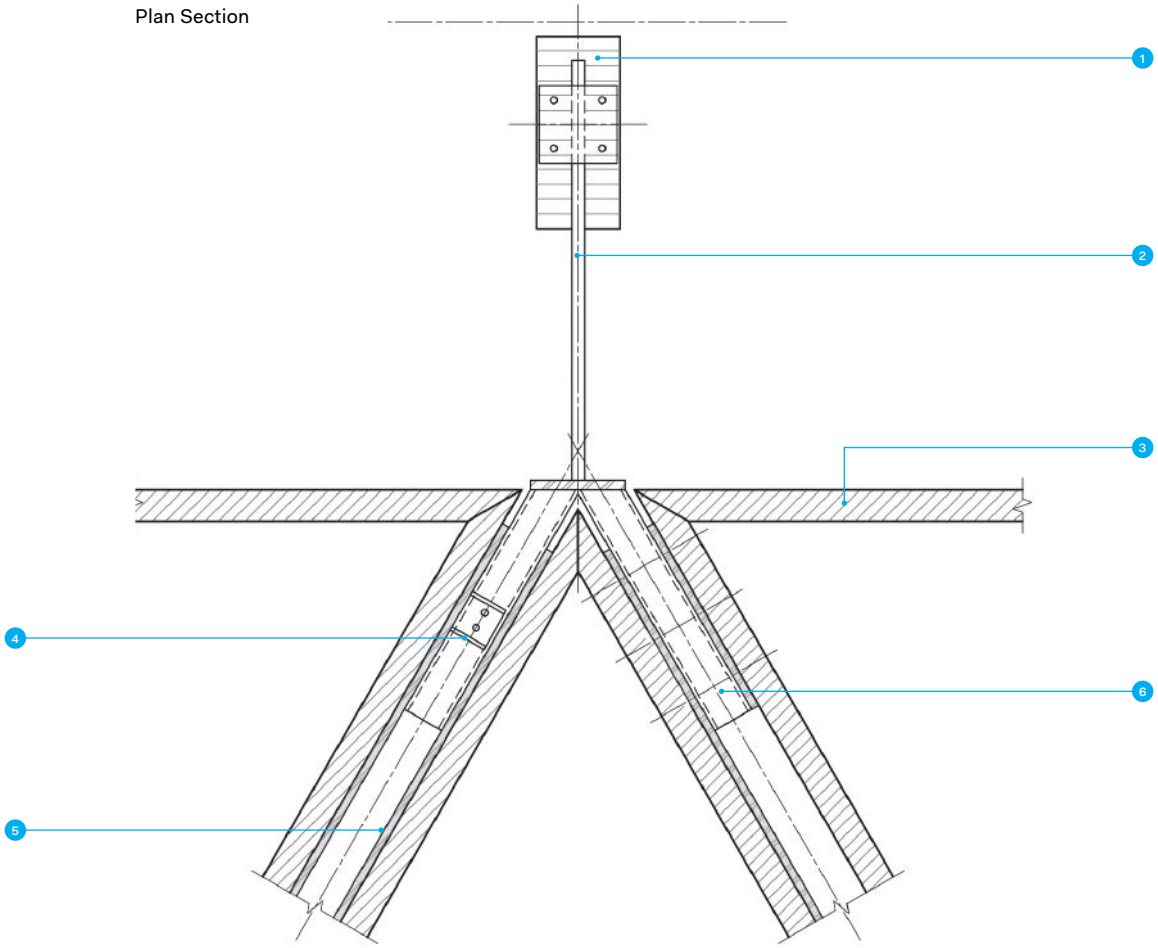


1. Douglas fir glulam column
2. Steel Y-shaped knife plate
3. 3.1"-thick × 9.5'-long Douglas fir glulam coffer, tapering in depth from 4.25' to 3' (typ.)
4. Panel 2 seat onto Panel 1
5. 0.79"-thick × 29.5"-deep steel stabilizing plate
6. 3.9"-wide steel rectangular hollow section

On the 150th anniversary of Canada's confederation, July 1, 2017, the National Arts Centre (NAC) in Ottawa, Ontario, raised the curtain on the first phase of a $110 million renovation and restoration project designed by Toronto-based Diamond Schmitt Architects (DSA). Adding 60,000 square feet of new space, the project brought the total size of the arts complex to 1.1 million square feet.

Designed by Canadian-Polish architect and theater designer Fred Lebensold, the original 1969 building was Brutalist in style with repeating hexagonal geometries in both its floor plan and finishes, such as the lobby ceiling's triangular concrete coffers, tessellated to create a hexagonal pattern. However, the structure's windowless concrete façade offered little in terms of the public realm. "When you're in the parliamentary precinct … looking back to the city, you see the NAC, except it's so mute, dark, and windowless that it almost looks like [part] of the landscape," says DSA principal in charge Don Schmitt, AIA.

How to update Brutalist architecture for today's needs is a question architects are increasingly facing. To preserve the original NAC building but reorient it to its surroundings, DSA wrapped the northwest side of the building with a new multistory lobby, complete with a ceiling that draws from the hexagonal forms of the original lobby, but interpreted in wood.

Designed in Autodesk Revit by DSA, the coffers are arranged on a 10-foot equilateral triangle grid, forming hexagons that total 20 feet across. Each triangular coffer comprises three 9.5-foot-long, 3.1-inch-thick glulam members, with slightly rounded edges at their vertices to blur any misalignment. Members taper in depth from 4.25 feet to 3 feet, from the hexagons' centers to their perimeters to create a sense of undulation. "The coffers themselves are not connected to one to another except by small pieces of blocking, approximately 10 inches square, maintaining the 150-millimeter [visual] gap between the coffers," says Will Loasby, senior project manager at structural engineering firm Fast + Epp, in Vancouver, British Columbia.

DSA's choice of wood stemmed in part from its desire to celebrate Canada's vast forests and to showcase a domestic product—glulam made from Douglas fir trees grown in British Columbia. Wood is also a warm, "natural material used in a natural state," Schmitt says.

Moreover, the wood ceiling could be prefabricated off-site. The NAC had set an aggressive 18-month construction schedule to reach completion on the country's 150th anniversary. Prefabrication would considerably expedite construction.

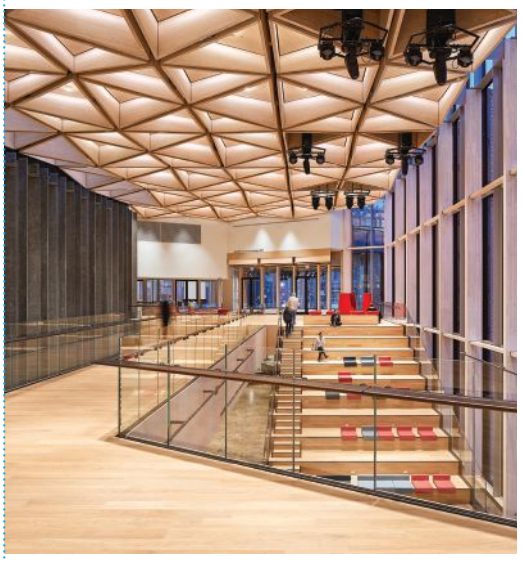
On the outskirts of Ottawa, timber engineering and construction firm StructureCraft Builders, based in Abbotsford, British Columbia, transformed a warehouse into a temporary production facility, in part to reduce transportation costs. Once workers assembled the triangular coffers off-site, they raised the panels to install lighting and electrical conduit using notches cut into the top edges of the glulam members, which DSA designed with Fast + Epp. Triangular acoustic ceiling panels would conceal the services from below.

The triangular coffers were assembled and trucked to the site in long, linear panels of up to 12 coffers, the largest of which measured 65 feet and weighed 30,000 pounds. The panels alternate the orientation of adjacent triangles 180 degrees so that, when hung, they create a field of hexagons. A Y-shaped steel plate ties the coffers into the building's glulam-timber-and-steel structure.

With help from a custom glass curtainwall with transparent LED screens that transform the building's façade into what Schmitt calls a "fifth stage," the addition's exposed wood structure creates a diaphanous layer between the intimacy of the NAC and the bustle of the city. In a sense, the architects turned the building inside-out, a move occurring more frequently in performing arts venues around the world, Schmitt says. No longer relegated to ticket-taking and coat-checking, lobbies are become extensions of both the venue and the street, creating a third space in which the two are overlaid.

Notably, DSA's expansion and renovation also defers to the NAC's historical architecture, using new materials in ways that honor Lebensold's original design intent. "We didn't demolish anything," Schmitt says. "We retained and preserved all of it."

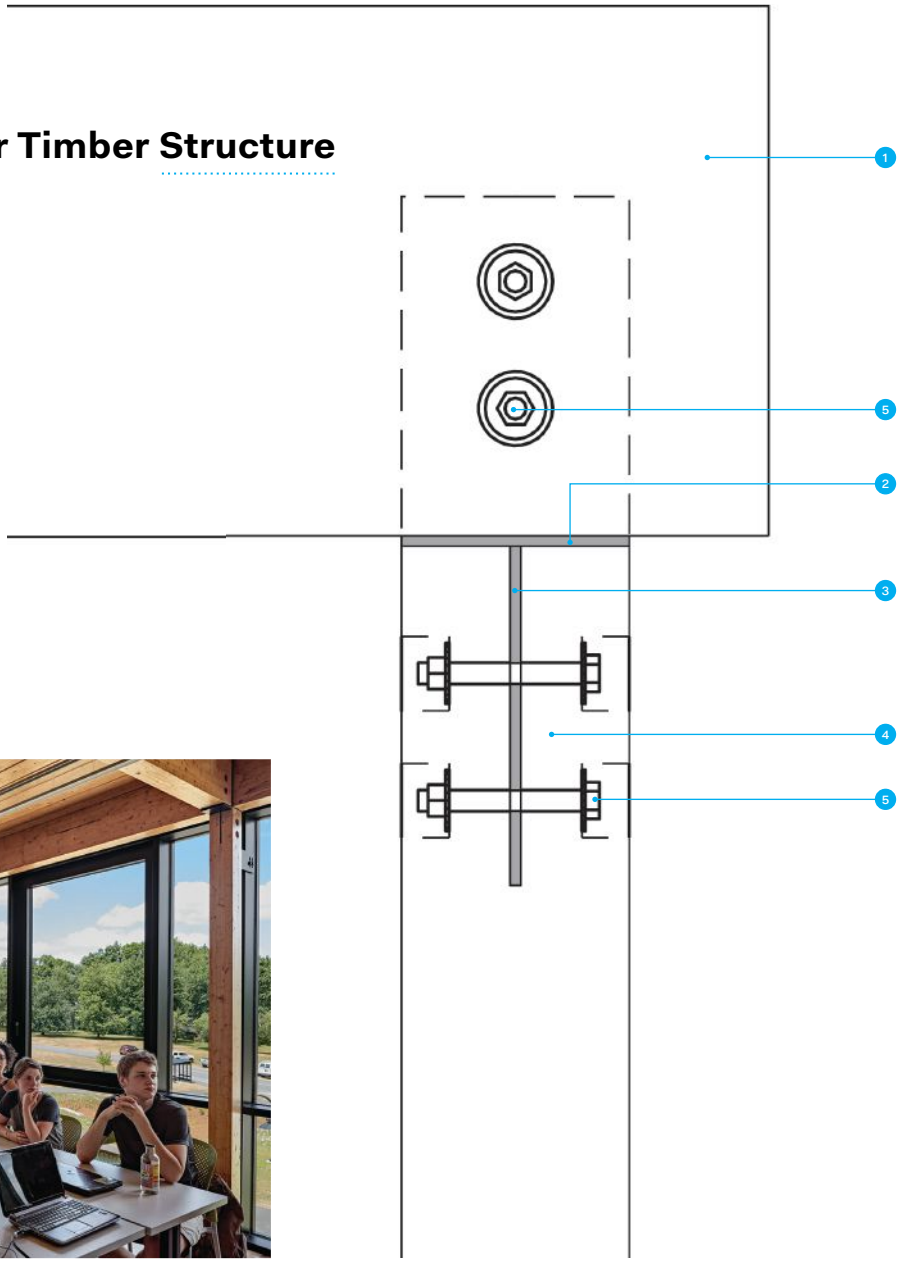
Shortly after the NAC reopened, Schmitt himself had a chance to observe the space in action, attending a lecture on architecture. Afterward, the lobby



transformed into a quasi-street fair, with food stalls manned by some of the city's top chefs and an array of musical performances, from jazz to a singer-songwriter. When Schmitt finally pulled himself away to leave, around 11 p.m., he was astounded by what he saw: more people newly arriving.

DOUBLESPACE PHOTOGRAPHY

The R.W. Kern Center Timber Structure



1. 5" × 12" glulam rim beam
2. 0.5"-thick steel beam strap and seat
3. 0.25"-thick steel knife plate
4. 5" × 5" glulam post
5. Ø0.5" × 4" bolt with Ø1.4375" washer and 2" countersink (typ.)

The R.W. Kern Center at Hampshire College in Amherst, Mass., was designed by Boston firm Bruner/Cott Architects to be "rooted in its place," says principal Jason Jewhurst, AIA. Completed in 2016, the two-story, 17,000-square-foot building houses the school's admissions department, classroom and gallery space, and a coffee bar. As the first new structure built on campus in more than three decades, the Kern Center aimed high, attaining Living Building status from the International Living Future Institute.

A good portion of the center's construction materials was sourced in close proximity to the site: The schist cladding was quarried 30 miles away from Amherst; the glulam timber was fabricated 60 miles north in Walpole, N.H.; and the café's small, round tables were crafted from two mature pin oaks that were felled on campus.

"We steered ourselves toward really honest materials," says Bruner/Cott principal Jason Forney, AIA. "So you have this palette of materials that are very much true to themselves." Most prominent of these materials is wood. The Kern Center features a half-dozen wood species, chosen specifically to cohere within the space: black spruce for the glulam; ash and birch for the doors; salvaged red oak for the flooring and monumental stair; pine for the ceiling; and cedar for the exterior.

Materials and building systems are left exposed, inspired by the Living Building Challenge's (LBC's) push for material transparency. Along with wood, curtainwall glazing makes up the building envelope. "It was important that the glass felt like a veil that wrapped the wood structure. And it was okay that you could see the wood posts behind the glass," Jewhurst says. "It was a good test for us to be minimal about the connections."

The Kern Center features a mostly column-free glulam structure. The structure was further complicated by the architects' goal to eliminate any unnecessary material. Instead of uniformly sized beams, Bruner/Cott worked with Montreal-based glulam supplier Nordic Structures, Walpole, N.H.–based fabricator Bensonwood, and Newton, Mass.–based structural engineering firm Foley Buhl Roberts & Associates to determine the smallest possible size of each member. "We worked out a hierarchy of framing so that we could increase the overall efficiency of the yield that would need to be produced for the building," Jewhurst says.

The design team also used lightweight, 4-inch oak "car decking" for the second floor "so that the decking could support itself to the extent possible," Jewhurst says. Beam members could then be spaced 8 feet on center.

Equal attention was paid to simplifying connections between structural members. "We wanted this building to feel like it was of the highest quality, like fine furniture, and the detailing at those joints is where the magic has to happen," Jewhurst says. In the second-floor classroom, for instance, 5-inch by 12-inch glulam beams neatly join an equivalent-sized rim beam and a 5-inch-square post. A 5-inch-wide steel base plate is sandwiched between the end of the beam and the face of the rim beam, with knife plates centered in both the posts and beam, secured by just two lag screws and two bolts.

Besides the mostly hidden steel plates that attach to the aluminum mullions of the curtainwall system, the only steel visible is a small seat tab below the roof beam. Jewhurst credits Bruner/Cott project architect Christopher Nielson, AIA, who was "on the phone day and night, working through how minimal we could make these connections."

Although it was fabricated just one hour from the site, the timber for the glulam was grown in a taiga forest in northern Canada, where Nordic's forest team selectively harvests extremely small-diameter trees. The timber is then shipped around the world, in this case to Bensonwood's facility outside Walpole, where it was fabricated to Bruner/Cott's specs. Although many of the beams are relatively small, some are as large as 41 feet long, 9 inches wide, and 38 inches deep, with weights creeping up to 3,700 pounds.

On-site, the novelty of the timber structure created its own challenges. According to Bensonwood structural engineer Nate Black, the company had never constructed a floor diaphragm without sheathing. To attach the deck to the glulam beams, the company used what Black describes as the "largest nail gun in our arsenal," which can fire 5-inch-long nails.

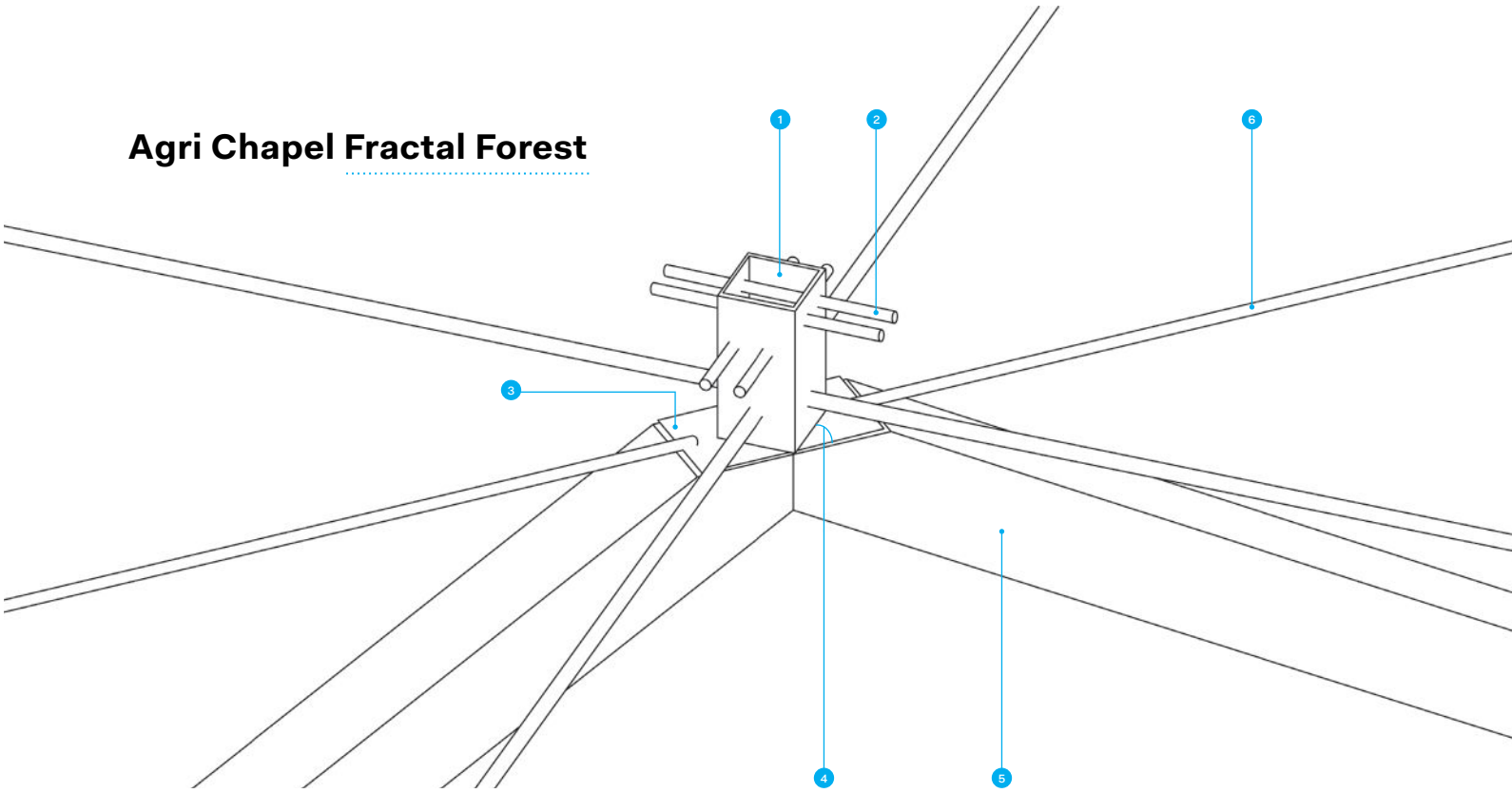
Among the benefits of the building's apparent structure is that it can be easily adapted or, when the time comes, disassembled. "One of the imperatives of the Living Building Challenge is net-positive waste," Forney says. To that end, the Kern Center is designed for flexibility, so that it can be adapted as the school's needs change—an attribute that was tested when the college abruptly chose not to relocate the campus bookstore to the Kern Center. With the building two-thirds of the way through construction, the architects redesigned the bookstore space as a ground-floor classroom. "We were able to in-frame interior glass systems that are all bolted together that fit inside the structure without making any edits," Jewhurst says.

Forney attributes the Kern Center's success to the dedication of the entire project team, and in particular, the general contractor Wright Builders, based in Northampton, Mass. The company's founder and senior adviser, Jonathan Wright, is a Hampshire College alumnus and helped select Bruner/Cott as the project's architect. "He was deeply committed to the LBC," Forney says of Wright, who led LBC training seminars for the subcontractors.

"Everybody was pulling in the same direction," Jewhurst adds. "And it's reflected in the result."

ROBERT BENSON PHOTOGRAPHY

Agri Chapel Fractal Forest



When seeking design inspiration for a chapel at a resort hotel in Nagasaki, Japan, Momoeda Yu Architecture Office (MYAO) looked to the nearby Ōura Tenshudo, a wooden, Gothic-style Catholic basilica that French missionaries built in 1864. The firm's namesake founder, an alumnus of Kengo Kuma and Associates, wanted to explore wood construction while also paying homage to the basilica, the rare tourist attraction that is also beloved by locals.

The one-room, 60-seat Agri Chapel is almost a cube, approximately 30 feet in length, width, and height with expansive floor-to-ceiling windows. Once inside, visitors are greeted by an array of stacked tree-like pillars that rise the height of the chapel, filling the volume. Inspired by fractal geometries, the interconnected cedar structure supports the chapel's flat roof. With no altar and the interiors finished in white, the wood structure becomes a sculptural centerpiece, drawing the eye upward and encouraging contemplation, much like the vaulted ceilings of Gothic cathedrals.

Momoeda first conceived the branching structural system while studying at Yokohama National University in Kanagawa Prefecture. The system divides the chapel interior vertically into three tiers, again similar to Gothic architecture. With each tier, the trunk-like pillars multiply in number—first four, then eight, then 16—while shrinking in size by a factor equal to the square root of two. At grade, wood members are 4.7 inches square; at the next level, 3.5 inches; at the final level, 2.3 inches.

At each tier, the pillars bundle five cedar posts, which support up to eight angled beams that splay like branches. These boughs either intersect with those of the neighboring trees to support the next tier of pillars, or terminate in space, tying into the base of the overhead tier of trunks via steel tension rods. These latter, truncated beams are critical, Momoeda says. "Without these beams, the building would collapse."

1. Steel sleeve for central cedar post
2. Steel bolts (typ.) to fasten surrounding cedar posts
3. Steel base plate
4. 45-degree rotation between tiers
5. Angled cedar beam (typ.)
6. Ø 0.63" steel tension rod (typ.)

It's common for Japanese architects to make "a lot of models," Momoeda says, and he is no exception. He and his team built dozens of digital and plastic models, exploring the relationship between each layer of trees and their impact on the space. Quickly, they realized that simply doubling the number of trees at each tier would clutter the chapel by the second round: The architecture would have no room to breathe.

To solve this problem, the designers twisted the trees 45 degrees between tiers, partially embedding several trees in the middle tier as vertical supports for the exterior walls. That is, the second tier consists of four stand-alone pillars and eight additional half-pillars. These latter trunks, which carry half the structural load of a stand-alone trunk, help support the second set of angled beams that supports the top tier of 16 trees, which stand apart from the walls.

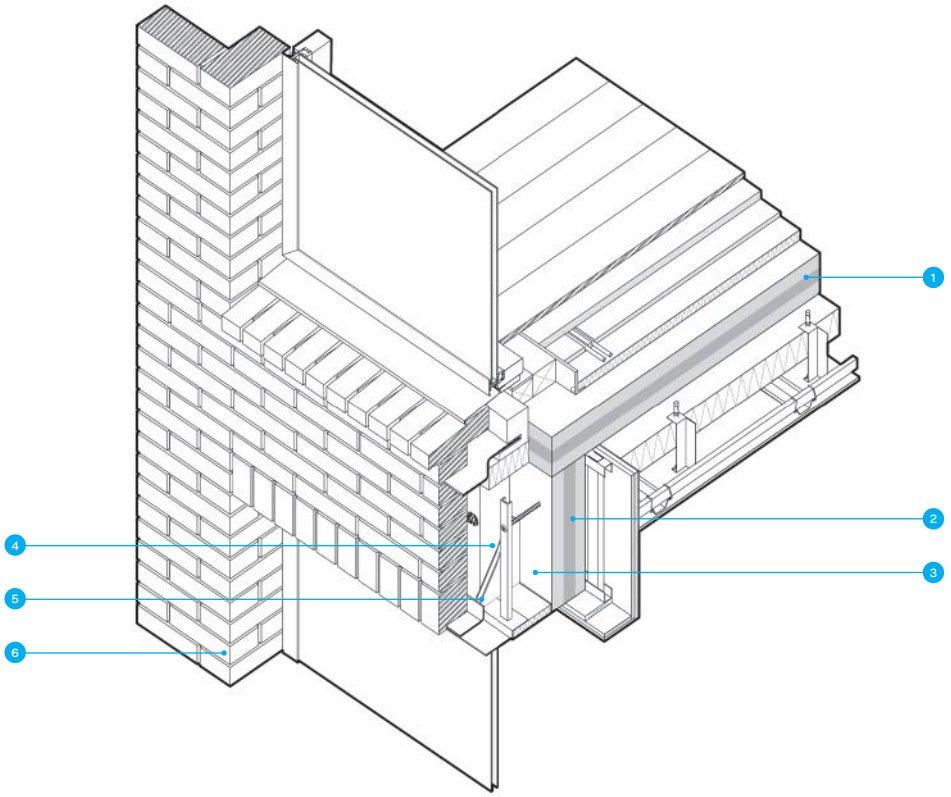
The unique condition of the half-embedded trunk structures in the middle tier was one of the project's more challenging aspects, says Momoeda, who worked with Jun Sato Structural Engineers out of Tokyo. The team designed a custom gusset plate to which they could attach both the angled beams and three 0.63-inch-diameter steel tension rods. A centered angled knife plate, matching the depth of the beams, connects each beam to the columns via a concealed steel plate. "This detail was complicated," Momoeda says.

The other steel connections were no less so. Where the angled beams form the base of an upper pillar—which, again, are rotated 45 degrees between tiers—a steel base plate anchors a rectangular steel sleeve that supports the five-post trunk as well as six tension rods. Four posts attach to each face of a central post, which slips inside the sleeve and is secured with steel bolts. Where the trunk meets its crowning bough, a steel node with angled knife plates works in combination with mortise-and-tenon joints, fitting the maximum eight branches together like puzzle pieces.

Each of these details was fabricated in plastic by MYAO and shown to local contractor Yushin Construction before they were built and shipped to the site. Momoeda specified cedar because it is readily available, and thus economical, and milled outside of Nagasaki. Cedar is also common in traditional Japanese houses, which helped the structure feel familiar. Construction took four months with a team of four carpenters. The exterior walls were erected first and then the pillars built from the bottom up.

It's an understatement to say that the Agri Chapel is a personal project for Momoeda. "This building is in my hometown," he says. "My parents and my family can see it." The chapel is also his firm's first built project. Since its completion in late 2016, it has captured the attention of the public as well as that of the profession. Architects travel from around Japan to Nagasaki to visit the chapel. "It's quite far from Tokyo, but many people come," Momoeda says. "So I'm happy."

Dalston Works Building Envelope



1. CLT floor panel, 4" to 8" thick
2. CLT wall panel, 4" to 5.5" thick
3. Vapor barrier (not depicted)
4. Foil-faced rigid insulation, 4.3" thick
5. 3.5"-deep masonry angle attached to 10"-tall by 5.6"-deep steel shoe
6. Brick

Waugh Thistleton Architects isn't particularly interested in conjuring timber skyscrapers or extolling wood's expressive qualities. In fact, though the London firm was the forerunner in modern residential timber towers with the 2009 completion of the nine-story Murray Grove building, its latest timber project gives little hint that it is the largest cross-laminated timber (CLT) building in the world.

Like Murray Grove, the 155,000-square-foot Dalston Works is located in the London borough of Hackney, which instituted a "timber first" policy for new construction in 2012. The latter project comprises several building volumes ranging from five to 10 stories tall that provide 121 units of housing along with office, restaurant, and retail space. Except for the building's concrete podium, the structure is built entirely of CLT, from the floors to the walls to the elevator cores. As a result, Dalston Works weighs just one-fifth of its hypothetical concrete counterpart, an important trait given its location atop a potential Crossrail 2 station.

And yet passersby would never know. Dalston Works' exterior is clad in brick without a square inch of wood peeking through. "It's counterintuitive to clad a lightweight building in heavy stuff," acknowledges project architect Dave Lomax, a senior associate at Waugh Thistleton. But normalizing mass timber construction is a priority for the firm. "We don't think that sustainable buildings always have to be made of hay bales and have a whirligig on top that spins in the wind," he says. "We want to develop beautiful architecture that shows no sign that it's sustainable."

Due to the structure's light weight, local developer and general contractor Regal Homes was able to increase the number of housing units by 25 percent. "In real hard pounds and pence, if you have 25 percent more homes to sell, that's going to win the debate for our clients," Lomax says. "And that means we get our narrative: taking carbon and locking it away in our buildings, rather than pumping carbon into the atmosphere to make concrete."

Copenhagen, Denmark–based structural engineering firm Ramboll—which, along with B&K Structures in Derby, England, helped design the timber skeleton—estimates that Dalston Works sequesters 2,866 tons of carbon dioxide in its 136,000 cubic feet of CLT.

The spruce used in the CLT panels was harvested by timber supplier Binderholz, headquartered in Fügen, Austria, with forests, sawmills, and mass timber production facilities throughout Austria, Germany, and Finland. Wall panels range from 4 to 5.5 inches thick while floor slabs range from 4 to nearly 8 inches thick, with the thicker panels used on lower floors. For residential units' interior walls and ceilings, a layer of plasterboard provides fire protection—a more economical option than beefing up the CLT—while office walls are exposed wood. On the exterior, the CLT is protected by a vapor barrier, a 4.3-inch layer of foil-faced insulation, and the brick façade.

The bricks are full-sized, not a veneer, Lomax notes, as they tend to be more aesthetically pleasing and more durable. Hackney building official also made it clear that brick veneer was not an option. Slight differentiations in the brick's color—depending on whether the brick was fired once or twice—denote changes in program: a darker brown brick for the office tower and a warmer, redder brick for the residences. The brick is attached via stainless steel masonry support angles developed specifically for CLT. The 3.5-inch-deep angle attaches to a series of steel "shoes," which are 10 inches tall and 5.6 inches deep and are screwed directly to the wood, Lomax says. The availability of such a product is relatively new, he adds. "It's not the most exciting bit, but for us to be able to go specify things off-the-shelf that work with CLT just shows how the industry has matured."

Other details had to be developed in-house. Worried that the weight of the brick, accruing over the building height, would gradually crush the CLT floors, the design team worked with Binderholz to cut pockets into the edge of each CLT floor deck. The pockets were then filled with structural grout, into which the wall panels that sandwich each floor panel would nest, transferring the vertical load from the upper wall panel to the one below.

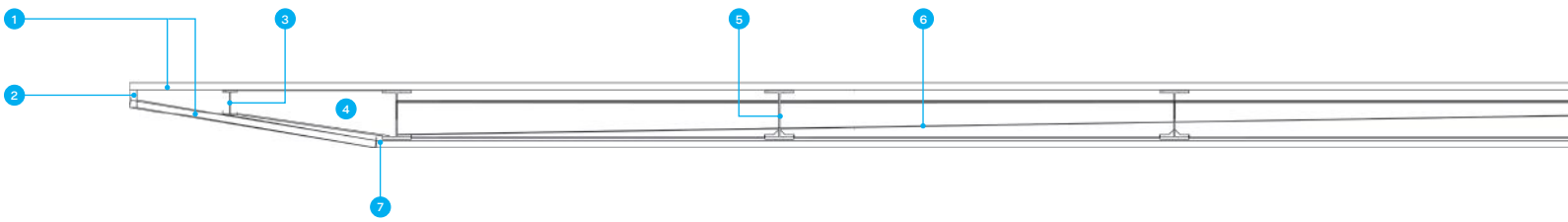
One of CLT's biggest advantages is the speed with which it can be erected: Dalston Works was built in 18 months, opening in summer 2017. Timber construction also makes for a quieter, less busy project site, Lomax says. On-site deliveries were reduced by almost 80 percent from a conventional site, and Lomax estimates that Dalston Works uses 25 percent less CLT per square foot than Murray Grove due to an increased understanding of and trust in the engineered wood product.

If building with CLT has a downside, it's the amount of upfront design work required. To prefabricate Dalston Works, every cut, every groove, every hole needed to be executed accurately. More often than not, the finesse is there though sometimes the project team has to be convinced, Lomax says. At Dalston Works, floor openings for plumbing were sized nearly 8 inches at the request of Regal Homes to account for any potential misalignment. "Funny enough, our pipe went in a dead-straight line and then we had these huge holes in the wood that we had to try to seal up," Lomax says. "It actually became a big task."

Despite not blatantly announcing itself as a wood building—or perhaps precisely because it doesn't—Dalston Works represents another step on the evolutionary path of tall timber construction. It's an evolution with significant implications for the world's cities, not least because of CLT's promise in supplying urban housing. "It's important to us to demonstrate that all developers of large-scale housing should be considering timber," Lomax says, "because there is absolutely no reason not to."

DANIEL SHEARING

Ateliê Wäls Brewery Porte Cochère



Even in the modern industrial park, supersized utilitarian structures can create large, desolate swaths of development. On a dead-end street in the outskirts of Belo Horizonte, the capital of Minas Gerais in southeast Brazil, Ateliê Wäls' ribbon-like wood porte cochère stands out, beckoning passersby to the brewery's new restaurant and taproom, both designed by the local firm Gustavo Penna Arquiteto & Associados (GPA&A). An addition to the company's existing brewing facility, the project—which also included a wine cellar, shop, and outdoor space for food trucks—faced a pair of unusual challenges.

First, Ateliê Wäls is carved into a steep hillside, creating a 35-foot grade change from street level to the brewery entry. To the east, Rua Adelino Testi is level with the facility and provides vehicular access to the main warehouse. To the west, Rua Gabriela de Melo runs 16 feet above the roof of the building. For the porte cochère, located on the west side, GPA&A created a stair and elevator shaft to take visitors from street level down two stories to the reception area. A material palette of concrete, steel, and glass complements the surrounding industrial buildings.

The second challenge was to give the street-level volume curb appeal since the elevator shaft essentially has no façade, says GPA&A project manager Oded Stahl. GPA&A conceived of the undulating steel-and-wood canopy curving from the restaurant roof over a sidewalk and vehicular drop-off area, reaching down to the ground, and then curling inward to form a long bench. "It's like somebody opened a huge barrel and stretched it over" the entrance, he says. "By making this canopy, we enlarged the presence of the building on the street level."

To design the canopy, the architects began with what Stahl calls "3D dreams"—sketches and detailed drawings that helped them explore scale, which they then translated into models in Trimble SketchUp and Autodesk AutoCAD. GPA&A worked with local structural engineering firm Misa Engenharia de Estruturas to minimize the canopy's underlying steel frame, beveling its edges to create a thin profile. "The edge of it had to be quite fine," Stahl says. "It could not look heavy or otherwise we were going to lose this effect of something wrapping, something flowing."

The canopy rises 17 feet above street level, forming a tunnel that is 38.5 feet deep and, if it were unrolled and laid flat on the ground, 104 feet long. Wood slats clad its inward and outward faces, sandwiching the steel frame, a concealed sheet metal roof, and rain gutters, which channel water into a planted area below the canopy.

The steel frame comprises 200-millimeter-deep (7.9-inch-deep), 40-foot-long wide-flanged beams welded together to form a grid that ties into the elevator core. To create the "fine" edge that GPA&A envisioned, the

1. 4"-wide by 0.75"-thick teak cladding, 6.5' to 19.5' long
2. Teak cap on edge
3. 3.9" × 2.3" wide-flanged beam
4. Metal corbel beam
5. 7.9" × 4.7" wide-flanged beam with cutouts for drainage
6. Sheet metal roof trough
7. Drainage pipe (not shown)

steel beams running along the canopy's longitudinal edges are just 4 inches deep. The transverse beams taper to meet them. Wood slats cap the sides, concealing the steel structure.

For durability, GPA&A specified *cumaru*, or Brazilian teak, for the 4-inch-wide, 0.75-inch-thick slats; when heat-treated to 6 percent humidity, the wood becomes highly insect resistant. The wood was sourced from the state of Rondônia, near Brazil's western border, which is also one of the world's most deforested regions; GPA&A ensured that the wood carried a *Documento de Origem Florestal*, or certificate of origin, which allows authorities to track the movement of lumber products across the country. Local manufacturer Gebauer milled the wood into the slats, which range in length from 6.5 feet to 19.5 feet long.

Pórtico Construções Metálicas in Rio Acima, 20 miles south of Belo Horizonte, prefabricated the steel frame, which made in situ construction go quickly, Stahl says. The construction crew first laid the sheet metal roof and gutters, then worked from the top down, adding the wood cladding to the canopy's outward surface first.

The wood slats fasten invisibly to the steel structure via small steel knife plates spaced roughly every 2 feet. The connection allowed for a clean appearance devoid of screw holes, but was a challenge for construction workers, Stahl says. Each knife plate was welded on site, but with the structure just 6 inches deep, there was very little room for error, he says. "That was the headache on the site."

Completed in June 2017, the porte cochère has helped showcase how wood can be used in a way that Stahl says is "very plastic and very precise." GPA&A had never used wood in this fashion before. "The wood here was the king," he says. "It was the material that spoke."

DANIEL MANSUR

ADVERTISEMENT

Origine is the signature building of a new Quebec City neighborhood on the banks of the St. Charles River intended to be a showcase of sustainable development. Land developers selected by the city were tasked with offering eco-responsible solutions. Photo: Courtesy of EBC Inc.

WOOD: MID-RISE HOUSING THAT GOES BEYOND CODE

Origine is a 13-story, 92-unit condominium tower now open in Quebec City. This $18.9 million (U.S.) structure is more than the world's tallest all-wood residential tower. It also happens to be one of the region's most resistive to fire and seismic events.

Origine may hold many firsts for size, safety, speed, composition, and construction innovation. Just don't call this groundbreaking, cantilevered structure another pilot program for mass timber.

View it as the latest entry in a growing line of engineered wood and hybrid structures now in place across North America, says project architect Yvan Blouin of Quebec City-based Yvan Blouin Architecte.

Blouin and André Huot, the representative for Origine's mass timber wall and panel manufacturer, regard Origine as the latest chapter in a well-evolved, rapidly-advancing mass timber story.

"This type of building is about the future. It embraces a green vision. We're building with materials that will help our children and children's children enjoy a better tomorrow," says architect Blouin.

More With Less

That future-forward vision takes many forms in Origine. Take the question of space. The decision to build with wood transformed a prized vacant parcel on the banks of the St. Charles River. The site's sandy soil conditions limited design of a concrete structure to no more than six floors, according to Blouin. Wood's lighter mass freed designers to proceed with a considerably larger hybrid structure,

The project team conducted two years of research and development to demonstrate that Origine's wood structure would meet sustainability and economic goals, and would be as safe as a concrete and s teel structure. The research carried out for this innovative building are paving the way for other designers to realize the many benefits of using wood as a building material. Courtesy of Nordic Structures | Photo: Stephane Groleau

mounting a 12-story mass timber tower on top of a single-story concrete podium. Origine's comparative lightness enables higher occupant density than otherwise attainable, a win-win for city leaders and the community.

All-Season Constructability

Construction speed also worked to the development team's advantage. Origine was assembled within four months, from December 2016 to April 2017. Blouin says a similarly sized project using typical construction materials would have taken twice as long. And, yes, assembly was performed through the dead of winter, proving out wood's all-season constructability.

Fire-Rated Confidence

Origine meets the code standards expected of any mid-rise residential dwelling. To support an inclusive process and show national commitment to tall wood buildings, federal authorities sponsored comprehensive testing to rate mass timber's fire resistive qualities. A full scale, three-story cross-laminated timber (CLT) stair-and-elevator shaft was exposed to intense flames for 2 hours and 12 minutes, reaching a peak temperature of 2,012 F. The interior of the CLT shaft remained intact, smoke-free, with interior sensors recording a temperature rise of just 3 C. The code's two-hour fire rating was easily achieved.

Seismic and acoustic testing was also conducted. The engineers' response to the findings are detailed in Quebec's guide *Mass Timber Buildings of Up to 12 Storeys*, published by the provincial government. Today "anyone in the province can build up to 12 stories with wood by following the research and the approved directives," Huot says.

Proven Way Forward

Today, Origine stands as a symbol of a way forward in mass timber mid-rise applications. Huot says "over 1,200 officials from Korea, China, Turkey, Japan, Canada, United States, and South America have toured Origine during and after construction."

For architect Blouin, Origine turns a critical page in the story for sustainable affordable housing. "We have to find a way to build better buildings," he says. "Wood is the way to do that." By all accounts, the world is eagerly watching and learning.

Developer: NEB Group
Architect: Yvan Blouin Architecte
Code Consultants: Technorm, GHL Consultants
Timber Engineering: Nordic Structures
Mechanical Engineering: Génécor Experts-Conseils Inc.
Civil Engineering: Groupe Conseil SID Inc.
Mass Timber Supplier: Nordic Structures
General Contractor: EBC
Structure Assembly: Les Constructions FGP
Laboratories: FPInnovations, National Research Council of Canada

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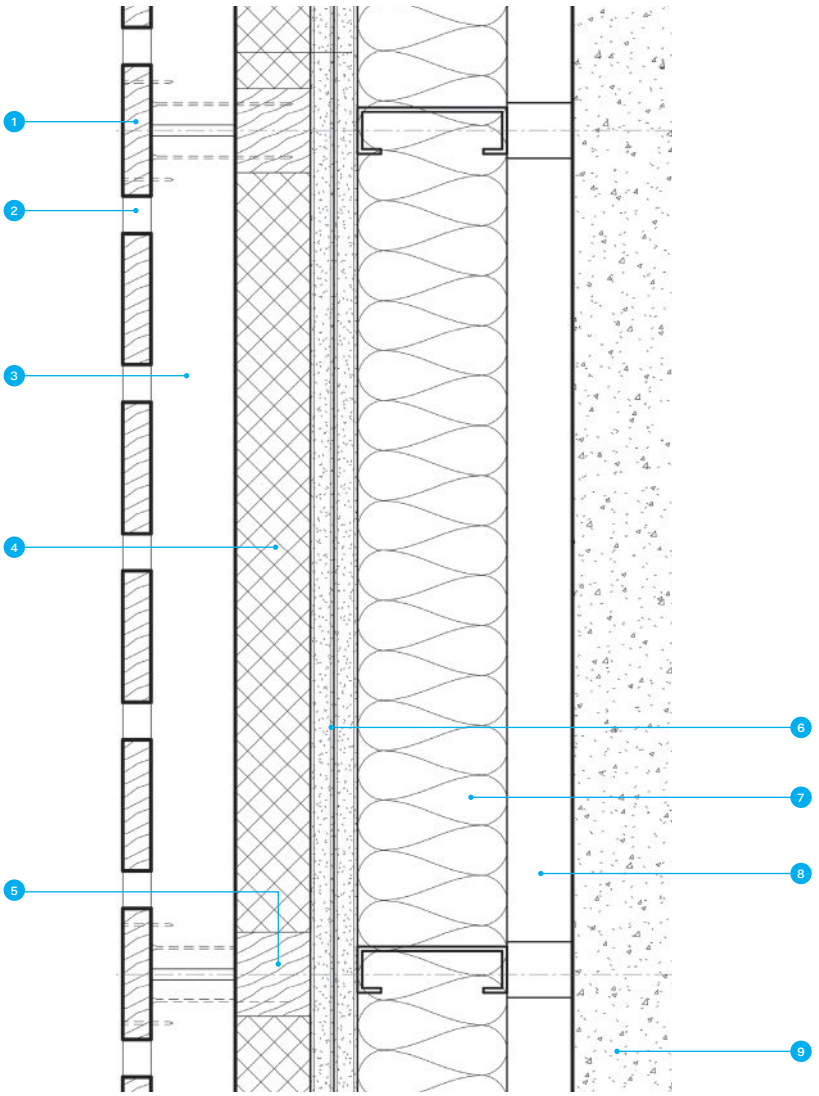
Pendleton West Acoustical Wall System

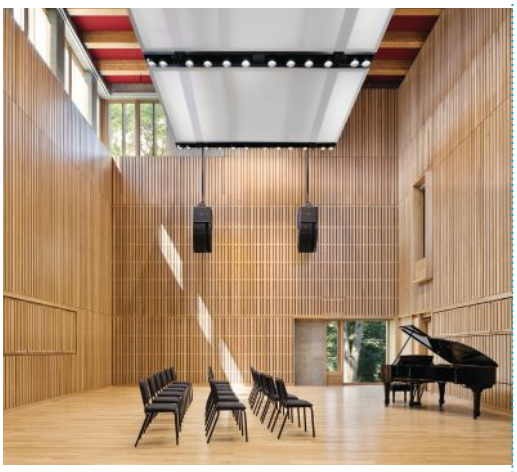
Plan Section



1. 3.5" × 0.75" white oak slats
2. 1" airspace
3. 2.25" horizontal wood furring (24" o.c.)
4. 2" fabric-wrapped fiberglass panel
5. 2" vertical furring (22.5" o.c.)
6. Gypsum wallboard
7. Metal stud frame with insulation
8. 2" cavity
9. Concrete shear wall

In designing a music rehearsal hall for an addition to Wellesley College's Neo-Gothic Pendleton West arts building, in Massachusetts, Philadelphia-based KieranTimberlake was inspired by the wooden sounding box of violins and other instruments. Naturally lit from clerestory windows, the double-height space is wrapped almost entirely in a custom wood acoustical wall system, developed in collaboration with Cambridge, Mass.–based Acentech.

The 1,625-square-foot rehearsal hall is the main programmatic element to the 10,000-square-foot jewel-box concrete addition that connects Pendleton West, built in 1934 and renovated as part of the project, to Paul Rudolph's 1958 Jewett Arts Center via a series of bridges.



In such a sylvan and storied setting, the architect's job is that of a doctor's: *Primum non nocere.* First, do no harm. "That's sort of a primary goal," says KieranTimberlake principal Tim Peters, AIA. "So the work tends to be deferential in a lot of ways, but it's not trying to match, it's not trying to mimic."

In tone and materiality, the addition takes cues both from Rudolph's exposed-aggregate concrete columns and the natural landscape, using concrete and red oak to create a quietly contemporary, high-performance building. Wood serves as a unifying element, visible not just in the interiors and curtainwall but also in the contours of the board-formed concrete. "The making of a concrete building involves an incredible amount of wood," Peters says. "So why not imprint the wood as evidence of that making?"

Although the building's concrete shell is mostly exposed, the design team knew the rehearsal hall's walls would need to absorb and contain sound. At the same time, Peters says, "we were extremely strapped for space. Every inch counted. So we didn't have the luxury of shaping that room in a way that would've been a little bit more acoustically beneficial."

The acoustical wall system the team developed essentially creates a "box within a box." From the outside in, the building's 10-inch-thick concrete shear walls support an insulated metal-stud frame sheathed with gypsum wallboard. Affixed to the gypsum wallboard are vertical furring members and 2-inch-thick, fabric-wrapped fiberglass panels, the latter of which attach with aluminum panel cleats. The furring members are crossed with horizontal nailers, spaced 24 inches on center, creating a 2.25-inch airspace between 3.5-inch-wide, quarter-sawn white oak slats and the sound-absorbing panels.

The system is tunable, incorporating 19 bifold panels that increase the absorption of sound when opened. The acoustic wall system also conceals utilities, including plenums for the building's displacement ventilation system, which helped the rehearsal space become more zen-like. "We had this incredible desire to create a serene space, one that, when everything was in its place, was more like a chapel than a music practice room," Peters says.

Using hand calculations and 3D modeling, KieranTimberlake built a prototype of the wall system that it then took to Acentech's office for acoustic modeling and experimentation with variables such as airspace depth, acoustical panel thickness, and wood-slat width and spacing. Finding the right combination of parameters that would perform the best acoustically is "a little bit of a dark art," Peters says.

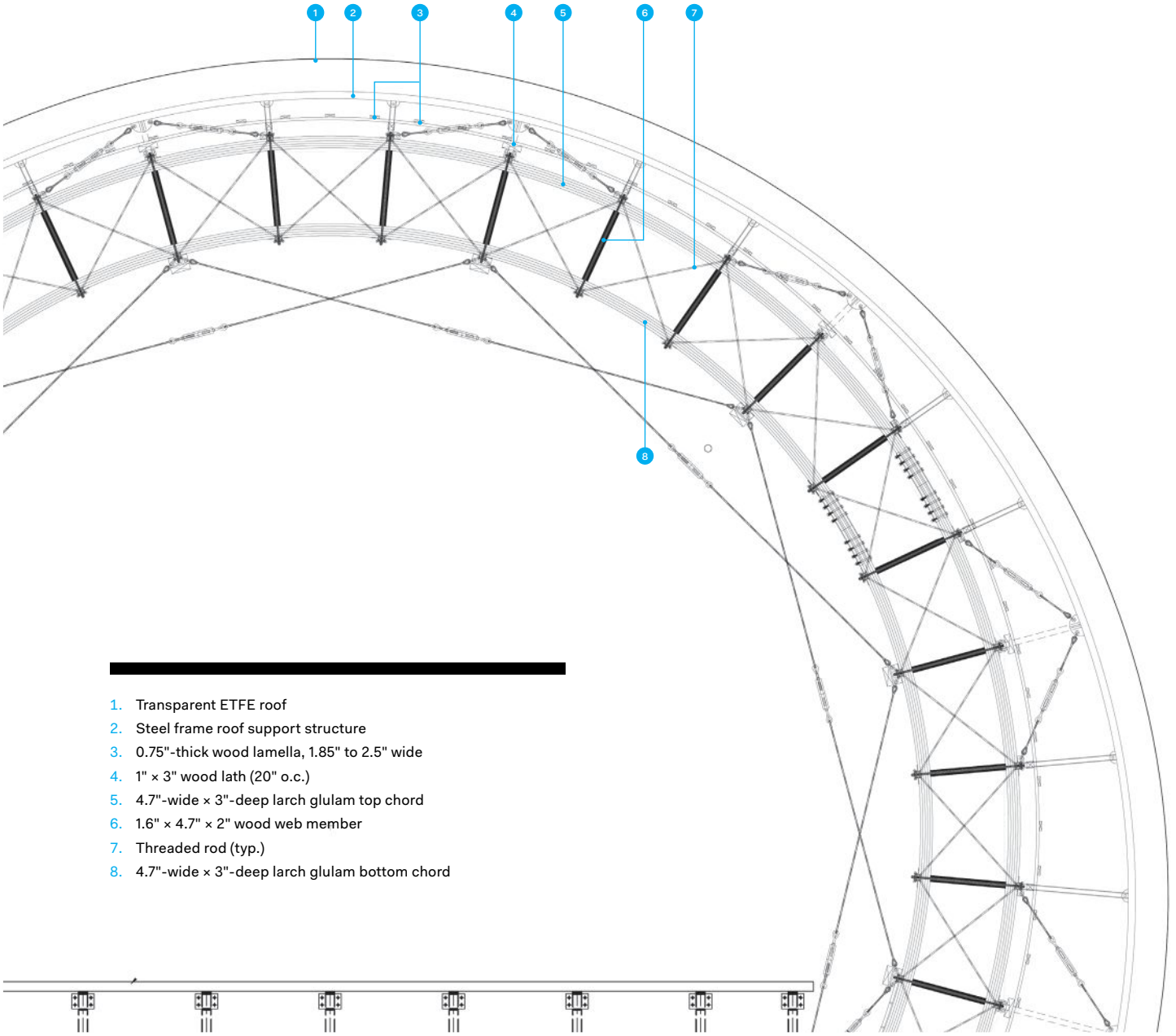
The testing proved invaluable. The designers learned that the assembly, configured as it is now built, balanced the absorption of the correct sound frequencies as equally well as a layout that varied slat widths and spacing. "Because of our desire for serenity in the space, we chose the regular wood slat dimension and layout over the randomized version," Peters explains. The testing also revealed that the upper volume of the rehearsal hall needed to reflect more sound; as a result, in that area, the designers closed the 1-inch gaps between slats with a solid plywood backer in the walls, eliminating the need for the fabric-wrapped acoustical panels.

Although the panelized wall system was designed to be prefabricated off-site, CDD Custom Millwork, in Norwich, N.Y., assembled the system in situ using parts that workers had prefinished in the shop. By completing the system on-site, Peters says, the carpenters could better align the system with adjacent conditions, such as doors and windows, and coordinate with other trades on integrated components, such as airflow plenums and utility enclosures. "At the end of the day, it really worked out," he says. "The stars aligned, and we had very few hiccups."

The project took two years to complete, with the renovated Pendleton West and the addition opening in spring 2017. While the new building deftly marries its adjacent buildings, finding commonalities across 80 years of campus building, Peters is most pleased with the activities the arts center now hosts. "It's been extremely gratifying to see students engage with the building," he says. He has seen students documenting the architecture or mounting small art installations that acknowledge the building's materiality. "How does light filter across a board-formed concrete wall? How do certain textures reveal themselves? Students are engaging very literally with those things," he notes. "And that's the best thing that could possibly come of it—that the building is actually a pedagogical tool."

MICHAEL MORAN/OTTO

The Dox Centre's Gulliver Shell



1. Transparent ETFE roof
2. Steel frame roof support structure
3. 0.75"-thick wood lamella, 1.85" to 2.5" wide
4. 1" × 3" wood lath (20" o.c.)
5. 4.7"-wide × 3"-deep larch glulam top chord
6. 1.6" × 4.7" × 2" wood web member
7. Threaded rod (typ.)
8. 4.7"-wide × 3"-deep larch glulam bottom chord

A wooden zeppelin looms over the stark white roofs of the Dox Centre for Contemporary Art, in Prague, cantilevering more than 50 feet beyond one of the cultural center's warehouse-like buildings. As fantastical as it appears, the 130-foot-long, 30-foot-diameter structure known as Gulliver is in fact not an airship, but an elevated event space and pedestrian bridge that incorporates stadium seating and a stage for literary events and lectures.

Gulliver is the brainchild of Dox Centre founder and director Leoš Válka, who for years harbored a desire to "invade" the Dox with a "parasitic" structure with "an absurdly fascinating organic shape that would contrast with the Dox Centre's existing architecture," he said in a statement. In 2013, Válka asked Martin Rajniš, co-founder of local firm Huť Architektury Martin Rajniš (HAMR) to design him such a space. "I didn't hesitate," Rajniš says.

Rajniš sketched what he describes as "a soft space defined by a wooden structure made out of unrefined wooden branch sticks, in utter contrast to the strict white cubic volumes of the Dox." He showed his sketches to Válka, who initially loved them but, 24 hours later, had a change of heart. "'This has to be different,'" Rajniš recalls Válka saying. "'Let's draw an airship—but not just any airship. Let's draw one that fulfills all the dreams of 12-year-old boys!'"

Válka drew a long blimp form spanning from one building to the other, extending over the Dox Centre's courtyard and angled slightly, as if about to land. "I was amazed," Rajniš says. "Needless to say, when I feel that someone else's idea is great, I gladly join."

HAMR partnered with Timber Design, a structural engineering firm in Česká Skalice, Czech Republic, to create a freestanding steel structure that anchors into the ground and is encircled with 14 timber truss rings, forming the zeppelin's skeleton.

Rajniš, who draws everything by hand ("I don't own a computer and never will—all the software I need is in my head"), originally wanted to forgo the steel frame but load tests convinced him otherwise. "The wind force above the roofs of the center is very strong," he says. "Generating enough resistance against horizontal wind forces to stop the structure from pivoting was difficult."

Counter to Rajniš' dismissal of software—his staff translates his drawings into 3D models—Timber Design structural engineer Zbyněk Šrůtek embraces digital technology and used Dlubal Software's RFEM to model the structure's steel, timber, and ETFE elements. He worked with Rajniš to ensure the structural components would not detract from the "illusion of flight."

Thus, Gulliver's two white-painted steel truss support columns, rising 65 feet and 54 feet from the concrete foundation, tuck against the neighboring Dox Centre buildings connected by the zeppelin. To address the high wind load, the designers also ran a 7-inch-diameter steel tube from the front of the airship to the building, creating a third anchor point.

The 30-foot-diameter glulam larch wood truss rings, whose top and bottom chords are 4.7 inches wide by 3 inches deep, are connected by roughly 2-foot-long web members, also 4.7 inches wide. In the longitudinal direction, similarly constructed wood truss beams stiffen the structure with the help of steel cables, and provide the base for a shell of 3-inch-wide, 1-inch-thick curved wood laths spaced every 20 inches. These laths support the airship's exterior lamella. To protect the unfinished lamella, the architects added a curved roof of transparent, mechanically stretched ETFE (ethylene tetrafluoroethylene).

Concocting this structural puzzle took two years, Šrůtek says. Timber Design also oversaw Gulliver's fabrication and construction. "Special CAD systems for steel and timber with the possibility of data export to CNC machines were used," Šrůtek says. His team built a full-scale mock-up of one of the circular truss rings to test all of the connections, including the custom brackets that anchor the steel cable system.

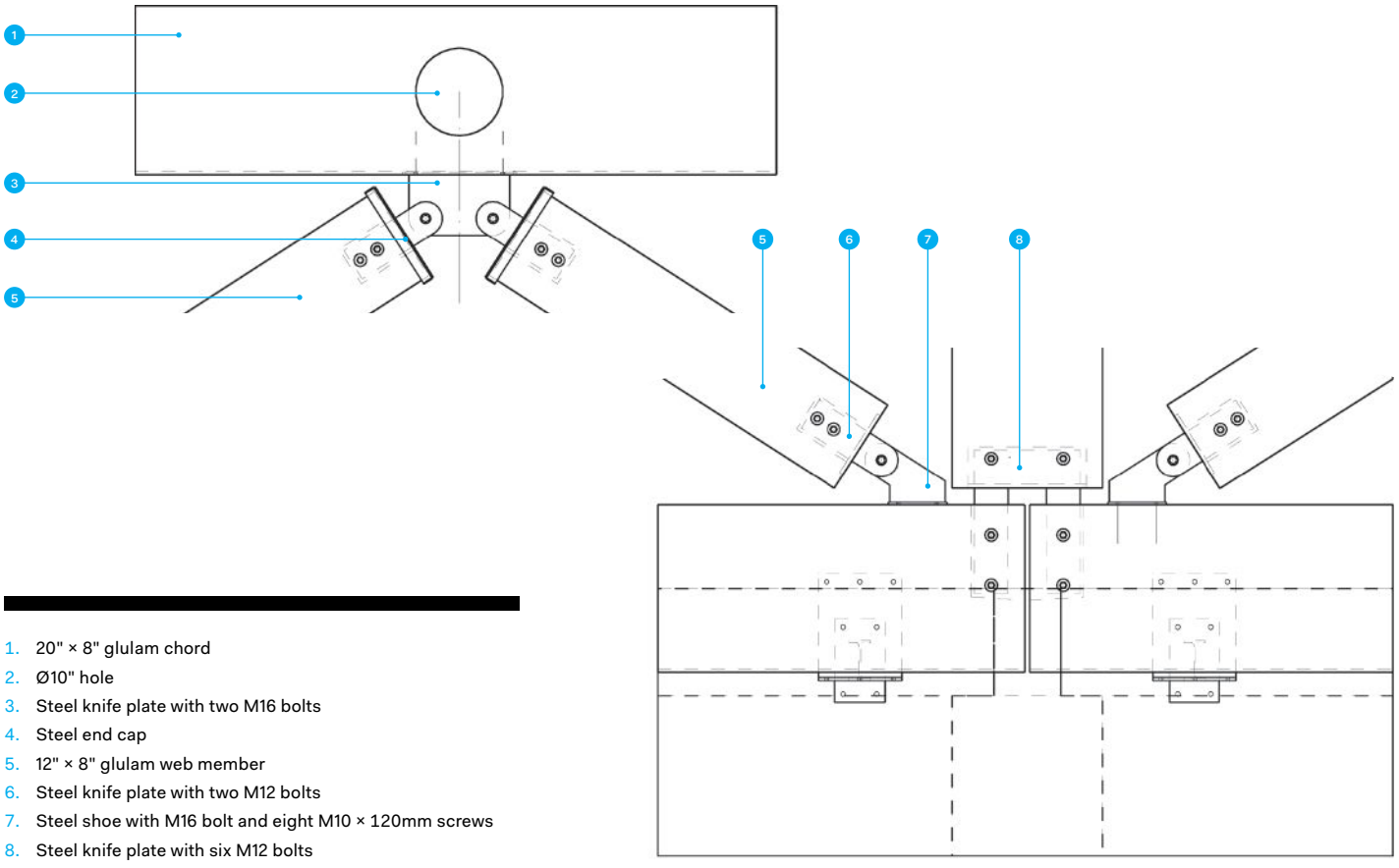
The circular timber truss rings arrived at the construction site broken down into three arcs each. First, workers erected the steel framework and then secured the truss rings with steel plates and high-strength screws. Next, they constructed the nose and tail of the airship and craned them into place. Finally, they screwed the lamellae into the shell and the ETFE diaphragm added via steel ribs that are also secured with bolts and steel cables.

Gulliver was completed in late 2016. For its opening, the Dox Centre brought in a number of celebrated authors for readings and a discussion, and mounted an exhibition about the airship's inception, design, and construction.

Rajniš and Šrůtek are both proud that the project was designed, fabricated, and built completely within the Czech Republic. It showcases the country's talent, Šrůtek says. "Having the opportunity to design and then manufacture and build an exceptional construction where wood is statically used to its limit of possibilities, in the amazing atmosphere of the gallery, was a very powerful driving force for the whole project," he says. "It was a very beautiful three years of my life."

For Rajniš, Gulliver is a testament to the power of collaboration. "I work with the stars and rising stars of the youngest generation," he says. "I would recommend it to anyone."

Patch22 Exterior Trusses



1. 20" × 8" glulam chord
2. Ø10" hole
3. Steel knife plate with two M16 bolts
4. Steel end cap
5. 12" × 8" glulam web member
6. Steel knife plate with two M12 bolts
7. Steel shoe with M16 bolt and eight M10 × 120mm screws
8. Steel knife plate with six M12 bolts

A physical building model whose floors had yet to be glued down was the design genesis for the seemingly casually stacked floor plates of Patch22, a seven-story, mixed-use timber structure in Amsterdam by local firm Frantzen et al Architecten. But the concept of pushing the envelope of what's possible through architecture dates back to 2005, when firm founder Tom Frantzen first began directing the money he spent on design competitions toward development projects.

Four years later, the city of Amsterdam was soliciting proposals that prioritized sustainability for a waterfront site in the industrial Buiksloterham district in North Amsterdam. "This is our chance," thought Frantzen and his business partner, Claus Oussoren.

And it was. Their concept—a 58,000-square-foot, net-zero energy building composed of a row of townhouses that culminates in a 100-foot-tall tower—was selected, scoring an 8.9 out of 10 on the city's sustainability evaluation. Earning points were the project's proposed solar panels, graywater recycling system, and a heating system that uses pellet stoves fueled by a timber byproduct. But for Frantzen, Patch22's real innovation is its structure, a heavy timber frame made from glulam and CLT, with hollow concrete-and-steel floors that allow for flexibility in programming.

On its exterior, Patch22's broad-faced tower is defined by its skewed floor plates and exposed timber trusses, which visually reinforce the building's horizontality. Despite appearances, the tower's primary structure is purely rectangular, a skeleton of timber columns and beams that join at right angles. The projected corner, or "twist" from floor to floor, is achieved by sequentially extending the building's massive transverse floor beams—measuring 1.5 feet wide, 2.6 feet deep, and approximately 30 feet long—a foot further than its neighbor. The reverse happens on the building's opposite face, creating a parallelogram in plan.

Cantilevered off the main structure are enclosed balconies of variable depths, with glazing to buffer both noise and wind. Structurally, the balconies are stiffened by an exoskeleton of redwood trusses, 8 inches wide and 12 to 20 inches deep, that tie into the floor beams via steel knife plates and a series of bolts.

Moisture was among the biggest challenges when building with exposed trusses, Frantzen says. "[T]he Netherlands are almost never totally dry," he says. "We have an ideal climate for microorganisms so if you get water inside your structure, the structure will start to rot immediately." Steel caps completely cover the ends of the diagonal web members where they connect to the top chord. Where they connect to the bottom chord, the steel plate is surface mounted to the lower chord, rather than embedded.

Similarly, where the tops of the twisted story volumes jut out, the architects needed to shed water from the miniature roof decks. They added aluminum trim with a ventilated backing sloped away from the building. The trim was necessary on just one half of the façade length, since the other half transitioned to become recessed below the floor above it, but Frantzen and his team decided to run the trim the full length to reinforce the aesthetic of the disconnected volumes piled atop each other.

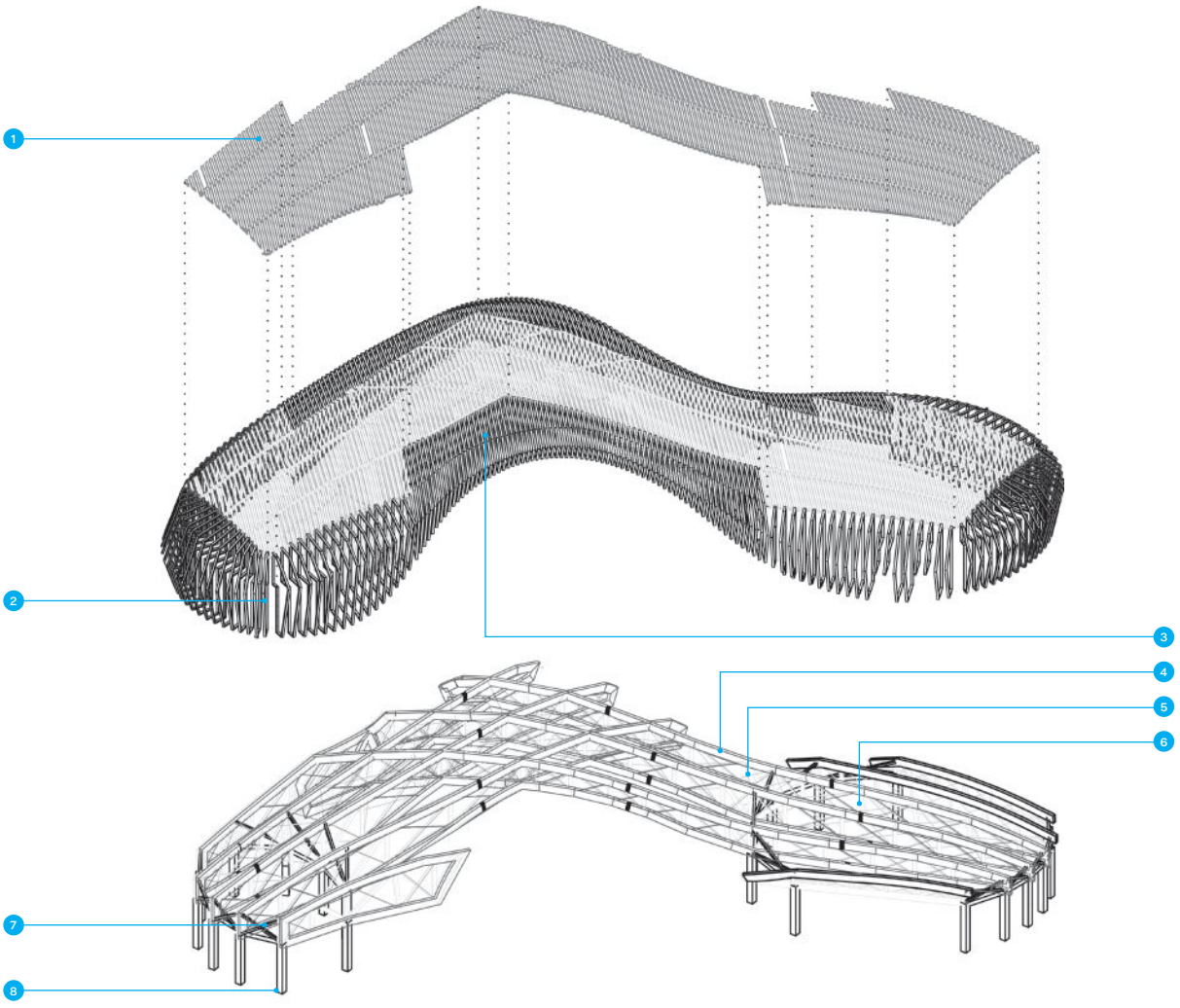
Moisture also dictated the coloring of the building. For Patch22's more solid east and west elevations, the architects specified fire-treated Douglas fir that had been pre-weathered. "If you didn't pre-gray the façade, it wouldn't gray evenly," Frantzen says. "You would get black lines."

Construction of Patch22 began in December 2014 and was completed in March 2016. After that, the individual commercial and residential interiors were fit out. Frantzen's firm moved into the building and also designed several of the tower's 31 units, while consulting on the remainder. "We assisted all the buyers but [acted] more like the editor of a magazine," Frantzen says, revising plans to meet building codes and to maximize functionality—but otherwise remaining hands-off. He adds that the famous 1909 drawing by A.B. Walker showing a New York skyscraper composed of traditional houses was inspirational: "We wanted to give people freedom to design their own villa."

Patch22's adaptability and versatility have already been tested—by Frantzen himself. After his wife accepted a job in Denmark, he downsized their original apartment in Patch22, which was half a floor. "We sold part of our apartment, and we kept the smaller part," he says. They added division walls, rerouted some of the plumbing, and added new electrical meters. "Everything was connected, and then we had a new, but smaller, home. It even had the right house number because we were smart enough to negotiate with the city that we needed extra house numbers in a good order in case the big apartments were split up."

More than a decade later, Frantzen's decision to wade into development seems to have paid off: He and Oussoren are constructing a second seven-story building of mass timber, concrete, and steel, on the plot of land immediately adjacent to Patch22. Frantzen believes the increasing visibility of timber structures in Amsterdam, led by Patch22, has paved the way for even higher-profile projects such as Haut, a 240-foot-tall tower designed by Team V Architecture, based in Amsterdam. "That project is a being done by a commercial developer," he says. "And they would have never, ever dared it without this building being a success."

The Barn's Soaring Superstructure



1. Purlin topped by Class A untreated 6"×17" cedar shingles (not shown)
2. 2×6 secondary frame (24" o.c.) topped with 0.75" OSB plywood and waterproofing membrane (not shown)
3. 2×6 secondary frame (12" o.c.)
4. Glulam truss with 21" × 8.75" chords
5. Ø0.75" to Ø1.5" steel tie-rods
6. Steel cross-bracing between trusses
7. Cross beams
8. Concrete-filled steel column (typ.)

Dutch designer Jerry van Eyck didn't set out to create a building. He and his New York–based urban design and landscape architecture firm !Melk had been hired by Sacramento, Calif.–based Fulcrum Property to help invigorate the Bridge District. The 178-acre mixed-use development in West Sacramento suffered from the perception of being in the "unsavory part of town even when that reputation was no longer deserved," says Stephen Jaycox, Fulcrum's chief marketing officer and design director at the time. The site, he continues, needed a "larger, more operatic gesture" to draw residents across the Sacramento River.

As such, van Eyck proposed creating a gathering place for all event types: a shade structure, perhaps, in which "the river ecology leaps into the organized geometry of the city and locks fingers with it," Jaycox recalls the !Melk founding principal saying.

The design team ran the material language of the archetypal structure of California's Central Valley agrarian heritage—the barn—through parametric design software as if through a translator, exploring novel forms that could be built with nominal lumber. Working in Rhino and the now-retired Autodesk T-Splines plug-in, they began with the shape of a sprouting seed in plan and then studied sun angles to maximize the amount of shade the structure could provide. After controlling for several factors, including an existing right-of-way that meant firetrucks had to be able to drive through whatever was built, they arrived at the sinuous, wood-shingle-clad structure now known simply as the Barn.

Only a third of the Barn's 9,100-square-foot plan is indoor space. The rest is essentially a giant breezeway, an 80-foot-long canopy roughly 30 feet wide that soars 20 feet over a large public plaza. The structure functions as a double cantilever, according to !Melk. A series of intersecting, angled, and trestle-like glulam trusses, whose top and bottom chords measure 8.75 inches wide and 21 inches deep, extend toward one another from their respective anchoring pods, which also act as ovoid-shaped enclosures. "When we started designing, that was our intent: to be this weird, ambiguous element," van Eyck says. "Is it landscape? Is it architecture? Is it installation art? And then afterward, it was, 'Oops, we designed a building!'"

The trusses, the longest of which span 140 feet, are supported by cross-bracing and criss-crossing steel tie-rods that range in diameter from 0.75 inches to 1.5 inches. Glulam truss members are joined with heavy-duty, gang-nail plates secured by dozens of 3.5-inch-long timber rivets.

Giving the Barn its sleek form is a secondary structure made out of 3D frames of nominal lumber. Spaced 2 feet on center in proximity to the pods and 1 foot on center near the canopy's apex, the frames provide the armature for 0.75-inch OSB plywood sheathing topped with a waterproof membrane and Class A untreated cedar shingles. Structurally, the Barn's skin is as crucial as its cantilevered trusses. "If you leave one of the elements out, the barn starts deflecting," van Eyck says.

Still, he maintains the structure is not overly sophisticated: The secondary members are "all 2x4s and 4x4s," joined using standard connections, though "the lengths and the angles of the joists vary." Early on, the design team made physical models of the structure—some 3D-printed, others from Starbucks stirring sticks—to ensure they understood it themselves. The firm also consulted with Seattle-based structural engineering firm Magnusson Klemencic Associates.

They ultimately realized that, while the details themselves might be familiar, the number of unique angles could be overwhelming for local builder Brown Construction. "It's not going to be a six-page IKEA instruction manual [that the design team would be creating]," van Eyck remembers thinking, "but more like a 200-page IKEA instruction manual."

And yet construction went smoothly. Wood Tech Services in Eugene, Ore., fabricated the glulam members, made of Douglas fir and larch woods, and Brown Construction erected the Barn between April 2015 and June 2016. Because the skin plays a structural role, van Eyck says, "there were temporary supports underneath until the very last shingle was up."

It's no secret that the Barn was meant to improve public perception of the neighborhood while also creating a revenue stream for Fulcrum. "But it really worked," van Eyck says. "Man, it worked! The effect was much stronger than I ever could have imagined."

Even so, Jaycox adds, the Barn represents much more than an aesthetic object. "Though it's sort of satisfying as a sculptural thing, it was never designed just to be something you look at," he says. "It was designed to be something you experience."

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“Yet his architecture practice is not a sideshow, something separate and discrete; it is, in fact, central to the kind of change he’s trying to create.”

The Political Activism of Henry Muñoz by Ian Volner

"I'm not an architect," says Henry Muñoz III, "but I think I am an architect of change." This is no modest claim, but then Muñoz, the 58-year-old principal and CEO of the architecture firm Muñoz & Co., is not given to understatement.

On a hot day in his hometown of San Antonio, Muñoz, wearing his signature reflector shades and a floral shirt, his hair lifted into a slight wave, is touring his studio's latest project, a rehabilitation of the long-derelict San Pedro Creek. The initial phase opened in May, and already the new public space has had a significant impact, at least on one segment of the population. "The birds," Muñoz says, pointing to a jet-black grackle lifting into flight. "They came back almost immediately."

The now-complete half-mile segment of the waterway, renamed the San Pedro Creek Culture Park, is the first component of an anticipated three-part project; the next phase has already broken ground with completion expected in 2020. Muñoz's firm has attempted to liberate the waterway from the concrete culvert to which it had been confined for most of the last century, adding lush wetland foliage to its margins and turning it into a less formal, more contemporary counterpart to the San Antonio Riverwalk nearby. Situated not far from where Spanish missionaries first founded the town in 1718, the park has an even more significant location within the city today. "This is really the connective tissue between the Mexican-American west side and downtown," says Muñoz: The project will help weave the Latino neighborhood back into the city as a whole, a crucial objective for Muñoz and his studio.

The San Pedro Creek Culture Park in San Antonio

Both are unusual hybrids. The firm was founded in 1927 as Eickenroht & Cocke; by the time Muñoz joined it in 1983, the studio, then operating as Jones & Kell, had risen to become a regional powerhouse. Today, its portfolio includes large-scale public works scattered all across Texas, with a strong track record of educational projects, public parks, and cultural facilities, all made possible by its staff of 43 who range from interiors specialists to city planners. As for Muñoz, he has no formal training, is not licensed, and came to the firm primarily in order to help its then-exclusively Anglo staff forge connections within the Latino community. "When I first started to work on this," says Muñoz, "I didn't really understand what I was doing."

Twenty-five years later, he provides input on nearly every design while also bringing in new work. Yet his professional profile remains, to say the least, a singular one. This is because, since 2013, Muñoz has been the national finance chairman of the Democratic National Committee. His name appears on countless fundraising invitations and mailers soliciting contributions; his 2017 wedding to partner Kyle Ferrari was officiated by former Vice President Joe Biden. Since assuming the post, his work as an advocate has only intensified: He sits on numerous boards and councils (for the National Parks Foundation and the Cooper Hewitt National Designs Museum, among others), and in any given hour may field a half-dozen phone calls from the likes of DNC Chairman Tom Perez and actress Eva Longoria. "I just think this is a time of activism," Muñoz says. Yet his architecture practice is not a sideshow, something separate and discrete; it is, in fact, central to the kind of change he's trying to create. This unlikely pairing is not without its challenges (and its contradictions). But it does make Muñoz's firm a fascinating case study in the architecture of engagement.

Architecture for the Marginalized

Muñoz's motives are a product of both nature and nurture. "The Fox," as Muñoz's father was known in political circles, was a major figure in civil-rights and

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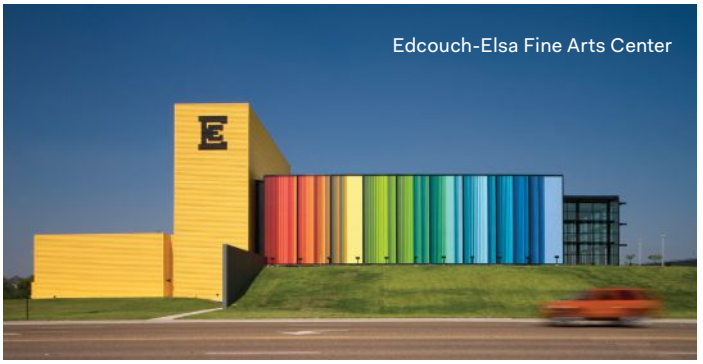
labor struggles in the state for decades. Upstairs in the younger Muñoz's home, an aging picket sign testifies to his father's influence: The son, then 35, held the sign aloft during a protest—organized by the Fox—that demanded an increase in the local minimum wage. Having such a driven figure as a father did have its drawbacks. From an early age, Muñoz exhibited an artistic streak; his sister, Emily Bueche, recounts how the Fox reproached the boy for "always wanting to do everything," volunteering for every extracurricular activity rather than focusing his efforts. Undeterred, Muñoz never relinquished this diffuse intensity, becoming an avid collector of art and design (with a special focus on the work of emerging Latino artists) even as he pursued his double-pronged professional life.

Muñoz first broke onto the political stage in 1992 with a three-year term on the Texas Transportation Commission under then-governor Ann Richards. Among his proudest accomplishments: a vast expansion of the state's highway network in the underserved Latino-majority cities of South Texas. In the McAllen area, only a few miles from the border, Muñoz helped oversee the construction of a massive new freeway corridor spurring what has become a huge influx in commercial and residential development. "That was really the beginning," says Muñoz, the first time he understood how the built environment could bring change to marginalized communities.

In the years since Muñoz returned to the private sector, his firm (first as Kell Muñoz Wigodsky, then in its current incarnation since 2013) has developed a portfolio of projects aimed at the underserved in Texas, especially the Latino population. Taking a page from prominent San Antonio artist and Chicano theorist Tomas Ybarra-Frausto—a close personal friend whose ideas, Muñoz says, "inform everything we do"—Muñoz coined the term "Mestizo Regionalism" to describe his approach. It's less a stylistic genre than an abstract sensibility, one that aims to infuse every project with the richness and energy of America's borderlands. As Muñoz puts it, Mestizo Regionalism entails "an expanded view of context as including culture—not merely buildings but the people." In Texas, where Mexicans and Anglos (as well as African-Americans, Germans, and the French) have mingled for generations, communities are often no less diverse than their architecture, and all of Muñoz & Co.'s projects aim to expand the space of exchange and encounter.

Mestizo Regionalism can take a variety of forms. The firm regularly samples the palette and formal details commonly associated with the art and design of the Southwest: the 2007 Edcouch-Elsa Fine Arts Center in Hidalgo County, Texas, is faced in vibrant swatches of primary colors that recall the decorative traditions of Texas' Mexican-American community, where storefronts are routinely enlivened with brightly painted murals and eye-popping signage. Likewise, the 2007 Museo Alameda in San Antonio (a museum of Latino culture, initially a Smithsonian outpost that is now occupied by Texas A&M University), which features a steel exoskeleton clad in a decorative metal lattice—a clear nod to the ornate grillwork that decorates older houses throughout Latin America. In other instances, the relationship to the local social and historical currents is a little less overt, as with Los Tomates, a border-crossing facility near Brownsville, Texas, that boasts a large trellis on the southern side. While providing shade to visitors, it also hearkens back to the tomato farm that once occupied the site. "A lot of this is storytelling," says Muñoz, himself a polished raconteur who ensures that narratives like these are always embedded in the office's work.



Edcouch-Elsa Fine Arts Center

CHRIS COOPER

The Evolution of Mestizo Regionalism

The firm's most recent projects demonstrate how that approach, not to mention the interplay between the detail-oriented staff of designers and their big-picture principal, has evolved. "Henry lets us take care of the way the building works, but there's always these underlying ideas of his that carry through," says Rene Lemos, ASSOC. AIA.

Lemos joined the firm in 2008 and was on the team responsible for one of its latest undertakings, the Billy Earl Dade Middle School (BEDMS) in Dallas. Accommodating more than a thousand students in a facility of 213,000 square feet, the building is a long, oblong block in plan, with a glass-encased library to the east and a brick volume housing an auditorium and gymnasium to the west. Between the two, classrooms occupy the slender length of the structure with protruding oriel windows. The design has been such a hit, Lemos says, that "the only problem is everybody wants to use it,"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Billy Earl Dade Middle School in Dallas

with locals seeking to book the building for community events.

While the technical requirements of the project required the design expertise of trained practitioners like Lemos, its cultural character—the values it sought to communicate—were very much within Muñoz's bailiwick. He led an in-depth dialogue with the school's predominantly African-American families in an effort bring their collective experience to bear on the design. After recognizing the important legacy of the school's namesake, a prominent local educator, he worked with firm interiors specialist Joaquin Abrego to make the building a testament to Dade's life and ideals. Together, they added artistic features that include a giant portrait of the educator, situated in the main entryway and composed of hundreds of quotes from its subject rendered in shades of black and white, as well as an elaborate sequence of discarded doors (most of them from demolished buildings in the area) covering the entryway walls, recalling Dade's statement that "education is the door to opportunity."

A similar artistic and cultural strategy has come to characterize the office's nearly two-decade relationship with the University of Texas Rio Grande Valley (UTRGV). The university's campus in Edinburg, Texas, was originally designed by Houston-based architect Kenneth Bentsen as a series of courtyards surrounded by Louis Kahn–inspired monumental pavilions, their façades given a slight Southwest flavor with Mission style arches. Muñoz & Co. has designed a series of new buildings for the school, starting with the Engineering Building; their latest project, a new Science Building, opened over the summer. "It's a

The Science Building at UTRGV

TOP: CHRIS COOPER; BOTTOM: DROR BALDINGER, FAIA

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Master plan for the border city of Brownsville, Texas

COURTESY MUÑOZ & CO.

good relationship," says Geoffrey Edwards, AIA, the firm principal who oversaw the project, "and it's allowed us to color outside the lines so long as we respect the overall architecture [of the campus]." The new building, a stout brick volume like its neighbors, harbors a surprise on its courtyard-facing side, with a blue brise-soleil of ribbed vertical strips and round dimple-like recesses.

Perhaps the firm's most significant project at the campus is the 2005 Education Complex, a three-story building near the campus's northeast perimeter that also a packs a few symbolic punches into its modest frame. Greeting visitors on the northern front is an elaborate entryway of decorative metalwork, "an abstracted concept of barbed wire," Muñoz explains. Inspired by the work of a local artist, the door is a satirical take on the defensive infrastructure of the U.S.-Mexico border, here transformed into a symbol of welcome. Inside, the central elevator shaft features a series of *dichos*—traditional Mexican proverbs—etched into the glass, in both English and Spanish; as the elevator ascends, the two languages become increasingly intermingled, mirroring the linguistic cross-pollination common to the region.

Back in San Antonio, the office is now ready to embark on a restoration that's been a pet project of Muñoz's for years—the transformation of the long-empty Alameda Theater, a stunning 1940s Art Deco/Moderne structure that was once a hot spot for Spanish-language cinema, into the new headquarters of Texas Public Radio (one of Muñoz's favorite causes). The firm will also be breaking ground next spring on San Antonio's new federal building, a sprawling $117 million complex which Muñoz is determined to equip with a little artistic embellishment. Emerging from a meeting with his government clients, Muñoz seemed optimistic that his view would prevail, despite official resistance. "They were worrying about the budget," he said. "But it's going to happen."

Marrying Architecture and Activism

Muñoz often expresses frustration at the current political landscape. "Some people will tell you there's not enough opportunity in this country for all of us," he says, a reactionary point of view he's determined to combat. In 2017, under his leadership, the DNC succeeded in raising nearly $66 million, the largest haul in any off-cycle election in almost a decade, most of it from grassroots donors making small contributions. In the midterms, much to Muñoz's delight, the blue wave also turned out to be something of a Latino wave: According to early voting data, Latino participation was up 174 percent compared with 2014.

Marrying architecture with activism hasn't always made for an easy relationship, however. In the case of the Museo Alameda, Muñoz devoted considerable networking and fundraising energies before landing the commission, only to have the project lose its Smithsonian affiliation in 2012 due to financing shortfalls—a failure that many in San Antonio blamed on Muñoz himself. His tenure at the state Department of Transportation also attracted criticism for his lack of fiscal discipline, and in the world of Texas public works he is known as a hyper-competitive job-getter,

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Henry Muñoz

with a tenacity and wiliness that more than live up to his father's nickname.

Of course, that tenacity and ambition often serve him well. In Brownsville, a border city where the U.S.-Mexico barrier fence cuts straight through the heart of downtown, the studio has been at work for years on a master plan that aims to turn a neglected segment of the Rio Grande riverbank into a vibrant mixed-use district. "We went a little bit over the top," jokes Steve Tillotson, FAIA, who led the project. Envisioning a grand esplanade that would incorporate both the border fence and the river levee, the team proposed a dense cluster of buildings recalling a supersized Southwest adobe city, looming romantically over the riverside. As far-fetched as the proposal seemed, the rudiments of the plan are actually moving forward, with a $250 million first phase underway now.

On the afternoon that Muñoz toured San Pedro Creek Culture Park, he strolled past new signage that explained the history of the site and its restored natural life, as well as a waterfall featuring a perforated steel panel, with star-like LEDs glowing in the exact pattern of the night sky on the date of San Antonio's founding. Huge murals, recalling the work of Diego Rivera, covered segments of the retaining walls, recounting the story of the city's settlement and its struggles and triumphs through the centuries. Looking at the images, Muñoz saw a reflection of his own, decidedly optimistic, outlook.

"It's all about movements of people," said Muñoz, looking at the artwork. "And movements need architecture."

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“To all these rejections,
I have a response ready:
‘Do you think Zaha
Hadid ever thought
it was the right time?’”

Lifting the Veil on Succession by Eva Hagberg Fisher

At first I think it must be me. Maybe my interview requests aren't getting through, or if they are, they're too forward, or too personal, or too impersonal, or too acontextual. A friend offers to get me in touch with his friend, a MacArthur prize–winning architect, and I send him a draft of my request. I think things will go better if my email is lyrical and loose. It doesn't; he asks me to formalize my inquiry, says this isn't going to get past the architect's marketing guy. So I rewrite the request, try to remind whomever's going to be reading it of my credentials, personal and professional. I don't get a response. I ask my friend if he's heard anything, and after a few weeks he hasn't, so I email the press office myself, and receive a very kind—though very firm—rejection. I try my old contacts. Rejection. I try a beloved architect/interior designer, part of a four-person New York City–based firm with its hands in pretty much everything: restaurants, bars, ranches in the Napa Valley, fashion. I ask her for comment, and she says something like, *It's so nice to hear from you but it's just not the right time*.

I try the friend of a consulting client of mine, a Mexico City–based architect who spent a week in Vermont with my client, leading a sort of advanced class for midcareer students, and I hope that my connection to our mutual friend might get me in the door. I get no response. I ask two publicists I've worked with since my very first byline, 15 years ago, to ask their clients, in particular a husband-and-wife team who recently finished a massive public project in Long Island City and who I know will recognize me, who I believe harbor enough goodwill towards me that they'll respond, and a few days later I get an apologetic email response, on their behalf, that it's not quite the right time.

I email another architect who I totally bonded with during a friendly dinner at a magazine event in San Francisco, someone who's on the faculty at my current educational institution, where I've got nine-tenths of a Ph.D., something that I also hope will give me and my project legitimacy. No response. Still, I don't give up. I email the assistant of a famed British architect, who I wrote about for an internationally respected design magazine, and ask if perhaps his boss might be interested in speaking with me again. I hear back the morning I'm filing this story, with a very gentle no thanks, "given the sensitive nature of the subject."

To all these rejections, I have a response ready, but I never use it. The response I would use, if I were a different person, a more aggressive person, would be something like, "Do you think Zaha Hadid ever thought it was the right time?"

What I'm asking everyone to talk about is their deaths, even if they may seem far away, even if they may come with sufficient warning. In other words, I'm thinking of the opposite of how Hadid died: suddenly, unexpectedly, at the height of her career. I still get press releases from Zaha Hadid Architects; the firm announced shortly after her death that they'd keep going. Patrik Schumacher, her former second-in-command and now the sole partner, says there was a succession plan in place. But who's really running things behind the scenes? At what point is the work no longer Hadid's, the firm no longer an embodiment of her worldview? Schumacher has a history of writing extraordinarily contentious articles, saying extraordinarily insensitive things. As I was putting this story to bed, he filed an application to the high Court in London to remove the three other appointed executors named in Hadid's will, essentially leaving him in charge of what is reported to be a nearly $90 million estate. Is this what Hadid would have wanted?

And so I press on. I ask my editor if it's OK to interview some of my behind-the-scenes consulting clients. He agrees, as long as there's full disclosure. I think, finally, I'll get someone on the record. But when I ask my contacts to participate, they laugh nervously, and then they say, "Tell me what everyone else says," and then when I tell them that so far no one else has said anything, they say, "Hmm, well, keep me posted—but it's just not the right time." I want to scream at them. I want to ask them why they think they can decide what the right time is. As I said to a border agent when I crossed into Canada to care for a sick parent earlier this year: "Death comes for us all."

Mortal Ambiguity

There seem to be three main ways that things can go when a prominent architect dies. The practice can fold almost immediately after their death, unable to live beyond the founder's demise, as was the case with Louis Kahn. Or the practice can morph into something different, as with Hadid, where we're mostly left wondering how long the office can ride on its reputation. Or as with Charles Gwathmey, who died in 2009 and whose firm, Gwathmey Siegel, lives on—but not without the widespread belief that this isn't really how Charlie would have wanted things.

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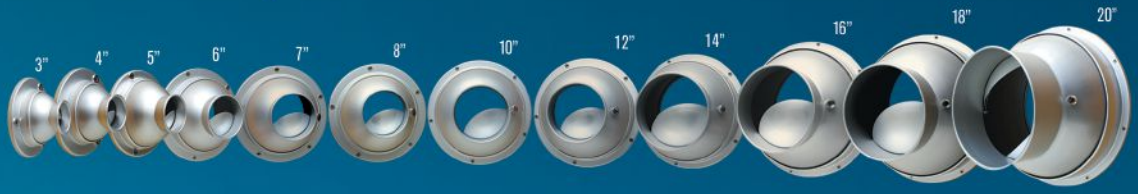

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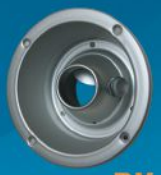

Model: **PK-A**
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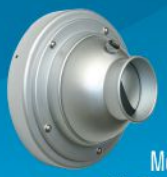

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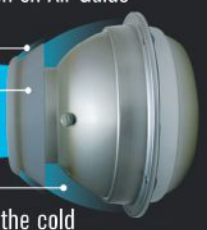

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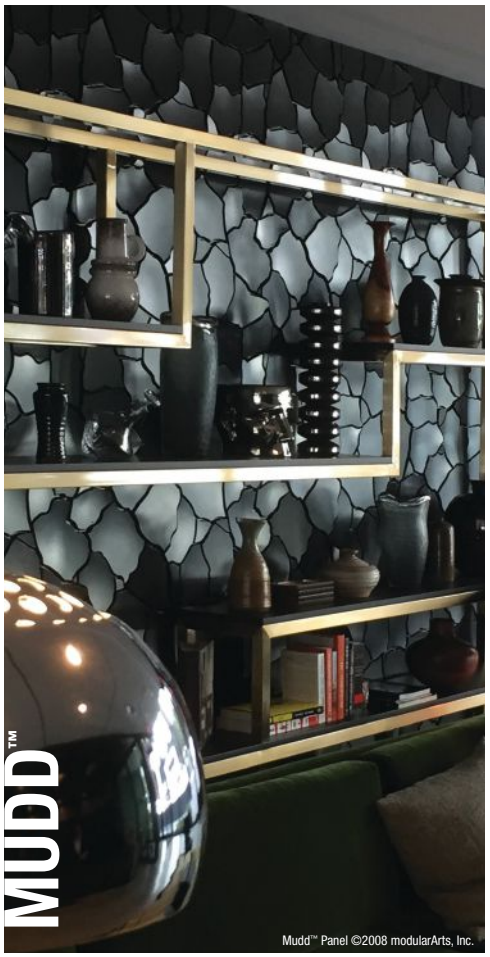

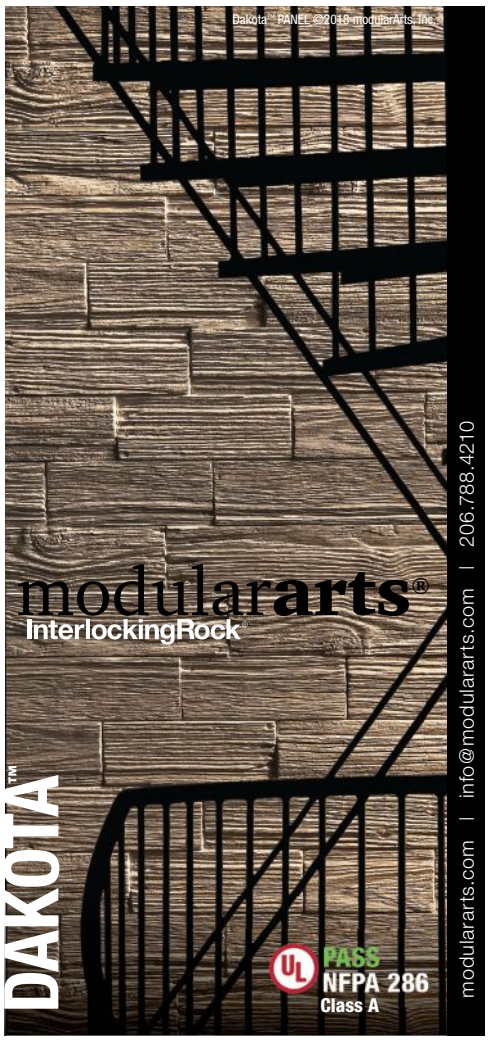

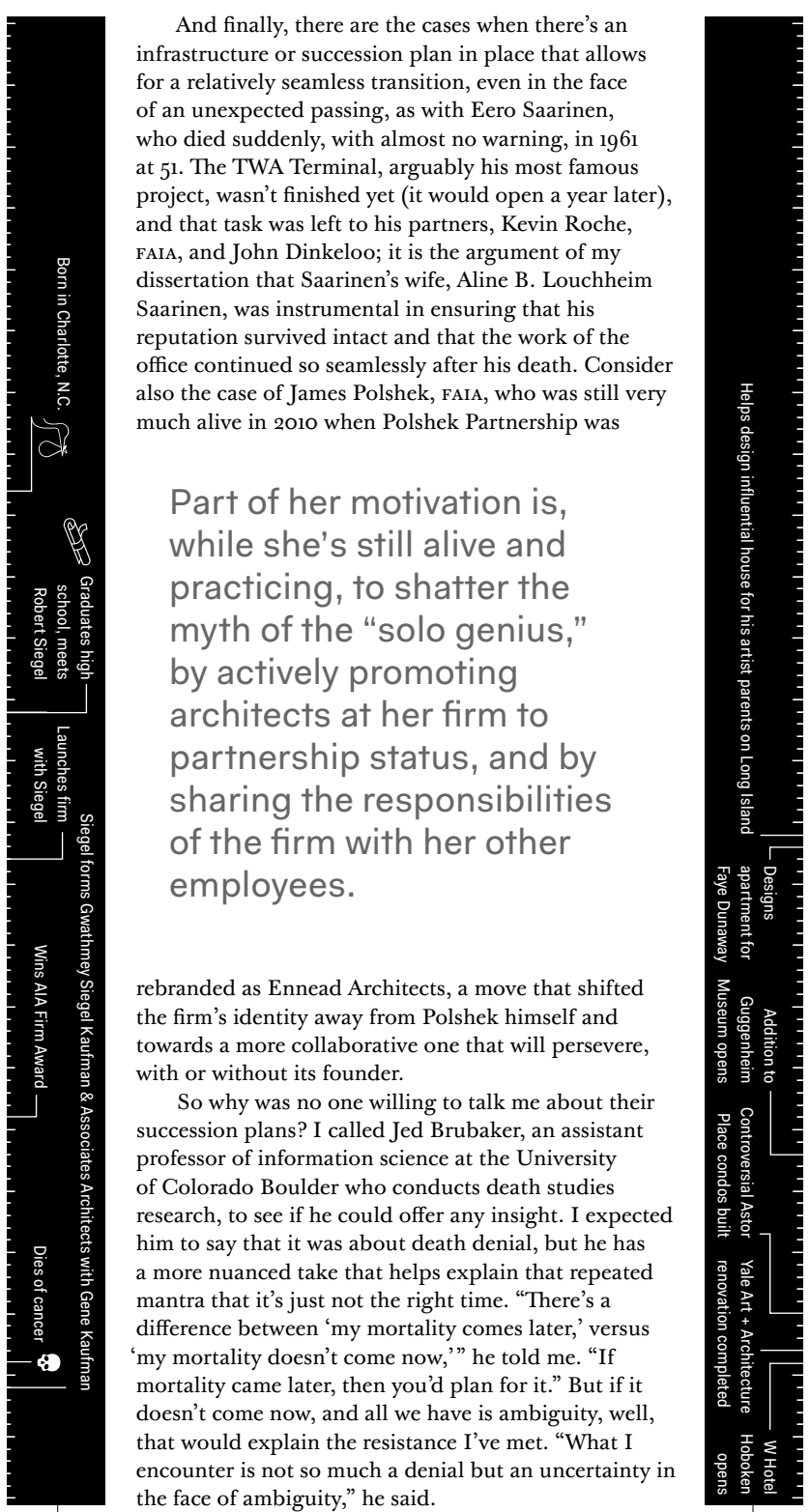

And finally, there are the cases when there's an infrastructure or succession plan in place that allows for a relatively seamless transition, even in the face of an unexpected passing, as with Eero Saarinen, who died suddenly, with almost no warning, in 1961 at 51. The TWA Terminal, arguably his most famous project, wasn't finished yet (it would open a year later), and that task was left to his partners, Kevin Roche, FAIA, and John Dinkeloo; it is the argument of my dissertation that Saarinen's wife, Aline B. Louchheim Saarinen, was instrumental in ensuring that his reputation survived intact and that the work of the office continued so seamlessly after his death. Consider also the case of James Polshek, FAIA, who was still very much alive in 2010 when Polshek Partnership was rebranded as Ennead Architects, a move that shifted the firm's identity away from Polshek himself and towards a more collaborative one that will persevere, with or without its founder.

> Part of her motivation is, while she's still alive and practicing, to shatter the myth of the "solo genius," by actively promoting architects at her firm to partnership status, and by sharing the responsibilities of the firm with her other employees.

So why was no one willing to talk me about their succession plans? I called Jed Brubaker, an assistant professor of information science at the University of Colorado Boulder who conducts death studies research, to see if he could offer any insight. I expected him to say that it was about death denial, but he has a more nuanced take that helps explain that repeated mantra that it's just not the right time. "There's a difference between 'my mortality comes later,' versus 'my mortality doesn't come now,'" he told me. "If mortality came later, then you'd plan for it." But if it doesn't come now, and all we have is ambiguity, well, that would explain the resistance I've met. "What I encounter is not so much a denial but an uncertainty in the face of ambiguity," he said.

CHARLES GWATHMEY

He's quick to clarify that he hasn't studied my particular question—why professionals might be unwilling to discuss their impending deaths and what their firms should do after they die—and that he's just offering a hypothesis. "It's not a fear of dying," he said. "I see people as uncertain about how to make choices."

He tracks the cultural approach to death in the Western world through three stages: a family approach, common in the Victorian era, where the bodies of the deceased were visited before being buried; the medicalized approach, common in the first two-thirds of the 20th century, where people often died alone, in hospital rooms; and the current approach, where "people are living in the presence of death" thanks to diseases like cancer and AIDS, which can create a seemingly endless in-between stage. My friend who has cancer calls it "the gray area." I call it life.

Which brings me to the reason why I wanted to do this story. It's not because of a particular devotion to Hadid's memory, or a worry that what will happen to Gwathmey will happen to my practicing friends. When I was 30, a cyst in my brain ruptured, hemorrhaging blood and protein and disturbing the hypothalamic-pituitary axis. My doctors were concerned the cyst was a malignant tumor. I had an operation to rule that out, and I almost died because of a complication. Eight months after that, I had heart surgery for a congenital—and potentially fatal—condition. A few years after that, I got incredibly and mysteriously sick. I remain a well-scanned, extremely medically supervised person. If an MRI suddenly revealed something life-threatening, I would be sad, but I wouldn't be surprised. Ever since my brain hemorrhage, I've felt like I've been a little closer to the thin veil. I live in the presence of death, and I don't want to live here alone.

Shattering the Myth of the Solo Genius

Daniel Libeskind, FAIA, and Deborah Berke, FAIA, seem to share my openness. They are the only two architects I contacted who agreed to speak on the record for this story, and both are starting to put succession plans in place. I asked Berke why she was willing to ponder the end of her own career so calmly and forthrightly. Part of her motivation came from observing what happened to the firms of a few architects she knew well and respected, and who died without a plan. Part of her motivation is personal: Her husband, a surgeon, has been retaking his board certification every few years. The most recent test, he realized, would be his last one; soon, he will be considered too old to perform complex surgeries. And while design clients might be more enthusiastic about having a 95-year-old architect than a 95-year-old surgeon, his own calm acceptance

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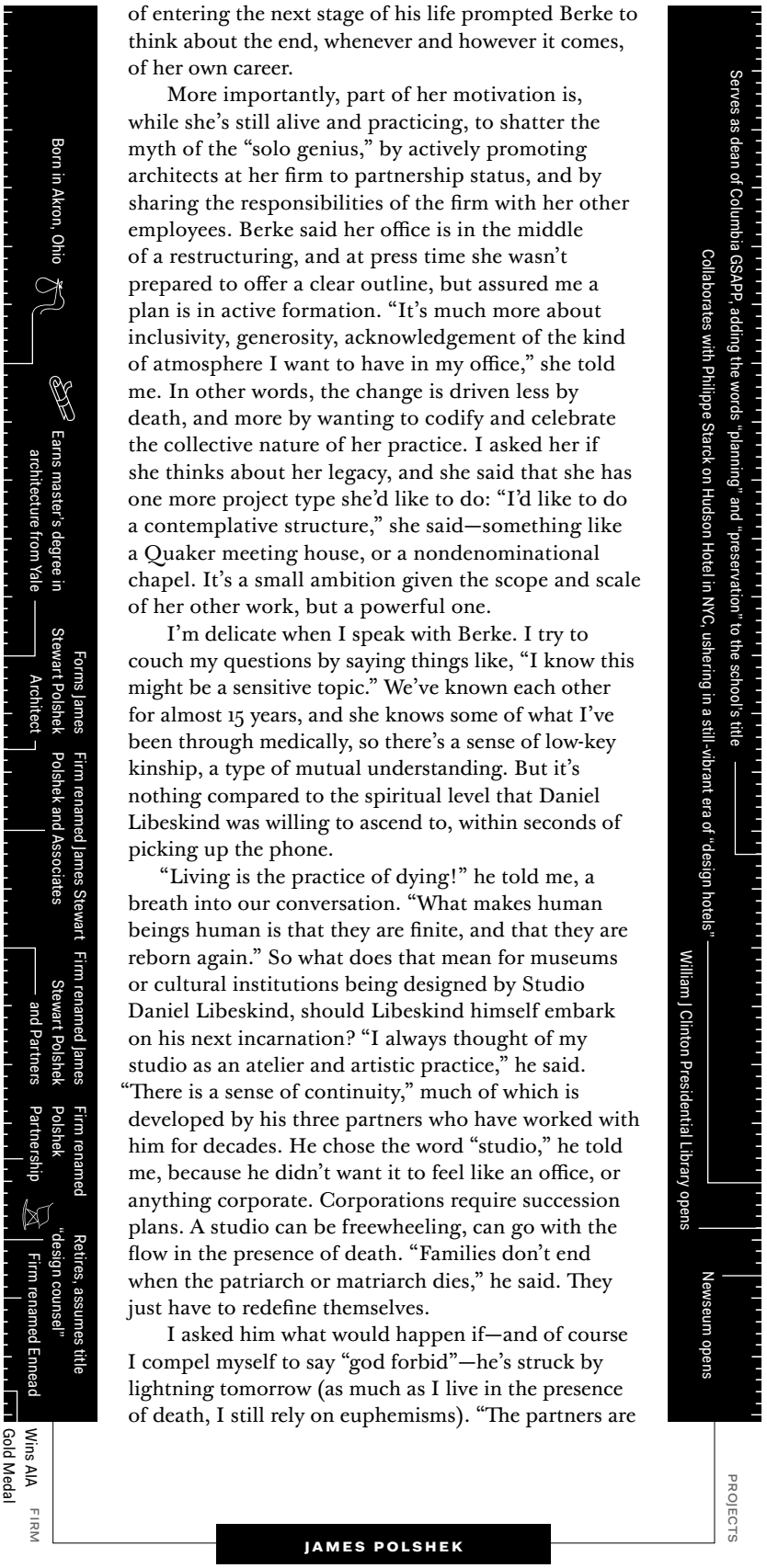
of entering the next stage of his life prompted Berke to think about the end, whenever and however it comes, of her own career.

More importantly, part of her motivation is, while she's still alive and practicing, to shatter the myth of the "solo genius," by actively promoting architects at her firm to partnership status, and by sharing the responsibilities of the firm with her other employees. Berke said her office is in the middle of a restructuring, and at press time she wasn't prepared to offer a clear outline, but assured me a plan is in active formation. "It's much more about inclusivity, generosity, acknowledgement of the kind of atmosphere I want to have in my office," she told me. In other words, the change is driven less by death, and more by wanting to codify and celebrate the collective nature of her practice. I asked her if she thinks about her legacy, and she said that she has one more project type she'd like to do: "I'd like to do a contemplative structure," she said—something like a Quaker meeting house, or a nondenominational chapel. It's a small ambition given the scope and scale of her other work, but a powerful one.

I'm delicate when I speak with Berke. I try to couch my questions by saying things like, "I know this might be a sensitive topic." We've known each other for almost 15 years, and she knows some of what I've been through medically, so there's a sense of low-key kinship, a type of mutual understanding. But it's nothing compared to the spiritual level that Daniel Libeskind was willing to ascend to, within seconds of picking up the phone.

"Living is the practice of dying!" he told me, a breath into our conversation. "What makes human beings human is that they are finite, and that they are reborn again." So what does that mean for museums or cultural institutions being designed by Studio Daniel Libeskind, should Libeskind himself embark on his next incarnation? "I always thought of my studio as an atelier and artistic practice," he said. "There is a sense of continuity," much of which is developed by his three partners who have worked with him for decades. He chose the word "studio," he told me, because he didn't want it to feel like an office, or anything corporate. Corporations require succession plans. A studio can be freewheeling, can go with the flow in the presence of death. "Families don't end when the patriarch or matriarch dies," he said. They just have to redefine themselves.

I asked him what would happen if—and of course I compel myself to say "god forbid"—he's struck by lightning tomorrow (as much as I live in the presence of death, I still rely on euphemisms). "The partners are



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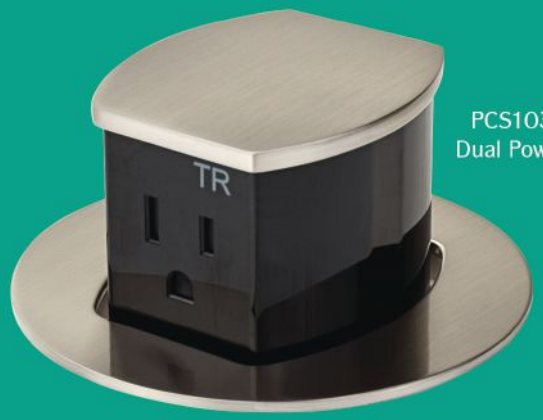

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a sort of trinity," he said. And it's that trinity that gives him confidence that the studio would carry on—that it isn't up to just one person to, essentially, replace him. He didn't get into the specifics, but it seems clear he trusts them to make the kinds of decisions that would reflect his ethos. I asked if he worries about death, or what might happen to the studio. "Death is not just something negative," he replied. "There's an excitement about it." He has a hybrid view, he said: "A fear of life and a fear of death."

I thank him for participating so openly. "I think people who don't think about it, who just fly by expediently, you can see that in the work," he said. "If you don't think of yourself that you're moving towards death then you're moving nowhere." Of course, on the one hand, he would be arguing for a death-sensitive and death-embracing approach, given that it's his. I recall in architecture school marveling at the idea that designers were being given a responsibility to produce forms and space that would last far beyond their own lifetimes. It was an imagined responsibility that often produced—at least for me—a certain paralysis, that made me design projects where everything changed, all the time. Why this wall and not another? Why this site and not the other? How could I choose a material in the face of the eternal?

So I became a writer, which is even more ephemeral. This article will be on desks or coffee tables for a month, and then ... gone. A version of it will die. And then, so will I. So will everyone I tried to talk to, and everyone I did talk to. Will their silence have kept them safe? Or will their openness? Maybe we're all too focused on legacy—at least some of us anyway. What if we realized that we're all in this together, and we're all headed to the same place, and legacy won't matter there? All we have is this moment, and in this moment we can care for our colleagues and let them know we're thinking about what will happen to them after we're gone. And maybe it's the right time for that.

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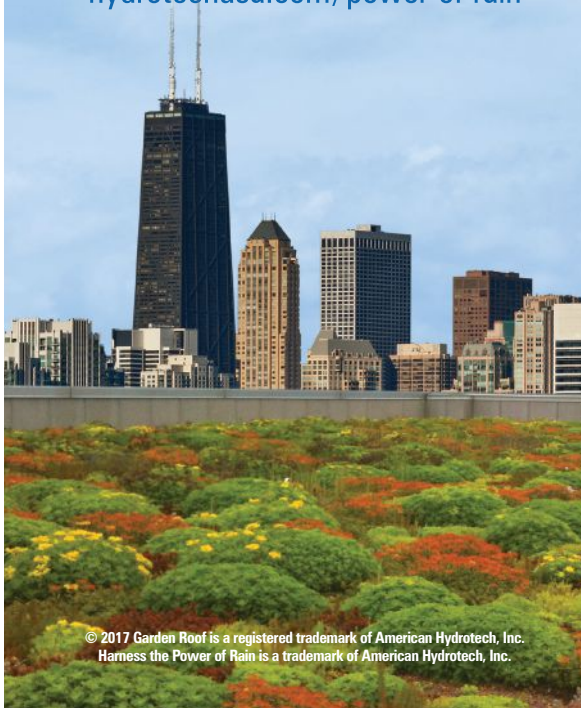

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Residential Architect Design Awards

JURY

Stella Betts, ASSOC. AIA, partner, LevenBetts
Dirk Denison, FAIA, founder, Dirk Denison Architects
Rosalyne Shieh, AIA, principal, Schaum/Shieh

SCOTT FRANCES/OTTO

EDITED BY KATIE GERFEN
PROJECT DESCRIPTIONS BY EDWARD KEEGAN, AIA,
AND CLAY RISEN

Each year, the Residential Architect Design Awards celebrates the best in housing design. But this year's jury, which included Stella Betts, Dirk Denison, and Rosalyne Shieh, evaluated the nearly 600 entries with an eye not to where we have been, but rather where we should be going. The 20 winners that you will see in the following pages reflect the jury's emphasis on doing more with less (be it space or resources), focus on sustainability (by reusing existing building stock or pursuing new technologies), and resolve that everyone deserves thoughtful, elegant, and well-designed housing (whatever their economic status). Whether it's a micro-unit that can grow vegetables for its residents, a rethinking of the Los Angeles ranch house, or the transformation of a local eyesore into a luminous destination, these winners show that architects can innovate to make better housing for a new era of living.

Shelter Island House **Shelter Island, N.Y.** **Christoff:Finio Architecture** Custom Home / Less Than 3,000 Square Feet

AWARD New York–based Christoff:Finio Architecture designed this house to accommodate a young family on Shelter Island, N.Y., off the east end of Long Island. The designers chose to break up the program for the 2,864-square-foot residence into ← ← three discrete rectangular volumes. These wood-clad forms are set in what the designer's call a "loose, seemingly casual relationship" to one another, and tied together by inflected roof and floor planes. The covered outdoor spaces that result increase the apparent size of the house while flowing seamlessly with the interior. ¶ The length of the house roughly follows the eastern edge of the property, helping to shield the site from adjacent residential development. This position allows the living spaces to open to the bulk of the property—an open field enclosed by woods on the west side. The public areas are in the central volume, with three bedrooms to the north, and a pool house/guest room to the south. The three volumes and open-air circulation spaces enclose a small planted courtyard. ¶ Inspired by the nearby tree line, the architects rendered the house entirely in wood: exposed Douglas fir framing provides the structure, shiplap Western red cedar clads the exterior, oak floors run throughout the primary interior spaces, and ipe decking lines the exterior patios. All the wood is untreated to compel its uneven weathering, which will provide an ever-changing patina over time. A preview of the eventual effect is provided by the interior cladding in the kitchen and laundry rooms, which was salvaged from a shed demolished on the site. The Shelter Island House might better be dubbed the Wood House for its evocative exploration of the material within a simultaneously rigorous, yet informal, framework. —E.K.

"There's a solidity and a porosity that is carried through the project not only in the way the spaces are used, but also in terms of the materials and the atmosphere. There are inversions that are happening all the time." —Rosalyne Shieh

Mariposa1038 **Los Angeles** **Lorcan O'Herlihy Architects** Multifamily Housing AWARD

Mariposa is Spanish for "butterfly," which is a good name for this surprisingly curvy apartment complex designed by Lorcan O'Herlihy Architects (LOHA), for a site in the Koreatown neighborhood south of downtown Los Angeles. It's one of the densest residential areas in the ← country and desperately in need of affordable housing. But that need also presents a conundrum: How do you maximize residential space without crowding out public space? ¶ LOHA's solution is decidedly straightforward, yet elegant. The 32-unit, 68,000-square-foot building is square in parti, but LOHA bowed the four façades inward to create a buffer space between the exterior and the apartment block itself. On the ground floor, the space in front of the street-facing elevation is filled in with concrete planters; up above, folded-metal hoods extrude from the façades, framing windows and balconies. ¶ The façades are covered in white stucco, but the metal hoods alternate in color between black and white, giving the building a depth and character that changes as the sun and shadows move during the day. The effect is a bold edifice that gives back to the public sphere. ¶ Inside, the subtle curves of the exterior are echoed in a central, oblong courtyard, whose sinuous form outlines the procession of breezeways and stairs leading four flights up to the roof, where LOHA installed garden planters and outdoor seating to take advantage of the stunning views north toward the downtown Los Angeles skyline. At ground level, the courtyard features a large planter that acts as a rainwater catchment and is bounded by built-in wooden benches. In a challenging brief, LOHA created a building that plays a dual role, improving the public, street-level experience in a dense neighborhood while creating a sense of private serenity for residents. —C.R.

"I think it's fun, it's modest, and it's a very Los Angeles vernacular. I also think the landscape on the roof looks great embedded in the project." —Dirk Denison

East Lawrence Sustainable House **Lawrence, Kan.** **Studio 804** Custom Home / Less Than 3,000 Square Feet

AWARD The East Lawrence Sustainable House pairs a 1,500-square-foot three-bedroom structure with a 500-square-foot accessory unit. Located on the site of a former scrapyard in East Lawrence, Kan., the double lot is at the east end of a → nine-parcel subdivision where it takes advantage of a forested edge to the east and an 400-year-old bur oak tree on the property. ¶ Designed by Dan Rockwell and the University of Kansas' design/build program Studio 804, the 12-foot-tall pavilions are positioned a few feet above grade to protect them from the surrounding flood plain. With their cantilevered edges, the simple rectangular volumes seem to float above the midwestern landscape. Both structures are 21 feet wide, with the main house 73 feet long and its sibling forming a perfect square. Glass is used on all the façades, with an opaque interior surface shielding the more private areas within the house. Living spaces face west, with views of the adjacent Brook Creek Park and the ancient bur oak. ¶ Finishes are restrained and minimal. Concrete floors offer easy-to-maintain surfaces while providing thermal mass for heating the home. Floor-to-ceiling window coverings, lighting, and thermostat are controlled via smart home technology. Rooftop solar panels provide much of the house's energy needs, while the extensive use of repurposed materials—a hallmark of Studio 804's approach—help the home to achieve LEED Platinum. ¶ The adaptable nature of the house is exemplified by the accessory structure, which can be utilized in a variety of ways—as a guest house, studio, or office. The property line along the north and west is defined by a low wall formed by welded metal grating filled with recycled crushed concrete. The driveway is similarly composed of crushed concrete to provide a permeable surface for drainage. Despite the site's recent industrial use, it is within easy walking distance of downtown. —E.K.

"The whole project is consistent, and the modesty of space—the idea that this is what you need to live—is worth looking at. The LEED Platinum rating in an all-glass house shows that it's doing a number of things well." —Dirk Denison

> *To see more pictures of the winning projects, visit bit.ly/2018RADA.*

COREY GAFFER

Midcentury Modern Revived **Quogue, N.Y.** **Austin Patterson Disston Architects** Restoration/Preservation

HONORABLE MENTION Charged with saving an early 1960s Abraham Geller–designed house atop a sand dune in Quogue, N.Y., Southport, Conn.–based Austin Patterson Disston Architects had a few things working in its favor: First, the firm's client had purchased the two-story, 3,830-square-foot house from the estate of the original owner, who had made minimal revisions over the previous half-century. Second, the client acquired many of its original furnishings and appointments with the purchase. ¶ Geller worked for a number of early modernists including William Lescaze, Walter Gropius, and Marcel Breuer—with the influence of each appearing in the house. The original design is memorable for its central butterfly roof expressed in a classic midcentury double diamond motif on each end, bracketed by simple boxes clad in diagonal wood siding. A ground-floor cabana (renovated into guest rooms) is built into the sand dune. The residence's primary living spaces—including five bedrooms—are located on the upper level. ¶ Despite the intact condition of the house and its contents, a half-century of wear and tear necessitated considerable renovation and reconstruction. The house needed to be jacked up to make it plumb and level, with shoring and structural reinforcement necessary throughout. The dramatic exterior entry ramp on the front façade was reversed to improve circulation, and minor interior modifications included combining the kitchen and sitting room into a single space facing the water view. ¶ The tall-ceilinged living room with clerestory windows under the butterfly roof retains its original large painting by abstract expressionist Norman Bluhm. Custom-made furniture and lamps, vases, and books were part of the client's purchase, and incorporated into the renovation. Geller's crisp geometric volumes again float above their Long Island landscape, preserving a particular moment of American design exuberance. —E.K.

"I was really taken with the original building and plan, and everything looks very well restored outside and in—even to its detriment at times. It's a wild and very interesting project." —Rosalyne Shieh

Olympia Place **Amherst, Mass.** **Holst Architecture** Student Housing AWARD

Olympia Place is a privately developed student housing project in Amherst, Mass., designed by Portland, Ore.–based Holst Architecture. The 99,426-square-foot complex provides 232 beds in 73 apartments adjacent to the University of Massachusetts, Amherst campus. The plan follows the lines of a traditional New England courtyard dormitory plan, but skews the placement of the outermost arms to match the irregularly shaped property lines and develop more dynamic outdoor spaces. The two courtyards—one public, one private—provide distinct gathering areas, with the private space stressing quiet through its birch trees and ferns. ¶ The four- and five-story-tall gabled forms also reference the region's traditional academic architecture, but are rendered in sleek contemporary materials: The parallel walls are clad in the same standing-seam metal as the roof, and only the ends of the gables using the more typical brick masonry. The standing-seam ribs and the narrow slot windows on the elevations emphasize the project's overall vertical massing. The simple white and red palette reflects older regional architecture while not precisely mimicking historic forms. ¶ The entry features a double-height common space that offers residents multiple fireplaces, study rooms, breakout areas, a lounge, and a fitness center—all readily accessible from the staffed front desk and offering views to exterior courtyards to the west and east. Most apartments are relatively large—three- and four-bedroom units with access to multiple exposures for natural light and ventilation are the norm. Circulation varies between single- and double-loaded corridors, with many units comprising entire floors of wings. Olympia Place meets LEED for Homes Midrise Gold standards, and its construction and building systems reduce energy consumption by almost 40 percent. —E.K.

"It has a very residential feel, and in the context of Amherst, which is the quintessential college town, the gesture to the gabled roof is clever. I think the plan is exceptional—it looks like it would create a great sense of community." —Dirk Denison

Peabody, Burridge Gardens, St. John's Hill **London** **Hawkins\Brown** Affordable Housing AWARD

Peabody, Burridge Gardens comprises the first phase in the reinvention of the 1930s Peabody St. John's Hill housing estate, in the Battersea area of southwest London. Designed by the Los Angeles– and London-based firm Hawkins\Brown, the initial three structures provide 154 mixed-income units, and the master plan will eventually see 599 units, plus retail and commercial space. ¶ In the past, the development was defined by identical utilitarian apartment blocks enclosed by a surrounding wall. Hawkins\Brown dispenses with the wall and sheathes each new building in its own distinctive architectural identity, with brick of varying hues and textures. Two attached linear structures—of six and seven stories, respectively—abut adjacent rail lines. A pedestrian avenue that will extend through subsequent phases separates them from a six-story structure with a central courtyard. ¶ The architects referenced Edwardian neighbors with similar shades of brick and contrasting window surrounds. Three-story maisonettes at the base of the courtyard block, which face the historic structures, receive a more finely grained, rusticated articulation that implies a shared design vocabulary. Ground-level units have front and rear gardens as well, tying them to the typology of the older townhouses. The architectural language is starker and more modern along the new pedestrian avenue and in the interior courtyards. Communal entrances are easily identifiable via brightly glazed bricks. ¶ The designers collaborated with a sculptor to create distinctive masonry reliefs on the façades that recall the site's history. Fences, railings, and gratings provide a level of ornament not generally associated with social housing. Peabody, Burridge Gardens will continue to grow and evolve as the rest of the master plan gets built out, but its early design success provides a compelling template for a rejuvenated community. —E.K.

"It has to do with the quality—I can imagine someone feeling like they could make a wonderful home there." —Dirk Denison

TOP: TRIA GIOVAN; BOTTOM: CHRISTIAN PHILLIPS

> *To see more pictures of the winning projects, visit bit.ly/2018RADA.*

JACK HOBHOUSE

Before ↑

Before →

TOP: TARA WUJCIK; BOTTOM LEFT: COURTESY BROOKS + SCARPA; BOTTOM RIGHT: BLAIR DOUGLAS

JC BUCK

Courtyards at Rossmore and Weldon **Los Angeles** **Brooks + Scarpa** Outbuilding HONORABLE MENTION

The existing service courts of historic 1920s buildings on Los Angeles' skid row are not where one would expect architectural invention. But Los Angeles–based Brooks + Scarpa have brought just that to three such extraordinarily tight spaces, by rejuvenating the courtyards at the Rossmore Hotel and the Weldon Hotel apartment buildings. ¶ Two courtyards at the Weldon are bounded by the building's five-story mass and adjacent two-story buildings. In both the 8-foot by 60-foot west courtyard and the 21-foot by 16-foot south courtyard, concrete pavers have replaced ordinary cement slabs and ill-conceived round pavers that previously dotted the ground. The perimeters are now lined with white gravel, and the same light-colored palette covers every surface of the renovated space. Poured-in-place concrete seats and tables provide durable and inviting places to sit and linger. Custom-designed white-painted steel pot holders on the white-painted CMU walls hold ordinary clay pots for planting. These pots can be left in the courtyards or taken by the residents to their apartments. ¶ At the Rossmore, Brooks + Scarpa contended with a more generously proportioned service court, with a mature tree at its center. The architects deployed the same concrete pavers, white gravel, and white paint as at the Wheldon, adding a slatted screen and built-in bench to replace the motley fence that had previously enclosed the space. Additional rolling wooden benches can be moved along steel-angle tracks, allowing residents to sit separately or together as they choose. ¶ Prior to Brooks + Scarpa's renovations, these poorly lit courtyards, with their dark-toned materials, held little attraction for the residents. They seemed to function more as dumpsters than as shared amenities. Today, however, they are vibrant tenant social spaces—with architectural creativity on a budget proving the value of design in even the most constricted of locations. —E.K.

"They really made something out of nothing. It's so minimal, but I love it for the spirit of taking a disused alleyway and turning it into something wonderful." —Stella Betts

900 Penn **Denver** **Davis Urban** Renovation / Adaptive Reuse AWARD

For years, 900 Penn, a seven-story apartment in the Governor's Park neighborhood south of downtown Denver, sat neglected and half-occupied. Faced in red brick with a Howard Johnson–esque mansard roof, it was both a local icon and, increasingly, a local eyesore. ¶ Its prospects changed when it was bought by a Denver software entrepreneur, Nadine Lange, who saw an opportunity to build a luxury address in a rapidly gentrifying part of the city. Rather than demolish the tower, she decided to renovate and reconfigure the 24,000-square-foot building, installing a single 3,000-square-foot residence on each floor, plus a ground-floor guest suite. ¶ To spearhead the renovation, she hired Davis Urban, a local firm known for its restrained Modernism. Founded in 2011, the firm and its founding principal, Matt Davis, AIA, have quickly made a name for themselves designing bespoke infill residences around Denver, as well as finding creative ways to repurpose overlooked relics from the city's industrial past for commercial and residential clients. ¶ Davis' solution for 900 Penn was to strip off the brick and pull back the façade to create space for expansive decks—two per floor—and to accommodate floor-to-ceiling sliding windows along much of the exterior. An added roof terrace includes an open fireplace and a trellis-covered dining area. Two service cores—one centered on an elevator shaft and the other around an emergency stair—are clad in gray brick. ¶ The result is a mid-rise tower that bears only the slightest resemblance to its previous self: sleek and simplified where before it was fussy, light and light-filled where it was dark and brooding. In its new form, 900 Penn is still a neighborhood icon, but it is no longer an eyesore. —C.R.

"I was really attracted to the kind of renovation that happened here—it's a phenomenal transformation, and it makes such a powerful case for the possibilities of reusing buildings." —Rosalyne Shieh

Harvey House **Palm Springs, Calif.** **Marmol Radziner** Restoration/Preservation HONORABLE MENTION

The Harvey House was built in 1969 for actor Laurence Harvey by Southern California modernists Buff & Hensman. Los Angeles–based Marmol Radziner was called upon to restore and update the classic 5,500-square-foot midcentury desert house in Palm Springs, Calif., with a brief to add modern conveniences and eliminate formal and visual barriers from the original design. ¶ The house is configured on three sides around an exterior courtyard, with extensive outdoor spaces—it comprises a great room, kitchen, master suite, guest suite, massage room, sauna, outdoor bar area, and pool, with a tennis court adjacent to the complex. Buff & Henson were known for their skillful deployment of exposed post-and-beam construction and the Harvey House was no exception; Marmol Radziner chose to enhance the outline of the frame with new brown-black trim that contrasts with the original white. ¶ Through thoughtful and strategic planning, the architects opened the space, increased glazing, and added skylights to maximize natural light and amplify many of the original designer's formal and spatial concepts. For example, a wall between the original dining room and den was removed to create a new great room along the eastern edge of the courtyard, and the architects fabricated a new metal screen to provide formal separation between the kitchen and dining room, while maintaining a clear visual connection between the two spaces. The architects installed new gleaming white terrazzo flooring that extends throughout interior and exterior space, providing a virtually seamless transition that reflects how the new owners use the home as a weekend destination and winter getaway. —E.K.

"It's really clean California Modernism, and they haven't competed with the original architecture at all—they've let the structure and spaces be the project." —Dirk Denison

ROGER DAVIES

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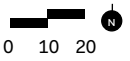
Floor Plan

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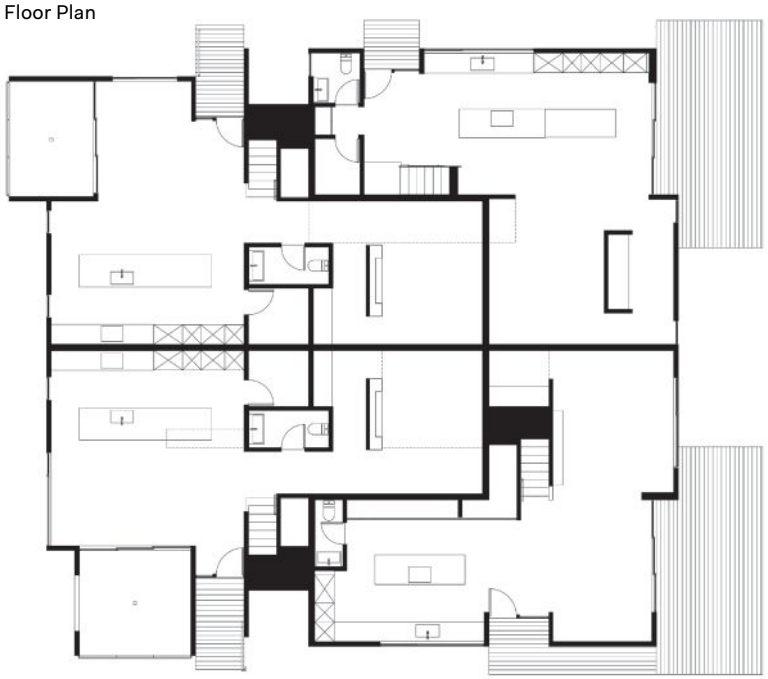


UCSB San Joaquin Student Housing **Santa Barbara, Calif.** **Lorcan O'Herlihy Architects** Student Housing

AWARD Los Angeles–based Lorcan O'Herlihy Architects has designed two clusters of buildings—one set of three and another of four—on the northern edge of the University of California, Santa Barbara (UCSB) campus. The project provides 50 student housing units within 95,000-square-feet of new construction. The architects blew open UCSB's typical housing model—outward-looking blocks with lifeless interior courts—by exposing the circulation on the interior side of each new building to the open air. Lined with minimal steel columns and simple industrial cable mesh, these outdoor walkways link the blocks into unified clusters, creating lively and active spaces that help establish community among the student population. Exposed stairs share the same formal vocabulary to further contrast the buildings and their circulation spaces. ¶ Organized around the activated courtyards, outward-facing student rooms are conceived as regularized, economically stacked units with a subdued architectural expression—providing a quiet exterior edge that contrasts with the active interior walkways. Solid perimeter façades are clad in corrugated metal panels with punched windows, and L-shaped sunshading devices shield exposed openings from the Southern California sunlight. ¶ Reading rooms, gathering spaces, and dining facilities were conceived as social hubs and are distributed throughout the blocks. These public spaces feature floor-to-ceiling glazing and their open expression relates to the exposed frame walkways and stairs, establishing a clear formal relationship between public spaces and public circulation. Most are located on the second and third floors, helping to activate the external corridors as they draw students. ¶ The design uses passive strategies that leverage Santa Barbara's ideal coastal climate for sustainability, as well as creating a pleasant series of protected outdoor places with natural plantings on the UCSB campus. —E.K.

"If I were living in this building as a student, I would feel like I was living in an apartment, which is kind of a cool feeling. And I like the plan—how the massing allows you to move through this project and to the rest of campus." —Rosalyne Shieh

Palm 4 **Manhattan Beach, Calif.** **RAS-A** Multifamily Housing AWARD Manhattan Beach is among the most desirable neighborhoods in Los Angeles—and, at a median home price of more than $2.8 million, one of the most expensive. The developers behind Palm 4, a four-unit apartment building about a mile and a half from the ocean, wanted to create an inexpensive alternative aimed at younger families starting out in the neighborhood, while also demonstrating the efficiencies gained through environmentally friendly strategies. ¶ The 8,008-square-foot building, designed by local design/build firm RAS-A Studio, is square in plan, with each unit occupying about a quarter of the structure (each apartment also gets a parking spot beneath the building). Every unit has its own front door to the outside, and has a slightly different layout from its neighbors—thanks to light wells, private terraces, and other features that the developers tasked the architects with inserting into the building. The light wells extend upward, above the roofline, where they are clad in a fluted polycarbonate skin that both allows light in and, at night, glows warmly from the interior lighting. ¶ Those features are carefully placed to take advantage of coastal breezes and act as thermal chimneys, ventilating hot air upward and out of the apartments while drawing in fresh cool air via windows below. The building combines environmental and economical friendliness with its white roof—which reduces cooling needs and therefore energy usage—and a stormwater basin, which provides water for some of the tenants' needs. The exterior is surfaced in low-maintenance, dark epoxy stucco interspersed with raked white plaster, both of which lend definition to the building's volume. ¶ The project replaces an older duplex on the site, and yet it doesn't feel crowded—proof that good design can make even a tightest Los Angeles block feel spacious and private. —C.R.

"The integration with the landscape and the siting of this project is great. The interior is so modest, but also really sweet. It's a very simple but nicely detailed solution." —Stella Betts

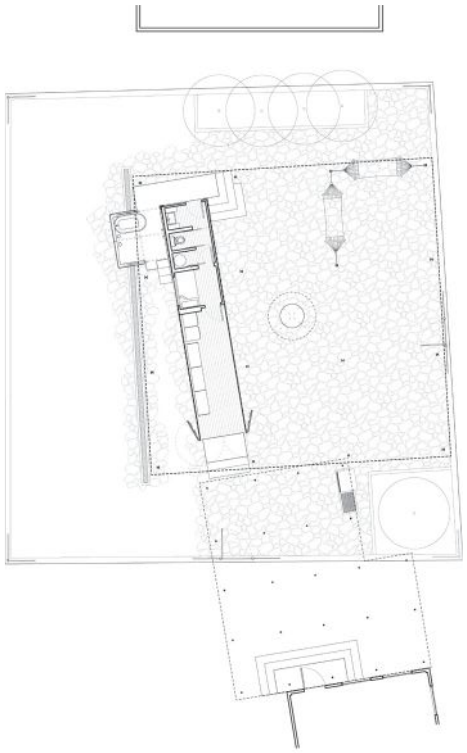
Sombreada Hasta **Real County, Texas** **Rhotenberry Wellen Architects** Outbuilding AWARD Dubbed Sombreada Hasta, or "shaded-up," this simple 2,400-square-foot pair of pavilions designed by Midland, Texas–based Rhotenberry Wellen Architects on a ranch in Real County, Texas, refers to traditional gathering spaces for cattlemen in the region. Built between two existing agrarian buildings, the larger and taller of the two structures sits within an existing homestead plot wall. Its grid of 16 self-weathering steel columns supports a steal beam system and corrugated roof of the same material. A shipping container beneath the canopy serves as a simple bunkhouse, with storage, a sleeping area, toilet, and lavatory within its enclosure. An outdoor bathing facility sits at the north end of the structure and extends beyond the sheltering canopy's western edge—with a water counterweight device that raises and lowers privacy panels. ¶ An oculus cut into the very center of the main pavilion's roof casts wide shadows across the flagstone paving and the shipping container, marking the progression of the day. Cross-bracing cables reinforce the importance of the central void. A circular firepit sits immediately below the round roof opening, allowing the theme of warmth and light to continue through the evening, drawing users to the middle of the composition when the structure's function shifts from cooling to warming. ¶ The smaller pavilion is composed of a trellis made of the same self-weathering steel as its sibling, and shelters the space between an existing bunkhouse and the main pavilion. Slightly skewed from the geometry of the larger structure, it features a barbecue pit. ¶ While offering shaded protection from the elements, Sombreada Hasta offers generous views of the surrounding landscape of prairie grass and oak trees. It draws on a regional vernacular of simple utilitarian structures, seeming simultaneously primitive and modern. —E.K.

"I think the informality and adaptability of this project are pretty fantastic. These aren't fancy pants details, but they are very well executed, and there's a complete elegance to a lot of aspects of this pavilion." —Stella Betts

CHANG KYUN KIM

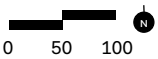
> *To see more pictures of the winning projects, visit bit.ly/2018RADA.*

Floor Plan



OPPOSITE: GRANT ALFORD, AIA; THIS PAGE: DAVID SUNDBERG/ESTO

Site Plan



Ecological Living Module **New York** **Gray Organschi Architecture and Yale Center for Ecosystems in Architecture**

Custom Home / Less Than 3,000 Square Feet AWARD

New Haven, Conn.–based Gray Organschi Architecture and the Yale Center for Ecosystems in Architecture designed the Ecological Living Module (ELM) for temporary installation at the United Nations headquarters in New York during the summer of 2018. The demonstration house embodies strategies for residential construction that meet the U.N.'s Sustainable Development Goals, can accommodate up to four people, and operates completely off-grid. ¶ Incorporating systems for on-site energy, water, air, and waste management, the 230-square-foot prefabricated unit makes use of vapor-open construction assemblies for floor, walls, and roof. The main level incorporates a small but well-appointed kitchen, bathroom, and living space under the dramatically sloped roof, which rises from a sunshaded glass door at its south end to a height of 16 feet at its north. ¶ All required energy is produced by a combination of traditional photovoltaic panels on the roof and an integrated concentrating solar façade from HeliOptix, which contains small solar cells in the air gap of a double-glazed façade that both generates energy and serves as sunshades to limit heat gain and reduce overall energy needs. Eighty percent of rainwater is captured, stored, and filtered for potable use. All graywater is retained to provide irrigation for a microfarming wall, which if deployed on both long elevations could provide up to 65 percent of the fruit and vegetable servings recommended per family each year. An indoor air-purifying plant wall, located in a narrow double-height space above the kitchen and adjacent to the loft sleeping space, promotes good cross ventilation and is predicted to remove 99 percent of small particulate air pollutants from the ELM's environment. ¶ While intended specifically as a solution for housing around the globe, the designers note that the module is adaptable for commercial and retail uses as well. They predict that the ELM can be produced for $50,000 per unit when put into large-scale production. —E.K.

"It takes a conceptual idea and then carries it all the way through. It's fantastic and fun, but also thoughtful and demonstrates a lot of ideas. I would live there." —Rosalyne Shieh

The Street **Mathura, India** **Sanjay Puri Architects**

Student Housing AWARD

The Street, designed by Mumbai, India–based Sanjay Puri Architects, is a 211,000-square-foot, 800-unit student housing complex on the campus of GLA University in Mathura, Uttar Pradesh, India. The designers took advantage of a wedge-shaped site between repetitive blocks to create a complex of radially aligned four-story-tall structures informed by the more organic organization and expression of traditional Indian cities. ¶ The architects create what they call a "discernable identity" for the project by marking each student room with a distinctive angular bay window that faces north to capture daylight (and heat) in the winter months and limit heat gain for the remaining eight months of the year, when the average area temperature is above 30 C (86 F). Louvers in each window provide sunshading while permitting natural ventilation, which is enhanced by openings at the corridor for each room. Overall natural air circulation is further encouraged by openings at regular intervals in each block, where the form shifts in plan. These irregular parts of the floor plan are filled with breakout spaces that provide natural light into the double-loaded corridors. ¶ Double-height, 20-foot-tall cafeterias, game rooms, and gymnasiums are located at the end of the buildings, where they open directly onto the campus's larger outdoor spaces. Canted rooflines reprise the bay windows at a more public scale, marking these indoor gathering spaces while also sheltering monumental outdoor stairs from the elements. Bright colors differentiate the blocks, the painted surfaces being located on the exterior of the volumes housing public amenities, and on the inside of individual bay windows, casting color into the students' rooms. —E.K.

"I think it's really adventuresome and has a great energy for student life." —Dirk Denison

The Bohn House **Austin, Texas** **Dick Clark + Associates**

Restoration/Preservation AWARD

The 1938 Henry Bohn House in Austin, Texas, was designed by architect Roy L. Thomas with inspiration from the film *Lost Horizon* that had been released the previous year. Through its episodic composition, the Art Moderne residence emulates the fictional Shangri-La depicted in the movie. Recently, a family of five retained local firm Dick Clark + Associates to almost double the size of the house (to 6,479 square feet) and make it suitable for a more modern lifestyle, while retaining most of the original structure and its most memorable details. ¶ Many of Thomas' spaces, including the entry hall, living room, and semi-circular solarium dining room on the main level were restored. The kitchen, however, was fully updated with substantial alterations that make it both more suited to modern living and open to the backyard. The new construction includes a garage, mudroom, and guest bedroom on the first floor, as well as three new bedrooms and associated service areas on the second level. ¶ The most striking addition is so convincing that it seems original: a curved parapet with paired porthole windows atop the original entryway. It reasserts the front door's hierarchical dominance, which the much-expanded massing could easily have obscured. Steel windows in the original house—a key feature of its classic modern pedigree—were faithfully restored, and in order to maintain the high level of authenticity (in both material and proportion), the addition's steel windows were sourced from a contemporaneous home in the neighborhood that was being demolished. ¶ Inside, the house's most enduring feature is also its most explicit reference to the mythical descriptions of Shangri-La—a circular mahogany door between kitchen and living room. The architects restored the feature (which slides upwards), including the original operation switch. The new Bohn House continues to be an Austin architectural icon, proving the possible compatibility of thoughtful design with historic fabric. —E.K.

"It's beautifully done and very consistent in its considering of context, yet it brings a fresh take on the Art Deco. It continues the spirit of the original architecture through to the addition." —Dirk Denison

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PAUL BARDAGJY


1301

Ground-Floor Plan

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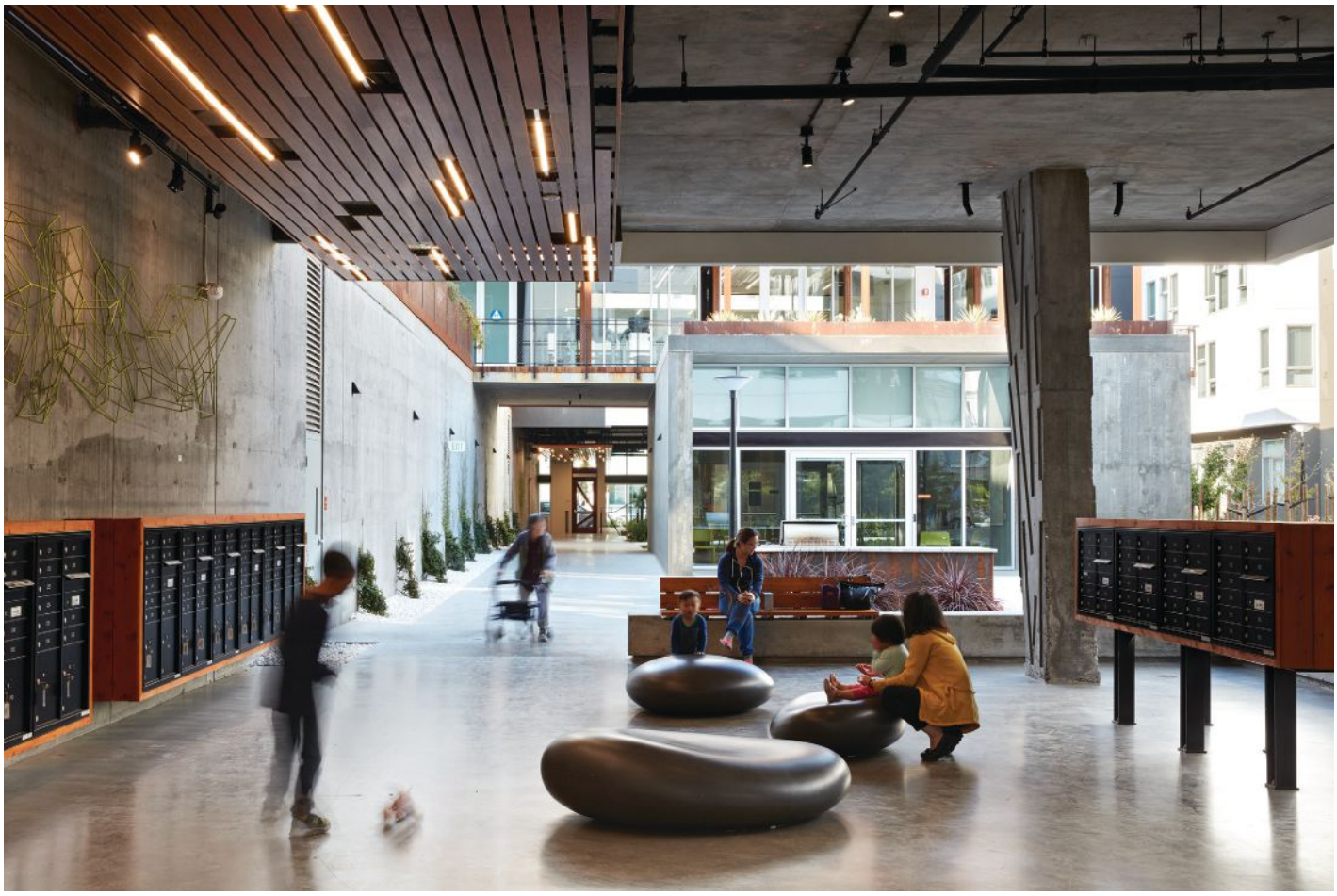


Ground-Floor Plan

Hunters View Housing Phase 2 **San Francisco** **Paulett Taggart Architects and David Baker Architects**

Affordable Housing AWARD Hunters View Housing Phase 2 comprises seven new buildings on three blocks overlooking San Francisco Bay. It's part of a larger master plan for a mixed-income community designed to replace a series of temporary barracks built in the 1940s that had been used well past their intended lifetime as substandard public housing. Designed by local firms Paulett Taggart Architects and David Baker Architects, the 246,086 square feet of construction in this second of three phases includes 178 units, plus substantial community amenities and services. ¶ The serrated façade of the five-story-tall Block 10 building responds dramatically to its site at a 90-degree bend in Fairfax Avenue on the highest point in the entire Hunters View development. Colorful glazed panels clad the building's saw-toothed bays and reflect the building's role as a vibrant neighborhood hub. ¶ Slightly below Block 10, on a flat part of the site, two five-story apartment buildings frame Fairfax Avenue on Blocks 7 and 11. On the north and south ends of these blocks, the topography drops off and one- to four-bedroom townhomes organized around landscaped central courtyards step down the hill. A diversity of scale and texture was created by dividing the design authorship of different structures between the two joint-venture architecture firms. ¶ Phasing the project avoided displacement by allowing on-site relocation during construction. More than 60 percent of existing residents moved into the new development, compared to a 15 percent typical retention in similar projects. Area crime has declined and school attendance rates are up by 30 percent. The resulting community's design reflects its needs and desires in an engaging set of evocative architectural forms. —E.K.

"I like how it's broken down so that it reads as a series of buildings—a series of neighbors. For San Francisco, that's very contextual." —Dirk Denison

Five88 **San Francisco** **David Baker Architects** Affordable Housing AWARD Five88 was designed by San Francisco–based David Baker Architects for the city's Mission Bay neighborhood. The 230,422-square-foot transit-oriented development is located along Mission Bay Commons Park, which separates the University of California, San Francisco campus from a residential area to the north. The building's southwest corner acts as a gateway to the neighborhood and is clad in perforated self-weathering steel. The building's other façades are primarily clad in cement plaster, accented with cedar, except at the northwest corner, where there is a five-story tower clad in white standing-seam aluminum. ¶ The building's courtyard plan comprises two C-shaped sections—the western half with four stories of apartments atop 10,000 square feet of retail and parking on the ground level, the eastern half with four stories of apartments sitting on grade. Resident entrances are via outdoor lobbies at either the north or south end of the block, at the seam between the two sections. Lobbies lead directly to a central landscaped courtyard, which is split between two levels. The lower is landscaped with drought-tolerant plantings; the upper is adjacent to laundry, fitness room, and resident lounge, plus a community pavilion and an outdoor play area paved in bright blue "Smurf turf." ¶ The building's 200 units include just three layouts—one one-bedroom and two two-bedroom—which effectively cut complexity and construction costs. Another economical design move was the use of conventional Type V, wood-frame construction, with the exception of the single-story concrete parking garage that serves as a podium for the western half of the structure. Five88 is the largest affordable housing building built in San Francisco in the last decade. A portion of the apartments are prioritized for local school and healthcare workers. —E.K.

"I really love the public spaces—they feel like neighborhood gathering spaces, and there's is a dignity to them. This really doesn't look like affordable housing to me, to be honest." —Stella Betts

Michigan Lake House **Leelanau County, Mich.** **Desai Chia Architecture** Custom Home / More Than 3,000 Square Feet

AWARD Michigan's northern coastline is dotted with stunning lake houses, and a 4,800-square-foot weekend home designed by New York–based Desai Chia Architecture and located outside Traverse City, fits right in. Clad in blackened wood planks, it features a dramatic 20-foot cantilevered roof that creates a covered terrace complete with a fireplace, looking out over a bluff toward Lake Michigan. ¶ The home arises from two sources of inspiration. As part of their research, the architects, Arjun Desai, AIA, and Katherine Chia, FAIA, traveled to Japan, where they became entranced with traditional Japanese design. In particular, they focused on the use of lightly charred wood as exterior cladding—a technique known as *shou sugi ban*—which prevents rot, deters pests, and lends the building a severe but natural look. ¶ At the same time, they took note of local vernacular design along Lake Michigan, especially in the fishing villages that sit in between the luxury weekend getaways. Those close-knit communities informed the house's massing, which is made up of three loosely grouped volumes—containing the living and kitchen spaces, the master suite, and the guest rooms, respectively—all linked by a breezeway that doubles as the dining area. ¶ After carefully studying the site's prevailing winds and light, Desai Chia oriented the home to take advantage of cooling breezes. The firm also salvaged wood from pest-ravaged ash trees in the nearby forests, which it had milled for use in the interior floors and cabinetry—and even a coffee table and the master bed frame. ¶ While the butterfly roof is dramatic, it is practical as well. The elevated lakeside location is prone to erosion, especially during the heavy storms that occasionally buffet this part of Michigan. The roof's shape, which directs water into custom scuppers, funnels water away from the foundation and into a gravel bed and cistern for later use. The result is a home as striking in its design as it is in its functionality. —C.R.

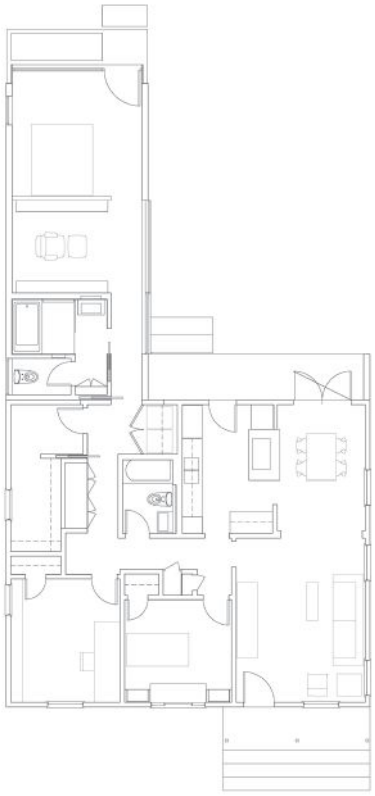
"It's just very strong—not only in its gesture, but also in its detailing. It seems like a very open space, but there is a welcoming warmth to it." —Dirk Denison

PAUL WARCHOL

> *To see more pictures of the winning projects, visit bit.ly/2018RADA.*

Floor Plan—Before

Floor Plan—After



Rear Window House **Culver City, Calif.** **Edward Ogosta Architecture** Renovation/Adaptive Reuse AWARD

Tucked into a residential neighborhood in Culver City, Calif., this 70-year-old, one-story bungalow offers a trim, updated façade on the street front, but few clues to the compact gem of an extension that owner and architect Edward Ogosta, AIA, added to the back. ¶ Needing more space for his growing family, Ogosta added a library, master bath, and master bedroom while retaining the sanctity of the small backyard. ¶ The 450-square-foot addition extends from one side of the house, creating an L-shaped plan that frames a small patio between the rear façade and an existing, freestanding garage. Floor-to-ceiling windows along the length of the addition and a covered back porch, attached to the original house, look out onto the patio, making it an outdoor room. ¶ Another picture window, at the back of the extension—the "rear window" that gives the house its name—looks out from the master bedroom onto a small green yard that is bracketed on two sides by tall shrubs. The window frame, made of aluminum-clad plate steel, cantilevers over a small pool, giving the scene a quiet, private serenity. ¶ Ogosta was intent on making sure the extension fit within the neighborhood vernacular, even as he modernized and slimmed down the original structure. He clad the entire extension in asphalt roofing shingles, which appear on most of the roofs in the area, and he gave the extension's mono-pitched roof a 3:12 slope—the same as on the existing roof and in line with other nearby homes. ¶ Ogosta kept the original home largely intact, making minor alterations to the existing floor plan to accommodate flow to the new spaces, adding skylights, and recovering the floors with bleached oak, which together give the home a cleaner, brighter, and more modern look. —E.K.

"I love the way it deals with renovating the very typical ranch house: This could easily be a brand new house that is ground-up, and it really does make a case for reusing an existing structure." —Stella Betts

Optima DCHGlobal Whale Bay **Mataka Station, New Zealand** **Optima DCHGlobal** Custom Home / More Than 3,000 Square Feet AWARD

Whale Bay, an inlet off the much larger Bay of Islands in far northern New Zealand, is one of the country's natural treasures. Surrounded by scrub-covered bluffs, it is prized as much for its stunning views as it is for its unparalleled world-class sport fishing. ¶ It was no easy task, then, for Optima DCHGlobal, based in Scottsdale, Ariz., to design and build a 5,000-square-foot, four-bedroom home—with an additional 2,100 square feet of decks—that took full advantage of its surroundings while infringing as little as possible on them. ¶ The house sits lightly on the land, with cantilevered floors and roofs, and it is made of recycled Cor-Ten steel, which stands up well to the region's occasional cyclones and blends in with its surroundings. The firm, led by architect/entrepreneur David Hovey Jr., FAIA, centered the design on a proprietary structural system based on a three-dimensional grid, which it prefabricated in Arizona and then shipped to New Zealand in 11 shipping containers—like an Erector Set, according to the designers. The grid features a 7-foot-square horizontal module and a 1-foot-3-inch vertical module, as well as a 21-foot-square structural bay, which includes all the beams, columns, and other elements needed to plug in the modules on-site. The floor and ceiling horizontal modules are constructed from nine press-formed panels, which are bolted together in a three-by-three square. Windows, plumbing, wiring, ductwork, and stairs were all designed to conform to the grid, and to be assembled on-site. ¶ The Whale Bay house is the third house designed by Optima DCHGlobal to feature this structural system, which the firm touts as a prototype for a low-impact, precision system for design and construction. The fact that the components were designed and fabricated almost 7,000 miles away from the site, with zero on-site errors, certainly bodes well for future projects. —C.R.

"It really started with a delivery system—how can we make the fabrication of architecture more efficient?—and then made something beautiful out of it." —Dirk Denison

STEVE KING

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PATRICK REYNOLDS

Project Credits

Page 125
Project: Shelter Island House, Shelter Island, N.Y.
Client: Withheld
Architect: Christoff:Finio Architecture, New York · Taryn Christoff, Martin Finio, FAIA, (partners-in-charge); Caleb Linville, AIA (project lead)

Page 125
Project: Mariposa1038, Los Angeles
Client: Mana Hale
Architect: Lorcan O'Herlihy Architects, Los Angeles · Lorcan O'Herlihy, FAIA (principal-in-charge); Nick Hopson, AIA (project director), Alex Anamos, AIA, Dana Lydon, ASSOC. AIA, Donnie Schmidt, Jessica Colangelo, Jennie Matusova (project team)

Page 125
Project: East Lawrence Sustainable House, Lawrence, Kan.
Client: Studio 804
Designer: Studio 804, University of Kansas, Lawrence, Kan. · Dan Rockhill (JL Constant distinguished professor); Danielle Latza, Hanu Anand Madireddy, Alexa Kaczor, Elayna Svigos, Will Ehrman, Austin Bosecker, Ian Mutschelknaus, Will Siegel, Joe Schafer-Glick, Ben LaRue, Kevin Purdom, Erik Erdman, Wes Seaba, Zach Lundgren, Eric Pincus, Linda Cotter, Mark Romanoff (M.Arch. students)

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Project: Midcentury Modern Revived, Quogue, N.Y.
Client: Withheld
Architect: Austin Patterson Disston Architects, Southport, Conn., and Quogue, N.Y. · Stuart Disston, AIA (partner-in-charge); Josh Rosensweig (project manager)
Interior Designer: Giovanni Foroni LoFaro

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Project: Olympia Place, Amherst, Mass.
Client: Archipelago Investments
Design Architect: Holst Architecture, Portland, Ore. · Kim Wilson, AIA, Dave Otte, AIA, John Holmes, AIA (partners); Drew Hastings, Heather Flegel, Lauren Sanchez (design staff); Mark Schmidt (associate); Lee Shradar (senior associate)
Architect of Record: DiMella Shaffer, Boston

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Project: Peabody, Burridge Gardens, St. John's Hill, London
Client: Peabody
Architect: Hawkins\Brown, Los Angeles and London · Russell Brown (founding partner); Iain Cochran (partner); Kenneth Gow (associate); Petr Kalab (associate director); Katie Tonkinson, Phil Catcheside (partners); Michelle Tomlinson, Richard Coskie (architects)

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Project: Central 1_Rossmore and Central 1_Weldon, Los Angeles
Client: Skid Row Housing Trust
Architect: Brooks+Scarpa, Los Angeles · Lawrence Scarpa, FAIA (lead designer); Angela Brooks, FAIA (principal-in-charge, project architect); Emily Hodgdon, Diane Thepkhounphithack, Eleftheria Stavridi, Arthur Vartanyan, ASSOC. AIA, Fui Srivikorn, Micaela Danko, Iliya Muzychuck, Jennifer Doublet, Yang Li, Yimin Wu (project design team)

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Project: 900 Penn, Denver
Client: Nadine Lange
Architect: David Urban, Denver · Matt Davis, AIA, Chris Jahn, AIA
Interior Designer: Griffith Interior Design

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Project: Harvey House, Palm Springs, Calif.
Client: Rea Laccone
Architect: Marmol Radziner, Los Angeles · Leo Marmol, FAIA, Ron Radziner, FAIA, Robert Tsurimoto Kirsten, AIA (associate, studio director)

Page 139
Project: UCSB San Joaquin Student Housing, Santa Barbara, Calif.
Client: University of California, Santa Barbara
Architect: Lorcan O'Herlihy Architects, Los Angeles · Lorcan O'Herlihy, FAIA (principal-in-charge), Donnie Schmidt (project director), Damian Possidente (project manager), Noelle White

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Project: Palm 4, Manhattan Beach, Calif.
Client: Minaret Development Partners · Jeff Bowers, Bryan Murphy
Design/Build Firm: RAS-A Studio, Redondo Beach, Calif. · Robert Sweet (principal-in-charge); Paul Miller, AIA, Charles Chambers (project team)

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Project: Sombreada Hasta, Real County, Texas
Client: Withheld
Architect: Rhotenberry Wellen Architects, Midland, Texas · Mark Wellen, FAIA, Cale Lancaster, AIA

Page 143
Project: Ecological Living Module, New York/site-variable
Client/Owner: United Nations Environment Programme; United Nations Human Settlements Programme
Architect: Gray Organschi Architecture, New Haven, Conn. · Lisa Gray, FAIA, Alan Organschi, (principals); Parker Lee (senior associate); Andrew Ruff, ASSOC. AIA (research coordinator); Dan Kazer (fabrication specialist); Brittany Olivari, Andrew Padron, Larry Beddall, Elaina Berkowitz, Nathaniel Elmer, Kelley Johnson, Joshua Kuhr, Seth Lauderdale, Yanbo Li, Jackson Lindsay, August Organschi, Oscar Scott, Ben Smith, Arghavan Taheri, Aslan Taheri, Joe Weisbord, Jack Wolfe (project team); Yale Center for Ecosystems in Architecture, New Haven, Conn. · Anna Dyson (director); Hind Wildman (director of communications and research development); Nick Novelli (director of research and engineering); Naomi Keena, Mohamed Aly-Etman (postdoctoral associates); Kipp Bradford, Mandi Pretorius, Phoebe Mankiewicz, Marshall James, Christopher Preusch, Paulo Pinheiro, Sheldon McLeod, George Graham, Adam Katzman, Kunhee Chang, Martin Man, Abena Bonna, Emma Crow-Willard, Valantyn Koziak (project team)

Page 143
Project: The Street, Mathura, Uttar Pradesh, India
Client: Ganeshi Lal Agrawal University
Architect: Sanjay Puri Architects, Mumbai, India · Sanjay Puri (principal architect); Ishveen Bhasin (senior project architect)

Page 143
Project: The Bohn House, Austin, Texas
Client: Bill and Misty Reid
Architect: Dick Clark + Associates, Austin, Texas · Kevin Gallaugher, AIA, Kim Power, AIA, Kristopher White (project team)
Interior Designer: Elizabeth Stanley Design; Lauren Allyn Interiors

Page 148
Project: Hunters View Housing Phase 2 (Blocks 7, 10 & 11), San Francisco
Client: HV Partners 2
Architect: Paulett Taggart Architects and David Baker Architects, a joint venture, San Francisco · Paulett Taggart, FAIA, (principal and founder, Paulett Taggart Architects); Roselie Enriquez Ledda, AIA (senior associate, Paulett Taggart Architects); David Friedlaender, AIA (associate, Paulett Taggart Architects); Daniel Simons, AIA, Amanda Loper, AIA (principals, David Baker Architects); Sally Roth, AIA (technical director, David Baker Architects); Julie De Jesus (associate, interiors lead, David Baker Architects)

Page 148
Project: Five88, San Francisco
Client/Owner: Related California
Architect/Interior Designer: David Baker Architects, San Francisco and Oakland, Calif. · David Baker, FAIA (principal); Caroline Souza, AIA, Billy Forrest, AIA, Julie de Jesus, AIA (associates); Kevin Wilcock, AIA
Associate Architect: G7A, San Francisco · Irving Gonzales (principal)

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Project: Michigan Lake House, Leelanau County, Mich.
Client: Michael and Barbara Collins
Design Architect: Desai Chia Architecture, New York · Arjun Desai, AIA, Katherine Chia, FAIA (founding principals)
Architect of Record: Environment Architects, Traverse City, Mich. · Ray Kendra, AIA (principal)

Page 151
Project: Rear Window House, Culver City, Calif.
Client: Ed and Kate Ogosta, and daughter Audrey
Architect/Interior Designer: Edward Ogosta Architecture, Los Angeles · Ed Ogosta, AIA (principal)

Page 151
Project: Optima DCHGlobal Whale Bay
Location: Mataka Station, Whale Bay, New Zealand
Client: Whale Bay
Architect: Optima DCHGlobal, Scottsdale, Ariz. · David Hovey Jr., AIA (president)

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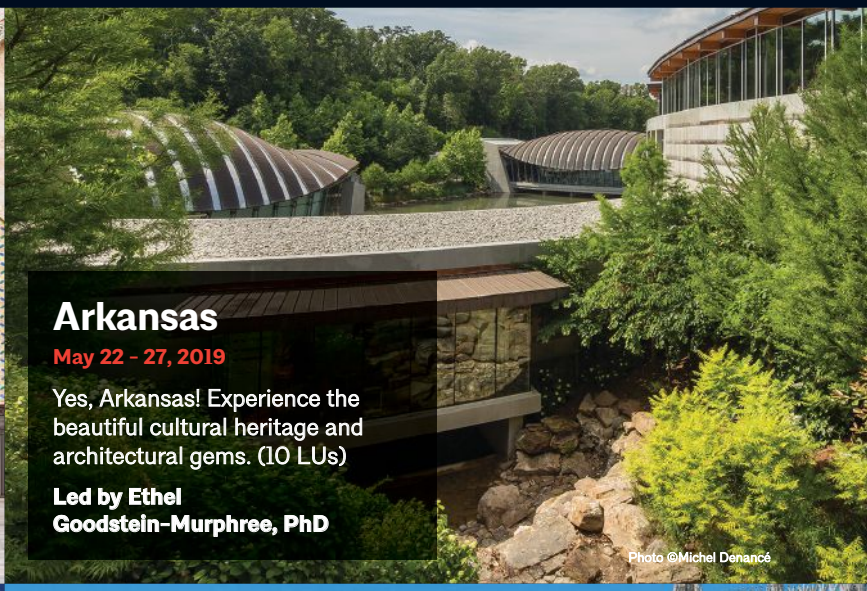

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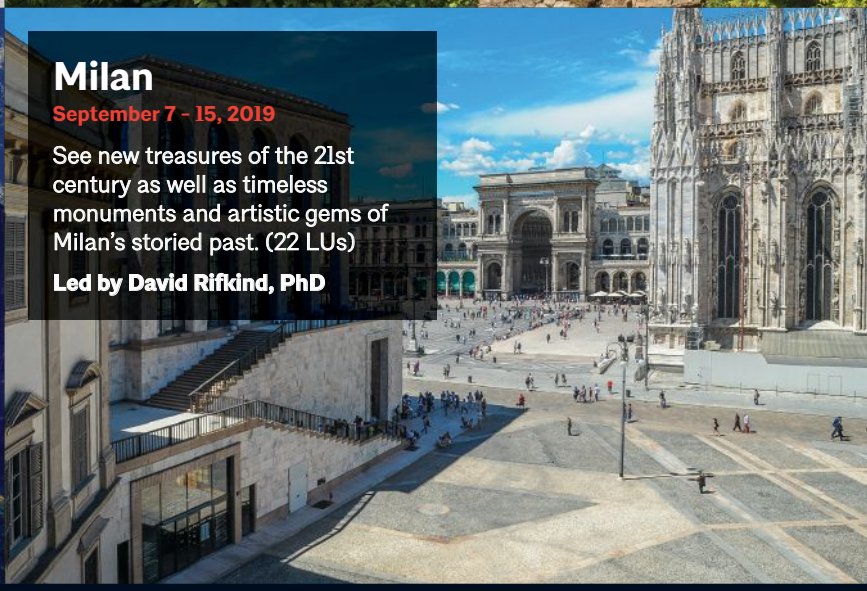

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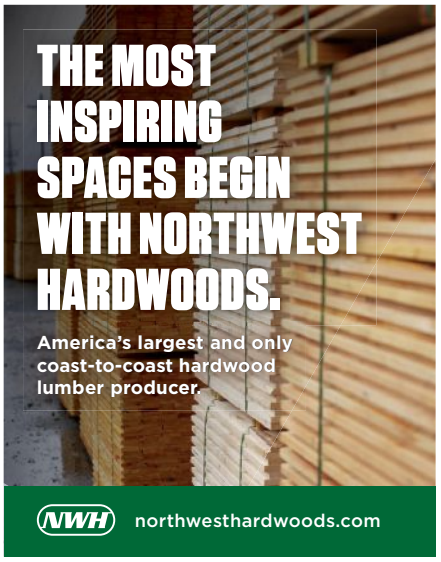

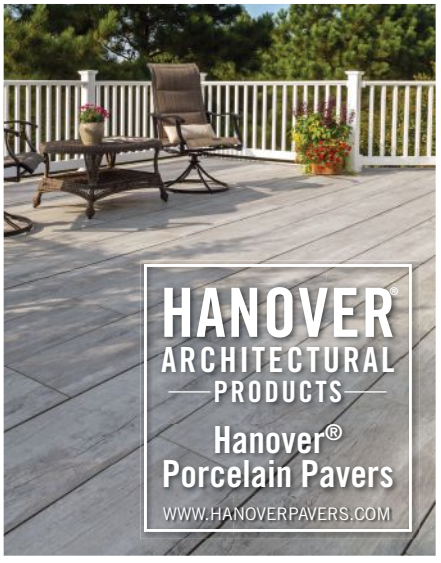

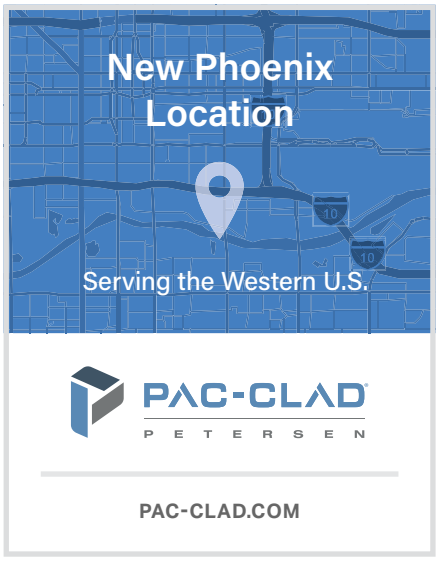

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Editorial: Quitting Is for Winners

Should we rebuild? That sad question is being voiced far too often in far too many places in the U.S.: New York and New Jersey, the Gulf Coast, South Florida, North and South Carolina, Colorado, and now, yet again, Northern and Southern California. Of one small town, Grayson, Ky., *The New York Times* reports, "residents have applied for loans to recover from nine severe storms in the last 16 years."

The answer usually lies with the insurance market. Increasingly, the answer will be "No."

Insurer Aon named 2017 the "costliest year on record for weather disasters," with $344 billion in economic damage overall and a $132 billion direct hit to the insurance industry. Not surprisingly, then, owners of vulnerable real estate are seeing premiums rise. What follows could be worse: At the World Economic Forum in Davos, Switzerland, this January, the CEO of French insurer AXA, Thomas Buberl, warned that as global temperatures increase and weather grows more extreme, underwriters will redline high-risk areas.

"If you go much further to 2020, 2030, we can clearly say that at a scenario between 3 and 4 degrees [Celsius], it's not insurable anymore," Buberl said, as reported by *Bloomberg*. "Your basement shop in New York, your basement shop in Mumbai will at this point not be insurable."

In 2016, four actuarial professional associations launched the Actuaries Climate Index, which monitors climate-related risk by region in the U.S. and Canada. Backdated to 1960, the index shows a frighteningly steady increase of risk over time. In one sense, the data could present an opportunity: As William McDonough, FAIA, observed on a panel at Hanley Wood's Hive housing conference this spring, the best lever to move developers toward resilient and sustainable design is money. So when underwriters shy away from troublesome locations and building methods, one can reasonably expect that developers will too.

Alas, some individuals and institutions will prove difficult to persuade. Remember the outrage when officials suggested abandoning economically blighted neighborhoods in Detroit and hurricane-ravaged wards in New Orleans? Human responses to the actuarial table's blunt math are not always driven by logic. Instinct and culture tell us to defend our territory in the face of terrible odds. Nobody likes a quitter.

Can humanity adapt? In Kim Stanley Robinson's hopeful 2017 novel *New York 2140*, the streets lie 50 feet under water but the city marches on, like a fantastic, latter-day Venice. Paolo Bacigalupi's 2015 thriller, *The Water Knife*, is more pessimistic, drought having all but consumed the Colorado River, the Southwestern states battling over the remaining trickle, and refugees desperately wandering the desert.

If we fail to curb carbon emissions, science fiction will prove to have been prescient, as millions deliberate whether to stay and fight, or to flee from floods, wildfires, drought, hurricanes, and all the other disastrous effects of a warming planet. Obviously, architects, clients, and governments must adopt resilient and sustainable design, wholesale, and without delay. But we also need to consider retreat, a dispassionate and proactive withdrawal to safer sites. Why build, or rebuild, where nature won't tolerate our presence?

STEPHEN VOSS

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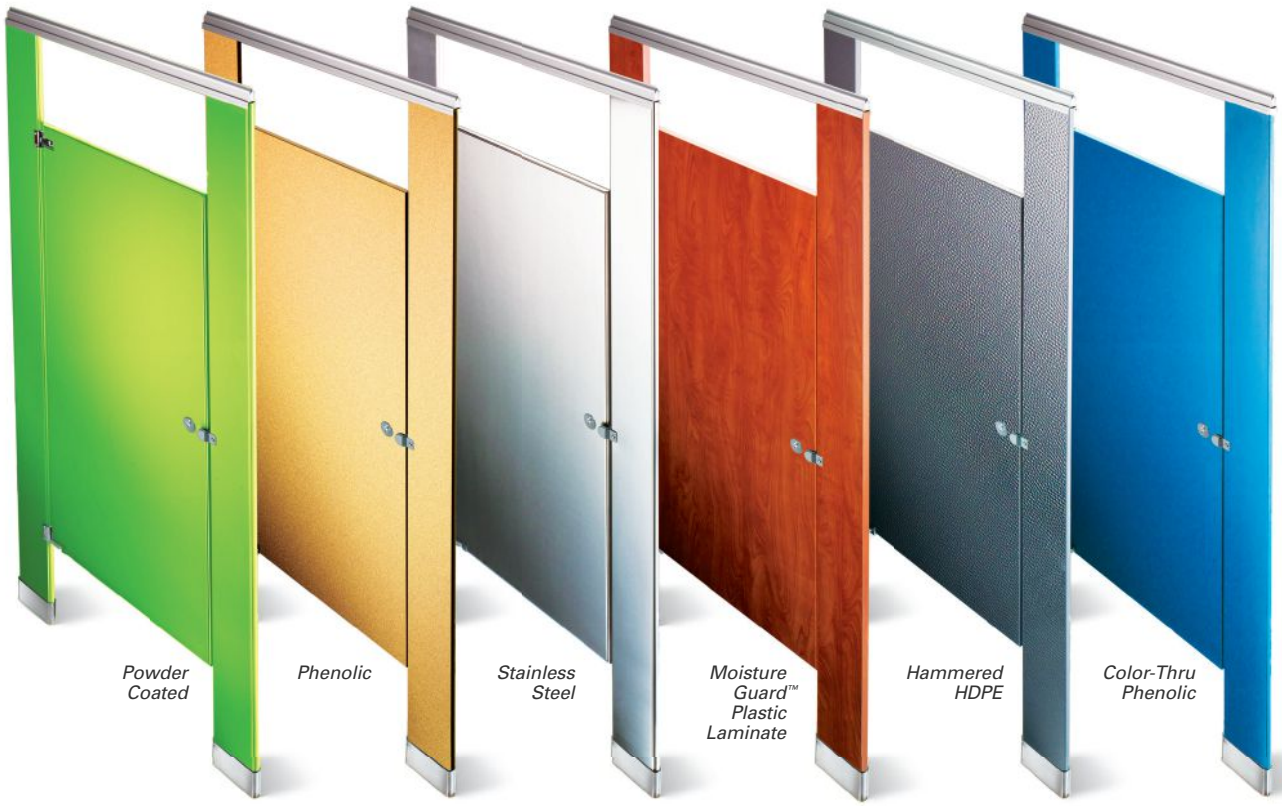

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