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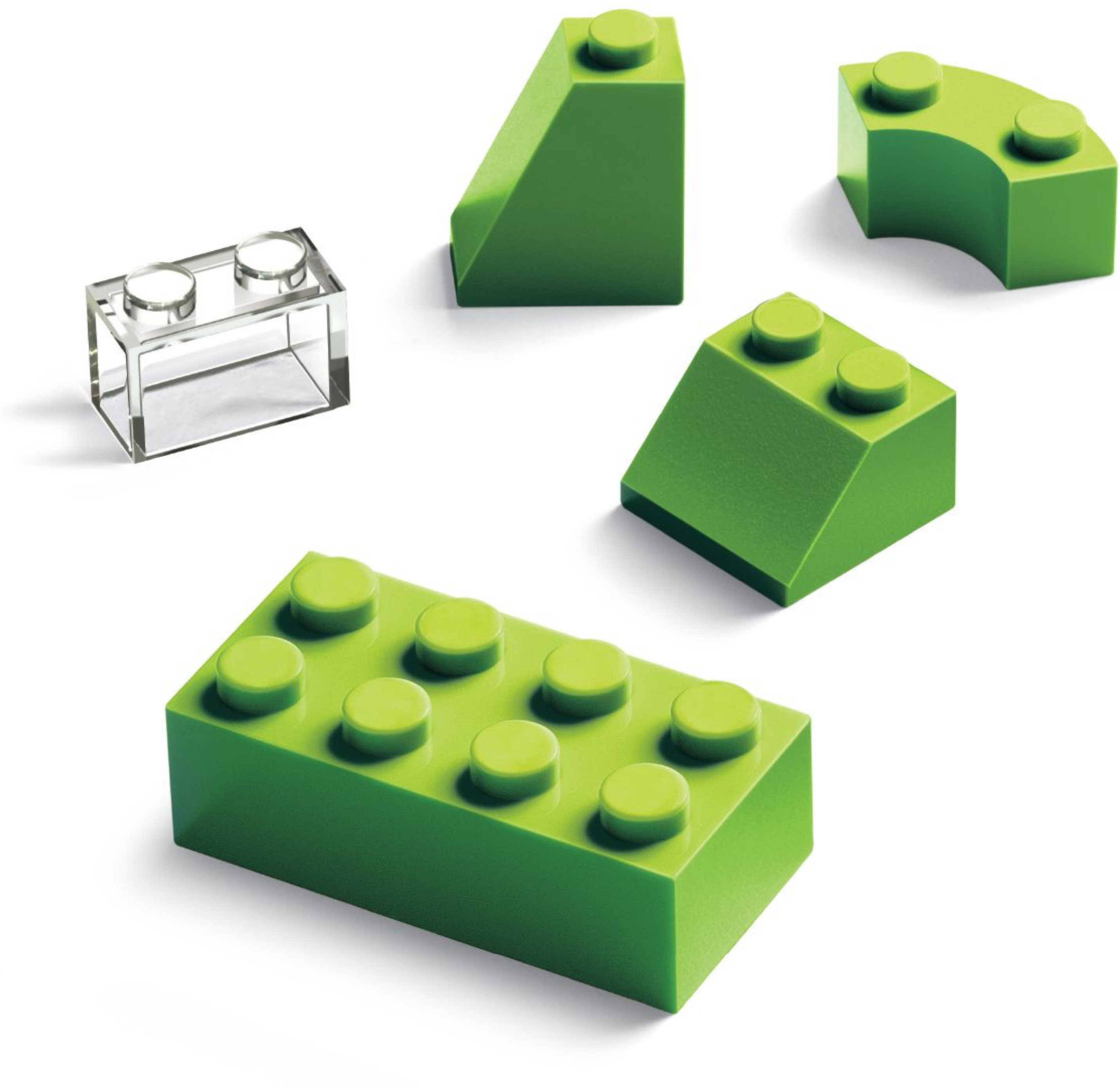

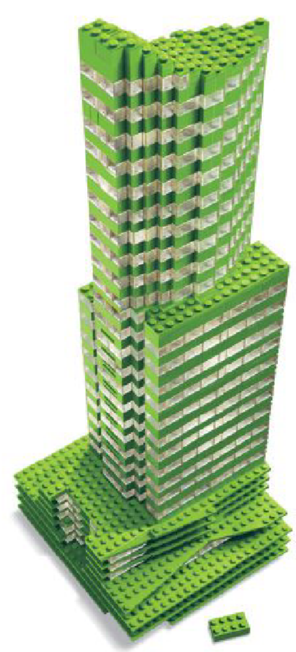

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Volume 105, number 7. July 2016.
On the cover: Vegas Altas Congress Center by Luis Pancorbo, José de Villar, Carlos Chacón, and Inés Martín Robles; photo by Jesús Granada

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Let's Get Classical

This year, the Institute of Classical Architecture & Art presented its Arthur Ross Awards to five designers and projects across five categories: Architecture, Civic Design, Education, Fine Arts: Photography, and Stewardship. The awards, which celebrate design excellence in the classical tradition, were respectively awarded to architect Duncan G. Stroik, AIA; "Ciudad Cayalá" (above), a new district of Guatemala City planned by local firms Town Architects of Cayalá and Estudio Urbano with Léon Krier; Robert A.M. Stern, FAIA; photojournalist Anne Day; and Savannah College of Art and Design founder Paula Wallace, HON. AIA. —AUGUST KING

> *To learn more about the five 2016 Arthur Ross Award winners, visit bit.ly/2016ArthurRossAward.*

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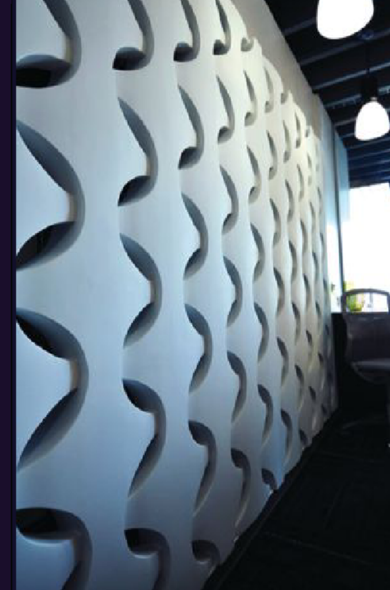

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JOSÉ HEVIA

Cash for Communal Kitchens

The Harvard Graduate School of Design has selected Spanish architect Anna Puigjaner as the winner of its 2016 Wheelwright Prize. Puigjaner practices in Barcelona as co-founder of MAIO with partners Maria Charneco, Alfredo Lérida, and Guillermo López (their Bar Nou in Barcelona is pictured above). She received a $100,000 travel grant for her proposal, "Kitchenless City: Architectural Systems for Social Welfare." Over the next two years she will delve into the typology of collective housing by investigating historical precedents in the former Soviet Union, solar kitchens in India, and kitchenless dwellings in Korea and Japan. —DEANE MADSEN

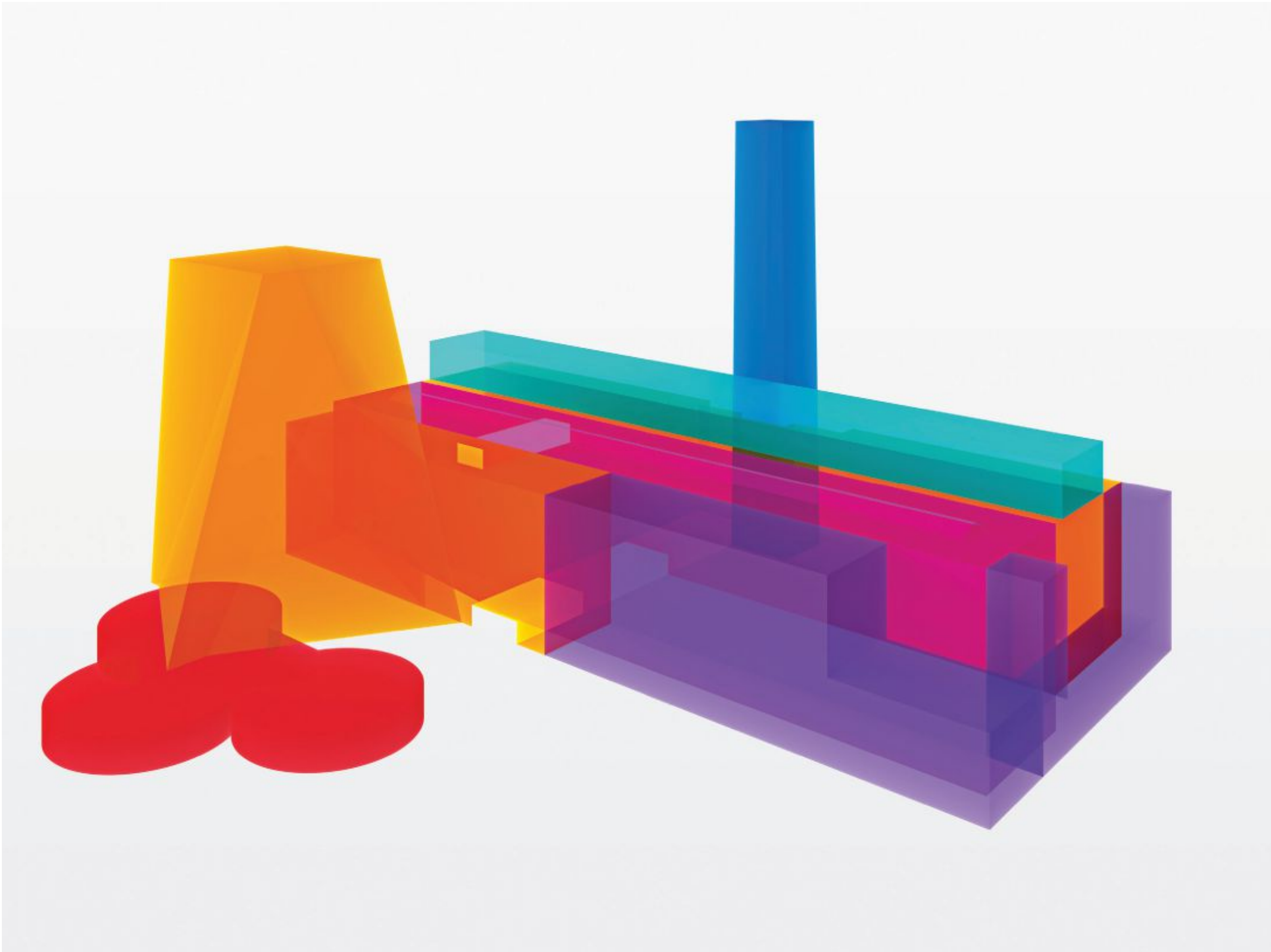
> Learn more about Anna Puigjaner's 2016 Wheelwright Prize proposal and those of the other three finalists at bit.ly/2016Wheelwright.

NELSON KON

A Lifetime of Brazilian Brutalism

Brazilian architect Paulo Mendes da Rocha was named the honoree of the 2016 Venice Architecture Biennale's Golden Lion for Lifetime Achievement. This year's director, Pritzker Prize–laureate Alejandro Aravena, made the recommendation. Regarded as a pioneer of Brazilian Brutalism, Mendes da Rocha and his colleagues in the Paulista School movement used concrete and steel to powerful effect, as in his portico for São Paulo's Patriarch Plaza (above). "Everything that is not necessary becomes grotesque," Mendes da Rocha has written, "especially in our time." —CHELSEA BLAHUT

> *To learn more about Paulo Mendes da Rocha's career, visit bit.ly/PauloMendesdaRocha.*

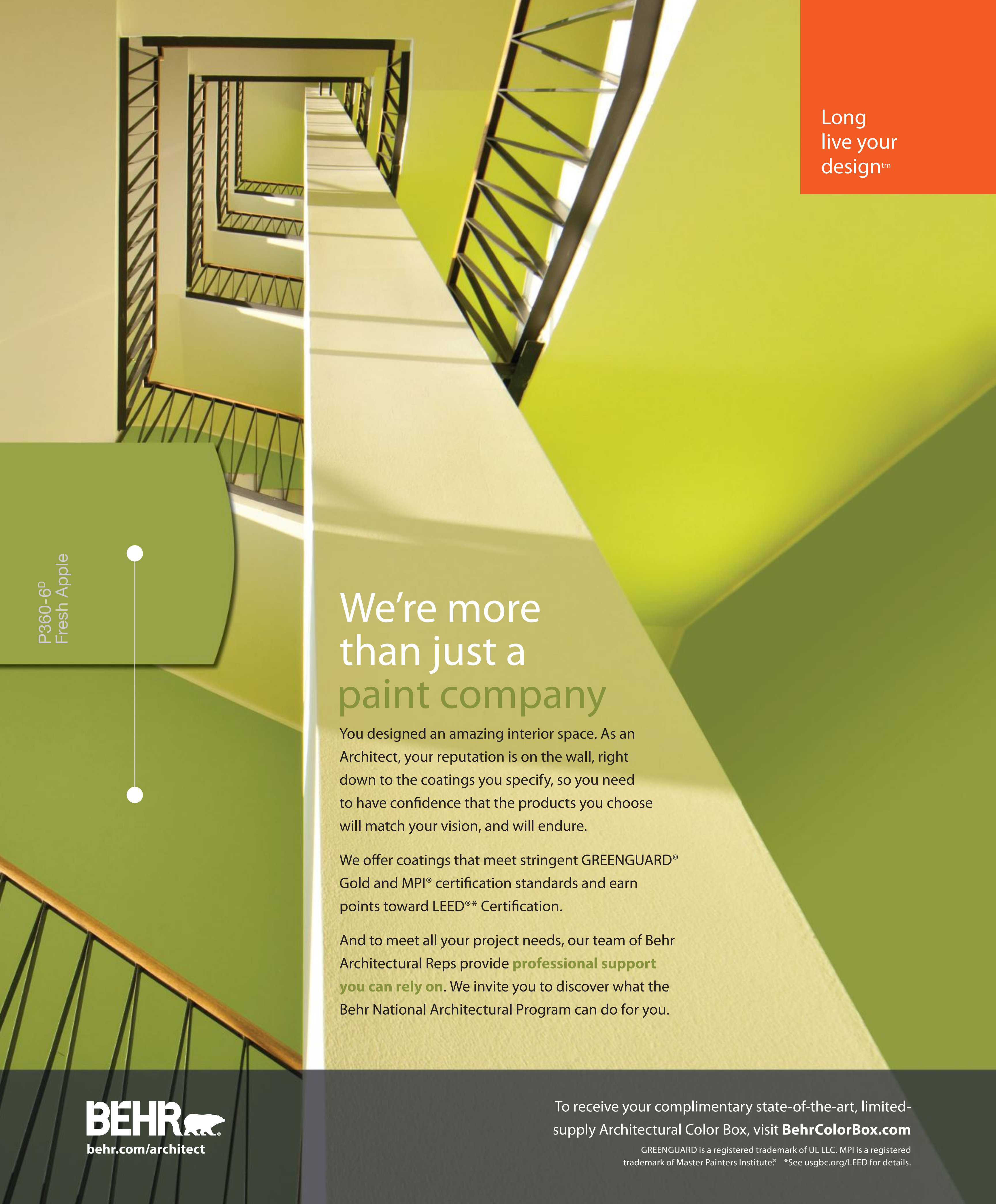


COURTESY TATE MODERN

Color-Blocked Museum Blocks

London's Tate Modern commissioned British graphic designer Peter Saville, known for designing dozens of covers for Joy Division and New Order, to create a color-coded model of the museum (above). The graphic illustrates the renovations completed over the 16-year history of the newly expanded museum, which opened on June 17. Orange denotes Herzog & de Meuron's new 10-story addition, dubbed the "Switch House," a follow-up to the firm's 2000 conversion of the old Bankside Power Station into the original Tate Modern. The oil-tanks-turned-gallery spaces beneath the new structure are in red, and the chimney is depicted in blue. —AUGUST KING

> To read more about the Tate Modern expansion project, visit bit.ly/TateModernExpansion.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When Concrete Meets Color

MoMA PS1's annual summer outdoor party series, Warm Up, has had a sequence of dramatic backdrops thanks to the museum's Young Architects Program (YAP). This year's series kicked off last month in a colorful installation by YAP 2016 honorees, Mexico City–based Escobedo Soliz Studio, entitled "Weaving the Courtyard." Cross-strung some 10 feet overhead, ropes in neon colors are moored to holes in the forecourt walls' original concrete formworks, and cast shade in different places at different times, complementing the spaces below, including a terrace filled with sand and a shallow pool lined with a wooden bench. —IAN VOLNER

> *To read more about the 2016 Young Architects Program installation, "Weaving the Courtyard," visit bit.ly/2016YAP.*


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IWAN BAAN

Unzipping Kensington Gardens

In early June, Bjarke Ingels Group (BIG) unveiled its design for the 16th iteration of the Serpentine Pavilion in London's Kensington Gardens. Designed annually by an architect who has yet to complete a major project in the United Kingdom, BIG's installation is an undulating wall that "unzips" into a passageway composed of 1,800 hollow, fiberglass bricks. Unlike past years, this pavilion comes with friends. Four smaller "summer houses" were also erected on the grounds, to designs by Barkow Leibinger, Yona Friedman, Asif Khan, and Kunlé Adeyemi of NLÉ. Adeyemi duplicated and deconstructed an 18th century folly (above). —CHELSEA BLAHUT

> *Learn more about the Serpentine Gallery Pavilion and its four Summer House accomplices at bit.ly/2016SerpentineGalleryPavilion.*

Best Practices: Hacking Charrettes

TEXT BY BRIAN LIBBY

For as long as architecture has been a profession, practitioners have come together in charrettes. In recent years, the hackathon has gained traction beyond its tech-sector origin as other industries, including AEC, have taken up the ideation exercise for its informal approach to discussion among project stakeholders. As the role of technology in the built environment grows, it's worth considering what the charrette can learn from the hackathon.

The Root of Charrettes

The use of the French word *charrette*, meaning "cart" or "chariot," in design dates to 19th-century Paris' École des Beaux-Arts and refers to the cart that would carry students' models to class. Today, the term is used for multiday working sessions to engage and receive feedback from project stakeholders. There is even the National Charrette Institute (NCI), in Portland, Ore., which offers guidelines and classes for a variety of industries to learn the process.

"We call it collaboration by design," says NCI executive director Bill Lennertz, who has an M.Arch. from Harvard University's Graduate School of Design. "The real potential is where you have a lot of disparate positions around contentious urban design projects." The charrette is a mechanism to "take all this uncertainty, volatility, and work with it," he says. The key to its success, and why it's often held over multiple days, is the feedback loop: the need to revise the plan once stakeholders have weighed in.

A Different Take

Hackathons are also multiday affairs but differ from charrettes in that they rely on digital tools. "A hackathon without technology, code, or working prototypes is not a hackathon," says Damon Hernandez, founder and executive director of the AEC Hackathon series, which brings technology experts and members of the design and construction industries together in cities worldwide. Although hackathons are used to generate a working prototype to establish proof of concept, they tend to place a greater value on an open-ended spirit of invention than do charrettes. At the Dallas AEC Hackathon, for example, Timothy Logan, a computational applications developer at HKS, recalls his team connecting an EEG reader to building design software in an attempt to enable design by thought. "A lot of teams had practical ideas, but a few of us just wanted to make something wacky and crazy," he says.

Often that wackiness generates a serious result: getting different practice areas to work together. "Each hackathon begins with a briefing document and general guidelines, but we intentionally keep the mechanics loose to provoke creative thinking," says Ryan Mullenix, AIA, a partner with NBBJ, in Seattle. In April, the firm held a hackathon with Time Inc. and the recruiting platform PowerToFly to explore the future of workplace collaboration. "Those surprising outcomes are what we find most exhilarating," he says.

Bringing Them Together

There is room for compromise between the (nearly)-anything-goes hackathons and the results-oriented charrettes. When Skanska was planning a 38-story commercial tower in Seattle, the company used a hybrid charrette–hackathon interview format to select an architect after its executive vice president Lisa Picard happened upon a hackathon being held in a co-working facility near her office in Seattle. After shortlisting two architecture firms for the project, Skanska used a multiday, hackathon-inspired selection process featuring a series of problem-solving exercises to test the firms out.

Although Skanska didn't formally incorporate technology, it used the hackathon moniker to signify the diversity of thought and the endurance element of the event, Picard says, adding that while the building industry often changes slowly, the tech industry's inclination toward rapid innovation makes it one source of collaboration solutions. Overall, the abbreviated hackathon format encouraged teams to "push through design fatigue," she adds, when new approaches to a problem were needed and time was running out.

> "We intentionally keep the mechanics loose to provoke creative thinking."
>
> —Ryan Mullenix, AIA, partner, NBBJ, Seattle

> For more ways to revamp your charrettes, visit bit.ly/HackingCharrettes.


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Detail:
La Cigarra Café Entry Pavilion

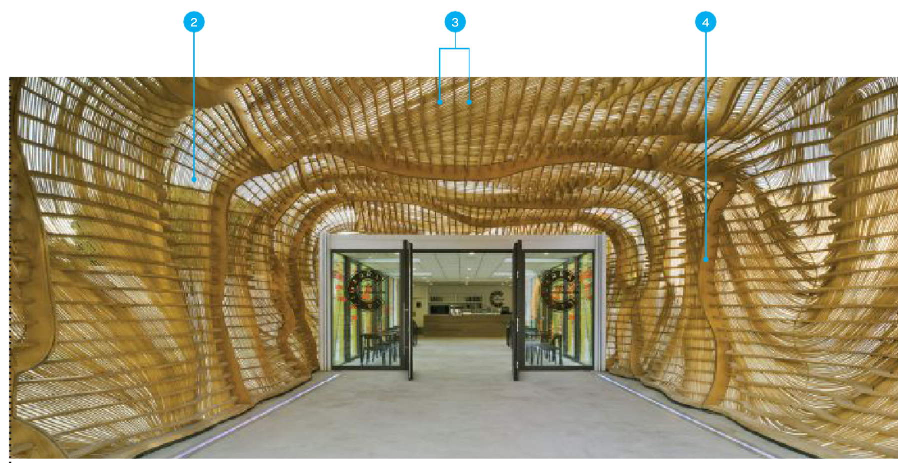
TEXT BY TIMOTHY A. SCHULER

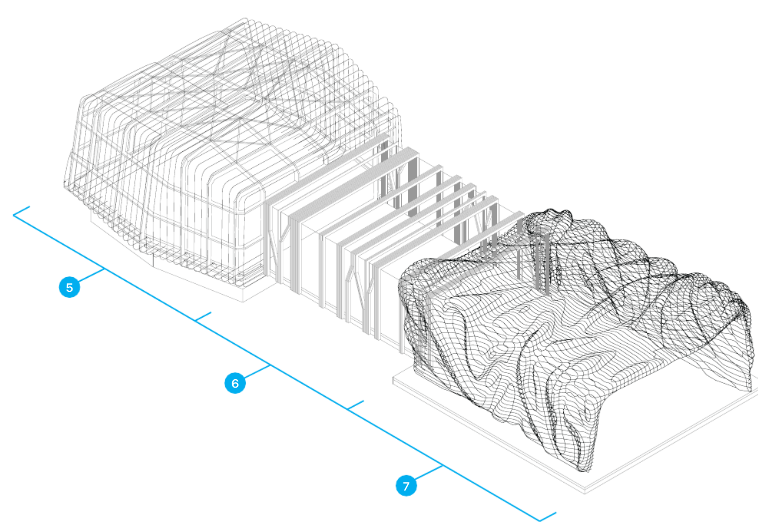
La Cigarra (the Cicada) Café sits among a collection of former tobacco factories in the port city of Alicante, Spain. Inspired by Barbarela Studio's nearby Jardin Vertical, Tomás Amat, founding principal at Tomás Amat Estudio de Arquitectura, envisioned the freestanding 2,600-square-foot café as an insect in a garden with a "head" (kitchen), "body" (seating area), and "tail" (entry pavilion).

The 600-square-foot tail is covered by a free-form wood shell crafted by artist Manolo Garcia, who first sculpted a 1.5-foot-long plaster model based on a digital mock-up by Amat. Together, they tweaked the curves and wrinkles by hand, creating a piece that looks like an insect's molted and scrunched skin.

The plaster model was digitally scanned and then transversely sliced into a series of sections. "To scan in 3D now is very common," Amat says, "but [the people of Valencia were] using it eight, nine years ago." CNC milling machines cut the five transverse frames and 48 longitudinal purlins that serve as the pavilion's structure.

This wooden skeleton was then wrapped in 10-foot-long strands of elm that were submerged in water for an hour before being stapled to the wood frame. The swirling skin follows the contours of the underlying structure, but each strand is placed "*sobre la march*," Garcia says—or "on the fly." Unlike the rest of the café, the tail is unbranded except for a series of wooden tags laser-cut with two names: Manolo Garcia and Tomás Amat Estudio de Arquitectura.





1. Polyurethane finish (not visible)
2. Elm strands, 0.5" × 0.1" × 10'
3. Pine purlins, 1" × 4.5" × 32' at 10" o.c.
4. Transverse wood frame (typ. 5)
5. Head
6. Body
7. Tail

DAVID FRUTOS

WOOD: LONG-LASTING PUBLIC WORKS BEAUTY AND PERFORMANCE

The taxpayers of Multnomah County, Oregon point with pride at their new 10,120 square foot fire station. They don't think twice about a fire house made of wood. The interesting part? Fire helped craft a structure of uncommon beauty and lasting resilience.

It's not often that firefighters eagerly bid to work in a fire station seared by flame. Yet that's exactly the case with a new fire station in rural Multnomah County, Oregon, just east of Portland.

Welcome to Fire Station 76.

The $3.24 million facility is not only distinguished by exposed 27-foot tall glulam Tudor-style arches in the expansive apparatus bay, but also by a shou sugi ban-treated barn wood cladding as part of the living quarter's rain screen system.

Code Compliant

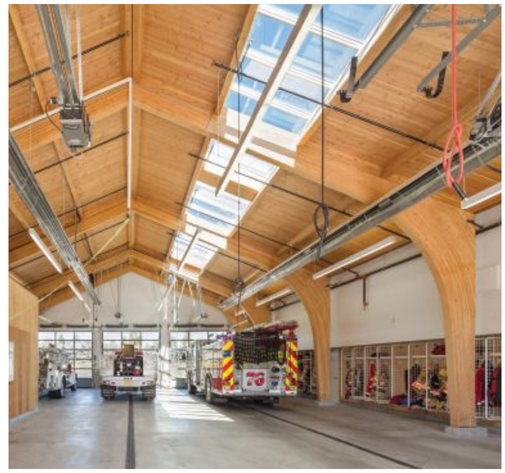
Complying with code, even Oregon's rigorous Structural Specialty Code for Essential Facilities proved routine, reports project architect Camilla Cok, AIA, of Hennebery Eddy Architects, an award-winning regional architectural firm based in Portland, Ore.

The design team made provision for increased load requirements expected of an essential facility to help ensure uninterrupted operation following a major seismic or weather event. The glulam Tudor arches in the bay and multiple plywood shearwalls in the living quarters serve as an efficient lateral-force resisting system. "The decision to go with wood," Cok says, "helped achieve a resilient structure designed for durability, redundancy, and recovery."

Firefighter Friendly

Western red cedar marks the fire station interior, from the living quarters for the crew of four full-time firefighters to the tongue-and-groove cedar decking vault over the apparatus bay. The glulam arches in the bay serve as part of the primary structural frame and were designed to resist vertical and lateral loads as the area's tough building code requires.

The salvaged timber was milled to board and batten siding, then charred and sealed using a traditional Japanese burning technique, shou sugi ban. The burn adds a layer of carbon which removes water from the wood. The carbon also protects against mold, rot, and insects, as well as fire.



The glulam arches serve as part of the primary structural frame and were designed to resist vertical and lateral loads, with additional structural factors of safety required for Essential Facilities under the Oregon Structural Specialty Code (Building Code).

The living quarters are constructed with open web trusses and I-joists at the roof, and conventional wood stud walls including plywood shearwalls as the lateral-force resisting system. Western red cedar-clad porches carve into the daylight-filled living quarters.

The firefighters' reaction? They love the exposed wood ceilings and walls. The overall effect is clean and natural, complementing Oregon's woodland splendor. The apparatus bay receives especially high marks for the durability and "solidness" of the large structural members, the plywood walls, and the wood finishing and cabinetry. The contrast of the black charred wood exterior with the interior's warm wood tones is also singled-out.

"The owner understood they were making legacy decisions. The vernacular of this area is farming, working with nature. It makes sense on so many levels to honor that spirit with the natural warmth and beauty of wood," explains Michelle Vo, AIA and principal-in-charge for Hennebery Eddy.

Maintenance-Free

A public building made of wood is no surprise to Oregonians. It's a common sight throughout the Beaver State. But still some may wonder, "Why build a firehouse with charred wood?" Architect Cok has an answer.

"We looked at different cladding materials including metal siding and a polycarbonate to reflect the area's many greenhouses," Cok recalls. "The question with exterior wood is always maintenance. We were aware of the shou sugi ban treatment. The more we investigated, the more we realized two things: one, the hardened carbonized layer solves the maintenance question, and two, it's beautiful. Charred wood is nearly maintenance-free," Cok says.

Vo adds, "We liked the idea of bringing something forward that has been used for centuries. This isn't bleeding edge innovation. It's tried and true. The innovation was using it so expressively in a prominent public building."

Coveted Assignment

Fire Station 76 delivered just over a year ago. Cok participated in the one-year walk-through with fire district officials recently. "The new fire district lieutenant was with us. He talked openly about how much they love working in the new facility," Cok says. As for the district's firefighters, they're busy pulling straws to see who is lucky enough to work in Fire Station 76.

Owner: Multnomah County Rural Fire Protection District No. 10

Architect: Hennebery Eddy Architects

General Contractor: Bremik Construction

Structural Engineer: Nishkian Dean Structural Engineers

Photographer: Josh Partee, Josh Partee Photography

Location: 30300 SE Dodge Park Boulevard, Gresham, Oregon

Year Completed: 2015

Awards

Top Projects, Public Service Category, DJC Oregon, 2016

Wood Design Award, Institutional Design, US WoodWorks, 2015

Wood Design and Building Award, Canadian Wood Council, 2015

Design Award, Portland Chapter AIA, 2015 (Merit Award, Public Projects)

Design Award, Portland Chapter AIA, 2013 (Unbuilt Award)

Architizer A+ Awards Finalist, 2016 (Institutional—Government & Municipal Buildings)

Next Progressives: Best Practice Architecture and Design

TEXT BY ZACH MORTICE
PORTRAIT BY BRIAN SMALE

Just five years old, Seattle-based Best Practice Architecture and Design has amassed a broad portfolio of residential, commercial, office, and restaurant projects. What distinguishes the firm is its ability to deliver an extra level of craft to clients by collaborating with photographers, metal sculptors, and neon artists on the city's art scene. "We're always looking for an excuse to work with our artists and fabricators … because it allows us to put more local, specific touches to our projects," says Kailin Gregga, ASSOC. AIA, who leads the studio with Ian Butcher, AIA.

Before founding Best Practice in 2011, Butcher worked for Roy McMakin, a Seattle artist whose practice had expanded into furniture and residential design. Butcher managed the residential projects, but wanted to strike out on his own with an emphasis on artistic craftsmanship. Gregga—who was earning her B.A. in architecture from the University of Washington while Butcher was pursuing his M.Arch. there—joined three years later after stints with Diller Scofidio + Renfro and LMN Architects.

Kailin Gregga and Ian Butcher

The firm name is "very open ended," Gregga says, "and it allows us to morph the firm into whatever we need it to be."

Indeed, Best Practice's work lacks any consistent aesthetic beyond an appreciation for low-fi, natural materials and the use of modular, space-dividing elements. Its projects can be minimalist stage sets for retail customers, as in its design for the Seattle footwear boutique Likelihood, or they can be breezy Postmodern smirks, such as the optometry shop Eye Eye, also in Seattle, for which the firm hired sculptor Troy Pillow to build repeating metal gables within the retail area.

Best Practice often uses slat systems as art canvases, partitions, or, in the case of Seattle street food bistro Nue, to display the owner's tchotchkes gathered from travel. In another local establishment, Estates Wine Room, two photographs (by Richard Knapp) of vineyards whose wines are featured on the menu are printed on opposite sides of another slat system. Visitors see one vineyard as they walk in one direction, and the other if they walk from the other end of the space.

The firm turned to slat systems when tech clients began asking for inexpensive, flexible, but decidedly non-cubicle space dividers for what might be their first bespoke spaces. With startup companies, "the enthusiasm is maximum," Gregga says, but "the budgets are pretty slim."

Butcher and Gregga see the space they're given to work with as a metaphorical piece of toast to which they can apply butter, or butter and jam. "One option is to take the butter and spread it as thin as you can," Gregga says. Another approach is to "put all of the butter and jam on one piece of the toast, and have this epic bite."

Their fit-out project for Simply Measured, a Seattle-based marketing analytics company, is an example of the first approach. Best Practice uses splashes of bright orange furniture and soft blue-painted walls, ceilings, and floors to create visual interest and quirk within the 20,000-square-foot office, as in its lounge area where a series of picture frames are painted to match the walls, with the art swapped out for foam pyramids. This lighthearted touch, along with alder tables, custom-designed by the firm, add warmth to the once monotonous space, while remaining within a budget of $35 per square foot.

The second approach, in which Best Practice seeks to create that "epic bite," can be seen in an office renovation for a Seattle industrial design firm (which wishes to remain anonymous). Here, the designers put much of the budget into a plywood seating-and-shelving installation that creates a social space for visitors and employees while adding a moment of heightened liveliness to the generic floor plate.

The Next Progressives series of emerging-firm profiles is proudly supported by VT Industries.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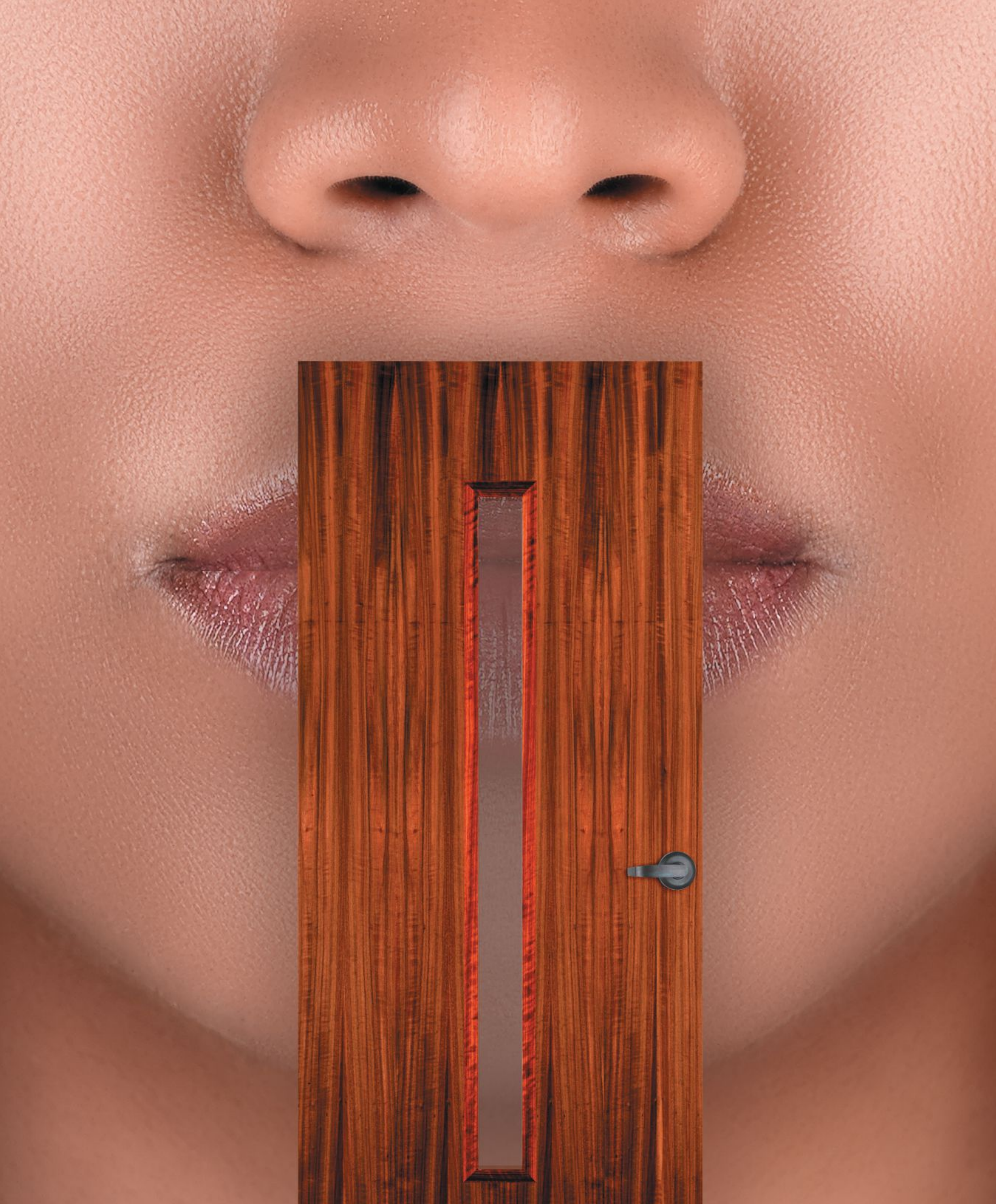
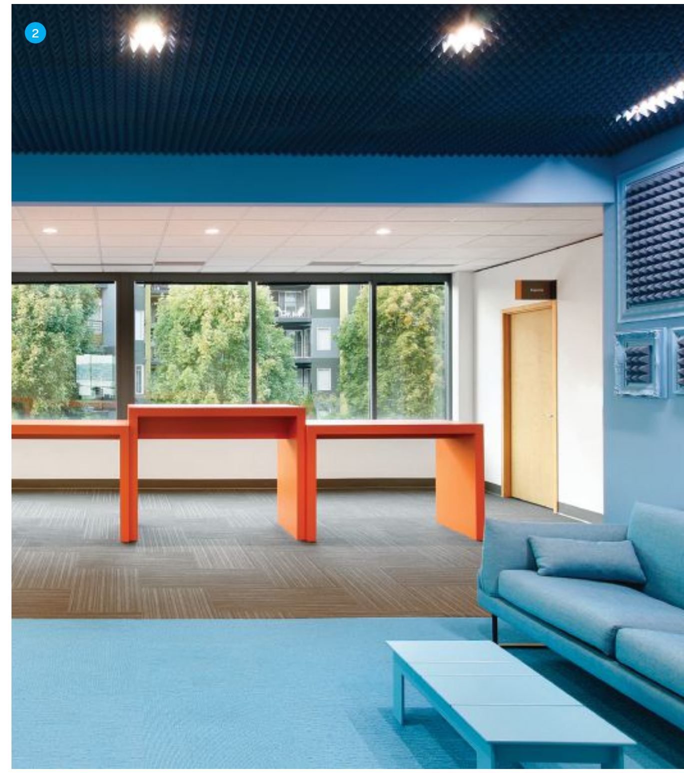
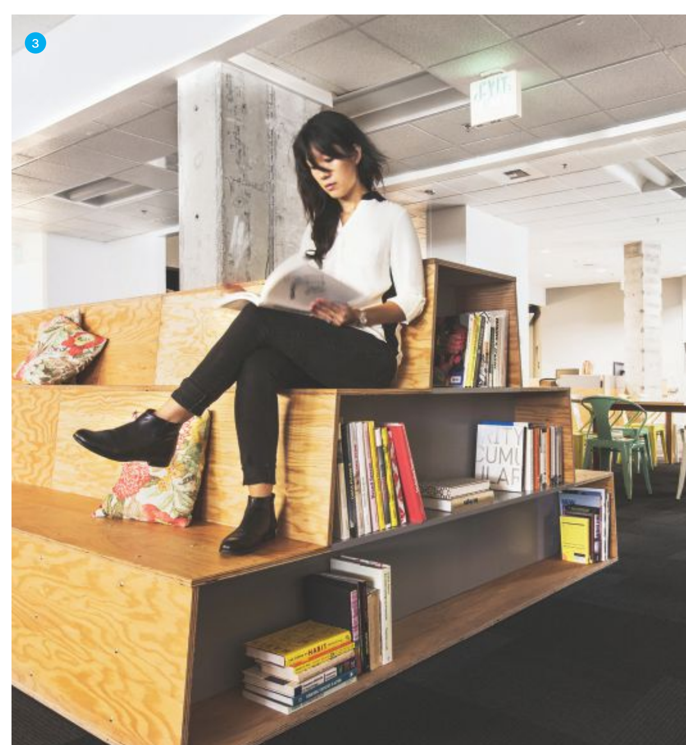


Next Progressives:
Best Practice Architecture and Design





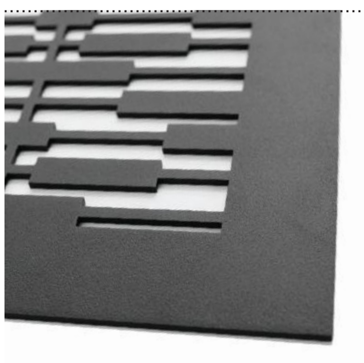
1, 3: MIKE WOODS

2, 4, 5: RAFAEL SOLDI

1. Shoes are displayed on risers at Likelihood, in Seattle, with a vertical wooden slat accent wall as backdrop. **2.** Strategic application of bright colors and custom furniture bring visual interest to the 20,000-square-foot headquarters office that Best Practice renovated for Seattle marketing analytics company Simply Measured, for $35 per square foot. **3.** The firm put most of the budget for a new industrial design studio toward a plywood seating and shelving installation. **4.** In the Seattle optometry boutique Eye Eye, Ian Butcher and Kailin Gregga enlisted sculptor Troy Pillow to fabricate a series of pentagonal metal frames that define space within the shop. **5.** A vertical, double-sided slat system with photographs by Richard Knapp brings vineyard views to Seattle's Estates Wine Room.

Products: Metals

TEXT BY SELIN ASHABOGLU

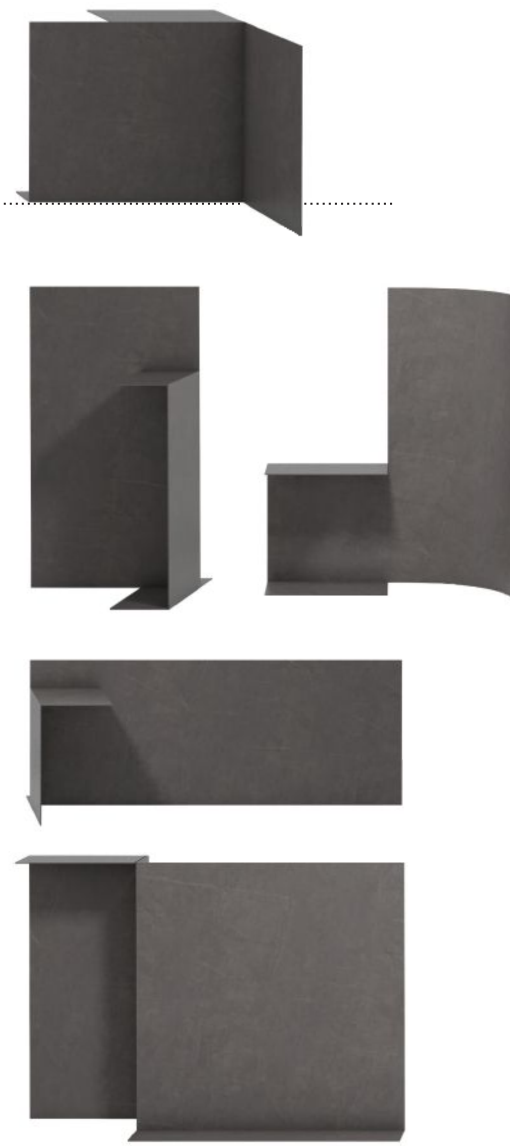


Ceiling Squares, AJK Design Studio
These laser-cut, 24"-square metal grilles come in 16 patterns and in a choice of steel, brass, bronze, or aluminum. Backing materials such as wool felt add color and utility. *ajkdesignstudio.com*

Giraffa, Pablo Designs
This geometric, fully rotatable LED table lamp stands 13" tall and is 2.25" wide at its base. It comes in gloss white lacquer, brushed copper, and black anodized aluminum finishes. *pablodesigns.com*

Ribbon Stool, Christopher Gentner
A perpendicular base and concave seat shape this minimalist stool, which is offered in darkened stainless steel or darkened brass. It measures 20" wide by 6" deep by 17" tall. *gentnerdesign.com*

Curve Pendant Ball, Tom Dixon
The British design brand's Curve Pendant, fabricated from thin-sheet etched metal with a nickel-silver coating, comes in precision-pierced globular shells of 12.5" and 17.7" diameters. *tomdixon.net*



085 Props, Cassina
This series of five 0.2"-thick, laser-cut, milled, and molded sheet-metal accessories serves as surfaces and storage for a range of domestic working and living spaces. *cassina.com*

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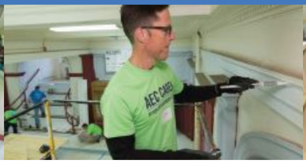


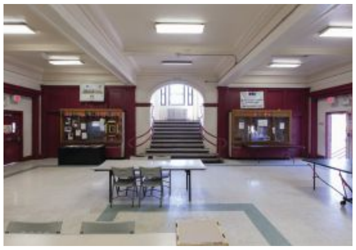
AEC CARES

projectPhiladelphia 5.18.16

Thank you to our amazing design team (pictured above) and contributing sponsors. So many from all across our great nation worked tirelessly and gave generously to help AEC Cares make a difference for at-risk youth in Philadelphia. Through your philanthropic efforts, we were able to leave behind a lasting legacy of hope. We can't thank you enough.

Please join AEC Cares community next year in Orlando - visit www.aeccares.com

Pictured above is the projectPhiladelphia Design Team (left to right):
(first row) Jeffrey Brummer, Kathy Lent, Heidi Levy, Patrick Snoke
(back row) Morris Zimmerman, Howard Lebold. Not pictured: Terri Schmitt



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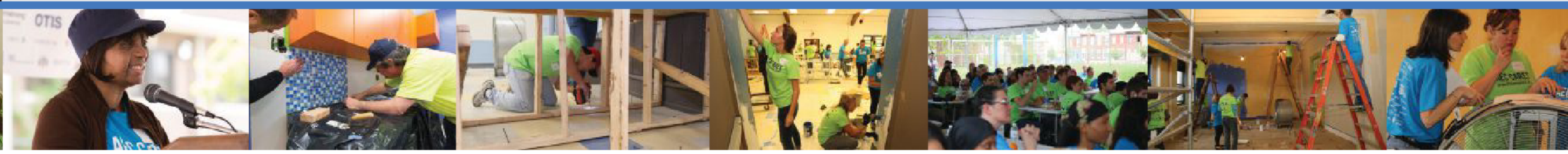

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AIA

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AIA Architect

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PHOTOGRAPHY: CARL BOWER

Community Centric

Designing with the world in mind.

Brian Phillips, AIA, is the founding principal of Interface Studio Architects (ISA), an award-winning Philadelphia-based firm. He's also a committed supporter of designing for the public interest, working closely with Public Architecture and its 1+ program to give back to the community. But to Philips, who also teaches at Parsons The New School for Design, "giving back" should—and does—mean much more than just donating time and energy to specific projects of local benefit. All projects, he says, are public interest projects.

As told to Steve Cimino

Whether you're aware of it or not, whenever you make a building you're impacting the public. At ISA, we start there with our work—and with that mindset, there's no way for us to not be involved.

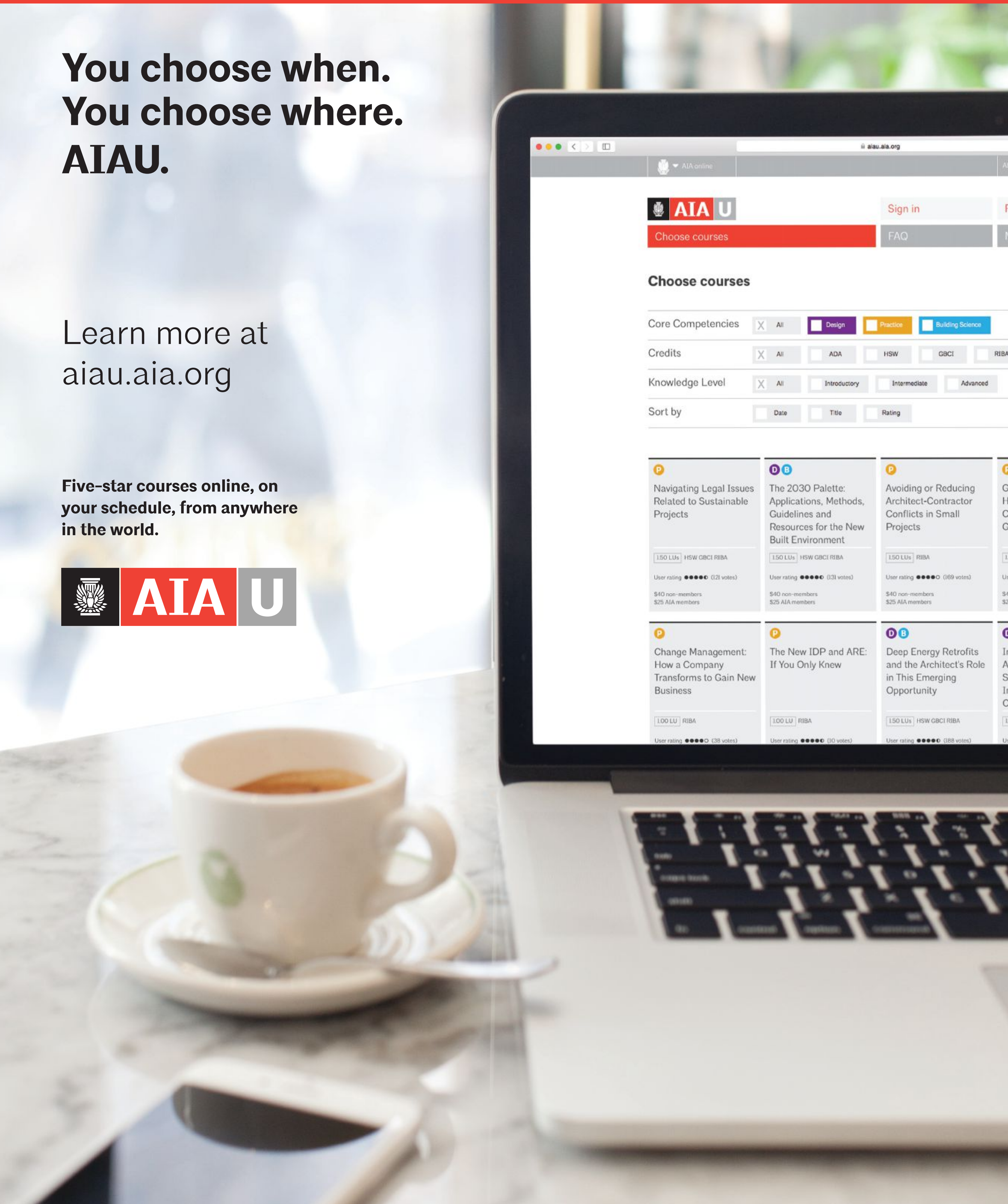
Each project we engage with comes with a different level of consciousness about public interest, and different ways to make an impact. Regardless of what's in front of you—be it a strip mall or a school—the best way forward is to ask, "How can I amplify the social impact associated with this project?"

What I admire most about Public Architecture and 1+ is the straightforwardness of the approach. Asking for one percent of your time allows anybody from any perspective to engage. We've made productive connections through these initiatives, which have allowed us to deepen our engagement with public interest work.

One important relationship that emerged from one of these events was our collaboration with Brooklyn, N.Y.-based HealthxDesign, a consultant we now work with to examine how spatial design can be measured against health outcomes. So much of public interest design is finding the right collaborators, and one of the program's best assets is creating an incredibly powerful network of like-minded people.

When it comes to young people getting involved in public design, what they may lack in experience and resources they make up for in energy, time, and a fresh perspective. As a teacher, I am struck by the renewed consciousness I've seen in students over the last five years [and] they're asking, "What does my career mean? How can I make the world better?" Questions like those go a long way towards integrating the idea of public interest into the basic fabric of how designers work.

There is an evolution going on, a generational shift, in how people relate to each other and how they feel about the community. In the recession, we lost a lot of experienced architects; we're still nowhere near where we were in 2005, and it might be a permanent gap at this point. But in a way it reduced the number of architects who were thinking small. The downturn allowed the profession, on some level, to be redefined. AIA



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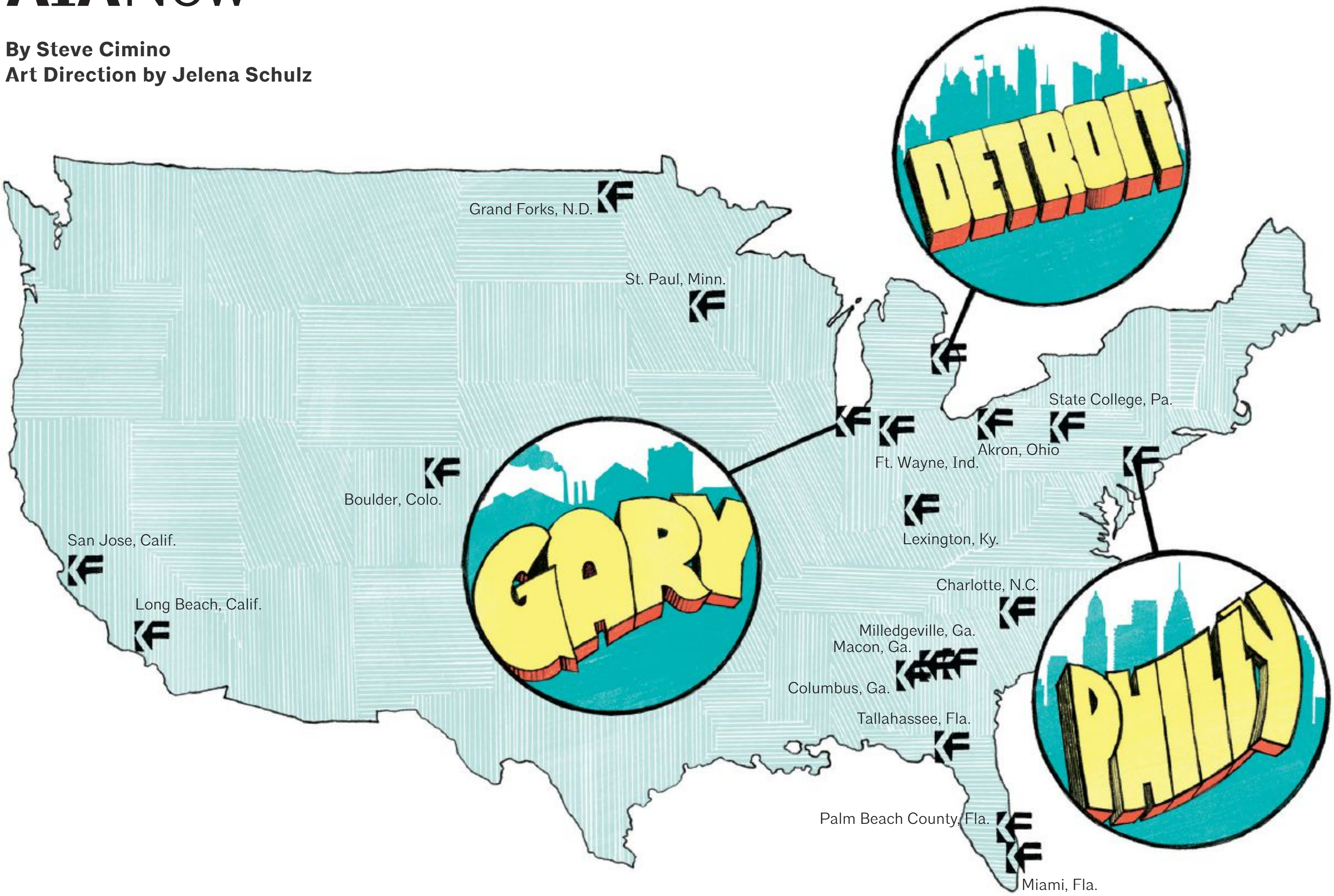
AIANow

By Steve Cimino
Art Direction by Jelena Schulz

ILLUSTRATION: LAUREN NASSEF



Investing in Urban Ideas

When $5 million is on the table, the best and brightest design ideas come to play. The Knight Foundation's second-annual Knight Cities Challenge attracted 4,500 applicants who were looking for funding for projects of all shapes and sizes with the express aim of improving pieces of their respective cities. From Boulder, Colo., to Milledgeville, Ga., 37 projects were chosen for their promise to promote the public interest by reinventing unloved spaces and empowering local residents to address a specific community need. Here are some of the highlights:

DETROIT

• Six winning projects (the most of any city) range in scope from monthly bike tours through historic neighborhoods to sustainable microparks to a pop-up market with individual shops made from shipping containers along the Dequindre Cut Greenway.

• $184,080, the most rewarded to a Detroit project, went to the People First Project by Chad Rochkind, founder of neighborhood consultancy Human Scale Studio. The aim of People First is to create a network of urbanists who, year by year, choose a challenge that can be solved with quick, low-cost improvements.

PHILADELPHIA

• Two projects that won here are related to music, which was tops among cities with multiple awards. Philly's history is awash with musical mastery, so it's no surprise that several of its winning ideas include hands-on business training via hip-hop and a traveling playground for local musicians.

• $873,364, the total amount of funding for Philadelphia's projects, is the most for any city. Of the $5 million available, the City of Brotherly Love garnered over 17 percent to support projects like ethnic-food cooking classes and cooperative business–based book clubs in over 20 neighborhoods.

GARY, IND.

• The city's only winning project is a substantial one: $385,000 will go towards funding a reuse facility for building materials such as cinder blocks, joists, sill plates, studs, and trusses. The source of those materials? Vacant homes, where structural elements will be reclaimed for use in job creation and collaboration on future community endeavors. The reuse facility grant goes to the Delta Institute, a nonprofit organization based in Chicago and Lansing, Mich., which pursues community betterment projects related to energy, ecological systems, and waste.

AIAFeature

The Pro Bono Payoff

Providing free architectural services can be tough, but firms say the benefits make it worthwhile.

By Jenna M. McKnight

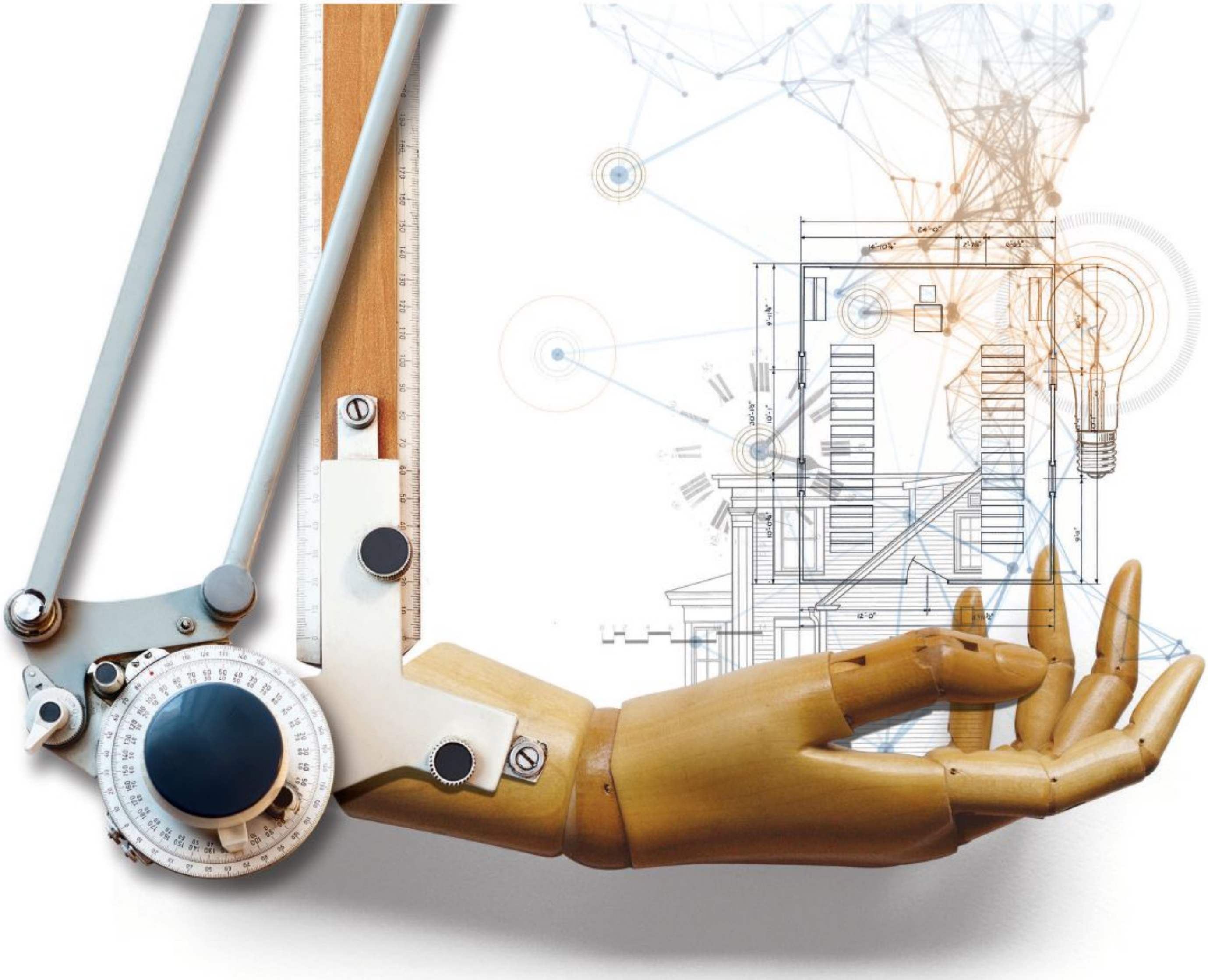


ILLUSTRATION: VIKTOR KOEN

When the Kids of Kathmandu set out to build 50 schools in an earthquake-ravaged area of Nepal last year, the nonprofit group knew it would need some help. So it reached out to SHoP Architects, asking if the firm would donate its services.

"I'm pretty shameless. I always start at the top," says Andrew Raible, a co-founder of the U.S.-based charity. He admits that SHoP was a long shot—the burgeoning firm is awfully busy these days with high-profile projects, including two supertall skyscrapers in New York. But they said yes. "It was beyond my imagination," Raible says.

SHoP sent one of its architects to Nepal last October to assess the conditions and has since conceived two prototypes that can be adapted to different sites. The first five schools will open this year.

"It's a project we really believe in," says firm partner Kimberly Holden, noting that SHoP designed pro bono a community center in Mississippi after Hurricane Katrina. "It made a huge impression on us. We've been seeking out situations and partnerships where we could do the same thing."

SHoP's efforts are part of a commitment among some architects to offer pro bono services. While architects have long been concerned with improving human welfare, the profession has been slow to institutionalize pro bono work. "It's relatively new," explains John Peterson, who founded the San Francisco–based nonprofit Public Architecture in 2002 and now heads the Loeb Fellowship program at the Harvard Graduate School of Design. "Firms are still finding their way and trying to figure out how to best incorporate it into practice."

The pro bono movement got a boost in 2003 when Public Architecture started the 1% (recently renamed 1+), a program that encourages firms to donate at least 1 percent of their working hours to pro bono service. Acting as matchmaker, Public Architecture offers a website with a list of nonprofits that need architectural services, and another list of firms willing to donate their time. Since the program's launch, nearly 1,500 firms have signed on, collectively pledging more than $55 million worth of services each year. Projects run the gamut, from retrofitting bathrooms to make them handicap accessible to producing entirely new buildings, from inception to completion.

"We do not police them, though we survey our participants pretty heavily," says Peterson, currently a Public Architecture board member. The last survey, in 2013, revealed that approximately 20 percent of firms had not achieved the 1 percent goal, which Peterson describes as normal. "Firms get busy and don't focus their energies on pro bono work," he says. "They might not do much one year, and then do 6 percent the next." Architects are notorious for operating on thin margins, and providing free labor might not always be feasible, even when the desire exists.

Firms that do provide pro bono services cite a range of benefits, including boosting staff morale, better-connecting architects to their communities, and paving the way to revenue-generating commissions. The AIA encourages pro bono work in its Code of Ethics and Professional Conduct, and offers related resources, including a contract document for pro bono work (B106–2010) and guidelines for managing such projects. Moreover, AIA members donate their services through initiatives such as the Regional/Urban Design Assistance Team program and Disaster Assistance Program.

In recent years, Public Architecture has seen a few trends emerging among pro bono practitioners. For one, firms are offering more than traditional design services. They might help an organization analyze sites for relocation and even help negotiate a lease. "Architects are getting involved earlier and in a different capacity," Peterson says.

A few years ago, Skidmore, Owings & Merrill's (SOM's) San Francisco office volunteered to help a local nonprofit group, the American Conservatory Theater (A.C.T.), create a vision for a second venue for more-experimental performances (its main home is a grand historic theater). The firm tested various sites and provided design development services, and was later hired to execute the project. The Strand Theater opened last year to rave reviews and is now raking in awards for its design, engineering, and environmental graphics. "A.C.T. is a great organization and a vital part of the city," says Michael Duncan, FAIA, a design director at SOM. "Being part of the conceptualization of a new venue for them was a great opportunity."

AIAFeature

CONTINUED

"MASS Design Group is achieving a level of innovation that goes beyond anything we could have imagined. This is next-level stuff. The bar has been raised."
—John Cary

Getting More Strategic

Firms are also becoming more strategic about pro bono work by performing services that deepen their expertise in a specific market. Take Gould Evans, whose portfolio includes a number of educational projects. Working in partnership with client Rockhurst University, in Kansas City, Mo., the firm launched a program for K–12 students called STEAM Studio, which offers hands-on learning experiences in science, technology, engineering, art, design, and math. Workshops are held at the firm's Kansas City office, in a mezzanine space that was converted into an "anti-classroom," as the firm calls it. Staff members and university educators lead workshops on varied topics, such as robotics, coding, and fashion design.

Gould Evans donated the space, and its employees contribute their time both on and off the clock. Devoting resources can be a challenge.

"It's not easy, I won't lie," says David Reid, AIA, a firm principal who oversees the program. But the benefits make it worthwhile. Not only does the program generate goodwill within the community, but it also enables the firm to create better learning spaces. "It gives us a sense of a day in the life of a teacher," says Reid, "as well as how the designed environment helps impact student engagement."

Reinforcing a firm's ethos and boosting employee morale are often cited as reasons for taking on pro bono work. NBBJ, founded in 1943, has long been devoted to philanthropy, with current efforts directed toward education, the arts, and environmental conservation. Each office finds and manages its own charitable projects. Recent efforts include two projects for the Nature Conservancy: a master plan for an eco-campus in Ohio and refurbishing a wetlands information center along the Yangtze River in China.

The firm handles its pro bono undertakings like any other project: It sets up a project number, assigns the right staff members and qualified volunteers, and generates full documentation. The work is both exciting and enriching for the staff, says firm partner Doug Parris, FAIA. "They gain a tremendous sense of investment in their community and the issues we, as a firm, believe in," he says.

Not Just Big Firms

It's not just large firms that are providing no-fee services. Mapos, a Brooklyn, N.Y.–based studio with 13 employees, has made charitable work integral to its practice. "Early on, my business partner and I decided to have at least one pro bono project going at any given time," says Colin Brice, who co-founded the firm with Caleb Mulvena in 2008, in the midst of the Great Recession. With paying work hard to come by, the duo took on a pro bono project for the Third Wave Foundation, which supports youth-led activism. The group explained what it wanted (a new office), and said it could pay $5,000 at most. "We said, 'That's ridiculous. Let's just do it for free,'" Brice recalls.

Mapos has no shortage of paying commissions these days, but it has continued to donate its services; most recently it designed an incubator space for entrepreneurs in a low-income neighborhood in Brooklyn. Brice says he has never been a big believer in architectural competitions, often organized by developers who want free designs. If his firm is going to donate its expertise, it should be for a charitable cause, and for a project that will actually get built. "We can do something helpful; we can give something back," he says.

A New Approach

Some firms are taking the do-good philosophy a step further. MASS Design Group, a Boston and Kigali, Rwanda, nonprofit architecture firm, got its start in 2008 when it volunteered to design a hospital in Butaro, Rwanda, for Partners In Health. MASS has since been paid by various agencies and organizations to design schools, medical clinics, and other humanitarian projects in sub-Saharan Africa, Haiti, and beyond. Moreover, the firm just opened a school in Kigali, called the African Design Centre, where it aims to train the continent's next generation of creative leaders.

In addition to its architectural fees, MASS relies on donations both generous and modest to fund its operations. "I think that all architecture firms could be nonprofits—then we'd be driven by ethics, integrity, and the public good, and not margins," says firm co-founder Michael Murphy.

The firm's efforts have earned ample praise from John Cary, a prominent expert on social impact design and former executive director of Public Architecture. "MASS is achieving a level of innovation that goes beyond anything we could have imagined," he says. In impoverished communities, the firm is building local capacity, which is something the architecture profession has strived for but rarely achieved. "This is next-level stuff," Cary says. "The bar has been raised." AIA

AIACollaboration

Driving Positive Change with Playgrounds

How a youth organization inspires neighborhoods to improve.

PHOTOGRAPHY: PUBLIC WORKSHOP

ABOVE AND BELOW: Strengthening communities by empowering residents is the goal of Public Workshop, which includes working in broad daylight to encourage contributions and creating engaging play areas to draw upon the inspirational power of youth.

In 2002, Alex Gilliam got a fellowship with Rural Studio and found himself in a K–12 school in rural Alabama. The school, Gilliam explains, was in very poor shape.

"Students wouldn't mention its name in public," says Gilliam. "In fact, one student attempted to burn it down twice."

With just 60 students enrolled—and one janitor for the 11-acre property—Gilliam knew something needed to change. So, he created a simple process that allowed students to identify things they wanted to change about the physical space of their school.

"The students [wanted us to] knock down derelict buildings, fix bleachers, repaint doors and an entire gym, repair windows, and replace ceiling tiles," says Gilliam. "It was beginning to have a social and academic impact on the school."

From that point forward, Gilliam continued to find opportunities in cities where young people could positively impact the design of their schools and neighborhoods. He committed himself to finding partners who believed in this idea and communities with strong needs to push this initiative forward. In 2009, Public Workshop was born. One of its first projects was in collaboration with an organization that works to empower young women on the South Side of Chicago. The organization, Demoiselle 2 Femme, wanted to get more young women of color interested in STEM professions.

"We were making worktables on the sidewalk by the vacant lot, and by the end of the day community members had actually cleaned up this massive vacant lot that was opposite where we were building," Gilliam says. "The lot had been riddled with needles and broken bottles, and hadn't been cleaned up for years, but I think we were all stunned that this simple act of these young women building with power tools could actually stimulate action. It was just overwhelming and incredibly powerful."

One tactic that Public Workshop program leaders use is to make their work highly visible—not just the end product, but that the actual work is done outside, on a sidewalk, during a time of day when the largest amount of people are around. The thinking behind this is that if members of the community actually see others making positive change, they'll contribute as well. The effect is contagious.

"In the end, two illegal liquor stores were shut down, the size of the church's congregation doubled, and trash no longer riddled the vacant lot," says Gilliam. "That demonstrated that these tactics worked, and that we needed to do a lot more of this."

Public Workshop now operates in cities all over the United States. Projects have included the creation of a green design leadership program, the development of design/build placemaking events to engage youth, the design and construction of playgrounds and exercise courses, and many other programs that encourage community engagement in the design of their communities.

"Even though our work looks like it's about youth, it's also tacitly acknowledging that it's not about kids," says Gilliam. "Youth have the capacity to inspire others to get involved. They act as a mechanism to get people of all ages to think optimistically and not resort to previous means or dialogues."

Gilliam's group has done more than rethink a city's most underutilized spaces, like vacant lots or abandoned parking lots; it has gathered together members of the community who otherwise wouldn't collaborate on anything. As Gilliam puts it, "Community engagement is actually a teenage woman with a circular saw." **AIA**

Caitlin Reagan

AIADesign

Beyond the Classroom, Beyond Borders

The Yale Urban Design Workshop brings community design to towns across Connecticut and to places riven by war and nature.

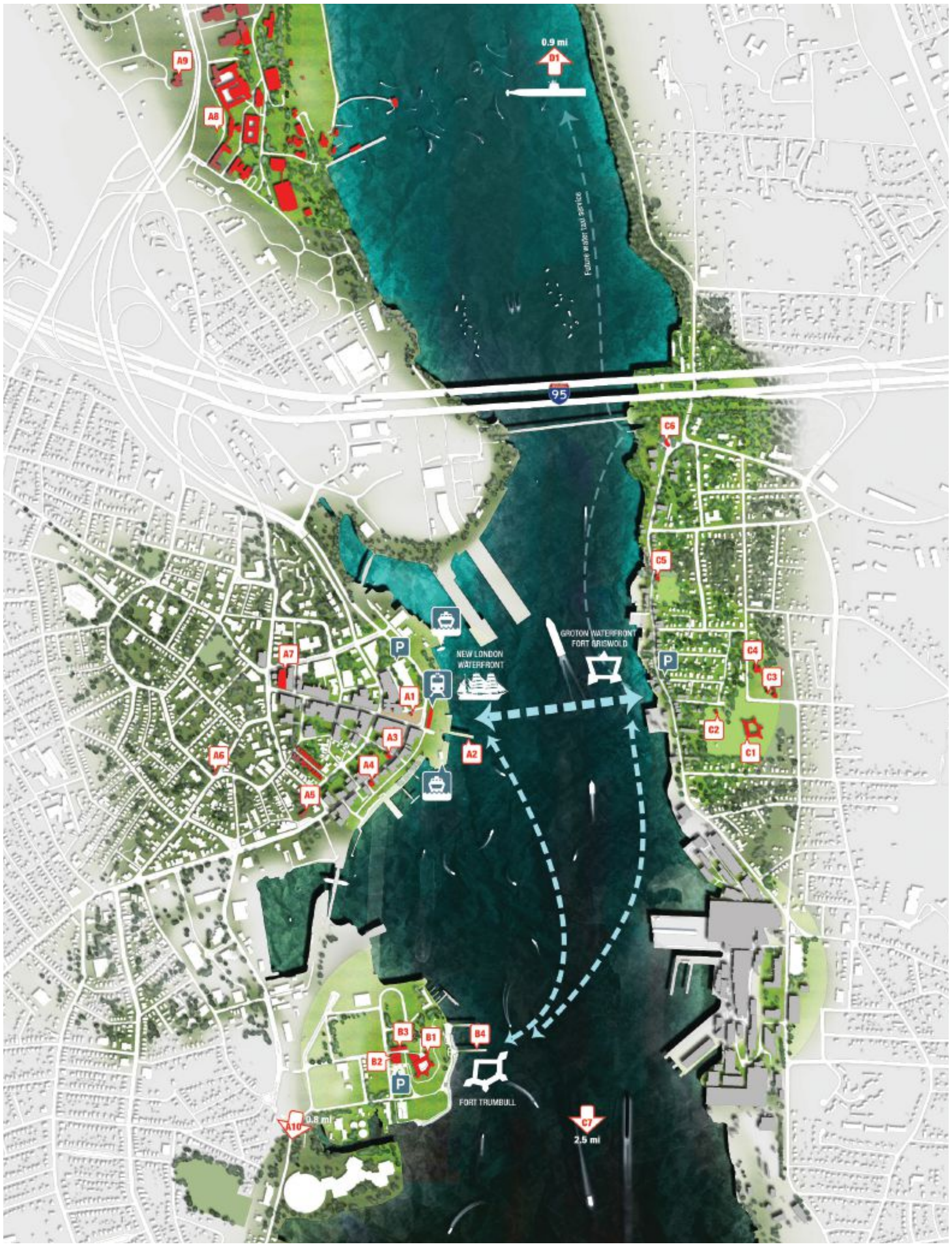
It's an ambitious plan in one of the most contested regions of the world: Since 2008, students in the Yale Urban Design Workshop (YUDW), a community design center connected to Yale University's vaunted School of Architecture, have been working to create the 1,200-acre Peace Park that will straddle the border between Israel and Jordan. Students have led charrettes, developed plans, and communicated with Jordanian, Israeli, and Palestinian professionals and students. It's a multiyear process, fraught with uncertainty, and yet slowly and steadily it's moving forward.

But, the YUDW started smaller. Since 1992, it has provided neighborhood planning and community design services at all scales to towns across the state of Connecticut, including the university's host city of New Haven. Although their work in the Middle East seems a world apart from the leafy New England charm of Connecticut, according to Alan Plattus, a longtime Yale professor and founder of the YUDW, at its root it's much the same: to get out in the community, understand the political and economic realities, and develop workable solutions.

In the late 1980s and early '90s, Plattus says, "Yale was waking up to its responsibility to get more meaningfully engaged in the local community. At the same time, New Haven wasn't doing so well. Things were kind of at a low point. So there was this need from both the inside and the outside to create this kind of community design center."

With the help of some U.S. Department of Housing and Urban Development (HUD) grants and partnerships, the YUDW quickly set up shop, first on the Yale campus and then in a ground-level storefront in New Haven's Dwight neighborhood, located just west of the university. Since the beginning, the workshop has had a long relationship with the Dwight community, contributing several iterations of a Neighborhood Plan and collaborating with local architects Thompson|Edwards on a new building housing the neighborhood daycare center and Greater Dwight Development among other projects.

About a year ago, the YUDW had to move to a second-floor space in the same building because the neighborhood wanted to use the first floor for retail. "It's a good problem to have in that there are no long-term vacancies here," Plattus says. "For architecture students, it's really healthy for them to walk a couple blocks down the street and interact with the community."



COURTESY YUDW.

ABOVE: A site plan of the Thames River Heritage Park Plan, an in-progress initiative of the Yale Urban Design Workshop designed to create a state heritage park in Connecticut that was originally envisioned more than 50 years ago.

Under the guidance of Plattus and Andrei Harwell, AIA, a fellow professor and a project manager, the workshop is staffed by current graduate architecture students as well as alumni and students from other Yale professional schools (such as the School of Forestry and Environmental Science). The workshop affords students the ability to combine the intellectual freedom of the academy—particularly the School of Architecture's famous first-year building

AIADesign

CONTINUED

project—with the constraints of real-world problems and budgets.

One YUDW intern, Apoorva Khanolkar, had worked in urban redevelopment in Mumbai, India, before attending Yale. "Both my education and my previous work experience have equipped me with an equal measure of naiveté and pragmatism that came to use while working on a real job, but one that was still grounded in an academic universe."

Among several other ongoing projects, the YUDW is now engaged in two major waterfront efforts in Connecticut. Two of the YUDW's ongoing projects consist of major waterfront efforts in Connecticut. One is a plan for Thames River Heritage Park, which would tie together the historic towns of New London and Groton with a water taxi and other connective signage as a means to boost heritage tourism and local economies. Another major effort involves a resiliency plan for the town of Bridgeport, which was hard hit by Hurricane Sandy. Along with New Orleans firm Waggonner & Ball, international firm Arcadis, and others, the YUDW is working to develop specific projects and plans that will protect Bridgeport against the effects of climate change while meeting other design goals.

"It is critical that institutions like Yale take their urban, social, and economic contributions seriously," Khanolkar says. "Yale has a tremendous footprint in the region with massive ramifications for local communities, and the YUDW aspires to leverage its resources—both material and intellectual—into the well-being of these people."

And not just them—but maybe even people far beyond the borders of a campus and a country, too. **AIA**

Caitlin Reagan

ABOVE: The Dwight Day Care Center is just one in a number of significant projects to emerge from two decades of collaboration between the Dwight neighborhood in New Haven and the Yale Urban Design Workshop. The center offers two adult education classrooms and office space along with space for dozens of young children.

AIAPerspective

PHOTOGRAPHY: CARL BOWER

Conductor or Soloist?

Determining the value of the architect's involvement.

Is the architect more like the conductor of the orchestra or the soloist in the front row? This metaphor has been debated over the years by theorists and practitioners alike. I would advocate that the best answer is "both." If we keep to music metaphors, my answer is that we are the lead musician in a jazz band or, in the rock genre, a "jam" band: We know where to take the tune and allow others ample opportunity to play their parts, but we are also the conductor, responsible for pulling the whole ensemble together.

Why does any of this matter? In the constant battle to show the public and our clients the value of what we do, and to get adequately compensated for that effort, we need to better explain the full range of the architect's role in the community and for each client's specific project. If we successfully portray our role as one that leads and coordinates the complex process of solving a community's or client's problem, we will be seen as more relevant and ultimately more valuable. The balancing act of how to present this needs to alternate between what you or your firm does uniquely as the architect, and what you or your firm does as the leader of a team of professionals. The personal branding that adds value to your involvement should boost the collective value of the team process that you will orchestrate. It is this coordination and leadership that is often cited by clients as the ultimate value of the architect's involvement.

The fluidity of the process is another important aspect of why only the architect is best-suited to be the lead player in the ensemble. Clients first seek architects for their excellent design skills but come to realize that design is only a part of the value from which they are benefiting. For a project to truly benefit from the architect's design acumen, architects need to lead a process that involves a complex team of collaborators.

Inevitably, projects will evolve, and the architect should orchestrate the team to ensure that the client's needs are met and the original design goals are realized.

I welcome others' thoughts on how to best communicate the value of what we do, so that we can benefit from our collective wisdom on this topic *(rdavidson@aia.org)*. In the meantime, keep leading the band, invite your collaborators to make their contributions, and bring it all together. It is what architects do best. **AIA**

Russell A. Davidson, FAIA, 2016 AIA President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WE UNDERSTAND
UNCONVENTIONAL

MODERN BUILDING CODES: KEEPING PACE WITH THE WOOD REVOLUTION

WOOD CONSTRUCTION AND THE 2012 INTERNATIONAL BUILDING CODE

Presented by:

reTHINK WOOD®

LEARNING OBJECTIVES

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

1. Discuss provisions in the International Building Code (IBC) intended to ensure that wood buildings provide the same level of fire performance as other building types.
2. Evaluate techniques that allow designers to safely increase the allowable heights and areas of building projects beyond the base limits stated in the IBC.
3. Identify the advantages of wood-frame structures in seismic and high-wind events.
4. Explain how advances in wood products and building systems are influencing the evolution of building codes.

CONTINUING EDUCATION

AIA CREDIT: 1 LU
GBCI CREDIT: 1 CE

AIA COURSE NUMBER: ARJULY2016.1
GBCI COURSE NUMBER: 920009066

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/AR716Course1 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.

There is a quiet revolution taking place within the design community. After a long emphasis on concrete and steel for buildings other than homes, design professionals are using wood to great effect in a growing number of non-residential and multi-family building types—in applications that range from traditional to innovative, even iconic. Some are driven by wood's cost effectiveness,[1] while others cite its versatility or low carbon footprint,[2] but their collective path has been made possible by building codes that increasingly recognize wood's structural and performance capabilities, and the continued evolution of wood building systems and techniques.

When the *International Building Code* (IBC) was introduced in 2000, it consolidated three regional model building codes into one uniform code that has since been adopted by most jurisdictions. It increased the possibilities for wood construction by (among other things) recognizing additional fire protection techniques, consolidating the maximum allowable areas and heights from the three legacy codes into one (thus increasing what's allowable in some jurisdictions), and allowing the use of wood in a wider range of building types. In subsequent versions of the IBC, even more opportunities have been created where additional fire protection features are used. Even so, the pioneering nature of building design is such that there are always architects and engineers seeking to push beyond the conventional, and it is common for project teams to request (and be granted) variances for designs not covered by the code that nonetheless meet its intent. (See sidebar, Designing with New Materials, page 7.) Given the code's three-year amendment cycle, this is necessary to keep pace with advancements in building systems, materials and construction practices.

FIRE PROTECTION

Building codes require all building components within a particular type of construction to provide the same level of fire protection regardless of materials used.

Wood-frame construction has an excellent history of code-compliant fire-resistive performance.[3] In fact, the IBC allows greater heights and areas for wood buildings than designers may think, in a wider range of construction types.

As a starting point, the IBC specifies a basic allowable area based on a single story, the type of construction and occupancy classification. It then increases the allowable area based on features of the building, including the addition of an automatic sprinkler system, side yard open space, fire walls, augmented exiting and additional stories.

For example, the code allows low-rise, two-story business and mercantile buildings of wood construction to be of unlimited area when they are equipped with an automatic sprinkler system throughout and have 60 feet of fire separation distance between the building and all property lines. Residential wood buildings with sprinklers and exterior walls made from fire retardant-treated wood (FRTW) can be up to five stories in height and have additional "levels" when mezzanines are included. Under the 2012 IBC, mezzanines are permitted to be 33 percent of the floor area below and considered part of that story, although some local jurisdictions may allow a greater percentage. The code also permits the use of wood for many features in buildings required to be of a non-combustible construction type, often even whole roof structures, based on other safety features.

Under the IBC, designers can use fire walls to create separate buildings for building area limitations when additional size is needed and sprinklers either aren't an option or they don't afford the necessary increases for the project's use and site characteristics. In Type V Construction, fire walls are permitted to be of wood-frame construction, allowing designers to divide the structure into separate buildings for purposes of size, each subject to its own height and area limits. Therefore, the size of a building can theoretically be doubled while maintaining the same construction type.

In addition to the sprinkler and open frontage increases, a designer's options also include increasing to a higher type of construction, which might include the use of fire-resistive construction throughout the building, fire retardant-treated lumber for exterior walls, or heavy timber construction.

Live Oak Bank Headquarters Wilmington, North Carolina Architect: LS3P Associates Ltd. Engineer: Woods Engineering WoodWorks Wood Design Award, Jury's Choice, 2015. Photo: Mark Herboth Photography

Rated assemblies. There are several types of fire-resistive assemblies and components within a building. These include: vertical assemblies (walls), horizontal assemblies (floors and roofs) and structural frame members (columns and beams). In most cases, these assemblies are required to have either a 1- or 2-hour fire-resistive rating. Fire-resistive construction is typically designated as the number of hours a representative test assembly will resist a standardized fire exposure when tested in a laboratory. One of the standards used for measuring fire resistance of building assemblies is A*STM Test Method E-119, Standard Test Methods for Fire Tests of Building Construction and Materials.*

The fire resistance of wood assemblies may be calculated using the provisions of Section 722.6 of the IBC, which is based on the known fire resistance of many tested assemblies. The assemblies in this Section are limited to 1 hour; however, the IBC also references Chapter 16 of the NDS, which has a broader application for calculating fire resistance of exposed wood members. By designing a building to

AMERICAN NATIONAL STANDARDS FOR WOOD DESIGN

The American Wood Council (AWC) offers a variety of publications to assist architects and engineers in the design of wood buildings, using both dimension lumber and engineered wood products. Several are referenced in the IBC and/or International Residential Code (IRC), including four that were recently approved by the American National Standards Institute as American National Standards.

2015 National Design Specification® (NDS®) for Wood Construction

A new product design chapter for cross laminated timber (CLT) includes information on the design of CLT members, connections and fire design. Another significant change is new provisions that explicitly permit structural composite lumber (SCL) to be designed for fire requirements using NDS Chapter 16. The *2015 NDS Supplement: Design Values for Wood Construction*, packaged with the NDS, contains updated design properties for visually graded southern pine and mixed southern pine dimension lumber.

2015 Special Design Provisions for Wind and Seismic (SDPWS)

New provisions have been added for seismic and wind design of cantilevered wood-frame diaphragms that provide important design clarifications, especially for design of "corridor-only" multi-story wood-frame structures. There are also revisions to the protocol for determining equivalent deformation-based shear distributions that allow more efficient seismic design of shear walls containing high aspect ratio shear walls.

2015 Wood Frame Construction Manual (WFCM) for One- and Two-Family Dwelling

New tabulated spans for lumber framing members reflect changes to design values referenced in the 2015 NDS. Tables were also added to provide prescriptive wood-frame solutions for rafters and ceiling joists in response to new deflection limits adopted in the 2015 IRC for ceilings using gypsum wallboard or brittle finishes.

2015 Permanent Wood Foundation (PWF) Design Specification

The permanent wood foundation is a load-bearing wood-frame wall system designed for both above- and below-grade use as a foundation for light-frame construction. The document primarily addresses structural design requirements and has been updated to reflect reference to the 2015 NDS and 2015 SDPWS.

AWC (www.awc.org) offers webinars, technical articles and technical support related to these standards.

meet the provisions of Type III Construction rather than Type V, the designer is able to take advantage of greater allowable heights and areas. For example, fire retardant-treated wood (referenced in IBC Section 2303.2) is permitted in different locations in different types of construction, as noted in Sections 602.3 and 602.4.2. In Type III and IV Construction, this includes exterior walls and interior walls and partitions. In Types I and II Construction, fire retardant-treated wood is allowed in non-bearing partitions, non-bearing exterior walls where a fire-resistive rating is not required, and portions of the roof construction. In Type I Construction, heavy timber roofs are permitted without fire retardant treatment.

Heavy timber construction combines the beauty of exposed wood with the strength and fire resistance of heavy timbers.[4] Modern versions include sawn stress-grade lumber, tongue and groove decking, CLT and glued laminated (glulam) timber. Under the code, fire resistance is achieved by using wood structural members of specified minimum size and wood floors and roofs of specified minimum thickness and composition; by providing the required degree of fire resistance in exterior and interior walls; by avoiding concealed spaces; and by using approved fastenings, construction details and adhesives for structural members. Type IV Construction utilizes heavy timber elements as the structural members. This type of construction recognizes the inherent fire resistance of large timber and its ability to retain structural integrity in fire situations. The fire resistance in heavy timber construction typically comes from surface char, which insulates the wood member and leaves a significant portion of the member to continue supporting the structure during a fire.

Fire safety during construction. The construction phase of a project presents unique risk scenarios that make the building more vulnerable than it is once complete, when features such as fire doors, smoke alarms and sprinklers are in place.

Minimum safety precautions for fire during construction and the protection of adjacent public and private properties are provided in IBC Chapter 33. This section includes, among other things, provisions for fire extinguishers, standpipes and means of egress. The International Fire Code also includes detailed requirements.

In buildings under construction, arson and hot work are the most common causes of fire. For this reason, site security, rigorous procedures for workers and access to fire hydrants are essential. Educating workers so they understand the vulnerabilities and how to avoid dangerous situations is also a must.

MINIMIZING FIRE RISK AND IMPACTS

Stella

Location: Marina del Rey, California

Architect: DesignARC

Engineer: Taylor & Syfan Consulting Engineers

Size: 650,466 square feet (2 buildings)

Completed: 2013

Photo: Lawrence Anderson, www.lawrenceanderson.net

Regardless of material, building components such as walls, floors and roofs are designed and rigorously tested to ensure they provide the necessary structural performance to allow occupants in a building to escape should fire occur, and for emergency responders to perform their duties. Fire and building safety codes are updated regularly to include new systems, standards and performance requirements, based on testing and evaluation, which continually improve the safety of buildings.

Building fire safety incorporates a combination of passive and active features. A passive fire safety feature may limit the height and area of the building, prescribe the use of fire-rated building elements or provide for adequate means of egress. Active fire safety features are those such as automatic fire detection or suppression systems that provide occupant notification, alarm transmittance and the ability to suppress fire growth until the fire service arrives. Codes are relying increasingly on active systems, since, with proper maintenance and alarm supervision, they have a high degree of reliability.

DESIGNING FOR FIRE PROTECTION

Cityville Cityplace

Location: Dallas, Texas

Architect: JHP Architecture/Urban Design

Engineer: RLG Consulting Engineers

Size: 626,500 square feet (gross)

Completed: 2013

Photo: JHP Architecture

A mixed-use urban infill project in the heart of Dallas, Cityville Cityplace includes five stories of Type IIIA wood-frame construction (modified per Dallas IBC amendments).

To meet building code requirements for fire protection, the project includes fire retardant-treated wood framing and sheathing at exterior walls, and an NFPA 13-compliant sprinkler system throughout—which, under the IBC, provides an allowable increase from four to five stories.

Architect Marvin Moss of JHP Architecture/Urban Design cited cost and value as the main reason wood was chosen for the project. "Type III Construction allows increased density over Type V without going to more expensive Type I/II Construction," he says.

The design accommodates the needs of two commercial occupancies, a retail store and health club, by providing ease of front access and wide visibility, while diverting much of the parking to a garage enveloped within the site plan. Features include a glazing wall and large balconies for each unit, a curved front elevation featuring eight units with large outdoor living spaces, and two interior courtyards with swimming pools.

SEISMIC PERFORMANCE

Years of research and building code development have proven that wood-frame and hybrid structures can meet or exceed the most demanding earthquake design requirements.[5]

Most earthquake damage is caused by seismic waves that force the ground to move and cause the building foundation to shake. Forces generated in an earthquake are proportional to the structure's weight. Thus, the overall magnitude of earthquake-induced forces that a building must resist is generally less for lighter buildings—and wood is substantially lighter than other common building materials. The fact that wood buildings tend to have numerous nail connections means they have more load paths, and there is less chance the structure will collapse should some connections fail. Numerous nail connections also give wood buildings an inherent ductility.

DESIGNING FOR SEISMIC PERFORMANCE

Photo: Togawa Smith Martin, Inc.

South Park

Location: Los Angeles, California

Architect: Togawa Smith Martin, Inc.

Structural Engineer: Englekirk

Size: 515,700 square feet

Anticipated completion: 2016

Developer: Mack Urban

Speed of construction and cost were cited as the main reasons wood was chosen for this project, which includes five stories of wood-frame structure over two stories of concrete and a concrete mezzanine.

According to the architect, the challenge for wood-frame buildings in high seismic zones is how to accommodate large glass areas and still provide sufficient shear walls. South Park in particular has a lot of window area. To achieve this, the design team determined the minimal length of shear wall required at each floor. Any area not required for shear wall was used for windows. This approach blended the structural characteristics of wood to create an aesthetically pleasing open window grid on the exterior of the building.

Within the wood-frame portion of the building, typical walls are either 2x6 (at exterior walls) or 2x4 studs spaced 16 inches on center. Floor joists are 2x12 sawn lumber and shear walls are plywood/OSB board.

QUIZ

1. The IBC allows designers to increase allowable floor area and building height of wood-frame structures:
   - a. if they specify the use of preservative treated wood.
   - b. if the height of each floor doesn't exceed 10 feet.
   - c. with the addition of an automatic sprinkler system.
   - d. if the connections are properly detailed.

2. In a Type V building, the use of wood-frame fire walls:
   - a. increases fire resistance by eliminating concealed spaces.
   - b. allows designers to divide the structure into separate buildings for purposes of size, each subject to its own height and area limits.
   - c. eliminates the need for sprinklers.
   - d. is not allowed under the IBC.

3. Which of the following is an active (vs. passive) fire safety feature?
   - a. Automatic fire detection or suppression systems
   - b. Limits to building height and area
   - c. Heavy timber construction
   - d. Rated assemblies

4. In Type IV (heavy timber) buildings, large wood members are recognized as having the ability to retain structural integrity in fire situations because:
   - a. a large number of connections means there is still support for the load if some connections fail.
   - b. Type IV buildings use fire retardant-treated wood.
   - c. surface char insulates the wood member and leaves a significant portion of the member to continue s upporting the structure.
   - d. designers use approved construction details and adhesives.

5. The IBC allows the use of wood for many features in buildings required to be of a non-combustible construction type.
   - a. True
   - b. False

6. Code-compliant wood-frame construction generally performs well in earthquakes because:
   - a. forces generated in an earthquake are proportional to the structure's weight. Thus the overall magnitude of earthquake-induced forces that a building must resist is generally less for lighter buildings—and wood is substantially lighter than other common building materials.
   - b. numerous nail connections means they have more load paths, so there is less chance the structure will collapse should some connections fail.
   - c. Both a. and b.
   - d. None of the above

7. For floor separating dwelling units in residential buildings, the IBC requires a Sound Transmission Class (STC) rating and Impact Insulation Class (IIC) rating of what, unless the "Authority Having Jurisdiction" has its own more stringent requirement?
   - a. 0—The IBC does not require STC or ICC ratings
   - b. 50
   - c. 100
   - d. 150

8. Which of the following statements is/are true of El Dorado High School in Arkansas?
   - a. Designers used exposed wood and natural light to create an environment that would motivate students to stay in school.
   - b. It was one of the first schools in Arkansas to make extensive use of wood following a change in school board policy that had previously prohibited wood in school construction.
   - c. Changing the original steel and masonry design to wood saved the school board $2.7 million.
   - d. All of the above

9. Which of the following is not included as a minimum safety precaution for fire during construction in Chapter 33 of the IBC?
   - a. Fire extinguishers
   - b. Standpipes
   - c. Means of egress
   - d. Proper scheduling of subcontractors

10. The 2015 IBC includes CLT of a certain thickness within what type of construction?
    - a. Type I
    - b. Type II
    - c. Type III and V
    - d. Type IV

This article continues on http://go.hw.net/AR716Course1. Go online to read the rest of the article and complete the corresponding quiz for credit.

THE IMPORTANCE OF WALL ASSEMBLY SYSTEMS

IN MOISTURE MANAGEMENT FOR MULTI-FAMILY, MIXED-USE AND LIGHT COMMERCIAL BUILDINGS

Presented by:

TAMLYN® www.TamlynWrap.com TamlynWrap™ Drainable Housewrap

Photo courtesy of Tamlyn

LEARNING OBJECTIVES

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

1. Describe how moisture impacts building durability.
2. Define the mechanics of moisture movement.
3. Identify common design defects that lead to moisture problems.
4. Review ASTM E2112 methods for flashing openings.

CONTINUING EDUCATION

CREDIT: 1 HSW/LU

COURSE NUMBER: ARjuly2016.2

Use the learning objectives above to focus your study as you read this article. To earn credit and obtain a certificate of completion, visit http://go.hw.net/AR716Course2 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.

MOISTURE'S IMPACT ON BUILDING DURABILITY

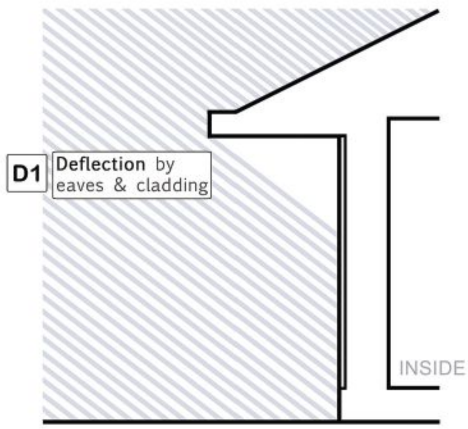
The primary goals for a building design are to be durable, long lasting, and energy efficient, as well as comfortable, healthy, and safe for occupants. Moisture represents the greatest threat to sustained achievement of these goals. As energy codes and voluntary green building programs continue transforming the building industry, the high performance, better insulated, and air-sealed assemblies now have a substantially reduced tolerance for drying.

As a result, managing bulk water, and more recently water vapor, has become critical to the design and construction of durable buildings. Moisture management also contributes to healthier buildings since mold problems cannot exist without moisture. The key to moisture management is to construct the site and building assemblies to allow all water to drain down, out, and away from the structure.

Water and moisture related construction defects are one of our nation's leading causes of building failures, call-backs, and construction litigation. Moisture's effects on a building's durability and comfort have been well documented. According to ASHRAE, moisture damage contributes to 90% of all building and building material failures with some experts estimating that as much as 80% of construction defect litigation in the construction market segment is due to water- and moisture-related failures. These failures are a significant contributor to a staggering $9 billion spent by the construction industry each year repairing finish and structural damage due to water intrusion, as estimated by ASTM.

A common misbelief is that exterior cladding systems do a good job of protecting a building from leaks, but the reality is that all cladding systems can leak; it's not a matter of if but when. In fact, cladding materials like stone, brick, and stucco actually store water, and some are actually designed with weep holes to let water escape because they are not watertight.

Building owners and tenants expect their buildings to not leak as well as be durable, long lasting, and healthy to live in. Let's discuss how to prevent water infiltration that leads to mold and indoor air quality problems that require expensive mitigation and disruption to occupants.



Deflection strategies include avoiding complex, drain-less designs; designing roofs that slope away for fast and easy drainage with no horizontal valleys or surfaces; and utilizing seamless kick–out flashings to divert roof water away from roof wall intersections. Image courtesy of Tamlyn

PREVENTING PROBLEMS—WATER INFILTRATION DAMAGES BUILDINGS

Preventing problems starts with knowledge. In order to build homes and buildings that are free from water problems it is important to understand how building components get wet and how building assemblies drain and dry. Once the building is constructed, it's important to regularly visually assess buildings for moisture damage and perform moisture tests on building materials to measure moisture content.

Wood, in general, is a very green building material that can have quite a long life span. There are wood structures in the United States that are over 300 years old and are still in service and performing well. Wood has remarkable hygric properties, meaning that it has the ability to absorb small amounts of water and dry out repeatedly and not be damaged.

However, it is critical to understand that if the wetting rate exceeds a building material's drying rate then the building material will begin to accumulate moisture and decay and mold will occur. If the moisture content of building materials increases and is sustained at over 22%, fungal decay is inevitable. New studies have pushed this number lower, suggesting that mold can grow on wood with moisture content levels as low as 15% to 18%.

It is also important to be aware that many engineered wood products like OSB rely on resins and glues to hold the wood, fibers, flakes, or strands together and therefore are much more sensitive to moisture damage than dimensional lumber and plywood. They are prone to faster decay and have dimensional stability issues when wet. Engineered wood products can perform well but they require a higher level of protection from moisture.

BUILDING SCIENCE FUNDAMENTALS—MOISTURE MOVEMENT IN BUILDINGS

How this wetting and drying takes place within a building is based on building science fundamentals that state:

- Heat moves from warmer areas to colder areas.
- Moisture moves from wetter areas to dryer areas.
- And pressure moves from high to low.

We now know that moisture moves from wetter areas to dryer areas, but how does this occur and how does it impact the wetting and drying of wall assemblies? Building components get wet and damaged by **liquid water** moving via gravity, wind driven rain, and capillary action, as well as **water vapor** moving via diffusion and air currents, which can be in the form of infiltration and exfiltration.

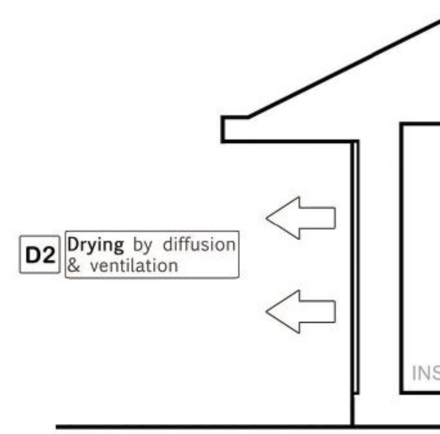
Wind and gravity driven rainwater comes from leaks in a building's cladding system or envelope due to fasteners or intersections between materials, and are inherent with all types of cladding but only occur periodically. Vapor, on the other hand, is carried in the air and from diffusion, making it a more constant factor in all environments.

The solution to wind and gravity driven rainwater is proper installation of a high quality, drainable, weather resistive barrier, and flashing systems that promote proper drainage to the exterior. A rainscreen of drainable housewrap behind pressure treated lumber is a best practice, as it allows lumber to dry and absorbed water to wick out and drain.

Capillary action causes surrounding wet materials to absorb water. Reservoir cladding systems, stone, stucco, and wood should not come in direct contact with materials that can absorb and store water. A rainscreen with an air space will create a capillary break to stop capillary moisture flow. Using a drainable housewrap can also help reduce the impact of capillary moisture because it facilitates faster, more efficient drainage of water.

Moisture-laden air infiltrates and exfiltrates through building assemblies, which can dampen building materials and even condense on cold surfaces, leading to mold and decay. The solution is to properly install a continuous air barrier system that consists of a breathable building wrap on the exterior with additional interior air sealing around all penetrations.

Moisture flow by diffusion means moisture flows as a vapor from a higher humidity environment to a lower humidity environment. Moisture is absorbed by building materials and then released to a dryer environment. An example of moisture flow by diffusion is the drying process that takes place when a wall sheathing is damp and the moisture diffuses or evaporates through a vapor permeable housewrap.



A good drainable weather resistive barrier or building wrap will prevent water intrusion but will ALSO be breathable enough to allow damp building materials to dry out should water ever get behind the wrap. Image courtesy of Tamlyn

THE DRYING PROCESS

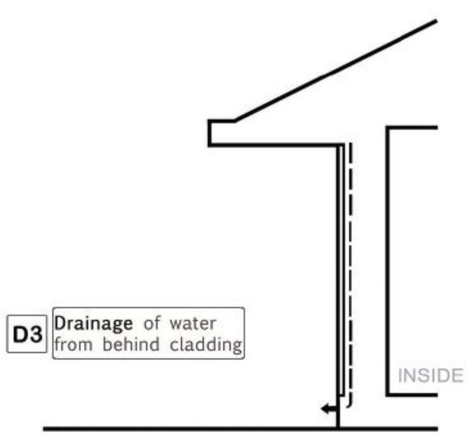
We know that wall assemblies dry slowly, so it is critical that all measures are taken to avoid complicating the drying process through proper design, specification, construction, and use. To reduce the risks of moisture related building failures avoid architectural design that traps or directs water back into the building assemblies and does not allow sufficient drainage. Detail a well-thought-out moisture management plan and specify the correct or compatible materials for the application. Ensure proper workmanship and standard construction practices are employed. Finally, plan for the moisture generated from occupants and lack of maintenance.

Some best practices that will ensure that drying occurs rapidly enough to prevent deterioration of building materials are to:

- Design for proper site drainage that does not slope back into the building.
- Avoid horizontal valleys; while they are

sometimes unavoidable, horizontal valleys are a major water hazard because they are difficult to detail and construct correctly, quickly becoming points of water collection.

- Also avoid water catching designs that require extra thought and care in detailing and construction.
- Design proper flashing for the roof-to-wall interface, which are a common occurrence, especially in multifamily construction. With a heavy water event point loads of water intrusion occur. The problem is amplified if there are no gutters and heavy runoff goes directly to a window. This puts unreasonable stress on the flashing of the window.
- Always design slope into architectural details.
- Avoid recessed openings, but if they are necessary there must be clearly documented installation details from the architect to ensure the water drainage is to the exterior and not into the window frame.
- Seal all wall penetrations BEFORE cladding the building. Most manufacturers have details for handling different types of penetrations and will gladly supply these.
- Design details with proper shingle fashion.



Drainage of water from behind the cladding aids drying as it removes bulk water and helps to alleviate pressure on the building envelope. Image courtesy of Tamlyn

BUILDING CODES AND STANDARDS

Building codes and standards require water tight performance and have progressively gotten stricter as a result of the increase in water related damage in buildings. Starting in the 2009 International Residential Code (IRC), and then expanding in IRC 2012, the code now requires a means of drainage on top of the water-resistant barrier that wasn't required in earlier versions of the code.

Section R703.1.1 Water Resistance states:

The exterior wall envelope shall be designed and constructed in a manner that prevents the accumulation of water within the wall assembly by providing a water-resistant barrier (WRB) behind the exterior veneer as required by Section R703.2 and a means of drainage to the exterior water that enters the assembly. Protection against condensation in the exterior wall assembly shall be provided in accordance with Section R601.3 (2009), Section R702.7 (2012) of this code.

As you can see the building code is very clear in its requirements to not only use a weather resistive barrier but also to provide a drainage path for water to drain from the wall assembly.

Additionally, sustainability is now an integral part of building design, with water management being a significant component of green standards and voluntary green building programs. Longer lasting, more durable homes and buildings equate to lower greenhouse gas emissions because less resources and energy are used to repair and replace them. "The greenest building you can build is one you don't have to rebuild," says building science consultant Steve Easley.

For example, the Department of Energy now requires that builders follow the Water Management Checklist as part of the qualifications for homes to be Energy Star Certified under Version 3.

The Energy Star Qualified Homes Water Management System Checklist mentions Water-Managed Wall Assemblies in Section 2:

2. Water-Managed Wall Assembly

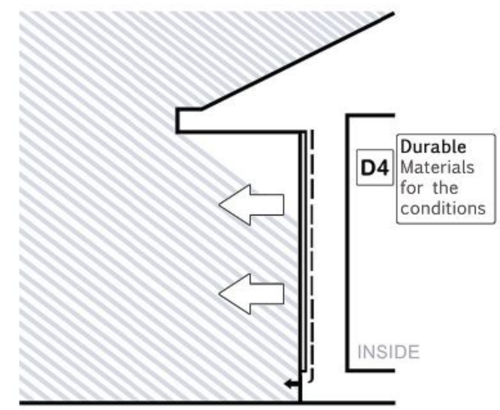
2.2 Fully sealed continuous drainage plane behind exterior cladding that laps over flashing in Item 2.1. Additional bond-break drainage plane layer provided behind all stucco and non-structural masonry cladding wall assemblies.

The 2012 National Green Building Standard (NGBS) recognizes this as well in the Resource Efficiency section of the latest version of the standard and awards bonus points towards a home's green certification for proper water management systems that promote water drainage, such as a drainable wrap.

NGBS Section 602.8 requires:

A cladding material or water resistive barrier with enhanced drainage meeting 75% drainage efficiency determined in accordance with ASTM E2273.

These important changes in the codes and other building standards will create homes that have fewer leaks and call backs, resulting in less liability for designers and builders, as well as higher quality construction and longer lasting buildings for consumers.



Specifying quality construction materials that are designed to last the life of the building is crucial to preventing moisture related call-backs long term. Image courtesy of Tamlyn

4 D'S OF MOISTURE MANAGEMENT

In moisture management we control water by employing the four D's of water managed design: deflection, drainage, drying, and durability. Deflection is the first line of defense and is provided by the eaves and cladding. This means utilizing designs, assemblies, and products that deflect rain water away from the building.

Fact: A one inch rain will deposit over 600 gallons of water per 1000 square feet of roof.

Designing to deflect this water away as fast as possible means that there will be less water for a building assembly to drain away. Deflection strategies include avoiding complex, drain-less designs; designing roofs that slope away for fast and easy drainage with no horizontal valleys or surfaces; and utilizing seamless kick–out flashings to divert roof water away from roof wall intersections.

Drainage of water from behind the cladding aids drying as it removes bulk water and helps to alleviate pressure on the building envelope. As we've discussed all cladding systems can leak and will allow water penetration. The faster water can drain from a building assembly the less water that can be absorbed by building materials. Fast, efficient drainage reduces the amount of time needed for drying because components are less wet, meaning less chance for fungal decay. The key here is to provide as much unrestricted drainage as possible.

Some drainable housewraps can remove at least 100 times more bulk water from a wall versus standard housewraps, which is achieved through the gap created by 1.5 mm spacers bonded to a high performance housewrap. The gap design provides a true drainage space between the sheathing and cladding material, giving it the drying capability of a 3/8" rainscreen. Photo courtesy of Tamlyn

For example, drainable housewrap utilizing a 1.5mm non-compressible filament provides a drainage gap between the cladding and non-woven substrate.

Drying, as we discussed earlier, is a slow process of diffusion and ventilation. The above-mentioned deflection and drainage reduce the amount of water absorbed by building materials and therefore reduce the drying time, but you can also design a construction assembly that is more conducive to the building assembly drying. A vapor permeable layer on the wall assembly will aid this process, as will an increase in cavity size within a rainscreen assembly due to better ventilation. A good drainable weather resistive barrier (WRB) or building wrap will have a balance of properties that will prevent water intrusion but will ALSO be breathable enough to allow damp building materials to dry out should water ever get behind the wrap.

Finally, you have durability which is in reference to materials used within the wall assembly, including a good cladding material, a high quality water management system, and high performance interior finishes. Specifying quality construction materials that are designed to last the life of the building is crucial to preventing moisture related call-backs long term.

According the 2009 US census, 50% of all homes in America are over 40 years old and the average age of US homes is 36 years. Since building wraps, rain screens, flashings, and sealants are a primary line of defense against moisture problems it is critical that all these components last and adhere for the life of the building, which could easily be 75 to 100 years.

QUIZ

1. According to ASHRAE, moisture damage contributes to _____ of all building and building material failures
   a. 50% b. 10%
   c. 80% d. 90%

2. True or False: New studies suggest that mold can grow on wood with moisture content levels as low as 15% to 18%.

3. True or False: Using a drainable housewrap can also help reduce the impact of capillary moisture because it facilitates faster, more efficient drainage of water.

4. Which of the following is a best practice that will ensure drying occurs rapidly enough to prevent deterioration of building materials?
   a. Avoid horizontal valleys.
   b. Avoid water catching designs that require extra thought and care in detailing and construction.
   c. Always design slope into architectural details.
   d. Avoid recessed openings.
   e. All of the above.

5. True or False: Starting in the 2009 International Residential Code, and then expanding in IRC 2012, the code now requires a means of drainage on top of the water-resistant barrier that wasn't required in earlier versions of the code.

6. ________ is the first line of defense and is provided by the eaves and cladding.
   a. Drying b. Deflection
   c. Drainage d. Durability

7. True or False: A 1mm+ gap can provide 100% drainage efficiency in testing under ASTM E2273.

8. True or False: A drainable housewrap is the best practice solution that will provide the advantages of a WRB plus the integration of a gap, which is the key to control hydrostatic pressure.

9. True or False: Some drainable housewraps can remove at least 100 times more bulk water from a wall versus standard housewraps.

10. According to the Building Enclosure Moisture Management Institute, any area that experiences more than _______ of annual rainfall should incorporate enhanced drainage techniques such as a drainable housewrap in the wall system.
    a. 10 inches b. 15 inches
    c. 20 inches

DESIGNING A MOISTURE MANAGEMENT SYSTEM

The key to building durable structures is more than just applying building paper or a housewrap. It's about employing tried and proven water management principles to develop a moisture management system that addresses all the mechanisms of moisture movement. It is a guide for architectural design, product selection and construction practice. Preventing moisture damage and call backs is really about implementing a system to effectively control moisture as a liquid and as a vapor.

This article continues on http://go.hw.net/AR716Course2. Go online to read the rest of the article and complete the corresponding quiz for credit.

SPONSOR INFORMATION

TAMLYN www.TamlynWrap.com TamlynWrap™ Drainable Housewrap

TAMLYN has brought to market a complete system of enclosure with **TamlynWrap™ Drainable Wrap, XtremeSeam™** and the related **XtremeFlashing™** tapes to ensure effective water management. This enclosure system compliments our **XtremeTrim®** line of extruded aluminum profiles for multiple panelized systems. **TAMLYN** strives to provide high quality design solutions.

SPECIFICATION CONSIDERATIONS FOR ARCHITECTURAL WOOD DOORS

Presented by:

VT INDUSTRIES Architectural Wood Doors

LEARNING OBJECTIVES

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

1. Identify components of an architectural wood door.
2. Increase awareness of wood door assembly and construction.
3. Provide a better understanding of industry standards and new door technology.
4. Review how to specify doors to meet project requirements.

CONTINUING EDUCATION

CREDIT: 1 LU

COURSE NUMBER: ARjuly2016.3

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/AR716Course3 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.

ENDLESS CREATIVE POTENTIAL WITH ARCHITECTURAL WOOD DOORS

Architectural wood doors command attention with their distinctive elegance. Whether you're envisioning something understated or wildly exotic, extensive wood veneer options, as well as a variety of factory and custom finishes will open your eyes to endless creative possibilities. But, taking all design and performance options into consideration when specifying the perfect architectural wood door is of utmost importance. Sometimes thousands of doors are specified for a project, so it's imperative that you understand the technical aspects of architectural wood door components, construction, and industry standards.

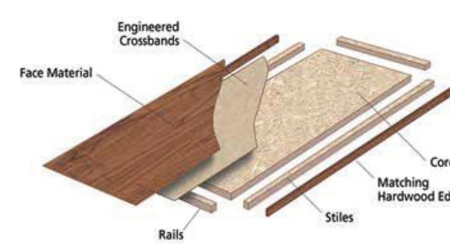
KEY DOOR COMPONENTS

Architectural wood doors are assembled products composed of multiple components, so let's begin by identifying these key components.

All doors consist of a core, stiles, rails, and face materials. Crossbanding and backers may be applied, depending on the construction process.

The core is the innermost layer or section in component construction. Core types include particleboard, structural composite lumber (SCL), staved lumber, agrifiber, and fire resistant composite. Stiles are the upright or vertical pieces of the core assembly of a wood flush door, while rails are the top and bottom edge bands of the door. The core, combined with stiles and rails, make up the bonded core assembly of the door. Faces are the outermost materials used in wood door construction and may include wood veneer, high pressure decorative laminate (HDPL), medium density overlay (MDO), high density fiberboard (HDF), or fiber reinforced laminate (FRL).

Crossbanding is a ply placed between the core and face veneer in 5-ply construction or a ply



All doors consist of a core, stiles, rails, and face materials. Crossbanding and backers may be applied, depending on the construction process.

placed between the back and face of a 3-ply skin in 7-ply construction. Crossbanding is typically constructed of hardwood veneer or engineered wood product.

CORE OPTIONS

Because cores are the main component of a wood door, the materials used for their construction are extremely important. The

The core material will provide varying degrees of durability, fire-rating, environmental, and acoustical performance and should be specified based on the application, installation, and project requirements.

material will provide varying degrees of durability, fire-rating, environmental, and acoustical performance and should be specified based on the application, installation, and project requirements.

Architectural wood door core options include particleboard, agrifiber, structural composite lumber (SCL), and staved lumber, as well as fire-rated cores and specialty cores such as lead-lined and those that are sound transmission class (STC) rated.

Particleboard Core

Particleboard is the most-specified core material because it has been an industry standard for over 30 years, has a proven track record, and meets ANSI A208.1 Performance Duty level and Window and Door Manufacturer Association (WDMA) Heavy Duty level performance requirements. A particleboard core is perfectly acceptable for most construction requirements and is available in 3-, 5-, and 7-ply construction.

In addition, particleboard will hold screws for closers and exit devices without blocking, and can meet a 20-minute positive pressure fire-rating. Or, it can be non-rated. A 20-minute positive pressure rating requires an intumescent seal or gasket applied to the frame or concealed within the door edge. Blocking is a material used to improve screw holding at hardware attachment points, and is also used to replace the core material at specific locations where the core material does not meet applicable performance duty levels.

100% of the door's construction weight is composed of pre-consumer recycled wood fiber and a Forest Stewardship Council® (FSC®) certified core is available, meaning it is manufactured with lumber from a certified forest. Alternatively, cores are available that contain no added urea formaldehyde (UF).

Structural Composite Lumber Core

Structural composite lumber (SCL) is an engineered wood product that is made by fusing a network of wood strands together with a water-resistant adhesive to produce a strong, solid, and stable product that has true structural properties with excellent screw holding capabilities and a very high split resistance. It is made from small diameter hardwood trees and is the most stable core material on the market.

SCL weighs more than particleboard, is moisture resistant, dimensionally stable, and has little environmental impact. In addition, the material does not require costly inner blocking to meet WDMA Extra Heavy Duty Levels. Structural composite lumber is available from some manufacturers with up to 45-minute fire-rating and can be FSC certified.

Staved Lumber Core

Staved lumber core is made with any combination of blocks or strips, not more than 2-1/2 inches wide, of one species of wood glued together (in butcher block fashion) with joints staggered in adjacent rows. Staved lumber is made from other wood product manufacturers' drop-off material. Previously, staved lumber was the standard core material for wood doors before better engineered, particleboard cores became available.

This core material is dry and will take on moisture differently from piece to piece, making it susceptible to twisting and warping. Staved lumber core is available FSC certified.

Agrifiber Core

Agrifiber is primarily manufactured with wheat and soybean stalks, which are both recycled and rapidly renewable. Cores are manufactured with no added urea-formaldehyde using a specialized resin bonding agent called methylenediphenyl isocyanate (MDI).

Agrifiber core doors are interchangeable with wood particleboard as they meet the same ANSI A208.1 and WDMA Heavy Duty levels, and have the same WDMA door descriptors with positive pressure fire-ratings up to 45-minutes. Note that there is limited availability for fire-rated agrifiber core products.

Fire-Rated Core

A fire-rated composite core is a non-combustible material typically incorporating minerals rather than wood fiber as the primary component, designed to improve fire resistance and thermal transmission. The fire-rated core, stiles, and rails meet rigorous smoke, flame, and pressure tests and have positive pressure fire-ratings up to 90-minutes.

Acoustical doors meet most building Sound Transmission Class (STC) performance requirements for a multitude of projects and applications, including schools, universities, government buildings, private offices, auditoriums, theatres, and libraries.

SPECIALTY CORE OPTIONS

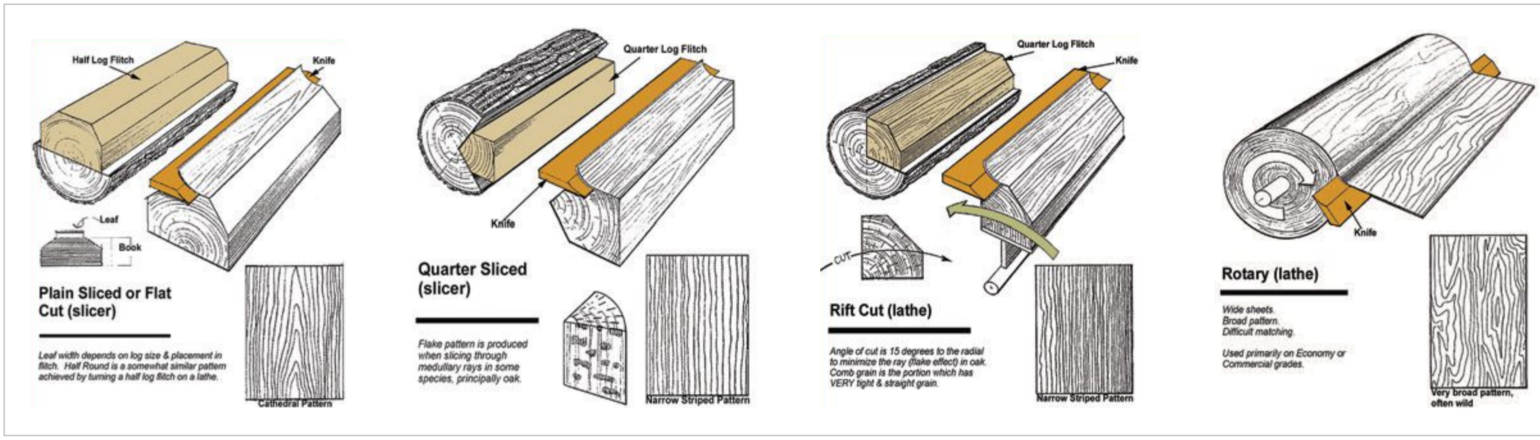
There are also specialty core options such as lead-lined, bullet resistant, and sound transmission class doors. Lead-lined doors provide different levels of radiation protection depending on the application; they have a sheet of lead on either side of the core. Lead-shielding doors are typically used in various medical X-Ray, PET, or CT scan rooms in hospitals and doctors' offices.

The maximum fire-rating for a lead-lined door is 45-minutes and maximum door size is limited to 4'x9' for single doors and 8'x9' for double doors (non-rated and 20-minute only). The maximum door size for a single 45-minute door is 4' x 8'—pairs are not permitted. Note that lead-lined doors require lead-lined vision panels and pairs of doors must always have a lead-lined astragal; wood stops and astragals are not allowed. In addition, a lead-lined door cannot be made with a stave lumber core.

Acoustical doors meet most building Sound Transmission Class performance requirements for a multitude of projects and applications, including schools, universities, government buildings, private offices, auditoriums, theatres, and libraries. STC ratings vary depending upon the manufacturer, and specific construction and acoustical door thicknesses may range from 1 ¾" to 2 ¼". Lite kits must be installed at the factory for STC rating.

Specify acoustical doors that have been laboratory tested per the most recent version of ASTM E-90, Standard Method for Laboratory Measurement of Airborne Sound Transmission. Testing of the entire opening system is conducted, which includes the door in combination with properly installed gasket seal systems (frame gaskets and door sweeps), accupads, and frames. These tests should only be performed in an operable state to accurately simulate on-site performance.

Finally, bullet resistant architectural wood doors meet security requirements for applications



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such as offices, theaters, government and education buildings, dormitories, multi-family residences, stadiums, and airports. Bullet resistant doors are manufactured with special ballistic rated materials within the core assembly. They are available to meet or exceed protection levels defined in UL 752 performance standards. When specifying bullet resistant doors, identify what protection level is required. UL 752 listed and labeled doors meet the following levels of bullet resistance:

- Level 1—9mm (3 shots)
- Level 2—.357mm (3 shots)
- Level 3—.44 magnum (3 shots)

Stiles and Rails

Moving beyond core materials, let's discuss the other components of architectural wood doors and how they are constructed. For aesthetic purposes, outer stiles are constructed using a matching hardwood outer edge, or with a compatible hardwood with exposed crossbanding. For the inner stile a mill option material, typically SCL, is used. SCL provides stability and performance, as well as superior screw holding capabilities compared to hardwood or softwood edges.

Crossband

A crossband is a ply placed between the core and face veneer in 5-ply construction and a ply placed between the back and face of a 3-ply skin in 7-ply construction. Crossbands are applied to prevent telegraphing of the stile and rail through the face material and provide stability to the door.

Engineered crossbands are typically high density fiberboard (HDF), a superior crossband material that meets all industry standards. These crossbands have a uniform quality and appearance that will not show through on light veneers and eliminates delamination due to their extremely flat surface.

Natural crossband materials are not recommended, as the color ranges from white to very dark, which could show through on light veneers. Also, voids and lapped crossbands may occur, which are not accepted by WDMA industry standards.

FACE MATERIALS

Both AWS and WDMA quality standards recognize multiple face material options as suitable for architectural wood doors. Wood veneers are available in multiple grades, matches, and assemblies to meet design requirements, including domestic and exotic selections. High pressure decorative laminate (HDPL) offers endless design possibilities and increased durability over wood veneer, while fiber reinforced laminate (FRL) meets high-traffic application requirements. Finally, mill option face materials provide a paintable surface.

Wood Veneer

Wood veneer faces are available in a variety of species, slices, and matches. Natural variations of the veneer and different cuts create unique textures, grains, figure, and color for each veneer piece and door. Decorative veneer cutting methods include plain sliced (or flat cut), quarter sliced, rift cut, and rotary cut. There are many species available, including exotic veneers for 5-ply construction, but 7-ply construction with 3-ply skins are only available in limited species. Door manufacturers follow WDMA standards for veneer grades, which are adapted from the Hardwood Plywood Veneer Association. Wood veneer doors may be GREENGUARD Air Quality Certified.

WOOD VENEER CUTTING METHODS

Plain Sliced Veneer

There are different cutting methods used to achieve the desired aesthetics for a wood veneer. With plain sliced or flat cut veneer, the half log, or flitch, is mounted with the heart side against the guide plate of the slicer. Cuts are made parallel to a line through the center of the log, producing a distinct figure. By keeping the veneer leaves in the same order in which they are cut, the leaves can be reassembled with only a very gradual grain figure transition from one panel to another. The leaf width depends on the log size and placement in the flitch. Half round is a similar pattern achieved by turning a half log flitch on a lathe.

Quarter Sliced Veneer

A quarter log, or flitch, is mounted so that the slicer cuts the log at a 45° angle to the axis lines of the log, creating a narrow striped pattern or straight grain effect. A flake effect is produced in oak veneers using this method.

Rift Cut Veneer

The rift cut veneer method is generally restricted to Red and White Oak. A quarter log is mounted off center and cut at an angle 15° to the radial, resulting in a straight grain without the flake effect of quarter sliced oak. Comb grain is the portion that has a VERY tight and straight grain.

Rotary Cut Veneer

Rotary cut veneer is a method of cutting in which the log is placed on a large lathe and turned against a fixed blade, so that a continuous cut is made round and round the log, more or less parallel at all times to the growth ring. This results in wide sheets. The result is a broad pattern with a wild, varied grain effect. Since the grain pattern is non-repetitive it cannot be used for sequence matching, and is used primarily for economy grade or commercial grades.

MATCHING OF VENEER COMPONENTS

Once the decorative veneer cutting method is specified, the type of match at the joint line must be specified. The way in which the individual cuts are placed next to each other during the fabrication of the veneer face affects the appearance of the doors.

Types of Veneer Match

Book Match—Book Match is the most commonly used match in the industry. Every other piece of veneer is turned over so adjacent pieces are opened like two adjacent pages in a book. The veneer joints match and create a mirrored image pattern at the joint line, yielding a maximum continuity of grain. Book matching is used with plain sliced, but less often with other cuts of veneer.

Slip Match—Slip Match is the adjoining of veneer components in sequence without turning over every other piece. The grain figure repeats, but joints won't show a mirrored effect. Slip matching is often used in quarter cut, rift cut, and comb grain veneers to minimize the barber pole effect.

Random Match—Random Match is a random selection of veneer components from one or more logs that produces a "board-like" appearance.

End Match—The End Match is typically selected for doors with transoms. This match utilizes a single piece of veneer that runs from the bottom to the top of the door. At the transom, a mirror image is created by turning the veneer at the joint.

Continuous Match—Continuous Match is when a single piece of veneer is utilized for both the face of the door and the transom.

Barber Pole—Because the "tight" and "loose" faces alternate in adjacent pieces of veneer, they may accept stain or reflect light differently, resulting in a noticeable color variation, often called "barber pole." These variations are not considered a manufacturing defect.

QUIZ

1. True or False: Rails are the upright or vertical pieces of the core assembly of a wood flush door.

2. Which of the following is the most specified core material?
   a. Particleboard
   b. Structural composite lumber
   c. Staved lumber
   d. Agrifiber

3. True or False: Crossbands are applied to prevent telegraphing of the stile and rail through the face material and provide stability to the door.

4. Which of the following meets high-traffic application requirements?
   a. High pressure decorative laminate
   b. Fiber reinforced laminate

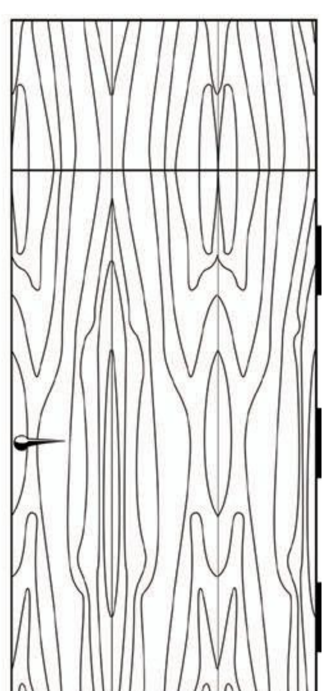
5. Which wood veneer cutting method results in a narrow striped pattern or straight grain effect?
   a. Plain sliced
   b. Quarter sliced
   c. Rift cut
   d. Rotary

6. Which of the following is the most commonly used veneer match in the industry?
   a. Book match
   b. Slip match
   c. Random match
   d. End match

7. True or False: 3-ply doors are not as stable and durable as 5-ply HPDL doors and are not available with wood veneer, as the core will show through or telegraph.

8. In which type of architectural wood door construction are wood stiles and rails NOT attached to one another or the core?
   a. Drop-in core
   b. Loose layup
   c. Bonded core

9. Which production finish provides the highest performance properties?
   a. Pre-catalyzed laquer finish
   b. TR/OP 6 - Catalyzed Polyurethane



The End Match is typically selected for doors with transoms.
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This article continues on http://go.hw.net/AR716Course3. Go online to read the rest of the article and complete the corresponding quiz for credit.

“When I asked Louis Joyner whether the city can maintain its architectural inheritance with its current approach, he shrugged. ‘That remains to be seen.’”

Letter from Columbus, Indiana by Reed Karaim

Special buildings are always best when you come upon them unexpectedly. So it was that I stumbled upon the First Christian Church in Columbus, Ind., in the dark. I had pulled into Columbus late in the day and had strolled downtown to get something to eat. Unready to head back to my room, I wandered for a while past closed storefronts on the city's version of Main Street, and then farther afield, until I looked up on a quiet side street and saw the church's tower: stark, rectangular, immense in its bold modernist silhouette against the stars.

A single set of windows were lit yellow in the building below and, as I approached, I saw a small group of men and women meeting around a table. The rectangle of light floated within the dramatic shadow of the church. As I watched, a man leaned back in his folding chair, stretched his arms toward the sky in an unconscious echo of the tower and then bent back to the work at hand.

The moment was a small example of a landmark building alive in its community, an organic part of the life it was intended to serve. I have a feeling it would have made the church's architect, Eliel Saarinen, the son of a Finnish Lutheran minister, happy.

Saarinen's church was one of several buildings that left me smiling during my visit to Columbus, a city of 46,000 that probably has more modernist architecture of note than any place its size in the country. Gunnar Birkerts, FAIA EMERITUS, I.M. Pei, FAIA EMERITUS, Kevin Roche, FAIA EMERITUS, and Harry Weese all worked here. The city is, in its own unassuming Midwestern way, an architectural treasure chest.

Columbus is also notable for having no historic preservation law or preservation commission to protect this legacy. Preservation law has been under attack in much of the Midwest by property-rights advocates, including in Michigan and Wisconsin, where Republican Gov. Scott Walker this year signed a bill restricting the ability of political subdivisions to create historic districts. Indiana has a tradition of small-government conservatism, which may have as much to do with Columbus's approach to preservation as anything.

Miller House

But local supporters insist there's another rationale for the approach. It's in keeping with the city's history as an incubator of creative design—a tradition of embracing the new without getting trapped by the past. As Jeff Baker, a downtown merchant who heads an architectural advocacy committee, put it, "Columbus is a community, not a museum."

I traveled there to see how that approach was working. As someone who believes in traditional methods of historic preservation, I had my doubts that it could be working all that well. And, of course, I came to tour the city's midcentury modern buildings, one of my favorite ways to spend a day. I particularly wanted to see the Miller House, a beautifully maintained modernist masterpiece designed by Eliel's son, Eero Saarinen, with grounds by the landscape architect Dan Kiley and interior decoration by Alexander Girard.

The house, beautifully maintained, was everything I hoped it would be. As for the rest of Columbus' architectural legacy, can the city continue to protect it?

Columbus' "Great Man" Theory

My Columbus tour guide was Richard McCoy, the executive director of Landmark Columbus, a local group chartered to care for and celebrate the city's design heritage. Wiry and intense, a runner, McCoy opened our conversation by telling me that the narrative commonly used to explain how Columbus became a center of exceptional architecture was wrong.

That narrative adopts the "Great Man" theory of history, giving credit to J. Irwin Miller, a former head of Cummins Inc., the diesel engine manufacturing firm that is still the city's biggest employer. Miller not only chose leading architects to design his own home and Cummins buildings, he set up a system that spurred the city to hire talented architects for its projects, too. "I think he has to be seen as one of the greatest architectural clients in the 20th century," McCoy acknowledges. But he believes focusing on Miller undersells a "collaborative community process" that supported so much notable architecture.

Maybe, but it sure seems like a lot of the credit belongs to Miller. The grandnephew of one of the founders of Cummins, he became the company's general manager in 1934. Educated at Oxford and Yale, he was a successful businessman, turning a local firm into a global behemoth that operates in 94 countries.

TOM HARRIS

He was active in the Civil Rights movement, helping to organize the March on Washington in 1963 and pulling Cummins out of South Africa because of apartheid. He was the first president of the National Council of Churches. If that's not enough, he played both the piano and violin, and he and his wife, Xenia, were collectors of fine art, including works by Matisse and Picasso.

But it was Miller's commitment to contemporary design that would distinguish the community he called home. He combined a fine eye with an essentially forward-looking philosophy, a faith in human progress. "He believed that the best response to the gifts we receive from previous generations is to create something of lasting value in our own time and in our own way for future generations," Will Miller, his youngest son, wrote after his death in 2004.

In 1960, Miller established an Architecture Program as part of the Cummins Foundation, which provided a list of five architects for any public project owned or operated by tax dollars. The foundation consulted with experts in the field to assemble the lists, which included both up-and-coming and more established talent. "Miller said if you use one of these architects, I'll pay for the design," McCoy says.

This commitment wasn't simply altruistic. Miller wanted to attract talented people to Cummins, and he knew a city that embodied creative energy would help. That said, what's most impressive is how Miller managed to strike a balance between guiding his community and empowering it. He never imposed the final choice of a hire. The various public entities, informed by public input, decided who they wanted to build their buildings and what they wanted those buildings to be. They simply selected from an elite list.

The result is a small city with more than 70 buildings of distinction, many by the giants of 20th-century architecture: schools, churches, banks, the city hall, the library, even a fire station. Certain details from my own whirlwind tour remain particularly vivid: The low-lying glass-walled offices of *The Republic* newspaper (the work of Myron Goldsmith of Skidmore, Owings & Merrill) that both reflect the surrounding cityscape and open the paper to its own inspection; the First Baptist Church by Weese, with its exaggerated roofline and nearly windowless interior, a thin ribbon of glass dropping light on the altar; the serene and minimalist elegance of the Irwin Conference Center, formerly the Irwin Union Bank and Trust, designed by Eero Saarinen.

The bank stands as an example of the egalitarian, essentially optimistic philosophy behind several Columbus buildings. In 1954, at a time when banks were built to impress and perhaps intimidate, Saarinen designed an open, welcoming interior that placed tellers behind an unintimidating low counter with no grates or other impediments to interaction. "This is Mr. Miller and Mr. Saarinen rethinking how banking works," McCoy notes. Even today, there is something in the clean, sun-filled brightness of the interior that seems to embody a hopefulness about the future.

A Recent Loss

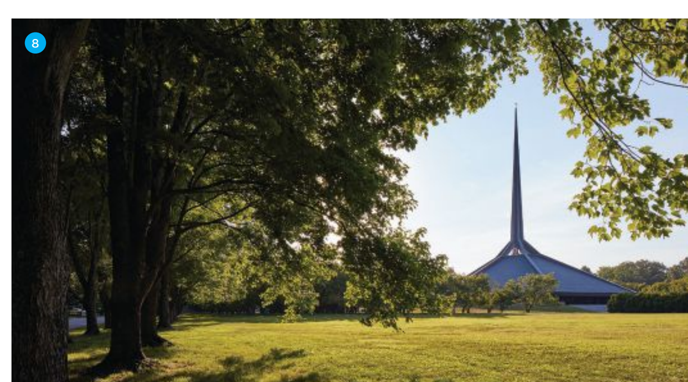
When you talk to people in Columbus you can't help but notice how strong the emotional connection is between many residents and the city's architecture. A few years ago, an addition was added to the Lillian Schmitt Elementary School, originally designed by Weese in the 1960s. The addition, designed by the respected Boston-based firm Leers Weinzapfel Associates, incorporates everything school officials asked for, and it's not a bad design on its own, but it overpowers the delicacy of the original building's saw-tooth roofline and glass-fronted design.

Here's the thing: the addition was added in 1991 and people in Columbus are still mad about it. The addition came up in three different conversations while I was there. When I had lunch with Baker, who heads Landmark Columbus' advocacy and education committee, this cheerful man referred to the building as "an abortion."

Let's be honest, in most of America, folks might have grumbled a little and then focused on the fact the school now had plenty of brand new classrooms. In Columbus, there were public meetings about the design and even an attempt to pass a bond issue to have it remodeled. This is the commitment that makes civic leaders think they can protect the city's best architecture without a formal preservation law. "We've been fortunate in that we haven't lost a lot of buildings," Baker says.

> "Every age has to make its mark and its own mistakes, and if you freeze time, you don't allow that to happen. I think that's something Irwin Miller believed."
>
> —Louis Joyner, preservation architect

That's true. Yet in 2014, a bank designed by Fisher and Spillman in 1966, considered part of Columbus' architectural heritage, was razed when a new buyer couldn't be found after the building sat abandoned. The tower at the First Christian Church is also in need



1. Harry Weese's Lillian Schmitt Elementary School **2.** I.M. Pei's Cleo Rodgers Memorial Library **3.** Eero Saarinen's Irwin Conference Center **4.** Harry Weese's First Baptist Church **5.** Skidmore, Owings & Merrill's Republic Newspaper Building **6.** Robert Venturi's Fire Station No. 4 **7.** Eliel Saarinen's First Christian Church **8.** Eero Saarinen's North Christian Church

TOM HARRIS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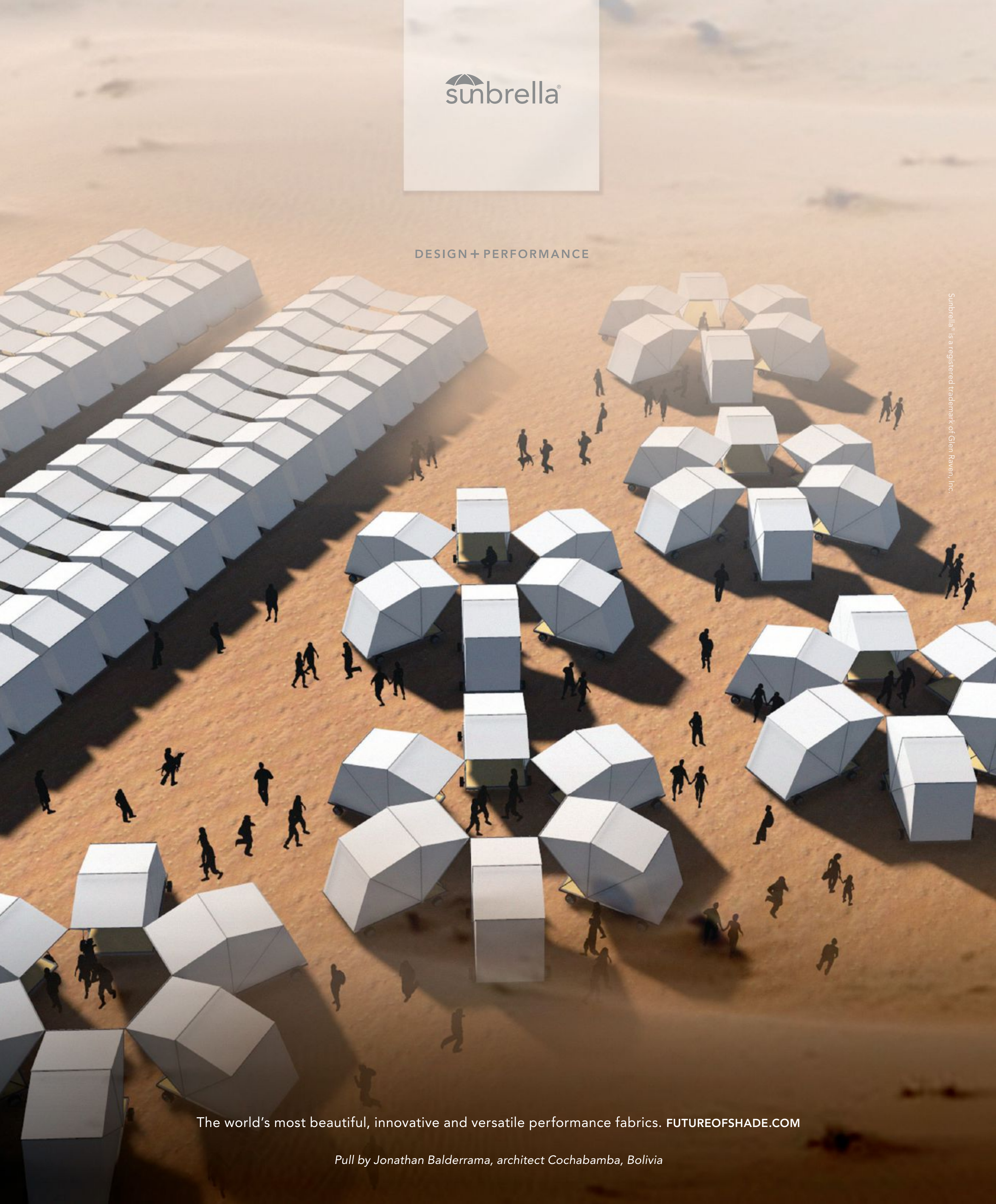
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of significant and costly structural reinforcement if it's to survive long-term.

These realities were part of the motivation for the creation of Landmark Columbus, launched in 2015 by the local Heritage Fund. The organization holds events to create greater public awareness about the city's historic design and also works to provide resources for owners of significant buildings. Indeed, it has helped establish a friends group to raise money for First Christian Church. "I don't think this community is ready for a preservation ordinance, but I think by organizing people we can do the same thing," says Brooke Hawkins, Landmark Columbus community project manager.

The Miller family is no longer as involved in Columbus as they were, but Cummins and other local corporations continue to work with civic leaders to preserve the city's legacy. "This is what the community would call the Columbus way," McCoy says.

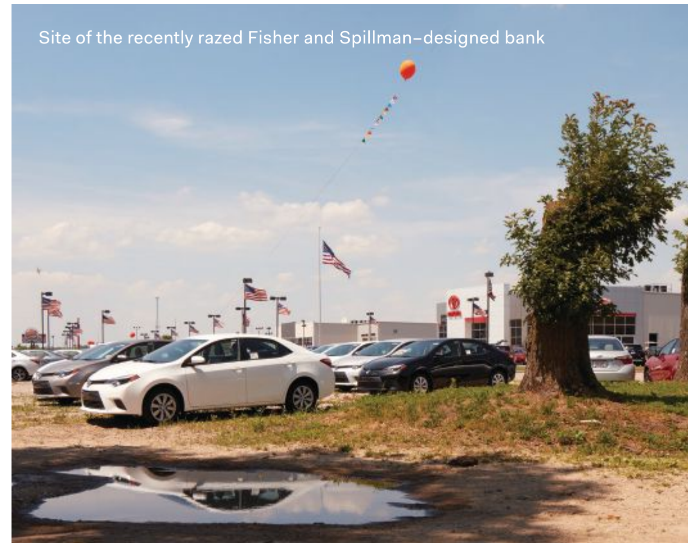
Few Recent Buildings of Note

Yet the problem with any voluntary approach is that it depends on continued good will and commitment, things subject to changing leadership and economic conditions. During my visit, I met with Louis Joyner, a local preservation architect who played a leading role in getting many of the city's most important buildings listed in the National Register of Historic Places in 2000, and with Tricia Gilson, head of the Indiana Architectural Archives program, housed in the library. We talked about both the past and the current situation. The Cummins Foundation still runs its Architecture Program, but the last buildings of significance in Columbus were built years ago. They were the 2000 Cummins Child Development Center, designed by Houston-based Carlos Jiménez, and the 2007 Central Middle School, with Ralph Johnson, AIA, of Perkins+Will serving as the principal architect.

While the city is economically healthy, the paucity of significant new building reflects a changing reality, one without a J. Irwin Miller or the same growth as in the past. "We're still figuring out how we move forward with new parameters, new leadership, a new economic reality," Gilson says.

Landmark Columbus hopes to spark a fresh wave of creative thinking. The organization is organizing "Exhibit Columbus," which will include a symposium this year and showcase temporary designs by young and upcoming architects in the center of town next year. Baker hopes the effort will "refocus people on the future."

Today's reality also intrudes on the question of preservation. When I asked Joyner whether the city can



Site of the recently razed Fisher and Spillman–designed bank

maintain its architectural inheritance with its current approach, he shrugged. "That remains to be seen. We have a legacy of people who are still very engaged. I think it's still very much part of the community, but it's very expensive."

Still, Joyner says he has come to believe there is a reason to try that goes beyond what he called simple Indiana conservatism. "The other thing is this idea that every age has to make its mark and its own mistakes," he says, "and if you freeze time, you don't allow that to happen. I think that's something Irwin Miller believed."

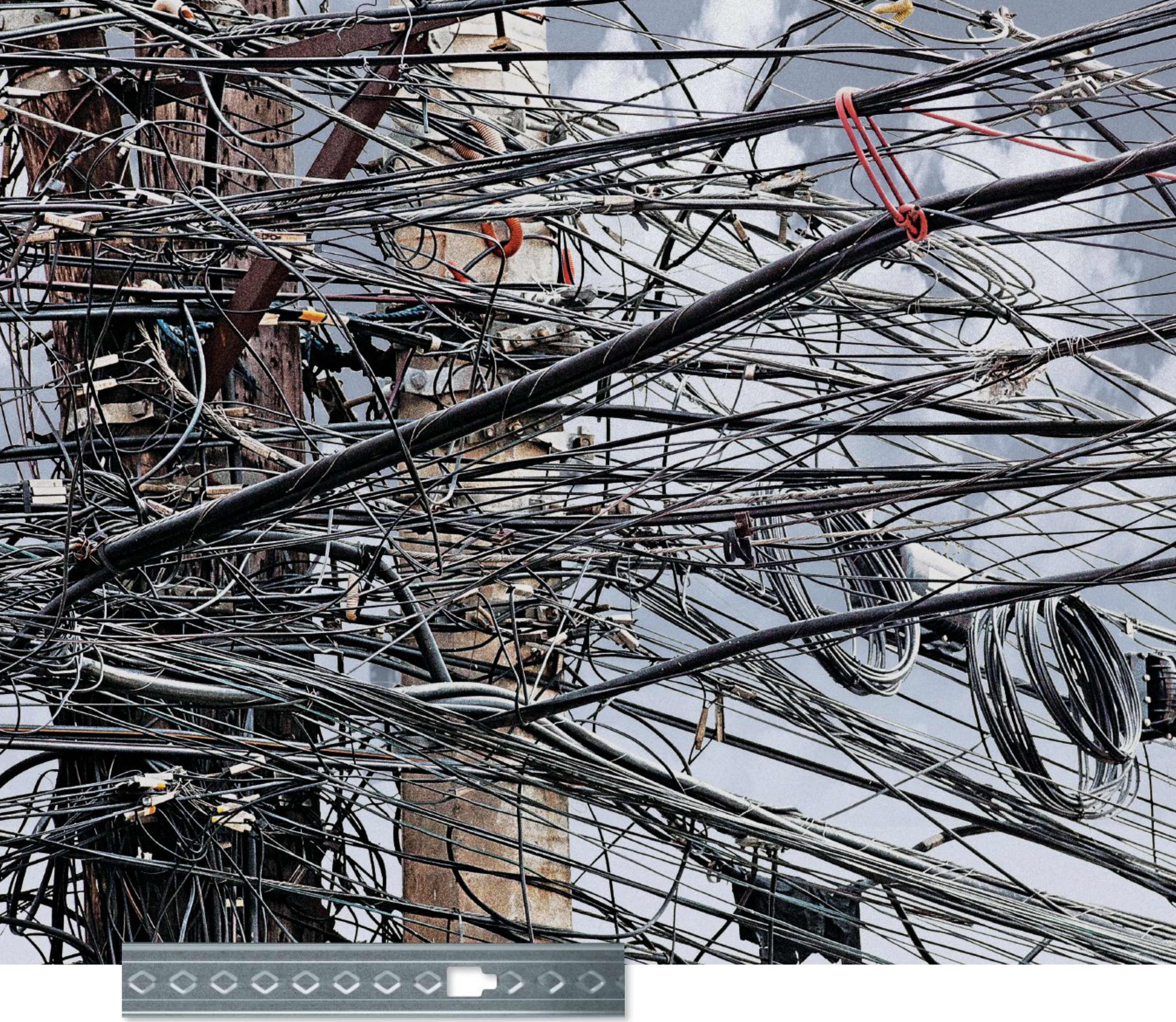
He points to Central Middle School as an example of the rewards that can come with that approach. "We had a 100-year-old, Neoclassical, central stairway, three-story middle school," he says. "Orthodox preservation would have kept that." Instead, he notes, "We got a very nice Ralph Johnson building."

After we finished talking, I strolled down to the middle school to take a look. It was a beautiful afternoon and kids were just leaving school. My own daughter is in high school, and I know from personal experience that the quality of the built environment in education directly affects the students' sense of worth. I was looking at a school that told you that you mattered.

I thought of something McCoy said as we were driving around town: "The other thing that needs to be preserved is this intangible thing—a community that wants good design. The idea that needs to be preserved is the value of making good things."

Whether the Columbus approach can be applied everywhere seems to me debatable. Preservation law and commissions arose in response to genuine threats, and preserving the best of the past does not have to mean elevating it above the best of today. But in Columbus, fine design is so woven into the town's character that it just might work. "Every town has something that helps it understand what it is," says Joyner, "and architecture is how this town understands itself."

TOM HARRIS



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"Seeing the city through the lens of the architect's adventurous musical mind was to see it animated and estranged."

Daniel Libeskind's Frankfurt Concerts by Ian Volner

"Look at the metronomes! A hundred of them!"

Daniel Libeskind, AIA, was standing in the basement of the Römer, the historic city hall of Frankfurt, Germany. Since the early 15th century, the building has been the seat of emperors, a meeting place for prosperous burghers and august dignitaries from around the world—and the business of feeding them, always a necessary practice of realpolitik, was carried out in the cellar, where a massive industrial kitchen now stands idle pending a prospective renovation.

On a weekend in mid-May, Libeskind had filled the half-empty space with ticking-tocking boxes, all set at different times and speeds, for a performance of Hungarian György Ligeti's rarely heard Poetic Symphony for 100 Metronomes. The event was part of "One Day In Life," a 24-hour concert series curated by Libeskind and organized under the auspices of the Alte Oper, the musical company that occupies the renovated 19th-century opera house in the center of Frankfurt.

Looking to reach a broader audience, the company charged Libeskind with finding 18 prospective venues all over the city (the unlikelier the better) to stage a wide assortment of his musical selections—classical, baroque, modern composed music—with tickets available to the public depending on how many attendees each venue could accommodate. Some pieces had an audience of 20; some had of upwards of 100; none were at anything less than near-total capacity. The citizens of Frankfurt ("Bankfurt," as it's sometimes called) were evidently eager to have a little offbeat culture in their notoriously on-beat town.

Libeskind as Musical Prodigy

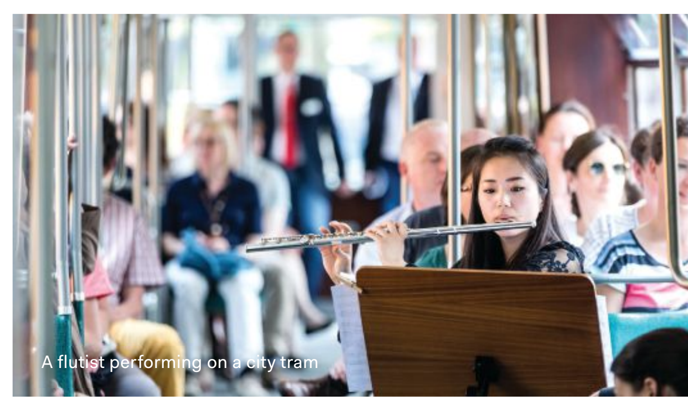
As a drum major for this unusual procession, Libeskind was a perfect choice. He's known as the fragment-obsessed, symbolically inclined designer of the World Trade Center master plan, the Jewish Museum in Berlin, and dozens of other projects—a "starchitect" with honest claim to the title, being an alumnus of the "Deconstructivist Architecture" exhibition at MoMA that first brought him, Zaha Hadid, and Rem Koolhaas, HON. FAIA, to international attention in 1988. But there is another side to the architect, one not quite so well known outside professional circles: Daniel Libeskind, accordion prodigy.

Born in Poland in 1946, Libeskind was a gifted instrumentalist long before he was a designer, and he emigrated first to Israel and then the U.S. on the strength of his musical talent. Even after he put down the squeezebox and picked up the T square, he continued his preoccupation with music, maintaining an extensive record collection that veers from the impassioned piano sonatas of Beethoven to the complex tonalities of avant-gardists like Harry Partch and Elliot Carter. His taste is one of the few things he does not entirely share with his business partner and wife of nearly 50 years, Nina Libeskind. "Sometimes when he plays music," she told me, "I say 'Okay, I am leaving the room.'"

Mrs. Libeskind was with her husband on the tour, as were the couple's artist daughter Rachel, their older son Noam, and Noam's wife and son. There was also a small detachment of personal friends, Alte Oper representatives, and a few members of the U.S. press, all navigating the town with surprising ease in a fleet of well-appointed vans, arriving at the disparate locations just in time for each performance. Greeting the motorcade at each stop, hordes of Germans crowded in for a closer look at the architect-Konzertmeister. Libeskind received them all warmly (though he doesn't speak German), and his enthusiasm for the enterprise seemed only to grow with every 45-minute presentation.

First there were the flutists in the subway. Sitting on an old-fashioned railroad handcar on an unused track, the musicians were pushed along by assistants, as the eerie strains of classic and baroque pieces wafted through the cavernous tunnel. Commuters and maintenance workers at a station stopped to stare.

"Only in Frankfurt!" gushed Libeskind.


A flutist performing on a city tram

A Little Urban Shock Treatment

That piece was only a preview-teaser; things began in earnest the next day at 10 a.m., when the Libeskind posse arrived at a firefighter training center—a vast mock-up of a city street, in which the concert organizers had installed a piano, two string players, and a series of speakers for a mixed program that included Karlheinz Stockhausen's "Songs of Youth in the Fiery Furnace." The thematic connection, given the location, was clear; even more exciting for Libeskind was the technical accomplishment, involving the coordination of those strategically placed amplifiers. "That's the first time it's

ACHIM REISSNER

ever been played in four channels!" he said.

In the 800-year-old Hospital of the Holy Ghost, reconstructed after WWII, concertgoers packed into an operating room to hear an unusual piece of program music by 18th-century composer Marin Marais: a viola de gambol and a theorbo sonically "enacting" a gall bladder removal while a speaker, reading in the original *français*, explained each step of the procedure. ("Only in French!") This was complemented by improvised Indian ragas performed by a sitarist perched cross-legged and barefoot on the operating table under the harsh glare of a huge surgical lamp. ("The light of the hospital!")

Then there was the performance at the Commerzbank Arena, the city's main soccer stadium, where a solo violinist paced across the field—a tiny spec in the huge void—playing snippets of Bartók, Bach, and others. There was the Hochbunker, a former military installation on the site of a destroyed synagogue, where the brutal screams and crashes of Luigi Nono's "Remember What They Did To You in Auschwitz" reverberated through the building's

Libeskind applauds a violinist at Commzerzbank Arena

WONGE BERGMANN


Shubert at the German National Library


Mozart at the VGF Railcar Depot Hall

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concrete maze. And there was the Boxcamp Gallus, where virtuoso pianist Pierre-Laurent Aimard was placed at the center of a boxing ring and proceeded to engage in an amazingly athletic tussle with Beethoven's Piano Sonata No. 31. "Did you see him?" said Libeskind afterwards, rushing up to congratulate the performer. "He was drenched in sweat!"

Seeing the city through the lens of Libeskind's adventurous musical mind was to see it animated and estranged, not a bad thing for a place one had believed (not without reason) to be a little *stumpf*—flat and lusterless. That, evidently, was what Libeskind was after—a little urban shock treatment, just to see how Frankfurt would react. He was not displeased with the results. At the Alte Oper itself, after a particularly clangorous rendition of a Helmut Lachenmann piece that featured scraping strings and a squawking vocalist, the audience's response had Libeskind in raptures.

"There was a boo!" he said. "A 30-year-old piece and it's still that controversial!" The composer, he said, would have been thrilled.

Vivaldi and Saariaho at the Senckenberg Museum of Natural History

TIBOR PLUTO

LEFT: ACHIM REISSNER; RIGHT: TIBOR PLUTO


Pérotin and Sciarrino on the 38th story of the Opernturm


Indian raga music in a surgery room enactment of a gall bladder removal

“The dirty little secret about Kahn’s serene museum is that it is filled with ‘Architecture,’ little of it neutral and much of it passively aggressive.”

The Restored Yale Center for British Art by Joseph Giovannini

By the time Louis Kahn designed the Yale Center for British Art in New Haven, Conn., the 69-year-old architect was already legendary. His priestly pronouncements ("What does a brick want to be?"), often delivered to his rapt students at the University of Pennsylvania, mystified his career, and virtually tattooed his late buildings with oracular certainty.

When the 114,000-square-foot center was completed, posthumously, on Chapel and High Streets in 1976, an aura of wisdom surrounded the structure. Faced with pewter-colored, matte steel panels set in the gridded, four-story concrete-frame structure, the building was serene, a timeless classic of understatement. The façades, with their muted, patinated surfaces, deferred to the tall Gothic arches of the Old Yale Art Gallery (1928) on the opposite side of Chapel, and the building's serenity spoke to Kahn's own brick-walled Art Gallery (1953), a quiet, considerate extension of the old museum.

But Kahn's design pointedly had nothing to say to the Art and Architecture (A & A) Building kitty corner, at Chapel and York, by Paul Rudolph. That cubic quarry of bush-hammered concrete was completed in 1963, and it was a Rubik's cube of solid mass and spatial porosity. In the narrow corridors of architectural power at Yale, the two architects were adversaries, midcentury rivals, like Borromini and Bernini in the more grandiose arena of Rome centuries before.

A Meticulous Restoration

Under the caring hand of New Haven architect George Knight, AIA, a Yale School of Architecture graduate, the university has just completed a $33 million restoration of the center. Its building systems were dated; the linen walls, tired; the honey-colored oak paneling, soiled or bleached; the perimeter wall panels, corroded and inadequately insulated. The three-stage restoration was started in 2008 and coordinated so that the museum was closed only from early 2015 until this May.

The restoration was thorough, meticulous, and sensitive. This is a building that thrives on tonal subtleties that, over the years, dulled with the simple passage of time. Knight has restored the glow and elegance: the oak paneling, floors, and trim have been refurbished or refinished, and the Belgian linen lining gallery walls, replaced. Perimeter walls were stripped to the steel panels, treated for corrosion, and re-insulated. Mechanical, electrical, fire, and telecommunication systems were upgraded. Oak paneling in the library was extended, per original plans. The founders' lounge was refurbished to standards that would make the center's donor and patron, Paul Mellon, feel at home. The traverse walls that had been built in the

Yale Center for British Art pre-restoration

fourth-floor Long Gallery were removed, and now 200 paintings, densely hung gallery-style, enjoy a 140-foot vista down the re-unified room, as originally intended.

Then there were the small surgical improvements, such as widening a door in the library so that flat files for prints and drawings can now be moved without being tilted. Knight rebuilt Kahn's famous removable pogo panel walls for the galleries, with a reveal at the floor that allows space to flow through the gap beneath.

Strangely, some decisions were deferred. The track lighting, with adjustable but obtrusive fixtures, was left as is rather than being upgraded per current standards with more discreet miniaturized lights. Large plate-glass gallery windows were left unchanged, without protections from UV rays. (Protective film may be added in the future.) Meanwhile, curators use Kahn's original sliding louvered shutters to protect the artworks from sunlight. (When Kahn's Yale Art Gallery was restored several years ago, much attention was lavished on its window walls.)

That the building now looks new again invites an evaluation not only of the restoration but also of the museum itself—as if at its inauguration. Seeing it as new rather than untouchably historic lifts both the presumption of aesthetic beatitude and the onus of deference. In a time when culture wars have raged over the role—and limits—of architecture for displaying art, the restored Kahn building tells a morality tale.

Kahn's Original "Sins"

The dirty little secret about Kahn's serene museum is that it is filled with "Architecture," little of it neutral and much of it passively aggressive. Kahn designed the building on a 20-foot grid, which he expressed consistently and even insistently. In the third-floor galleries, with their low ceiling height, the cage of columns and beams that measure space so emphatically

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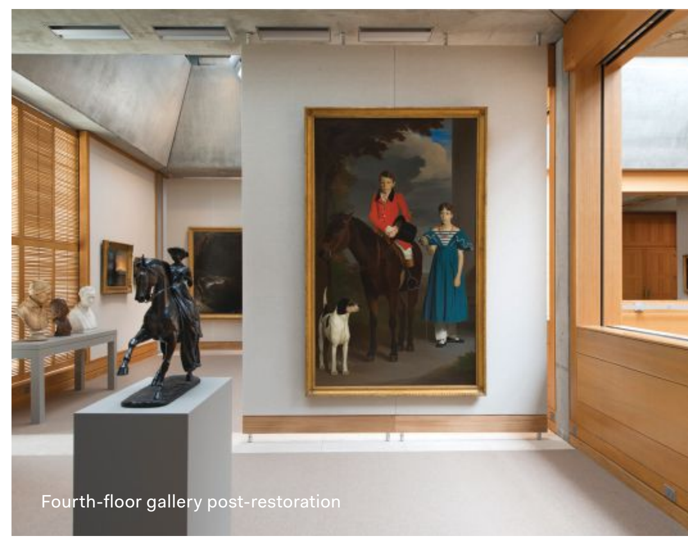
Fourth-floor Long Gallery post-restoration


Fourth-floor gallery post-restoration

forms a pile-up of small, serial "rooms" that are all the more crowded because circular air ducts, "honestly" expressed like the structural grid, press on the spaces below. Discrete modular units define the space, as opposed to the open plan under a tetrahedral space-frame ceiling Kahn had built in his art gallery across the street. At the Yale Center, Kahn's religiously expressed module gets the galleries into spatial trouble.

In the three-story Library Court at the core of the building, Kahn visualizes the grid on the paneled walls like a theme: paintings are regimented within the concrete grid, and many, including two monumentally large lion portraits by George Stubbs—are hung atop the grids of paneling, which pass beneath. The concrete grid confines the paintings, and the paneling grid disturbs them: the paintings sit uneasily on the paneling.

But perhaps the most unsettling parts of the design are the big planning moves in the basic parti. Kahn took as his given a rectangular prism built to the boundaries of the site, and he carved two-and-a-half

TOP: MICHAEL MARSLAND; BOTTOM: RICHARD CASPOLE

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volumes out of the volume: the corner entry, the four-story entry court, and the Library Court in the middle of the building. Kahn placed the elevator core and its landing between the two interior courts, plus a monumental concrete cylinder housing the stairwell—a tumulus of space copied almost literally from the stairwell in his museum across the street.

The discomfiting result of the carved voids, the elevator core, and the cylindrical stairwell is that they marginalize the working parts of the museum—the galleries, libraries, and offices—and separate those parts from each other. Unlike the Guggenheim Museum in New York City, where the atrium binds the galleries into a larger whole, Kahn's atria, basically closed to the surrounding areas, divide the museum. They act as opaque obstacles that diminish the building's spatial versatility, navigability, and cohesion. Of course Kahn believes in spatial stasis, but perhaps he achieved his goal too successfully.

The grid, however, does pay off handsomely in the principal galleries on the top floor. Each of the 20-foot modules there forms coffered ceilings that

> "You can't get away from the architecture here, but you really don't want to."
>
> —Scott Wilcox, deputy director for collections

rise inside angled, pyramidal walls up to filtered skylights. Kahn clearly believes in viewing art in natural light, though his geometries, including his striated section, do not permit bringing "heavenly" light from above to the lower galleries, where he depends instead on the large bay windows that necessitate the sliding shuttered screens.

If Kahn's expressive use of concrete and oak and his gridded geometry actually shape what could be called an un-neutral space—or, more charitably, a space of character—he mitigates the effect by domesticating the spaces. The linen wall coverings, along with the paneling, recall great country houses. He further domesticates the building by orchestrating a mellow tonal quality throughout: the concrete is pale and smooth, cast in metal forms. He designs forgiveness into the geometry through his palette of materials and colors. The golden oak plays a major role in warming the spaces.

"You can't get away from the architecture here, but you really don't want to," admits Scott


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Library Court post-restoration

RICHARD CASPOLE

Wilcox, the center's deputy director for collections. The curatorial staff admires it so much that they have chosen to work with it rather than fight it.

On returning to the center after its restoration, we discover that this priestly architect was mortal after all. It may be revisionist apostasy to even think it, but Kahn sinned. By today's standards of museum design, his building runs interference with the art. He adopts a rigid geometric system and casts it with a strong materiality, and then he compensates with mitigating moves. Yet somehow Kahn was never accused of faulty ratios: too much architecture for the art.

Eschewing the White Box

It is revealing to see the center through the reciprocal gaze of the A & A Building (now called Rudolph Hall) across the street, and through the antagonistic relationship between the two masters. Kahn was building volumetrically stable buildings in noble materials that made a pitch for eternity. In his lectures, Kahn said that Rudolph's fault was that he did not follow the "order of nature." "Order" here is the telling word for an architect who clearly considered the freedoms of the A & A Building "disordered."

In designing the center, Kahn uses the grid to form boxes rather than to liberate space from the box. The building suffers from an almost disciplinarian excess of


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order; paintings are over-controlled by the three-dimensional grid. With the A & A Building, Rudolph deliberately created spaces that open to each other horizontally, diagonally, and vertically, and they flow level to level, floor to floor. Kahn, a proponent of architectural gravitas and static rather than dynamic space, compartmentalizes spaces within his grid: the two atria are big boxes, and the gridded galleries on the second and third floors, especially when outfitted with the pogo panels, tend to closure because Kahn emphasizes the discreteness of each modular unit.

At a time when other architects have had their wrists slapped for over-exercised designs that upstage the art, Kahn somehow has gotten a pass. Critics then and now seem to have practiced a double standard, lauding the serene but geometrically and materially expressive Kahn building while criticizing other architects practicing ideologies that might seem inhospitable to art.

The point, however, is not that the center is an overrated design: the museum survives its architecture. Rather, the principles by which it was designed led Kahn to a museum with its own formal and spatial integrity. Recognizing its committed aesthetic establishes a precedent for other architects to argue for other forms of character. Kahn clearly eschewed the cold abstraction of the white box in favor of concretizing ideas with material weight, rendered in soft tonalities. He dials up gentleness once he establishes stern ground rules. At the center, he built a strong example of non-neutrality that establishes a strategic precedent for other architects.

The trick is to design strong architecture that curators "really don't want to get away from." Kahn knew the trick: ingratiating surfaces.

R+D
AWA
RDS

10th Annual R+D Awards

INTRODUCTION BY WANDA LAU
TEXT BY NATE BERG AND GIDEON FINK SHAPIRO

World hunger. Climate change. Natural disasters. Conservation. Anyone who questions architecture's relevance to the big issues should look no further than the 14 recipients of this year's R+D Awards, ARCHITECT's annual celebration of innovative research and technology. From 100 submissions, jurors Mic Patterson, Doug Stockman, AIA, and Elizabeth Whittaker, AIA, selected five winners, five citations, and four honorable mentions, all by impassioned, interdisciplinarily minded designers using advanced computation and fabrication technologies to tackle problems of all scales and scopes.

This year marks the R+D Awards' 10th anniversary, but we're not patting ourselves on the back. One decade is but a blip in the history of human habitation. We are content to help provide, as one of this year's recipients describes it, "validation that all the time spent working on this project has meant something."

> *Juror bios and project credits for the winning entries can be found starting on page 143.*

WINNER

Cricket Shelter and Farm

For the exhibition "Survival Architecture and the Art of Resilience," organized by the Oakland, Calif., nonprofit Art Works for Change, Mitchell Joachim, ASSOC. AIA, envisioned a structure that would provide not only shelter, but also a source of sustenance that could endure climate change and natural disasters. The food source? Crickets, whose protein-rich bodies require little water and energy to grow. "They're good for you and good for the planet," says Joachim, the co-founder of Brooklyn, N.Y.–based Terreform ONE and an associate professor of practice at New York University.

Ultimately, Terreform ONE's prototype cricket shelter and farm is less about providing emergency relief, and more about experimenting with food culture and ecology through architecture. Currently cricket protein is ground up in energy bars that "taste like wood," Joachim says. He suggests that the insect could be integrated into refined dining culture and cuisine, similar to how sushi took off in the U.S. in the 1980s. And crickets can—and should—be grown and harvested locally, he says, to match the farm-to-table values of today's eco-conscious gourmands.

Crickets have long been farmed in several countries, Joachim says, but the standard practices are unsanitary because they do not effectively screen out carcasses, baby crickets, feces, and dirt. In contrast, Terreform ONE's carefully considered design allows handlers to maintain hygienic conditions and to harvest living adult specimens only.

The 144-square-foot structure comprises 224 interconnected modules set within a vault of 16 CNC-milled wood ribs. Each module consists of a 5-gallon plastic container lined with a nylon mesh sac and equipped with a ventilated door, a shading louver, and "mobility tubes" that lead to other modules. These 0.5-inch-diameter PVC tubes are lined with soft nylon mesh. Cocoon-like "sex pods" affixed to the outside of the shelter make mating a potential spectacle. Once the baby crickets, or nymphs, are strong enough, they can hop freely into the main farm via the tubes.

"This is a brilliant architectural proposition combining science, cuisine, and construction—all

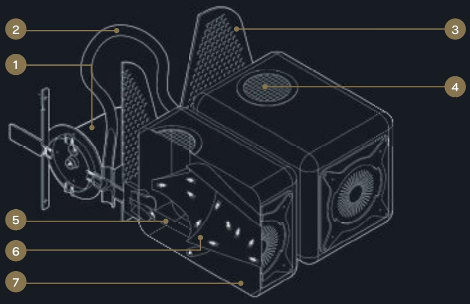
executed with a sense of humor," said juror Elizabeth Whittaker.

Crowning the shelter are 25 spiky quills, made of pipe cowls attached to 4-foot-long fins of plastic and coated masonite, that draw air and heat out via the stack effect, and amplify the sound of the crickets' chirping. Sculpturally, the quills nod to Constantin Brâncuși's *Bird in Space* and John Hejduk's *The House of the Suicide*, and reflect the designer's desire to "do something fabulous," Joachim says.

Details like these led Whittaker to call the project "a combination of the elegant and the grotesque." Juror Doug Stockman added, "It sort of reminds me of the scene in *The Martian* (2015) when he's trying to grow the potatoes."

The shelter and farm will be exhibited at the Appleton Museum of Art in Ocala, Fla., from Sept. 10 to Nov. 13. The first harvest, overseen by Robyn Shapiro of Seek Food, was used to make an infused vodka. Next on the menu? Cricket-flour bonbons with fruit and nuts. —G.S.

Module Diagram



1. Sex pod
2. Mobility tube
3. Shading louver
4. Ventilation mesh
5. Nylon mesh tube
6. Semi-rigid weave sack
7. 5-gallon module

MITCHELL JOACHIM

WINNER

BayArc: A Tidal Responsive Barrier

Rising sea levels are a worldwide problem, but for the approximately 500-mile shoreline of the San Francisco Bay, one partial solution may lie in something that is actually quite small: the 1.5-mile-wide mouth of the bay, where the Golden Gate Bridge crosses. If water could be stopped from surging through that opening, the San Francisco office of Skidmore, Owings & Merrill (SOM) reasoned, much of the Bay Area could be saved from flooding.

After analyzing tidal patterns in the bay, SOM worked with a multidisciplinary team, including marine engineers from Moffatt & Nichol, to identify specific days and times within a day when flood risks were highest. Their BayArc tidal response barrier, a tensile net structure, lies dormant on the seafloor until high tides trigger its deployment, creating a temporary, but nearly impervious, wall across the bay's mouth.

The flexible structure of cables and a waterproof membrane would unfold and rise, opening like a parachute filled by the water trying to squeeze from the ocean into the bay. Like a floating dam, its top edge would break the water surface, by approximately 1.5 meters, and keep most of the flow out. Once the surge dies down the structure would deflate, folding back onto the seafloor.

Using topographic data of the seafloor, the team developed 3D models of the bay and simulated the water's motion to understand how the flows could be tamed, and how much water needed to be stopped to prevent flooding. They then designed the barrier's structure, which comprises the membrane of plastic or Teflon-coated recycled rubber interwoven with a crisscrossed grid of stainless steel or carbon-fiber cables, like the vascular system of a leaf. When the barrier is engaged, the cable structure would completely be in tension. Wave-powered compressed air would help deploy the barrier.

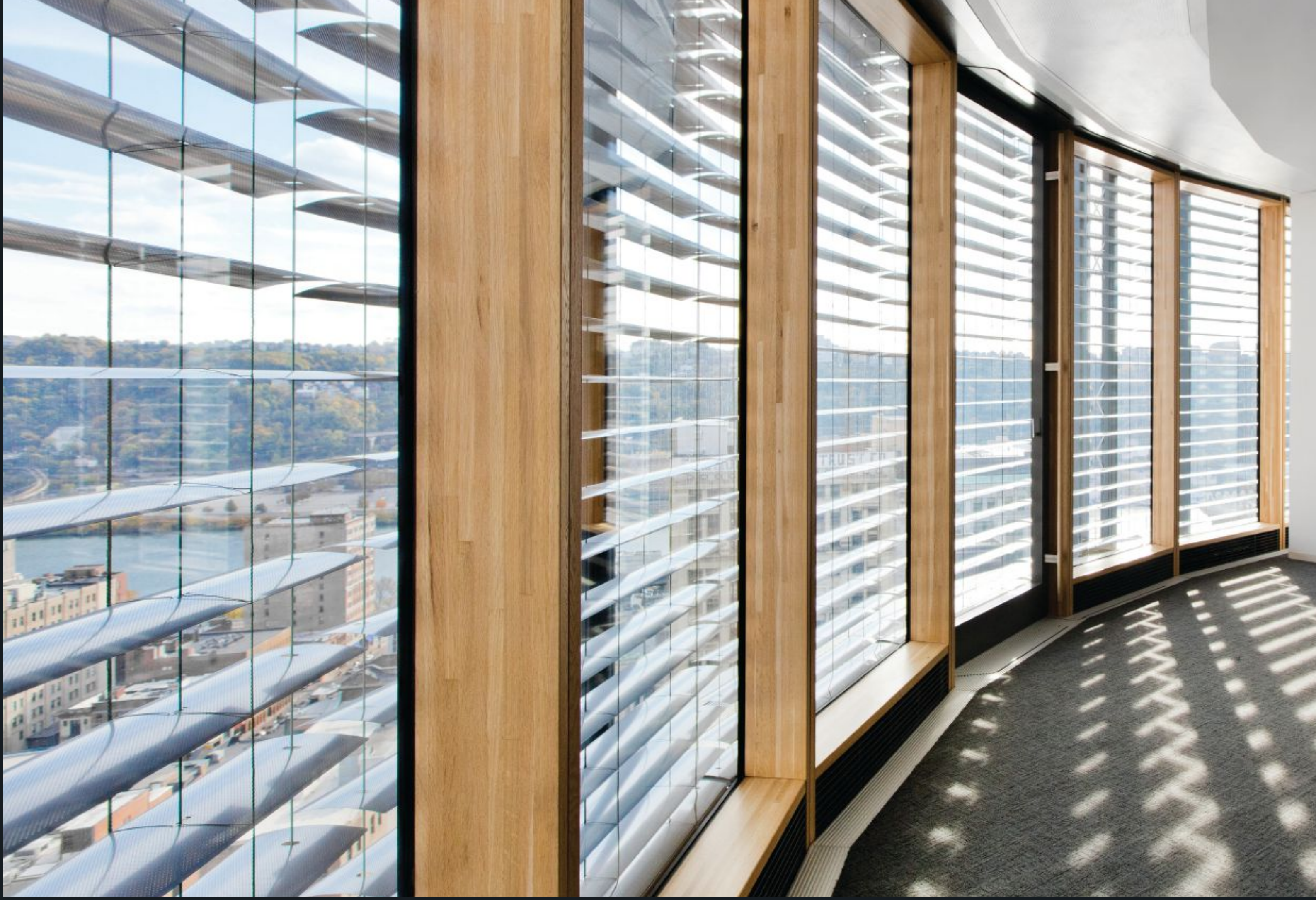
Though SOM has patented the system, the BayArc currently remains merely a concept for now. Other approaches to addressing sea-level rise in the Bay Area have been comparably scattered, focused on disparate segments of the shoreline as opposed to countering the problem head on, at the mouth of the bay. Though those community-based efforts are important for addressing local consequences, the region will soon need a more comprehensive plan, says SOM associate director Mark Schwettmann: "At some point, the magnitude of this problem will become apparent and there will be a cry for a more regional solution."

The jury was impressed by the barrier's potential. Juror Mic Patterson said the project "represents the kind of strategic design innovation we need in response to the tremendous challenges presented by the accelerating impacts of climate change. Let's build one and see how it works." —N.B.

WINNER

The Tower at PNC Plaza

CONNIE ZHOU



When PNC Bank asked Gensler to build its Pittsburgh headquarters as the world's greenest high-rise, the design firm's San Francisco office surveyed the competition worldwide to assess the state of the art in high-performance design. They even visited projects in Germany, England, and Canada to see what worked. And then the firm compiled all the ideas together into the Tower at PNC Plaza, which opened last October.

A hybrid of tried-and-tested design concepts, the 33-story, LEED Platinum–certified structure relies on fresh air for passive ventilation and climate control an estimated 42 percent of the year, a feat that impressed the jury the most. Based on the thermal stack effect, the Tower at PNC's conditioning system combines a ventilated double-curtainwall façade, two vertical thermal shafts, and a solar chimney.

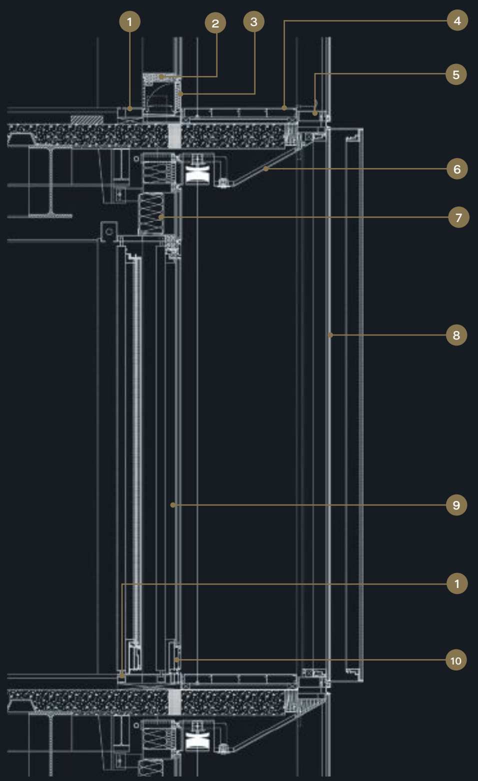
Fresh air enters through the building's outer façade and circulates through the interior as it is drawn into the centralized 350-square-foot, 400-foot-tall thermal shafts by the radiant heat created in a concrete pad inside a rooftop solar greenhouse. Architecturally, the ventilation system manifests as a geometric array of thin rectangular panels that either lie flush with the building exterior or pop out to admit fresh air. Inside, the thermal shafts are inconspicuous and integrated, like the structural core of a typical high-rise.

"You see a lot of these buildings where they just slap on a double skin that acts as a buffer," said juror Mic Patterson. "This double façade is integrated totally into the whole building energy and ventilation system."

"It's putting together, in a unique configuration, things that have been done in simplified or singular forms elsewhere," says Gensler principal Ben Tranel, AIA, the project's technical director. And the combination works. "A mechanical engineer would say you need four fresh-air changes per hour in a space," Tranel says. "With this strategy, we get 12."

To develop the integrated system, the designers worked with engineers to determine whether to design the building's massing around the ventilation, or vice versa. Through concept validation in computer

Double-Curtainwall Façade Section



simulations and mock-ups, the team evaluated each potential approach, altering ventilation points or adjusting the depth of the cavity between the façades to attain granular detail on how the system would function. They also measured how small design adjustments would affect ventilation floor by floor, and researched what types of building automation systems and sensors could help regulate the temperature.

The final system design also includes manual controls to allow office workers to open a vent to cool a room, or close a vent to warm it as needed. Sensors feed data into dashboard displays to let occupants know when the city's air quality is high enough for the vents to be opened.

Tranel says the design team wanted the building to be "tunable," as opposed to the countless office buildings with limited or fixed climate controls: It would be pointless to be the world's greenest high-rise if no one wanted to use it. "Human experience," Tranel says, "is the central ingredient." —N.B.

1. Sliding door track
2. Wood mullion
3. Vent flap
4. Aluminum catwalk
5. Temperature sensor
6. Painted aluminum closure panel
7. Aluminum shadow box
8. Outer vent (open beyond)
9. Sliding door
10. Extruded closure

WINNER

LELU Exit Sign

The exit sign—humble, omnipresent, code-mandated—is begrudged by designers. Perched above doors and in the nooks of long corridors, its fluorescent letters glow, gleefully indifferent to any adjacent color palettes, finishes, and details. Though essential in emergency situations, the exit sign is often the bane of architecture practitioners.

"We thought it was an area that was ripe for design," says Mark Wamble, a founding principal of Houston-based Interloop—Architecture. By stripping the sign down to its core—the four letters, E-X-I-T—he and his team have produced a sleek and elegant revision, now available commercially through Architectural Safety Components. Standard exit signs comprise illuminated metal boxes or side-lit panes of rectangular glass. Interloop found that advancements in LED technology—smaller package sizes, increased luminance, and wider cones of light—would allow the letters to stand alone without any framing or housing. With each stroke fully lit and minimally attached to the mounting armature, the letters appear to float in space.

PETER MOLICK

As a life-safety device, an exit sign is subject to rigorous design standards and operational requirements for its dimensions, its light emission levels, and the strict geometries of its lettering—all of which are mandated by federal law and scrutinized by Underwriter Laboratories (UL).

Meeting these UL standards proved to be a challenge. Working with machinists, electronics manufacturers, and engineers, Interloop went through several iterations to cram enough diodes into the letter forms to achieve the requisite brightness, and to perfect the design of the acrylic and aluminum light housing. For example, the arrangement of the diodes in each colored version of the sign had to be adjusted for the different ways red light and green light disperse, and the interior surfaces of the letter lenses had to be beveled and re-beveled.

"When you make prototypes for UL, you don't just whip something up in the back room," Wamble says. Instead, "you engage a half dozen manufacturers and say, 'Will you please work with us and make some prototypes?' and 'This is going to take a while.' We enjoyed it in a perverse kind of a way. It helped us clarify our ideas."

Interloop emphasized flexibility. The design attaches the letters to the armature in multiple arrangements, enabling the sign to be mounted from any side (top, bottom, left, right). Factoring in the various add-ons like a storage case for battery backups, different arrow positions, and multiple colors, the sign can be configured in 244 ways.

Having options was important to the team, itself guilty of adding exit signs to their own drawing sets at the last minute, or at the request of a fire marshal. "Architects just … suffer through it," Wamble says.

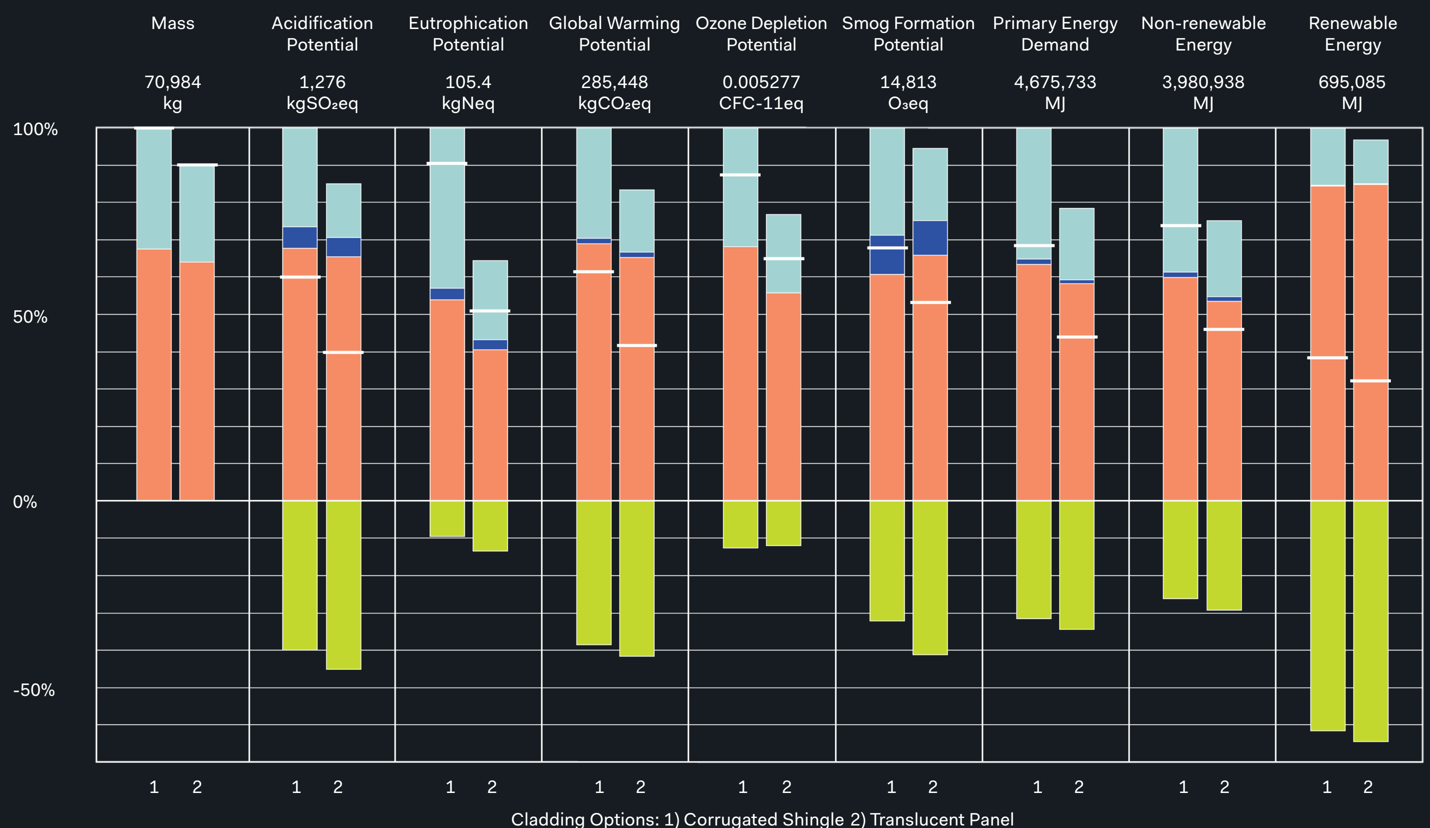
The jury celebrated Interloop's exit sign as a breakthrough for architects. "There's going to be a widespread cheer [that] goes up in all of architecture," juror Mic Patterson predicted.

And Interloop is eyeing other life-safety devices, such as strobe lights, fire alarms, and fire sprinklers. "All that," Wamble says, "is ripe for rethinking." —N.B.

WINNER

Tally

MICHAEL MORAN/ OTTO



Among architects determined to minimize buildings' environmental impact, few have had the means to quantify the energy embodied in material sourcing, processing, and construction. The prevailing system of hiring a consultant to conduct a life-cycle assessment (LCA) or cradle-to-grave analysis was "separated from design," says Billie Faircloth, AIA, a partner at Philadelphia-based KieranTimberlake.

The firm decided that architects should take the analysis into their own hands. It developed Tally, a plug-in application for Autodesk Revit that can perform an LCA on demand during the design process, when influential decisions can still be made. "This is something that badly needed to happen," juror Mic Patterson said. "There is critical need for a simple, early-phase design tool to provide feedback related to the embodied energy impacts of material selection."

Tally provides three types of analysis: whole building LCA, design-option comparison, and material selection. It draws upon an LCA database custom-developed by KieranTimberlake and sustainability consultant Thinkstep (formerly PE International) that combines environmental impact data with material attributes, assembly details, and specification information. It translates building-model elements into discrete materials and quantities, and generates an inventory or "bill of materials," which updates automatically as the design model changes. And it outputs comprehensible charts and graphics, not just spreadsheets full of numbers.

"It's holistic in thinking," juror Doug Stockman said. Juror Elizabeth Whittaker remarked, "You can imagine this being absolutely necessary for any kind of building design. Finally: a method of life-cycle assessment that is user-friendly."

Architects can compare the relative environmental impact of structural systems such as concrete, steel, and timber; or evaluate comparable materials, such as two insulation types with identical R-values. Conveniently, Tally can also provide scaled results based on a portion of a model, such as a 10-foot-square section. KieranTimberlake associate and

Life Cycle Stages

- Manufacturing
- Transportation
- Maintenance and Replacement
- End of Life

— Net value (impacts + credits)

Option 1: Corrugated Shingle Cladding

Option 2: Translucent Panel Cladding (Selected)

KieranTimberlake used Tally to compare the environmental impact of two cladding options for its design of the Consortium for Building Energy Innovation, in Philadelphia.

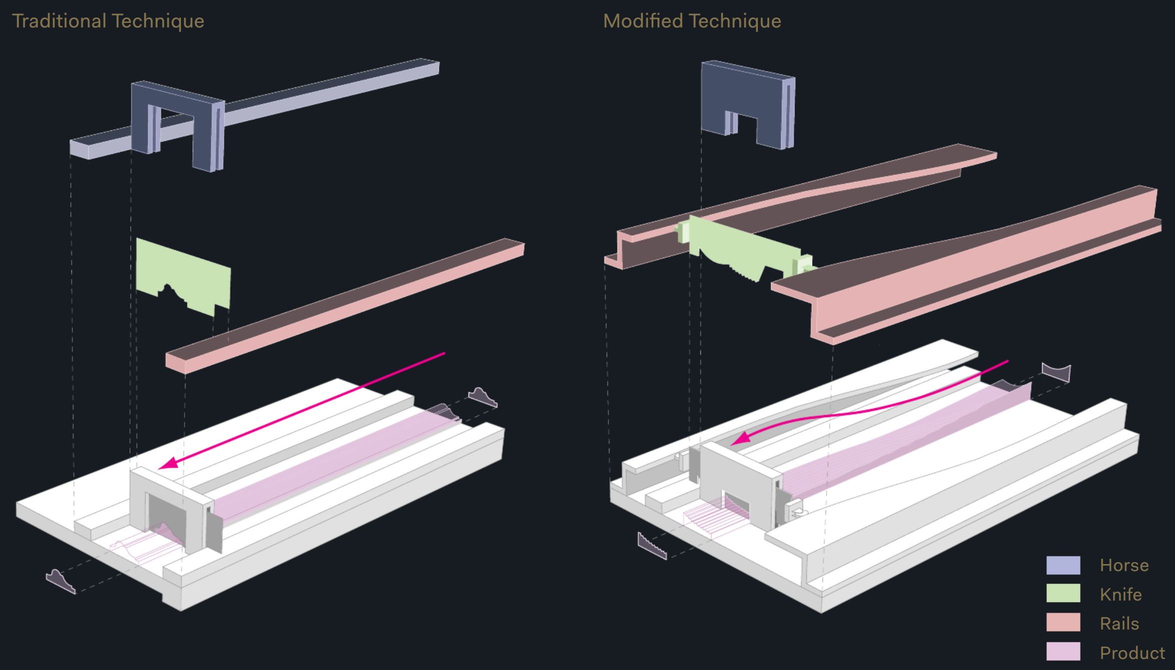
researcher Roderick Bates says, "You run the assessment and then extrapolate it, even without a completed full building model."

KieranTimberlake beta-tested the software with 400 architects, engineers, academics, and students before introducing Tally at Greenbuild 2013. "Our goal was to use the BIM platform to harness the information that is already nestled within these models and the knowledge within the team," says KieranTimberlake associate and researcher Stephanie Carlisle.

Now commercially available through the Autodesk app store and KieranTimberlake's affiliate company, KT Innovations, Tally was used by hundreds of firms and more than 50 academic institutions in the last year. The latest version, Tally 2017, contains updated graphics and enhanced capacity to interface with evolving material information, standards, and software. Faircloth says users can expect increasing specificity in the program's output as more manufacturers file Environmental Product Declarations. Tally, Bates says, "is like a building that you never stop building." —G.S.

CITATION

Pulled Plaster Panels



To create a custom tiled surface that wraps a 1,000-square-foot core wall of a New York duplex apartment, Bryan Young, AIA, considered using felt, glass, and metal. Then he came upon plaster. Plaster is both economical and full of "rich and unexplored" potential, he says. His curiosity was piqued when an artisan introduced him to the time-honored technique of pulled plaster, in which a pile of wet plaster is scoured into shape by a contoured die ("knife") and carrier ("horse") pulled along straight rails. The technique is used to make crown molding.

But Young imagined using the process in a radically different way: to create plaster panels that are mounted vertically, with joints obscured to form a "sculpted monolith." Rather than the straight and uniform extrusion of crown molding, he and his Brooklyn-based firm, Young Projects, designed wavelike "sweep" profiles through a combination of 3D modeling software and physical modeling.

They settled upon six master panel templates—each 7 feet long by 6 inches wide and between 0.375 inch and 3 inches deep—that give the impression of endless variation when arranged in different sequences. The panels could also be sliced in half to add further unpredictability in the overall installation pattern. The seamless appearance of the wall results not only from the scalloped surface geometry of the panels, but also because the pointing material, gypsum plaster, blends chemically and thermally with the plaster panels.

While others might have turned to CNC milling to execute the irregular panels, Young was determined to work manually with the wet plaster. But all the tools had to be modified: the knife required new profiles, the horse needed to allow the knife to slide side to side and up and down while being pulled forward, and the rails had to be cut and sanded to define a smooth arc.

"I appreciated the tactile quality of the panels, and especially in the process of making them," said juror Doug Stockman. Juror Elizabeth Whittaker called the ribbed panels "quite beautiful," adding: "It is exciting to see a product that allows for the customization and possibilities of the extruded fabrication process." And juror Mic Patterson commended "the nuanced complexity of form yielding from this novel yet simple craft technique."

Ultimately, the 674 installed wall panels were cast in molds derived from the six original hand-pulled masters. Casting results in a more durable product, Young says, and these full-height panels are likely to be bumped and touched as crown moldings are not. Still, he says, "the design of the apparatus and technique of pulled plaster are embedded within the product." —G.S.

CITATION

Chicago Horizon

This open timber pavilion with an overhanging roof was named the winning design of the Lakefront Kiosk Competition in 2015. Completed last October in Grant Park for the Chicago Architecture Biennial, Chicago Horizon has a square, flat canopy measuring 56 feet on each side—the maximum length of timber that can be legally carried by a truck.

The roof is the first point-supported, two-way slab structure to be built with timber, according to the design team members, Ultramoderne co-principals Aaron Forrest, AIA, and Yasmin Vobis, who are based in Providence, R.I., and structural engineer Brett Schneider, a senior associate at Guy Nordenson and Associates in New York.

The canopy consists of two plies of cross-laminated timber (CLT) panels laid crosswise to each other. The 14 panels, each 8 feet wide and 4.125 inches thick, are topped by a rubber waterproofing membrane and gravel ballast. Overall, the roof weighs around 135,000 pounds, nearly half of which is the CLT itself. The load of the roof slab is carried in perpendicular directions and bears directly on 13 glulam columns distributed in a radial pattern, as opposed to the typical beam-and-column grid. "The builders said, 'Why didn't you just do a frame?'" Schneider says. "We see two-way slabs in concrete everywhere, but in timber it's very unusual."

"They're leveraging this material to its fullest potential," juror Doug Stockman said, "and then creating the forms, the space, and the shapes out of that." Juror Elizabeth Whittaker added, "This project masters an economy of means and material that is precisely and exquisitely detailed."

The crucial pavilion details, according to the designers, are the column-to-ground connections, column-to-roof connections, roof perimeter, viewing aperture edges, and the chain link surrounding the stairs and kiosk. The team specified the configuration and angles of fasteners to maximize the roof span and to resist the shear forces of winds from Lake Michigan.

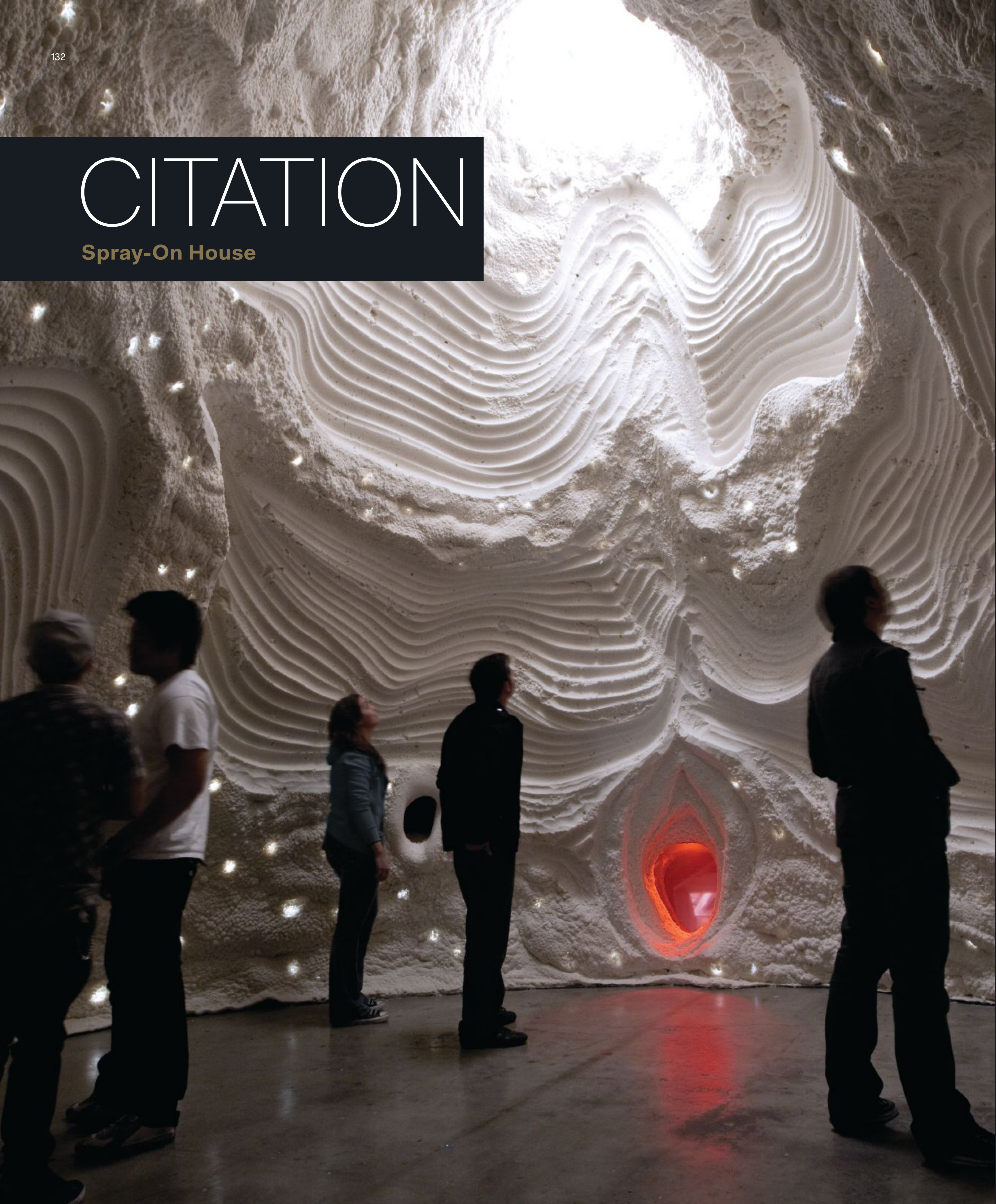
Visual intrigue was as much of a goal as technical prowess. Visitors can poke their heads through a portal in the roof by climbing the freestanding dual staircase-and-seating area, which terminates in a landing beneath the roof level. "When you go up the stairs, the roof becomes a plane to frame your vision of the horizon and the city," Vobis says. On grade, the long side of each rectangular column is rotated to point in a different direction, guiding visitors' gaze into the heart of the pavilion and back out to the horizon.

Juror Mic Patterson said, "This is a classic minimalist construction. The more you contemplate it, the more its subtle sensibilities draw you in." —G.S.

NAHO KUBOTA

CITATION

Spray-On House



Polyurethane spray foam is known for its use as insulation, quickly and effectively filling in wall cavities and lining attic roofs. The Spray-On House by Patrick Tighe Architecture shows how it can do much more.

After years of researching the high-density spray foam's structural capability, the firm is embarking on its first building using the material. The single-family house in the quirky and remote desert community of Pioneertown, Calif., will be a curvaceous, gourd-like mound with globular interior spaces and hardly a straight line to be found. The spray foam, installed in one continuous application, in combination with a cage of steel reinforcing bars, will become the house's foundation, walls, and roof.

Polyurethane is an ideal construction material for the remote site, where access would be all but impossible for multiple trades and their equipment. Requiring minimal materials and labor, the house is expected to cost just $125 per square foot. And by using soy-based foams, the environmental impact of building the Spray-On House will be significantly less than a comparable house built in concrete. A life-cycle assessment of the prototype house found that it would require less than half of the fossil fuels consumed in concrete construction and produce about 10 percent of the harmful respiratory inorganic compounds.

The firm's past research into spray foam culminated in a 2011 temporary installation (shown at left) at the Southern California Institute of Architecture that used a combination of high- and low-density foams to build a free-standing, parabolic chamber. "We were looking at the thinnest shell we could get, using the highest density foam," says firm principal and lead designer Patrick Tighe, FAIA. The prototype shell was 3 inches thick, stood 20 feet tall, and covered 600 square feet.

The 2,700-square-foot Spray-On House will require greater foam thicknesses, ranging from a few inches at the roof to a few feet at the wall base. The project's engineers have tweaked details like the location and size of interior walls to ensure the structure can support itself. In addition, the team has built full-scale prototypes of wall sections and footings to optimize the quantity and thickness of the foam.

The firm is still determining how best to coat and waterproof the house exterior. Still, Tighe says, the biggest challenge has been navigating the project through the building code.

Bureaucracy aside, the jury saw great potential in this exploration of foam-based design and construction. "It seems unlimited in what you can do with the process," juror Elizabeth Whittaker said. —N.B.

THIS PAGE: PATRICK TIGHE ARCHITECTURE; OPPOSITE: ART GRAY

CITATION

Vegas Altas Congress Center

JESÚS GRANADA

The architects behind the new Vegas Altas Congress Center in Villanueva de la Serena, Spain, wanted the 74,000-square-foot project to blend seamlessly into the landscape, becoming a scenic fringe between the medieval town's urban streetscape and its agricultural hinterlands. But they also wanted the building to be a landmark, distinct from its bucolic setting. So they crafted a structure that does both.

The four-person design team—Luis Pancorbo, José de Villar, Carlos Chacón, and Inés Martín Robles—partly buried the center's two large auditoriums before topping them with an expansive public plaza. Bursting from this flat surrounds is their counterpoint: a bold, cubic building cast in place with gold-colored concrete and punctuated with geometric window and skylight cutouts. To soften the contrast, the designers wrapped this cube, which houses a restaurant, offices, and service space, in a veil of horizontal bands that follow the cube's rounded corners, orbiting the structure in regimented paths inspired by the lines cut into farm fields after harvest. The veil also obscures the underlying concrete form from a distance, while providing invaluable shade to building occupants during the region's hot summers.

For the veil, the designers initially planned to use straight lengths of plastic pipe, but the cost was too high. In their hunt for an alternative, they discovered what turned out to be a superior material: naval-grade rope made from recycled plastic. Not only did the rope cost less, but the designers could customize its colors to include a mix of yellows, oranges, and greens, mirroring the surrounding fields and imbuing the building with the likeness of a hay bale.

Though the design clearly specified the ropes' thickness and spacing, along with the cantilevered, painted-steel armature that would support them, their precise attachment method remained uncertain until the center was nearly complete. As construction was wrapping up, the architects and their engineers rapidly explored different techniques to secure the ropes to the armature, "testing and trying again, and testing and trying again," Pancorbo says.

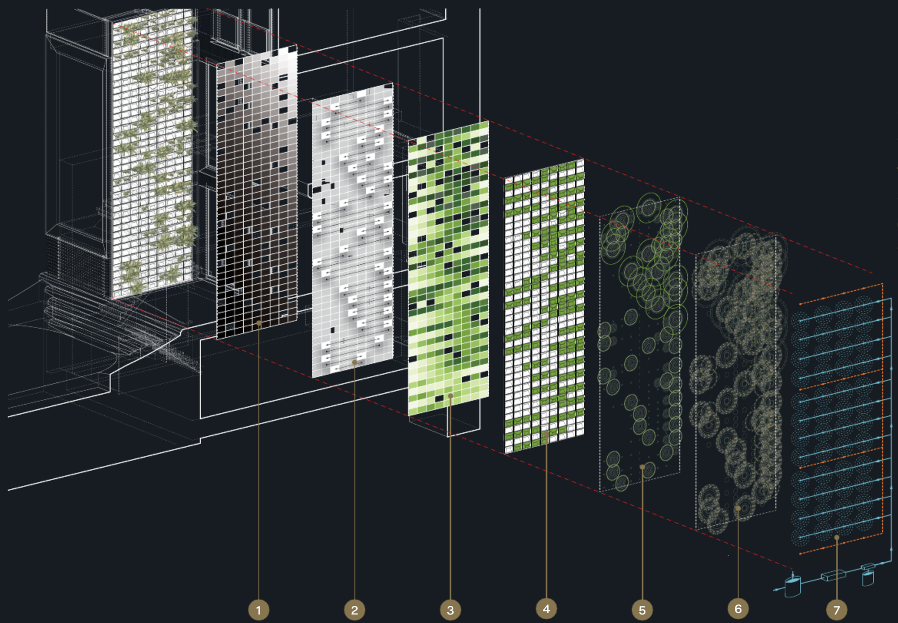
Finally, the team identified that 12-centimeter-diameter rebar would support the ropes, and that 10 or 11 brackets per elevation would ensure the ropes stayed horizontal and taut around the building. The rebar is painted to match the rope, to minimize its appearance.

The jurors praised the Vegas Altas as a monumental artifact. Juror Doug Stockman was particularly taken by the veil, both for its outward appearance and for the "effect it has, especially in that interstitial space" between rope and concrete. —N.B.

CITATION

Nanobiome Building Skin

Analysis and Components Diagram



1. Annual direct-sunlight exposure, from 111 hours (black) to 296 hours (white)
2. Shadow avoidance
3. Unique molds
4. Soil volume distribution
5. Winter plant spread
6. Summer plant spread
7. Aeroponic irrigation system

Though green walls sound nice in theory, they can be a mess in practice. The mounting armatures often are complicated and costly to build; vertical irrigation easily becomes uncalibrated; and plants receiving uneven water levels or sun exposure quickly die out.

For the Nanobiome Building Skin, a green wall for a Manhattan apartment, local firm Michael K Chen Architecture (MKCA) tackled these issues by using data and modeling to specify everything from the plant species and their arrangement to the manufacture of their containers. The result is a green wall perfectly tuned to its surroundings and ecosystem.

MKCA began by mapping the project site's environmental conditions to identify not just which plants to select but also which biome the green wall would be mimicking. Working alongside designers from Brooklyn, N.Y.–based Local Office Landscape Architecture and conservation biologists at the State University of New York College of Environmental Science and Forestry, in Syracuse, MKCA pinpointed the site's natural analog to the limestone cliffs of the Hudson Valley.

In Grasshopper, MKCA modeled the apartment's wall with a grid based on its varied exposure to sunlight and shade. It then used a genetic algorithm to optimize the location of each species of fern, wildflower, and moss, and how their fitness would range over the course of the year under different conditions.

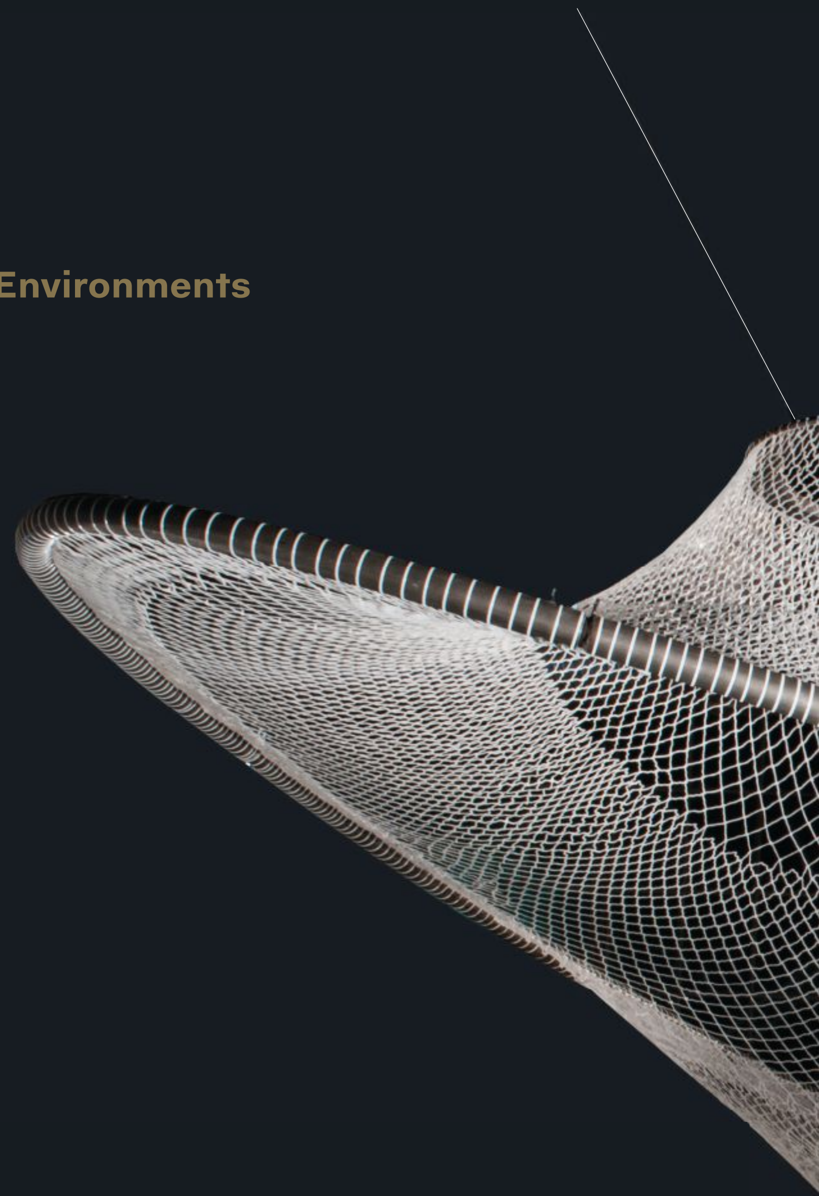
The grid also influenced the shape and structure of the custom terra-cotta tiles and 10 different types of container modules in the façade. Ranging from flat panels to shallow planters, and from deep planters to wedges, the terra-cotta forms respond directly to the environmental conditions and needs of each plant in each location and, in some areas, even create shade to help the plants below thrive.

Completed this June, the wall is also an exercise in conservation. It hosts three variations of an endangered fern species, which botanists will be periodically checking to gauge which may be a good candidate for broader propagation and perhaps even commercialization. "We're trying to find ways for the act of conservation to become more integral to the aesthetics of the building and the façade," says MKCA principal Michael Chen, AIA.

The jury praised the Nanobiome Skin for combining computational design with the comparably low-tech process of terra-cotta manufacturing, and for its potential contribution to urban ecology. "I love the idea of the façade creating a microclimate in a city," says juror Elizabeth Whittaker. —N.B.

HONORABLE MENTION

Infundibuliforms: Kinetic Tensile Surface Environments



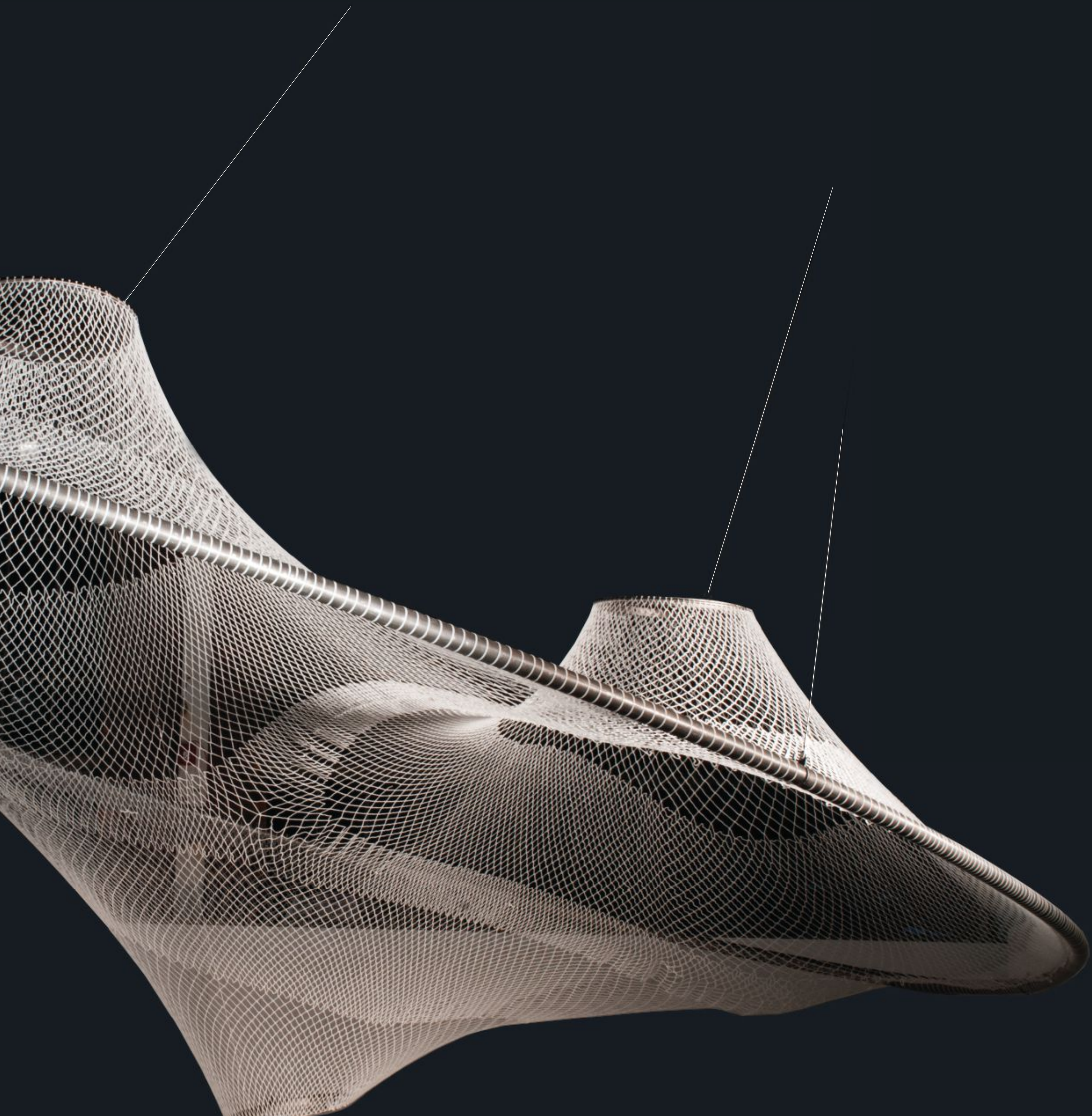
A metal ring woven with mesh, like a giant embroidery hoop, suspends from the ceiling. Suddenly, the netting moves and breaks the plane of the ring in opposing directions, creating three convex or concave funnels. Within seconds, the infundibuliform (meaning funnel- or cone-like) shapes shift again, collapsing into themselves, transitioning from mountain peaks to vortices and back again.

This exploration of kinetic architecture is the culmination of years of research and development in digital modeling, fabrication, and robotics by Kathy Velikov, AIA, and Geoffrey Thün, directors of Ann Arbor, Mich.–based RVTR, in collaboration with fellow University of Michigan faculty member Wes McGee, a principal and co-founder of Boston-based Matter Design. Computational design tools have made kinetic architecture increasingly attainable in theory, but translating digital simulations into physical objects has remained a stumbling point. Using Rhino, Grasshopper, and Kangaroo, the team created a design program that simulates what shapes and movements are possible given the constraints of physics and space, and tested applied forces on an extruded-elastomeric mesh. “It allows designers a one-to-one and immediate way to visualize something that’s very complex,” Velikov says.

Data gathered by the simulations guided the unique geometry of a mesh pattern that would enable the form to lie flat, stretch up, or distend down. Using a custom-built extruder, the team 3D printed flat panels of the tensile net surface with the thermoplastic elastomer. The physical net mimics the behavior simulated in the digital model spot-on.

Kinetic forms can be used to tune rooms acoustically or to alter the geometry of an enclosure for different lighting conditions. The team’s digital modeling and physical fabrication process is an “ingenious new technique,” juror Elizabeth Whittaker says. “The formal possibilities seem endless.” —N.B.

RVTR



HONORABLE MENTIONS

Timber Waste Modular Unit

Wood products are enjoying a renaissance in architecture. But when designers Yugon Kim and Tomomi Itakura, partners at Boston-based IKD, looked at the life cycle of timber, they found "inefficiencies in maximizing carbon sequestration, one of which was the unused waste from the milling process," Kim says. They wanted to reuse the C-shaped trim pieces of logs—which can comprise up to 38 percent of a felled tree—without down-cycling them into lower-grade products like particleboard, wood pulp, mulch, or fuel.

Their solution is remarkably simple: turn the pieces' flat, sawn faces out and create blocks that can stack in modular fashion. Kim, a former sculptor and furniture designer, and Itakura salvage the edges from local sawmills, cut them into manageable 8-inch lengths, and reassemble them four pieces a time, with mitered corners. The resulting "Timber waste Modular Unit" ("TwMU") is a hollow, load-bearing block. Juror Doug Stockman contrasted the elegance of IKD's prototype, in which "literally the edges are ripped off and reassembled in a different way, without further manipulation," to other wood products that use reconstituted material.

For the first trial of the TwMU system, IKD built a five-course-tall circular bench around the base of a tulip tree at the Heritage Museums and Gardens in Sandwich, Mass. During its five-month tenure, the blocks began to crack, Kim says, due to the uneven release and absorption of moisture. IKD began developing new prototypes to improve TwMU's durability. They drilled notches to facilitate evaporation and contraction, and applied coatings of beeswax, pine tar, and char. They also tested hardwood versus softwood, and green versus kiln-dried wood. As of press time, these second-generation prototypes had endured nine months outdoors, with the notched and coated versions faring better than the initial prototypes. Kim plans to run the trial for two years. —G.S.

IKD

Grove

JANE MESSINGER

At the 2015 Design Biennial Boston, a cluster of curious, oblong vessels propped on a metal armature invited onlookers to pop their heads into an enclosure created by the intersecting volumes of their papier-mâché-like skins. The cluster of 8- to 10-foot-tall, 4-foot-diameter forms is titled Grove. Brookline, Mass.–based GLD Architecture designed the installation to give people the experience of simultaneously inhabiting an intimate enclosure and a public space.

Grove represents a significant advancement in architectural form-making. By combining composite-based structural analysis with inflatable vinyl forms, GLD has developed a workflow that embeds structural logic into design from the very start—and at a low cost.

Principal Joel Lamere says the pillow-like forms are designed materially, as opposed to identifying the appropriate construction materials after design is completed. The team used Grasshopper, the physics engine Kangaroo, and the structural analysis program Karamba to simulate how Grove's forms would appear when inflated, which directly guided its fabrication. Patterns of vinyl sail material were cut and sewn into balloons that were inflated to act as the molds. These bulbous forms were then covered with layers of fiberglass strips and coated with resin. After an approximately 24-hour cure, the vinyl balloons were deflated and removed from the now-rigid fiberglass structures.

The digital simulation tools also informed the configuration of the 12 intersecting vessels, optimizing Grove's overall stability. Just 2 millimeters thick, the curvaceous shells are incredibly sturdy. "It's cladding and structure in a single surface," Lamere says. GLD has used a similar molding process to create furniture.

The jury selected Grove as much for its intriguing design as for the ideas behind it. "The intelligence of this fabrication process results in a highly sophisticated, formal ensemble," says juror Elizabeth Whittaker. —N.B.

HONORABLE MENTION

Blooming Bamboo House

DOAN THANH HA

Vietnam suffers from a relentless cycle of floods, landslides, earthquakes, and more. Because much of the country's housing stock is poorly constructed—and unsanctioned—the natural disasters destroy thousands of families' homes every year.

To minimize the risk of destruction, Hanoi-based H&P Architects developed the Blooming Bamboo House, a residential housing model that utilizes local materials and can be built by laypeople at a low cost.

The 62-square-meter (670-square-foot) prototype is the first structure in Vietnam to be built almost entirely out of bamboo, according to H&P principal Doan Thanh Ha. The material's high tensile strength enables the house to withstand strong winds and earthquakes, while a foundation of salvaged plastic drums will allow it to endure floods of up to 1.5 meters (4.9 feet).

Bamboo poles ranging in diameter from 8 to 10 centimeters are tied or bolted together to create the building frame, followed by smaller lengths that are tied onto the walls or lined on the floors as finishes, and sealed with bitumen to prevent water infiltration. The house can also be finished with other local materials, such as wooden planks, coconut leaves, plastic sheets, and bottles.

With an open floor plan and simple structural system, the house is designed to be built in modules of square rooms quickly and inexpensively; the prototype was built in just 25 days for $2,500, and accommodates six residents. Owners can adapt and expand their homes to include porches and veranda windows. Along with its storm resistance, the house's cubic shape and pitched roof establish an eye-catching vernacular that alludes to the traditional homes of the region.

Juror Mic Patterson called the house "a reminder of what can be realized with indigenous materials and building practices sensitively handled." —N.B.

Jury

Mic Patterson is founding principal of Los Angeles–based Design Tectonics, a consultancy that focuses on innovative façade technology applications and research. He was formerly the vice president of strategic development at Enclos. Patterson is a Ph.D. candidate in the University of Southern California School of Architecture with a focus on sustainable façade renovation practices.

Douglas Stockman, AIA, is a founding principal at El Dorado in Kansas City, Mo. He also serves on the Kansas State University College of Architecture, Planning, and Design Dean's Advisory Council, and is chair of the Downtown Council of Kansas City. Stockman received a B.Arch. from Kansas State University.

Elizabeth Whittaker, AIA, is founder and principal of Merge Architects in Boston. In 2015, she was a recipient of the AIA Young Architects Award and the Emerging Voices award from the Architectural League of New York. Whittaker received an M.Arch. from the Harvard Graduate School of Design, where she is an assistant professor in the practice of architecture.

Credits

Cricket Shelter: Modular Edible Insect Farm, page 112
Client: Randy Jayne Rosenberg
Design Firm: Terreform ONE, Brooklyn, N.Y. · Mitchell Joachim, ASSOC. AIA, (co-founder and primary investigator); Jiachen Xu, Lissette Olivares, Cheto Castellano, Ivan Fuentealba, Sung Moon, Kamila Varela, Yucel Guven, Chloe Byrne, Miguel Lantigua-Inoa, AIA, Alex Colard, Melanie Fessel, Maria Aiolova, ASSOC. AIA, Vivian Kuan (project management); Felipe Molina, Matthew Tarpley (research assistants)
Consultant: Seek Food · Robyn Shapiro
Fabricators: Shandor Hassan, Christian Hamrick
Funding: Art Works for Change; Terreform ONE
Photography: Mitchell Joachim, Matthew Tarpley
Special Thanks: David Stewart, Christian Hubert, Heather Lord, Scott Pobiner, New Lab, Brooklyn Navy Yard, GMD Shipyard, New York University Gallatin School of Individualized Study

BayArc: A Tidal Responsive Barrier, page 116
Design Firm: Skidmore, Owings & Merrill, San Francisco · Craig Hartman, FAIA (concept and interdisciplinary leader); Mark Schwettmann, AIA, Alex Cruz, Ross Findly, David Kwon (project team)
Project Adviser: Moffatt & Nichol
Drawings: Skidmore, Owings & Merrill
Structural Engineer: Mark Sarkisian, Eric Long, David Shook, Geoffrey Brunn
Marine Engineering Concept: Moffatt & Nichol · Dilip Trivedi, Richard Dornhelm

The Tower at PNC Plaza, page 118
Client: PNC Financial Services Group
Design Firm: Gensler, San Francisco · Doug Gensler, AIA (principal-in-charge); Hao Ko, AIA (principal and architectural design director); Benedict Tranel, AIA (principal and technical director); Lisa Adkins, AIA (project manager); Anastasia Huggins, AIA, David Hall, Gunwook Nam, Alison Wilkinson, AIA, Daniel Nauman, AIA, Jorge Barrero, AIA, Ethel Macleod, Eugene Lee, Joe Chisholm, Brent Van Gunten, AIA, Len Sciarra, Philip Kaefer, AIA, Joel McCullough, AIA, Rich Peake, Mariana Vaida, Jessica Yin, Yooju No (project team)
Rendering: Space Matrix; Tangram 3DS
Construction Manager: PJ Dick
Lighting Designer: Fisher Marantz Stone
Structural and M/E/P Engineer: BuroHappold
Sustainability Consultant: Paladino & Co.
Photography: Connie Zhou Photography

LELU Exit Sign, page 122
Client: Architectural Safety Components
Design Firm: Interloop—Architecture, Houston · Mark Wamble, Dawn Finley, AIA (design principals); Eric Hughes, Peter Muessig, Jack Mussett (project team)
Project Adviser: Architectural Safety Components · Sam Youdal
Consultant: Martin Co. · John Martin
Fabricators: Moore Fabrication · Kerry Krumbeck; Professionalized Products and Services · Jerry Huang; Southwest Electronic Energy Group · Alex Marin; Anodizing Graphics of Houston · Linda Sayers
Special Thanks: Underwriters Laboratories · Abdul Ahad (investigating engineer)

Tally, page 124
Design Firm: KieranTimberlake, Philadelphia · Roderick Bates, Stephanie Carlisle, Billie Faircloth, AIA, Elizabeth Friedlander, AIA, Ryan Welch (project team)
Development Partners: Autodesk; Thinkstep (previously PE International)
Project Team: Autodesk · Jonathan Rowe; Thinkstep · Heather Gaddoniex, Nick Santero, Maggie Wildnauer
Special Thanks: Emma Stewart, Jacky Liang

Pulled Plaster Panels, page 128
Design Firm: Young Projects, New York · Bryan Young, AIA (principal); Jon Cielo, AIA (project architect); Noah Marciniak, Samantha Eby, Nayoung Kim (project team)
Lighting Designer: Architectural Lighting · Rick Shaver
Structural Engineer: Silman · Nat Oppenheimer
Electrical Engineer: Engineering Solutions · John Ryan
Consultants: Butter and Eggs · Judy Dunne (interiors); Taocon (general contractor); Engineering Solutions · John Ryan (M/E/P engineering)
Drawings: Young Projects
Fabricators: Kammetal (stainless steel screen); Balmer Architectural Mouldings
Photography: Young Projects and Jon Cielo

Chicago Horizon, page 130
Client: Chicago Architecture Biennial, Chicago Park District
Design Firm: Ultramoderne, Providence, R.I. · Yasmin Vobis, Aaron Forrest, AIA, Emily Yen, ASSOC. AIA, Tida Osotsapa, Will Gant, Hua Gao, Ronak Hingarh (project team)
Design Structural Engineer: Guy Nordenson and Associates · Brett Schneider
Structural Engineer of Record: Thornton Tomasetti
Architect of Record: Animate Architecture · Joe Lambke
Fabricator: Nordic Structures
Funding: BP; Chicago Park District; Chicago Architecture Biennial; Rhode Island School of Design; ReThink Wood; Nordic Structures
Photography: Naho Kubota
Special Thanks: Laura Briggs

Spray-On House, page 132
Design Firm: Patrick Tighe Architecture, Los Angeles · Patrick Tighe, FAIA, Zachary Teixeria, Evelina Sausina, ASSOC. AIA, Risa Tsutsumi, Bran Arifin (project team)
Structural Engineer: Nous Engineering · Matt Melnyk
Consultant: Demilec
Fabricator: Machineous
Life-Cycle Assessment: Department of Civil and Environmental Engineering, School of Engineering, Stanford University
Prototype: Built at Southern California Institute of Architecture (SCI-Arc), as part of the SCI-Arc Gallery Series
Drawings, Renderings, and Photography: Courtesy Patrick Tighe Architecture
Special Thanks: SCI-Arc team

Vegas Altas Congress Center and Auditorium, page 134
Client: Junta de Extremadura
Design Firm: Pancorbo + de Villar + Chacón + Martín Robles, Madrid · Luis Pancorbo, José de Villar, Carlos Chacón, Inés Martín Robles (project team)
Drawings and Lighting Designer: Luis Pancorbo, José de Villar, Carlos Chacón, Inés Martín Robles
Structural Engineer: Mecanismo · Juan Rey, Pablo Vegas, Jacinto Ruiz Carmona
Electrical and Facilities Engineering: Úrculo Ingenieros · Rafael Úrculo, Sergio Rodríguez
Acoustics: Arau Acústica · Higini Arau
Models: Gilberto Ruiz
Construction: Placonsa · Eloy Montero; Julio Oreja (site manager)
Ropes Installation: Cotesi; Lastra & Zorrilla
Funding: Junta de Extremadura
Cost: €10,505,187 ($11.7 million, approx.)
Photography: Jesús Granada (building); Ignacio Bisbal Grandal (model)

Nanobiome Building Skin, page 136
Design Firm: Michael K Chen Architecture (MKCA), New York · Michael Chen, Justin Snider, AIA, Alan Tansey, Natasha Harper, Elena Hasbun, Braden Caldwell, AIA, Julian Anderson, AIA (project team)
Drawings: MKCA
Landscape Architect: Local Office Landscape Architecture · Walter Meyer, Jennifer Bolstad, AIA, Jenny Hindelang
Conservation Consultant: State University of New York College of Environmental Science and Forestry, Department of Environmental and Forest Biology · Danilo Fernando (associate professor and graduate program director)
Façade and Structural Engineer: Buro Happold
General Contractor: IA Construction Management
Manufacturer: Boston Valley Terra Cotta
Photography: MKCA

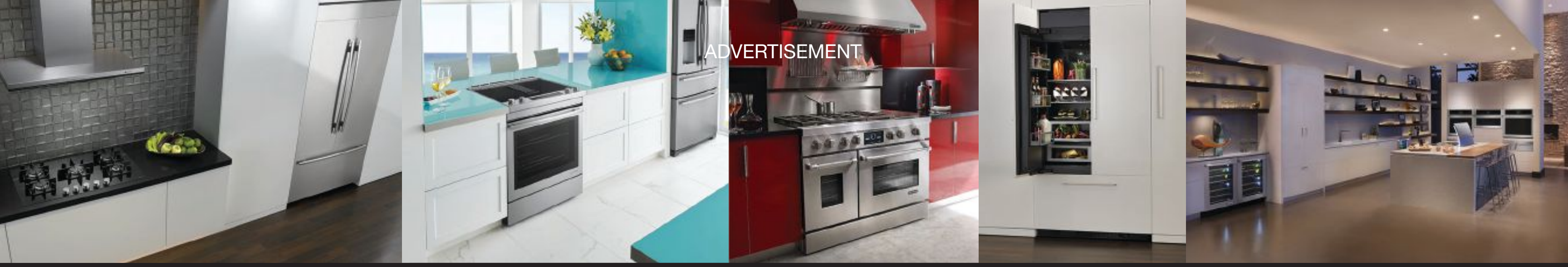
Infundibuliforms: Kinetic Tensile Surface Environments, page 138
Design Firms: Matter Design, Boston · RVTR, Ann Arbor, Mich., and Toronto · University of Michigan
Primary Investigators: Wes McGee, Geoffrey Thün, Kathy Velikov
Design Research Associate: Daniel Tish
Fabrication Assistants: Asa Peller, Dustin Brugman, Andrew Kremers, Andrew Wald, Iram Moreno Pinon
Wireless Sensing Adviser: Jerome Lynch
Technical Partners: Buckeye Polymers; Industrial Fabricating Systems; Beckhoff
Funding: Taubman College of Architecture and Urban Planning: 2016 Research Through Making Program; University of Michigan Office of Research: Small Projects Grant
Photography: Peter Smith

Timber Waste Modular Unit ("TwMU"), page 140
Design Firm and Fabricator: IKD, Boston · Yugon Kim, Tomomi Itakura (leaders); Yuki Kawae, Steven Hien, Brendan Casimir, David Morgan, Erin Kim, James Fan, Miguel Lorenzo Gumila (student research assistants)
Drawings: IKD
Funding: Heritage Museums & Gardens; Rhode Island School of Design
Photography: IKD
Special Thanks: Windy Hill Farm Sawmill

Grove, page 141
Client: Design Biennial Boston, Boston Society of Architects (BSA)
Design Firm and Fabricator: GLD Architecture, Brookline, Mass. · Joel Lamere, Cynthia Gunadi, Sophia Chesrow, Grigori Enikolopov, Zain Karsan, Dohyun Lee, Elizabeth Galvez (project team)
Drawings: GLD
Funding: Design Biennial Boston; GLD
Photography: Jane Messinger
Special Thanks: Rose F. Kennedy Greenway Conservancy, Boston Art Commission, Pinkcomma Gallery, BSA Space, Boston Mayor's Office of New Urban Mechanics, David Costanza, Sixto Cordero, Caitlin Mueller, Steven O. Anderson, John Skibo, Matt Wagers, Chris Dewart, Christopher Gunadi

Blooming Bamboo Home, page 142
Design Firm: H&P Architects, Hanoi, Vietnam · Doan Thanh Ha, Tran Ngoc Phuong, Chu Kim Thinh, Erimescu Patricia, Nguyen Van Manh, Nguyen Khanh Hoa, Nguyen Quynh Trang, Tran Quoc Thang, Pham Hong Son, Hoang Dinh Toan, Pham Quang Thang, Nguyen Hai Hue, Nguyen Khac Phuoc (project team)
Fabricator: H&P Architects
Photography: Doan Thanh Ha
Cost: $2,500
Special Thanks: Nguyen Tri Thanh


Three big challenges.
One ideal solution.



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Welcome to a new series of articles sponsored by JENN-AIR entitled “Residential Design for the Future”. Over the next nine months, ARCHITECT Magazine will publish articles that focus on a futurist position in design innovation within the residential housing market. Each of these articles will highlight an unique aspect of residential design that is innovative, oozes style and encapsulates what consumers today expect from homes for years to come.

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Residential:

This Modular Home Is Built with Chicken Wire and Cement Mortar, and the Whole Thing Only Takes Six Days to Build

TEXT BY MORGAN DAY

Indian architect Anupama Kundoo's Full Fill Home can be built in six days and dismantled in one. Currently on display at the Venice Architecture Biennale, the prefabricated prototype is a model for 22 houses that have been commissioned for Auroville, India, where her eponymous firm is based.

The Full Fill Homes, as well as most of the architect's other projects, use ferrocement, a lightweight, tintable material made with chicken wire mesh, cement mortar, and small-diameter steel reinforcement. The ferrocement is formed into blocks, each of which is a unit in a stackable modular system. Designed for speed of assembly, the kit of parts allows each house, including the foundation, to be built on site in six days.

Full Fill Homes are engineered to withstand seismic loads so the structure is preserved during inclement weather or a natural disaster. And the ferrocement walls not only provide a sturdy envelope, they also maximize interior space with built-in spaces for storage, fixtures such as sinks, and seating.

JAVIER CALLEJAS

Will Your Project Happen? UC Berkeley Has an App for That

TEXT BY NATE BERG

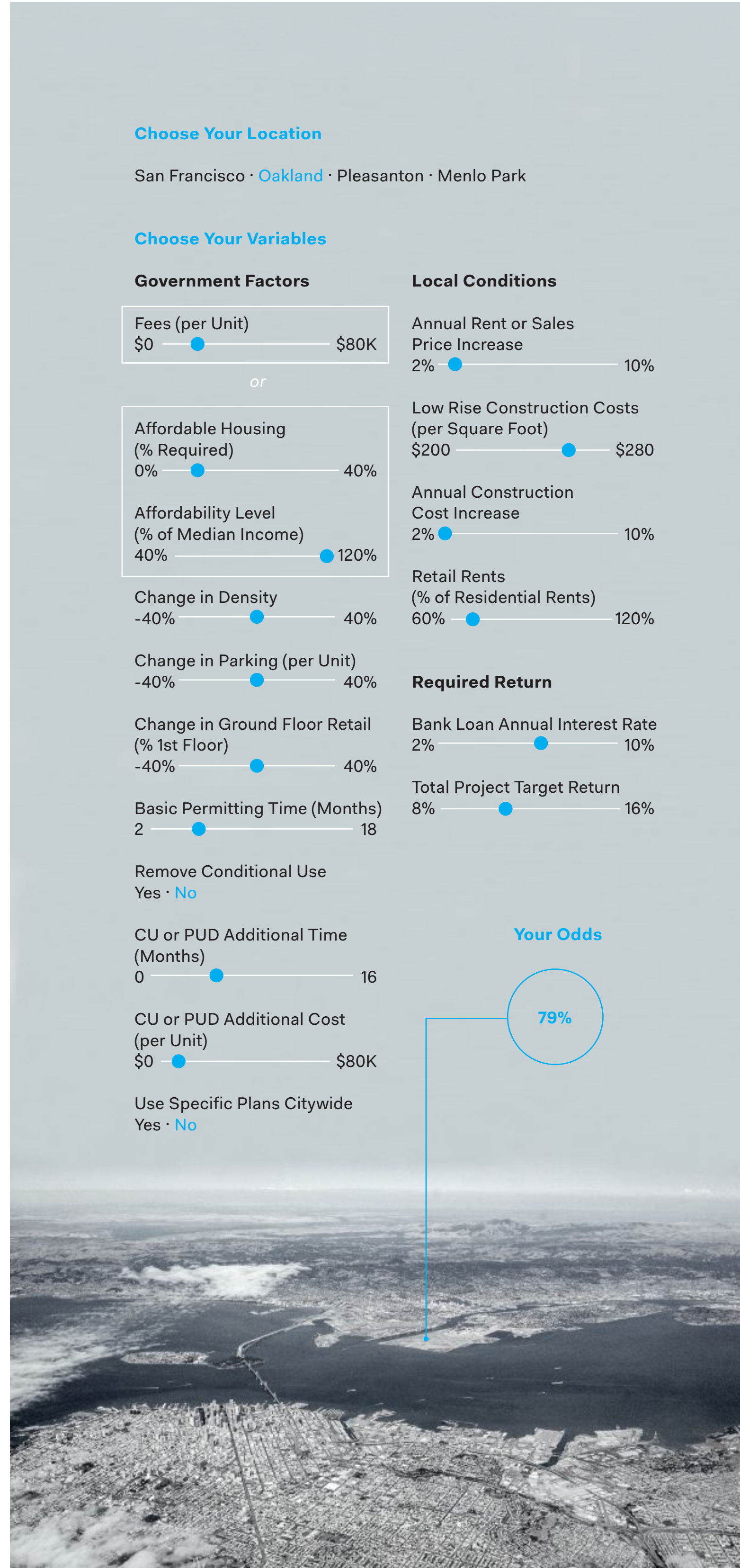
Though home builders are responding to the San Francisco Bay Area's housing crisis with new residential projects, supply is falling short of demand.

To try to address that shortage, the Terner Center for Housing Innovation at the University of California, Berkeley, launched a set of online calculators called the Housing Development Dashboard, aimed at helping to identify the most effective combinations of policies that can get more housing built.

The dashboard's Development Calculator estimates the probability of a project being built, given the local land-use policies and economic conditions, as well as variables like construction costs, rents, and desired return on investment. The Policy Gauge (at right) shows how changes to policies and zoning rules can impact housing production in four Bay Area cities: San Francisco, Oakland, Pleasanton, and Menlo Park.

"The Development Calculator is a great indicator for what would happen if supportive legislation and local planning policy changes were enacted, such as a reduction in fees to encourage affordable housing development," says Irving Gonzales, AIA, principal of the San Francisco–based firm G7A. But he also suggests some tweaks, like the ability to calculate for projects with more than 40 percent affordable housing.

Going forward, Terner Center faculty director Carol Galante hopes to grow the dashboard's reach beyond the Bay Area. "You don't necessarily need this tool everywhere in the United States, but there are other markets, Seattle or Denver as examples, where this type of tool could be useful," she says.



> Read more about the Terner Center for Housing Innovation's Housing Development Dashboard at bit.ly/UCBHousingDashboard.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In a New Furniture Line, Modern Minimalism Meets Medieval Maximalism

TEXT BY SELIN ASHABOGLU

Traditional stained glass gets a refresh in this new sideboard, a collaboration between Spanish architect and designer Patricia Urquiola and Italian cultural impresario Federico Pepe, founder of controversial art magazine *Le Dictateur*. The piece is part of the duo's limited-edition Credenza Collection for Milan-based boutique Spazio Pontaccio. Its rounded metal volume sits on four slender, cylindrical legs, while angular geometric patterns and bold colors make the stained-glass doors pop. In their contemporary take on the historic technique, Urquiola and Pepe swap religious vignettes for vibrant abstraction. In Italian, appropriately enough, *credenza* means both "sideboard" and "belief." *spaziopontaccio.com*

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JENN-AIR
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Enough House
Upper Kingsburg, Nova Scotia
MacKay-Lyons Sweetapple Architects

TEXT BY EDWARD KEEGAN, AIA
PHOTOS BY JAMES BRITTAIN

The 700-square-foot Enough House, designed by Halifax, Nova Scotia–based MacKay-Lyons Sweetapple Architects, sits within a unique complex of structures, called Shobac, on the Atlantic coast of the Canadian province. It's part of a fascinating dialogue between traditional and modern architectural forms on Brian MacKay-Lyons' Ghost Architectural Laboratory encampments. Enough House is the 10th permanent structure added to the ensemble and its site on the entry road gives it the prominence of a gatehouse.

The simple gabled volume plays off an adjacent schoolhouse, a classically designed 1830s structure that MacKay-Lyons, HON. FAIA, moved to the site just a few years ago. "The gable shape holds onto tradition as an archetype," he says. "We're searching for the mythic center." But while the historic structure is strictly symmetrical in its volume and detailing, the house stems from a more kinetic impulse that informs both its fenestration and the relationship between the interior spaces and the surrounding landscape.

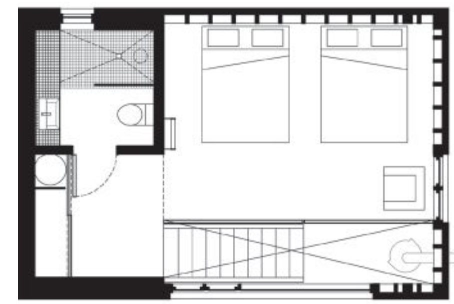
The simple palette is defined by 4-by-8-foot panels—Cor-Ten steel on the exterior, plywood on the interior. MacKay-Lyons refers to the aesthetic as "rural industrial" and eschews fetishizing craft or materials. The structure sits on two concrete walls that extend into the landscape, and the entrance is at the south corner, where a piece of the volume has been dramatically cut away. This negative space is balanced by floor-to-ceiling glazing at the north corner which provides expansive views of the property's agricultural areas (and the occasional visiting sheep) from within.

The Cor-Ten sheathing is detailed as a rainscreen with rigid insulation lying outboard of the wood-framed walls. This construction allows for exposed stick framing in the primary dwelling areas—the living room on the ground level and bedroom above. The service areas—a kitchen and bathroom—receive a more "finished" look with plywood sheathing that conceals services and provides a sturdy backing for cabinetry. The exterior's rusty metal is reprised within by a perforated Cor-Ten screen framing a bent-metal stair.

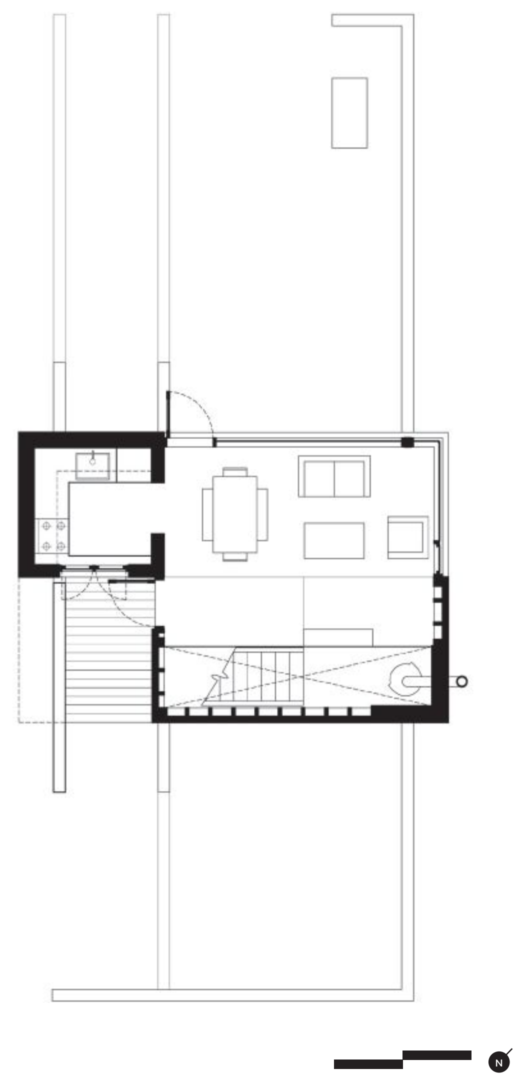
The building's lack of eaves is a sculptural detail to be sure, but is also rooted in the place; Nova Scotia has the highest weathering rate in North America, with as many as 265 freeze/thaw cycles each year. Having an eave is begging for trouble with ice dams.

The Enough House is a smart essay in how to create a quietly remarkable structure with minimal means. "It's not a folly," MacKay-Lyons says. Rather, it's meant to be a good, generic building that's part of an ensemble—not unlike the fishing shacks that have been the mainstay of Nova Scotia's coast for centuries. "That's what makes the best places," he says.

Second-Floor Plan



Ground-Floor Plan



Opening Page: Exterior view from west, showing corner entrance

Above: Living room, with stairs to second floor at right

Above: Second-floor bedroom with ladder to loft

Opposite: View from northeast, showing MacKay-Lyons Sweetapple Architects–designed cottages beyond

Project Credits
Project: Enough House, Upper Kingsburg, Nova Scotia
Client: Shobac
Architect: MacKay-Lyons Sweetapple Architects, Halifax, Nova Scotia · Brian MacKay-Lyons, HON. FAIA (principal/design architect); Meggie Kelley, Tyler Reynolds, AIA (intern architects)
Engineer: Blackwell · Renée MacKay-Lyons
General Contractor: Philip Creaser Custom Homes and Woodworking
Size: 700 square feet
Cost: Withheld

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DISRUPT OR BE DISRUPTED:

Housing's five most important solvable challenges

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KEYNOTE

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ELITE THOUGHT LEADERSHIP DEANS

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DEMOGRAPHICS
Professor of Policy, Planning, and Demography, University of Southern California

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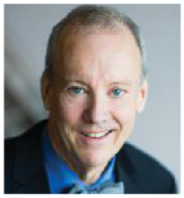

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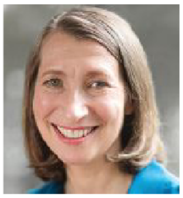
PRODUCTS
Co-author, *Cradle to Cradle: Remaking the Way We Make Things*



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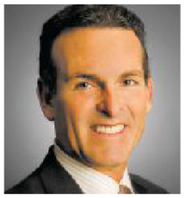
Author, The *Not So Big House* series



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Editorial: When the Boss Wants You Dead

When was the last time a member of Congress called for your death? For the estimated 9 million LGBT adults in the United States, it was May 26, during a meeting of the House Republican Conference on Capitol Hill. Expressing opposition to an amendment that would have added LGBT job protections to an appropriations bill, Rep. Rick Allen of Georgia read Romans 1:18–32 to his colleagues. One of six Bible passages about homosexuality, it decrees that "those who persist in such practices deserve death." Two weeks later, Omar Mateen murdered 49 people during Latin night at a gay club in Orlando, Fla. The deadliest shooting in modern U.S. history, it has sparked essential conversations nationwide about prejudice and violence—conversations that are germane to architecture as we strive toward greater diversity.

Homophobia didn't suddenly vanish last year after the Supreme Court legalized same-sex marriage. "More than 150 pieces of legislation were pending in state legislatures that would restrict rights or legal protections for sexual minorities," *The New York Times* reports. "Gays have surpassed Jews as the minority group most often targeted in hate crimes, according to the FBI." It is well-proven that hate speech promotes hate crimes. So say what you want, but please, watch what you say. Intolerance and the threat of violence don't just occur somewhere on the lunatic fringe. They're a reality in our schools and workplaces.

In a 2015 construction industry survey, *The Architects' Journal* found that while more than 70 percent of Britain's gay architects felt comfortable being open about their sexuality in the office, some 60 percent had heard homophobic comments at work in the past 12 months, only 20 percent felt supported by senior colleagues, and just 12 percent felt comfortable being openly gay on jobsites.

I am unaware of an equivalent U.S. study. (The AIA's 2016 diversity report focused solely on gender and race.) But an absence of data doesn't mean there's an absence of discrimination. Rep. Allen himself is part of the AEC industry, as founder of a commercial general contracting company. His official bio says he "graduated from Auburn University's School of Architecture and Fine Arts" (now called the College of Architecture, Design and Construction). Allen or someone with similar opinions could easily be your customer, client, colleague, or boss. For LGBT folks like me, that's a scary prospect, because in 29 states we have no legal job protections, in 75 countries homosexual acts are illegal, and in 10 countries homosexuality is punishable by death.

The AIA code of ethics lacks the force of law, but it admirably encourages a culture of diversity, prohibiting discrimination by "race, religion, gender, national origin, age, disability, or sexual orientation." While the code should be amended to encompass gender identity, it readily could serve as a model for other industry organizations, too many of which have no equivalent. Indeed, if I can find a bright side to Orlando, it is as a reminder that the profession, and individual architects, can take a leadership role, fostering inclusivity in design studios, on the jobsite, in meetings with clients and collaborators, and beyond. After all, architecture serves to build communities, not condemn them. It's part of our DNA.

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STEPHEN VOSS