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R+D Awards

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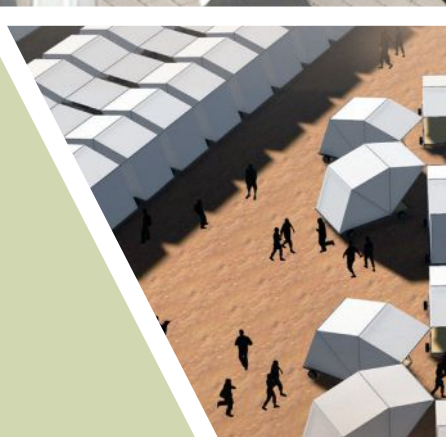

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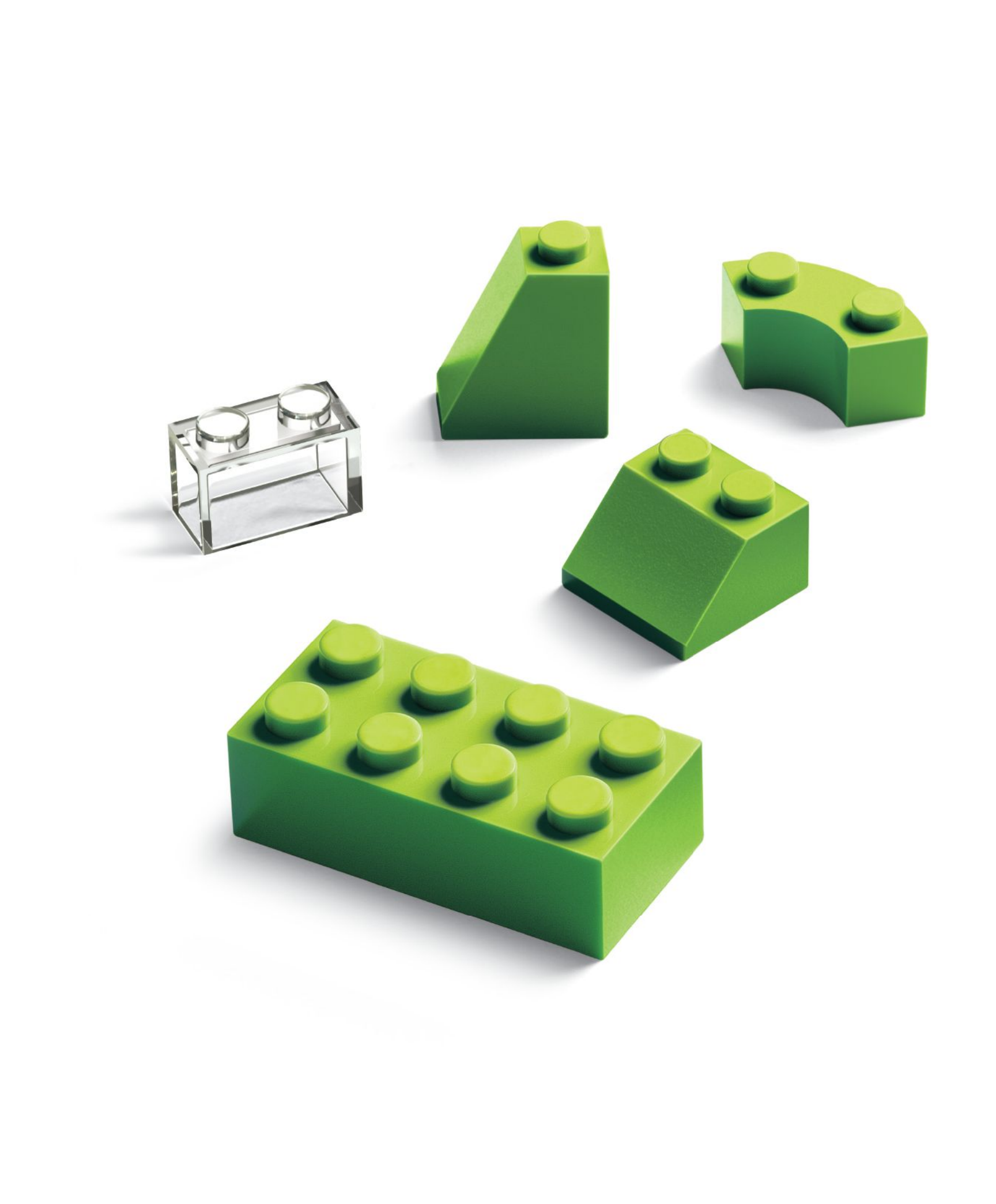

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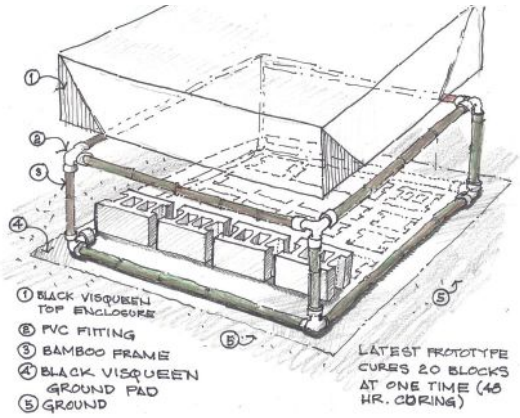
Contents

Volume 106, number 7. July 2017.
On the cover: The Empathy Effect by HGA Architects and Engineers, which received an Honorable Mention in this year's R+D Awards. Photo by Corey Gaffer.



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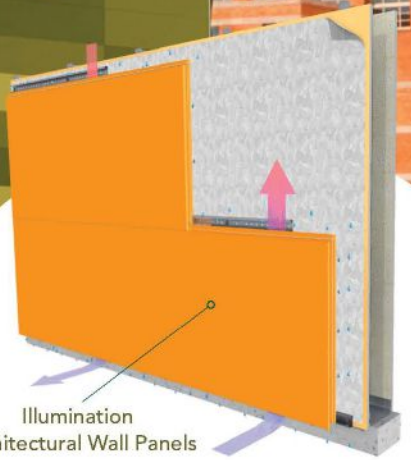

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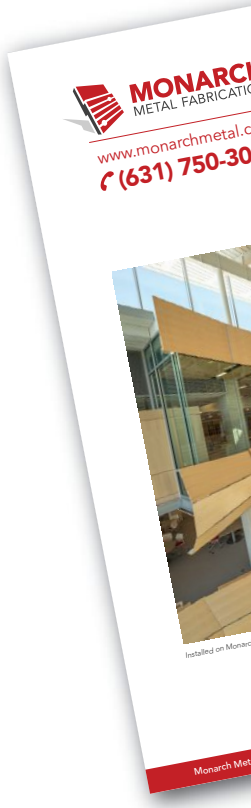

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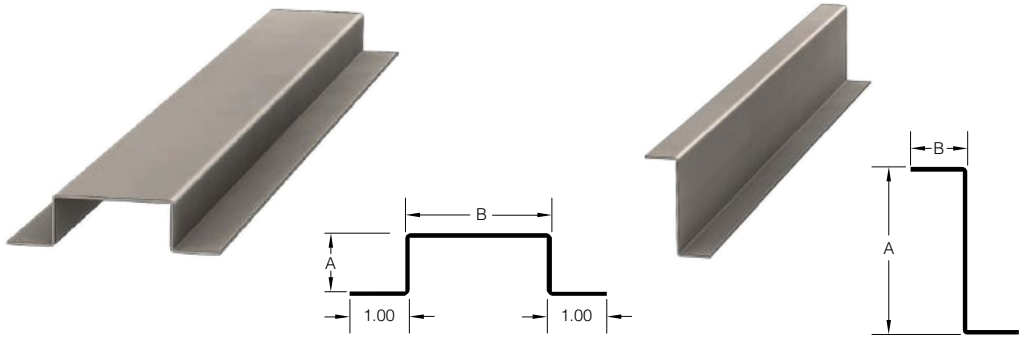

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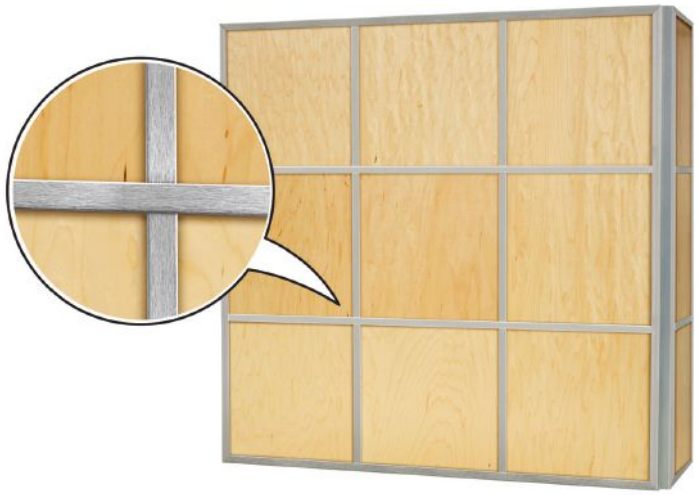

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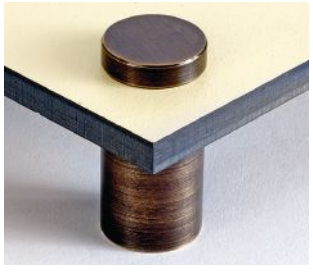

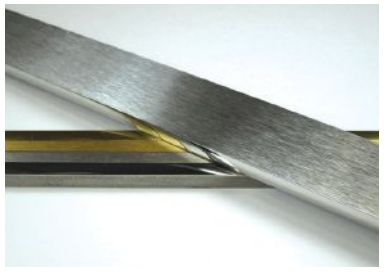

WORKFLOW ACCELERATOR

Suppose, for a moment, you could sweep away the small mountain of manufacturers' data sheets, tech manuals, and other building product literature that's always been a part of your practice.

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No more shuffling through files and piles of archived manufacturer literature. No more wondering, "Do they still make this?" With on-demand convenience, you click away to access the latest content on the material requirements and confidently advance the project. Workflow is streamlined, freeing more time for what you do best: design.

That's the winning formula behind the new building product selection platform that's gaining rapid traction in architecture firms worldwide, from sole proprietors to the global Top 20. Today respected architecture firms such as Gensler, Stantec, and HOK number among its users.

PPG PAINTS™ TEAMS UP WITH BIMSMITH®

The product selection platform is called BIMsmith®, a breakthrough platform for Revit and beyond that is now enhanced with the latest, most comprehensive array of Division 09 products from architectural coatings leader *PPG Paints*. BIMsmith is available free of charge to architects, designers, and contractors, putting over 50,000 unique building products at their fingertips within Revit.

TASK REDUCTION

"BIMsmith makes product selection workflows so much easier," says architect and BIMsmith CEO, Benjamin Glunz. "It can reduce a 30-minute process down to less than five minutes. Imagine the impact. Take a wall section, for example. There could be 10 or 12 different products in that assembly. As a former architect, I used to have to search piece-by-piece, spec-by-spec, to document the assembly.

"BIMsmith helps break down silos that can often impede multiproduct collaboration," he says.

For the A+D community, the recognition of BIMsmith's value has been immediate. "I have built my share of walls, floors, roofs, and ceilings even with advanced materials," said Jim Balding, architect and founder of The ANT Group in southern California. "But none compare to those I have built with BIMsmith. Now I specify with confidence, knowing BIMsmith offers all the information I need. The BIMsmith drawer of pre-built, filterable walls is priceless. When I needed an STC 55 wall, bam! It was there. Load and go!"

JUST CLICK THE PPG ICON

This powerful Revit web application empowers architects and interior designers with unprecedented efficiency when specifying *PPG Paints* product systems and PPG The Voice of Color® system. PPG-enhanced BIMsmith means more specification confidence, knowing only active and available products are displayed, including new product releases. No more product update worries or inadvertently specifying a discontinued product.

The *PPG Paints* brand is expanding their commitment to the architect and designer community in more ways than ever before. By making this new level of real-time convenience and simplicity available for designers, the *PPG Paints* brand is positioned as the Division 09 industry leader with Revit.

"We're taking a very comprehensive approach to this powerful Revit library," observes Brian Setness, Specification Segment Manager. "We're all-in. Architects now have access to *PPG Paints* products across all Division 09 categories. The PPG icon in the BIMsmith toolbar represents easy one-click integration of *PPG Paints* products all the way through 4D renderings on projects large and small."

GRADE: A+

Independent applications expert Tim Grim got his first look at BIMsmith in action at a trade show last year. He had heard the growing buzz and decided to test the system by building a wall system.

"You click Materials Properties to access details of the assembly layers. With the Paint layer, you're presented with a comprehensive paint selector," said Grim. He liked the option of saving the fully- specified assembly as a Revit RVT file, an AutoCAD DWG file, 3-part specification file, a PDF cut sheet, or JPEG image. Impressed, Grim named it an Editor's Choice (grade: A+) in his blog, Revit Add-ons.

Time-challenged designers have been quick to grasp BIMsmith's workflow simplicity, speed, accuracy, and convenience. As PPG's Setness says, "Architects are looking for smarter, more efficient ways to utilize Revit. By teaming up with BIMsmith, we're partnering with designers to do just that."

For more information, visit: bimsmith.com/ppg

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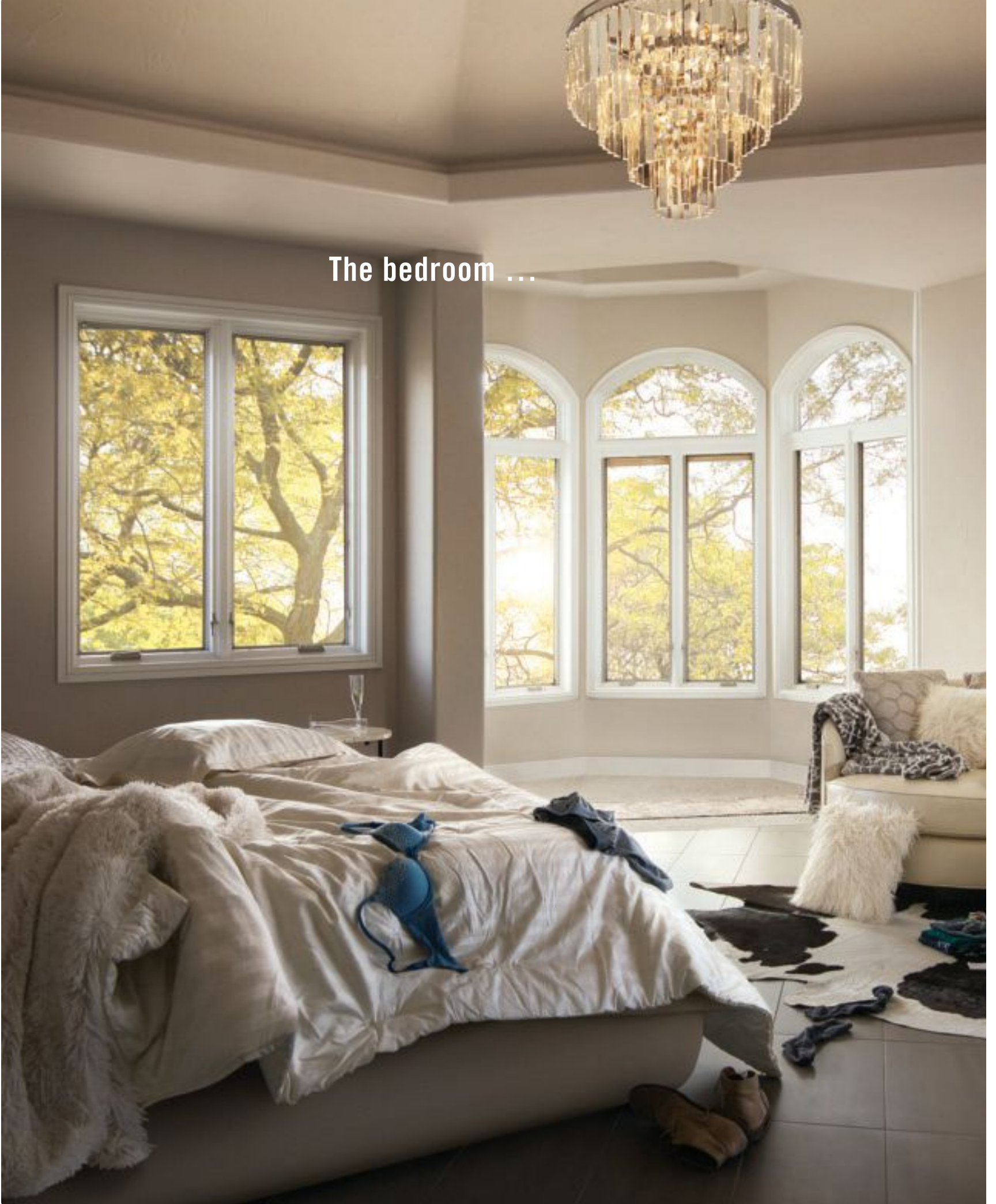
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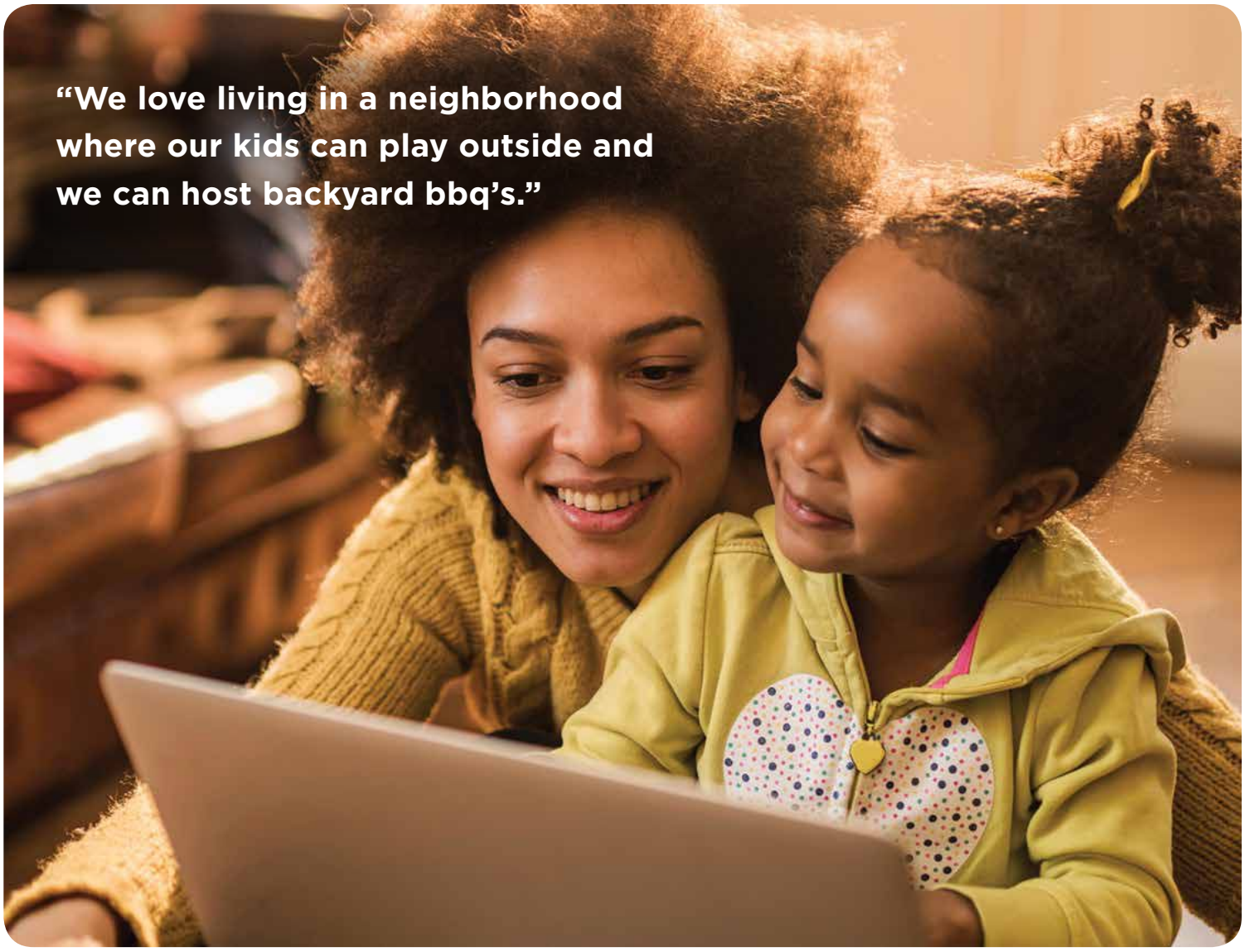

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DETAILS

Projects must have a client and a completion date after January 1, 2018. Judging will take place in November 2017. Winners will be notified in December 2017, published in the February 2018 issue of ARCHITECT, and honored at a ceremony in New York. For more information and rules and regulations, visit paawards.com.

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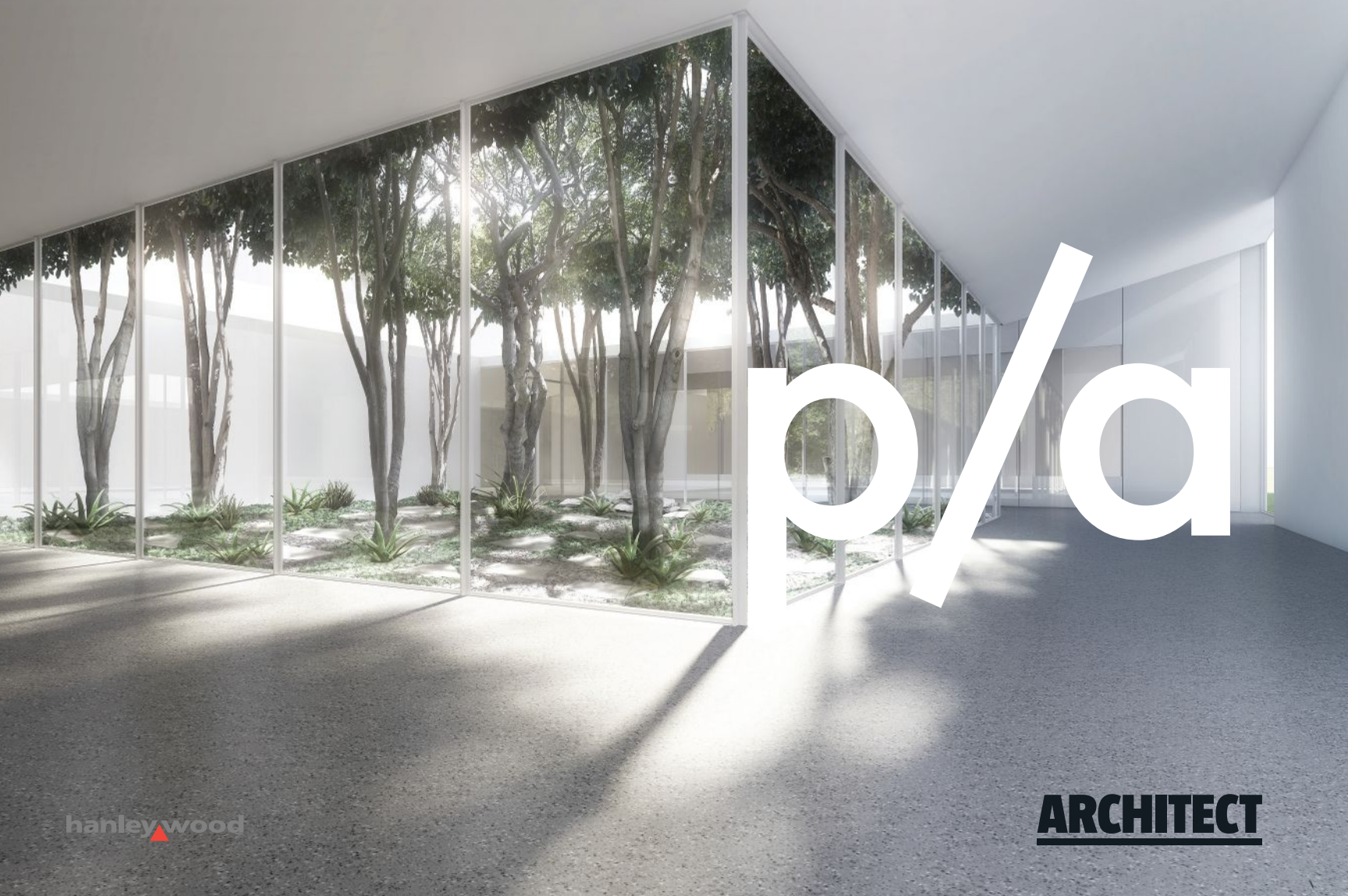

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A Practitioner of Humanistic Architecture

Robert Kliment, FAIA, co-founder of 1997 AIA Architecture Firm Award–winning Kliment Halsband Architects, died at his home on June 3. Born in Prague in 1933, his life was forever changed in 1939 when he was one of the more than 600 Jewish children rescued by Sir Nicholas Winton. Kliment served in the U.S. Army between getting his B.A. in architecture and his M.Arch. from Yale (in 1954 and '59), and then got a Fulbright Fellowship to study urban spaces in Italy. He is survived by his wife and partner Frances Halsband. His brother, *Architectural Record* editor Stephen Kliment, died in 2008. —SELIN ASHABOGLU

> *For more about Robert Kliment's life and work, including the renovation of Delano & Aldrich's 1932 Stirling Divinity Quadrangle at Yale, visit bit.ly/KlimentObituary.*

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SAMUEL BRAVO

Formally Studying the Informal

Chilean architect Samuel Bravo won this year's Wheelwright Prize, the Harvard University Graduate School of Design's annual travel-based research grant of $100,000 to a young architect. He proposed "Projectless: Architecture of Informal Settlements," which will take him to Bangladesh, Nepal, and India; the Amazon basin and flatlands; and urban areas in Africa. Bravo's work includes the 2012 Melimoyu Cabin on Melimoyu Bay in Chile as well as two 2014 collaborations with Sandra Iturriaga—the Ani Nii Shöbo healing center and nature preserve and the Nii Juinti School (above), both located in the Ucayali region of Peru. —SARA JOHNSON

> *Read more about the Wheelwright Prize and see more of Samuel Bravo's work at bit.ly/2017WheelwrightPrize.*

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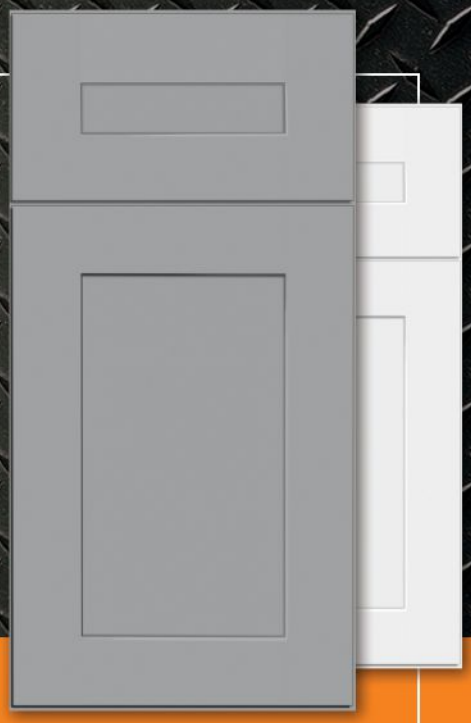

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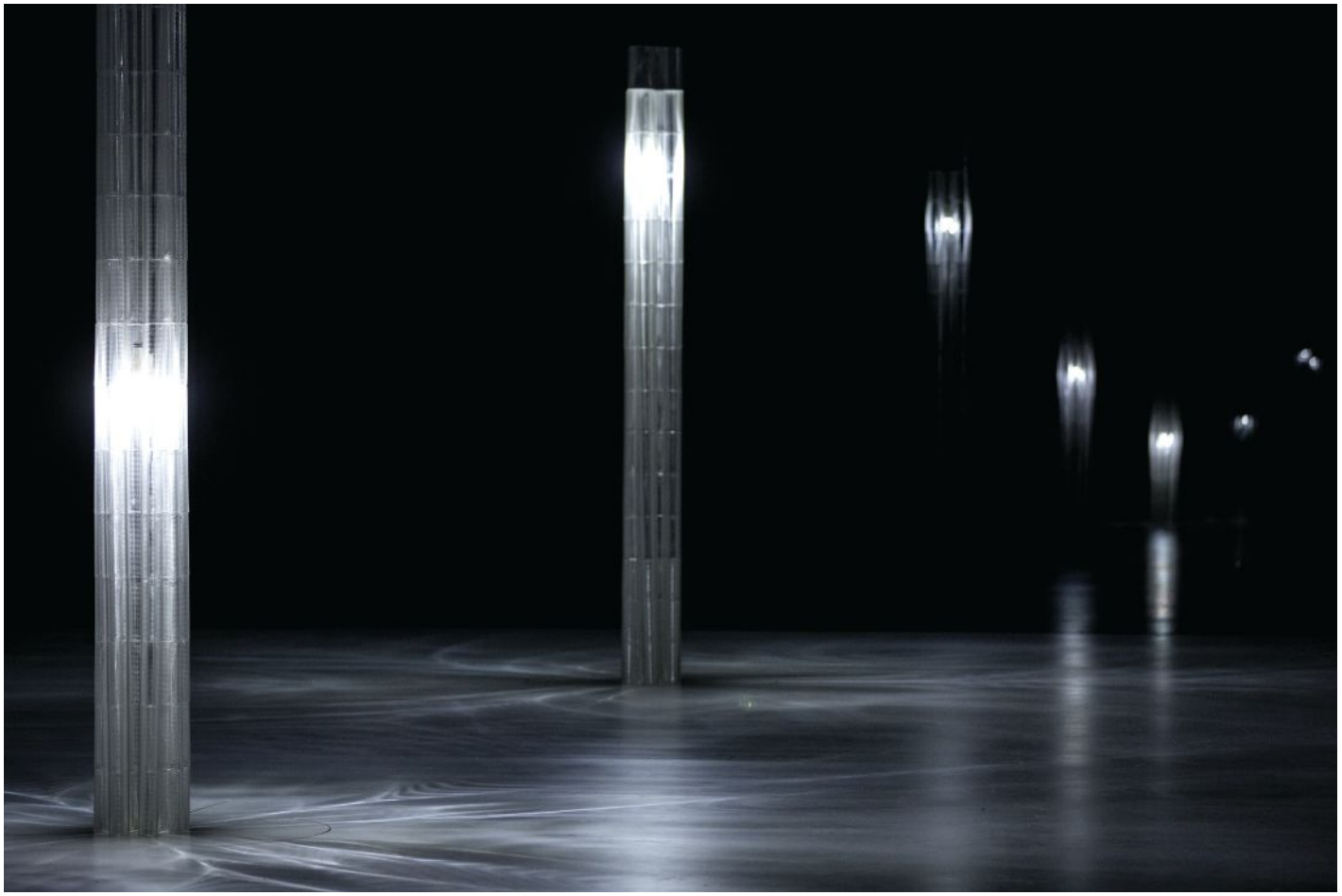

PAULA AGUILERA AND JONATHAN WILLIAMS

Printing with Molten Glass

In 2015, a team from the MIT Media Lab's Mediated Matter Group announced it could 3D print molten glass. This April, the group, led by associate professor Neri Oxman, debuted Glass II 3D Printing (G_3DP_2), the technology's progression to an architectural scale. G_3DP_2 is four times bigger than before—the device weighs more than 1 ton—and is capable of processing up to 30 kilograms (66 pounds) of molten glass in one print run. Oxman says the current limiting factor is the printer gantry. The group also outfitted G_3DP_2 with a digitally integrated thermal control system that accommodates the different stages of glass formation. —WANDA LAU

> *To read more about Neri Oxman and the Mediated Matter Group's G_3DP_2 project, visit bit.ly/Oxman3DPrintedGlass.*

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CHRISTOPHER SIMS

The Faux Front

In May, the Graham Foundation gave out more than a half-million dollars to 72 projects that are exploring architecture's "role in the arts, culture, and society." According to foundation director Sarah Herda, the recipients "make new work that directly engages the social and political dimensions of the designed environment." Among the winners is Christopher Sims, whose photography book *Theater of War: The Pretend Villages of Iraq and Afghanistan* studies mock training villages built at U.S. military installations, like the Green Mosque at North Carolina's Camp Mackall (above), which Sims captured in 2006. —KATHARINE KEANE

> *Learn more about the various recipients of the 2017 Graham Foundation grants at bit.ly/2017GrahamGrants.*

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DOUGLAS MASON

Mucho MoCA

On May 28, the Massachusetts Museum of Contemporary Art (MASS MoCA) in North Adams, Mass.—whose campus was once a 19th-century factory complex—opened its latest addition: the Robert W. Wilson Building. Also known as Building 6, the renovation project by Cambridge-based firm Bruner/Cott & Associates has created 130,000 square feet of new exhibition space, doubling the museum's capacity. This third and final phase of the firm's 25-year master plan makes MASS MoCA one of the nation's largest contemporary art museums. —AYDA AYOUBI

> *Read more about Bruner/Cott's MASS MoCA Building 6 and see more images at bit.ly/MassMoCA6.*

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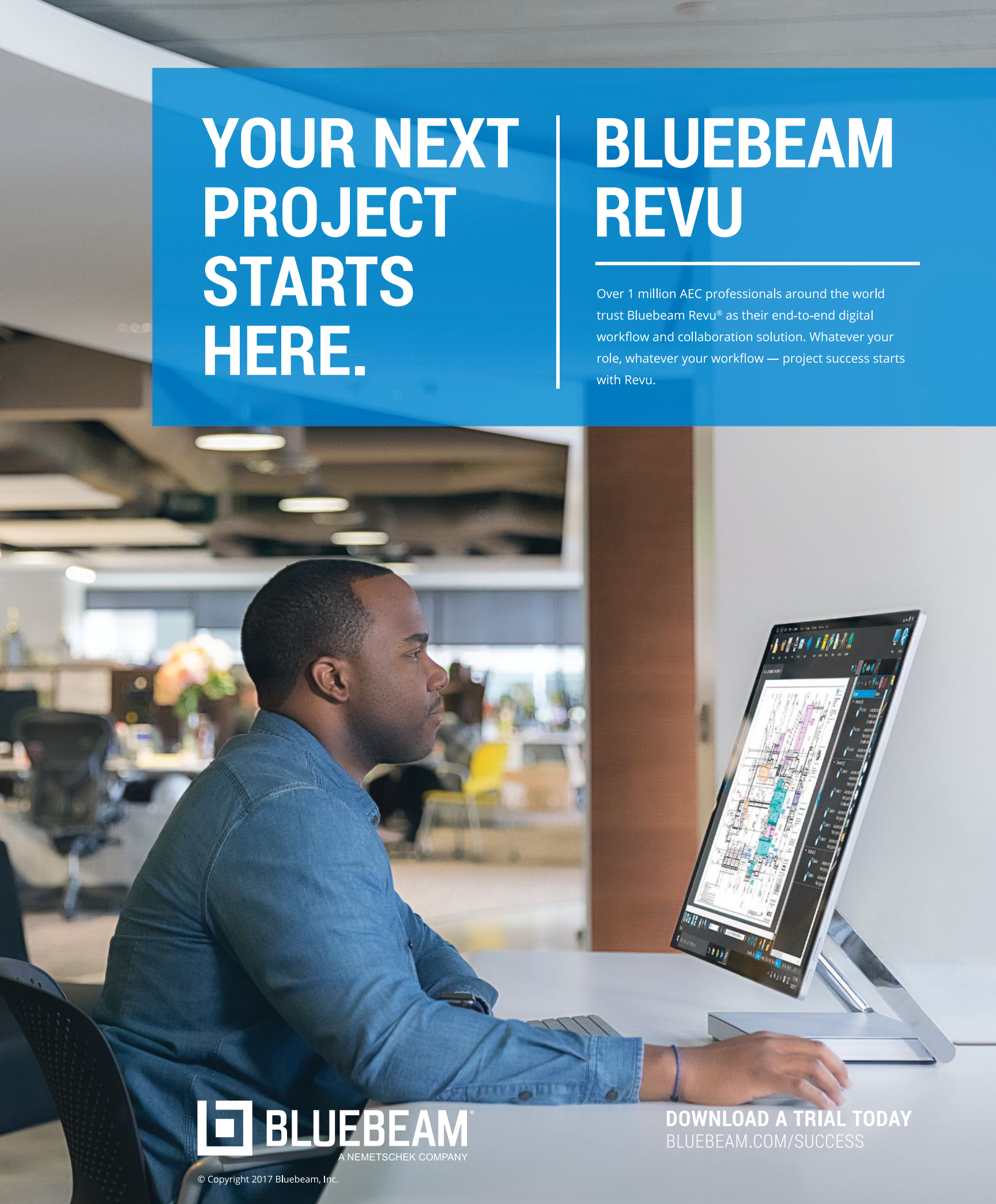
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Best Practices: Healthcare Plans for Smaller Firms

TEXT BY BRIAN LIBBY

In any competitive industry, retaining a talented, productive workforce means offering meaningful projects, adequate compensation, and benefits that can keep your staff and their families healthy. Below, business advisers and healthcare providers weigh in on what options you should consider when selecting a plan.

Cost and Coverage

Choosing the right plan starts with assessing employer and employee contributions. "The cost of a plan is the first question," says Joe Langel, an account executive for Holmes Murphy & Associates, a Des Moines, Iowa–based independent insurance brokerage that often works with architecture firms. The age of your staff will be crucial in determining cost: the younger they are, the more affordable the premium will be. "The Affordable Care Act took away the ability to underwrite other factors," Langel says. "It's a rate based on your age and region."

> "For a smaller practice, if you can be part of a greater pool, you get a lower rate."
>
> —Stephen Lapp, partner, Waterleaf Architecture

From there, it's a matter of finding the right balance for deductibles and employee contributions. A company shouldn't spend to a degree it can't afford, but lower rates are not always what matter most. "You get what you pay for," says Stephen Lapp, a partner at Portland, Ore.–based Waterleaf Architecture. "One year, we elected to save some money by going with another dental insurer, which caused several people in the office to spend time trying to substantiate a claim that was denied. We said, 'It's not worth it.' It's not worth our staff being disgruntled and on the phone settling claims."

In some parts of the country, firms with fewer than 50 employees can get a better rate by joining together in a group plan—as Waterleaf has done for the past 15 years, first as part of a group plan for architecture firms in association with an Oregon chapter of the AIA and then, after their plan went up by 20 percent last year, as part of a community-care plan for businesses in the city's metro area. "For a smaller practice like ours, if you can be part of a greater pool, you get a lower rate," Lapp says.

Self-Funding vs. Fully Insured

Employers must also decide how to pay for healthcare for their staff. A firm can opt to be fully insured, meaning they purchase a policy from an insurance provider for a fixed premium to manage employee claims. In this case, the annual cost may change upon renewal, but the insurance company incurs the financial risk of claims exceeding projections.

Alternatively, an employer can opt to self-fund its employee claims. In this case, "you, as the employer, pay the claim, and you buy insurance to protect yourself from catastrophic stuff," says Jeff Clayton, another account executive at Holmes Murphy. "If employees do not need a lot of access to doctors and hospitals, you'll actually pay less," he says. "It might make sense if you have a young, healthy workforce."

Jon Niedermeyer, CEO of Portland-based insurance provider Niedermeyer Risk Management says that firms with fewer than 50 employees usually opt for the fully insured coverage because, "they don't have the [staff] volume to justify self-funding. Self-funding is best for firms that have 100 or more employees."

Options for Employees

Next is the question of what type of plans to offer, such as a Health Maintenance Organization (HMO) or a Preferred Provider Organization (PPO). The major difference between HMOs and PPOs is that an HMO offers access to certain doctors and hospitals within its network while a PPO offers more flexibility in picking a doctor or hospital.

In some cases, selecting the right plan can be dictated by geography. "The PPO is the bigger network," says Langel. "If you're in a rural area, a PPO might be better because there are more doctors."

In the end, all of the options seem limitless, but by prioritizing the needs of staff members, smaller firms can select coverage that helps both the individual and the business.

> *For more advice on selecting a healthcare plan, visit bit.ly/ARHealthcarePlans.*

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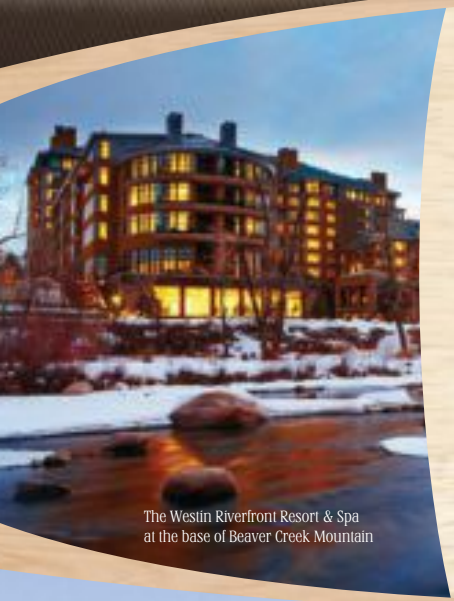

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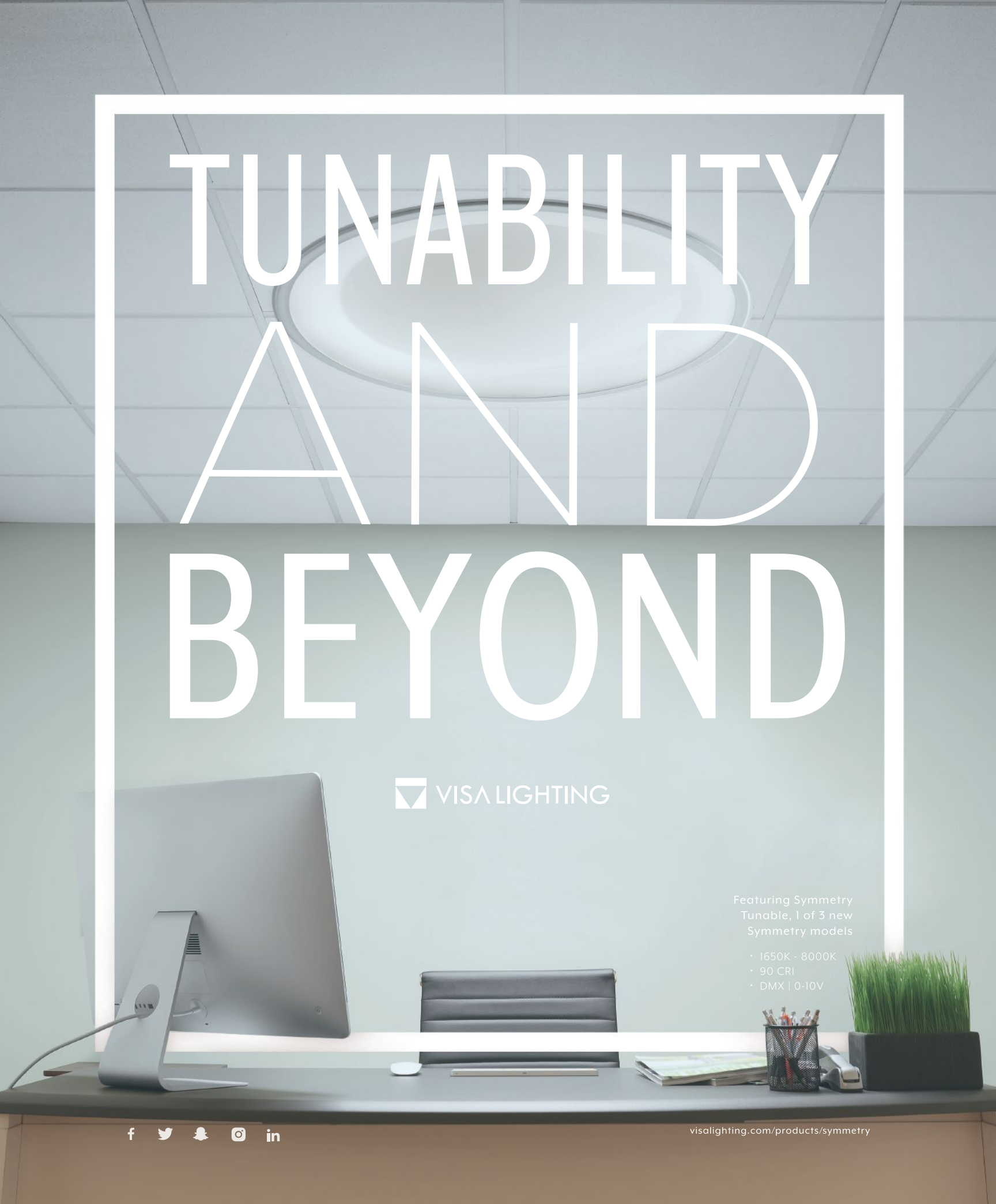
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Detail: Löyly Sauna Timber Skin

TEXT BY TIMOTHY A. SCHULER

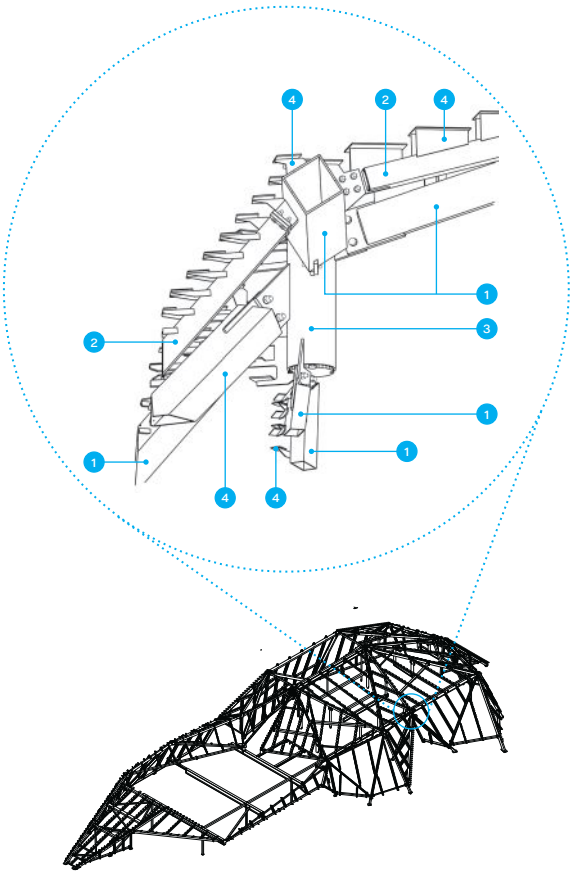
Architect Ville Hara calls the timber skin of Helsinki's Löyly sauna "the cloak." The angular, geometric façade, interrupted by narrow slit entrances, conceals a second structure: a simple rectangular volume of black concrete that houses Löyly's restaurant and public saunas, providing visitors a sense of privacy without limiting their views of the Baltic Sea. "From inside you see outside, but from outside you don't see inside. It acts like a venetian blind," says Hara, who founded Helsinki-based Avanto Architects with Anu Puustinen in 2004.

Opened in May 2016, Löyly—the Finnish word for the steam created by throwing water on heated stones—sits on the edge of a manmade peninsula in the capital city. Avanto designed the low, narrow building with its free-form "cloak" to evoke a natural landform, an effect that will intensify as the heat-treated pine weathers to a stony gray.

Formed by a series of sloping triangular planes created by thousands of wood lamellas, the cloak creates transitional spaces—open yet sheltered from the elements—for the periods before and after trips in to the sauna. The façade flattens out to become stairs, which lead to a pair of roof terraces.

Hara says the overall shape of the cloak was designed in AutoCAD, but working out the dimensions and spacing of the lamellas took time and required three-dimensional modeling.

Avanto selected a new product that the firm had never used for Löyly: glued-laminated wood from Finnish startup Nextimber. The heat-treated pine panels were baked and pressed to improve structural performance and weather resistance. According to Nextimber, this thermomechanically modified wood is 20 to 25 percent stronger than typical glulam. But it was attractive to Avanto because it is inherently sustainable, making use of a material—what Hara calls "trash wood"—that otherwise would go to waste.



1. 300mm × 300mm or 200mm × 100mm rectangle hollow section (RHS) steel edge beam.
2. 150mm × 150mm or 150mm × 50mm secondary RHS steel beam.
3. Circular hollow section steel tube joint welded with joint plate and end plates.
4. Steel support for lamellas.

KUVATOIMISTO KUVIO OY

> *To learn more about the design and construction of Löyly visit bit.ly/ARLoyly.*

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9. Outbuilding
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SPECIALTY ENTRY CATEGORIES ($95)

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12. Bath
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Next Progressives: LAMAS

EDITED BY KATHARINE KEANE

Location:
Toronto

Year founded:
2008

Firm leadership:
WH Vivian Lee and James Macgillivray

Education:
Lee: B.A. Wesleyan University, M.Arch. Harvard University Graduate School of Design (Harvard GSD); *Macgillivray*: B.Arch. Princeton University, M.Arch. Harvard GSD

Firm size:
Four to six

Mission:
We're excited by ornament, optical illusions, and lazy forms. Our ideas usually involve the perversion of a precedent, type, or technique. We do research, installations, and work for clients. We respect every situation that allows us to do our work and see each one as a distinct calling for our expertise.

Favorite project:
"Delirious Facade," probably because it is our most recent. We're using the artificial intelligence of Google's Deep Dream to design façades based on jpegs of existing buildings. We love it because we can get a lot done with very little work. It also invites a historical diversity of formal and ornamental

WH Vivian Lee and James Macgillivray

languages into our process that might not be there otherwise. This is really important to us, particularly as it relates to the diverse city where we live.

Origin of firm name:
It's actually just a boring acronym of Lee and Macgillivray Architecture Studio. But people think our name is all kinds of things: a South American animal, or Lorenzo Lamas, or two Tibetan monks. For some reason, everyone says it with a Spanish accent.

First commission:
We worked with poet Tung-Hui Hu at the University of Michigan on a structure to house the poetry he was writing using voice recognition software of people answering the question: "When was the last time you cried?" We built the installation "Last Time You Cried" out of extruded sound waves from the voice recordings, using florist foam.

Memorable learning experience:
We learned how to thatch from William Cahill, one of the last master thatchers in the United States. Most projects involve learning some kind of craft tradition, whether old or new—for example, when we learned hydrographics, it was mostly from YouTube.

Design hero:
Adelbert Ames Jr. was famous for inventing several optical illusions to test visual perception, most notably the Ames Room. But he made many others that dealt with normative architectural forms as something to measure against (windows, chairs, doors). His constructions presage the early work of Frank Gehry, FAIA, in interesting ways.

Special item in your studio space:
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Design tool of choice:
Pinterest

Design aggravation:
Glass and balconies. Where we live, it's enough already.

Superstitions:
Never write your name in red ink and don't give knives or scissors as a present.

Vice:
Looking at phone after midnight.

ANDREA STENSON

> *To learn more about the firm's work and inspirations, visit bit.ly/ARLamas.*

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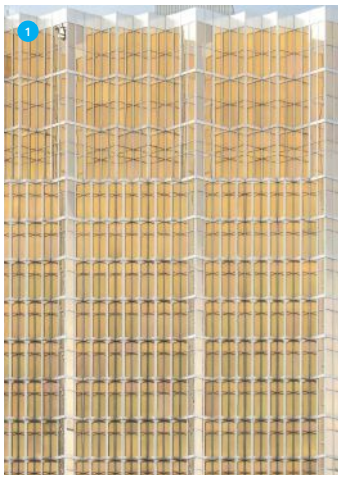
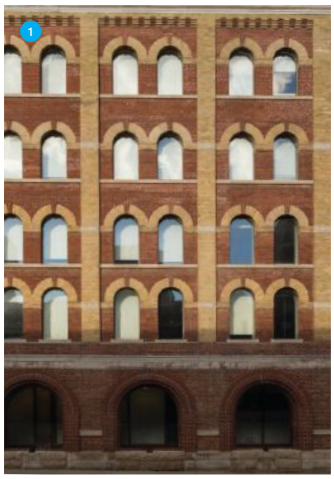
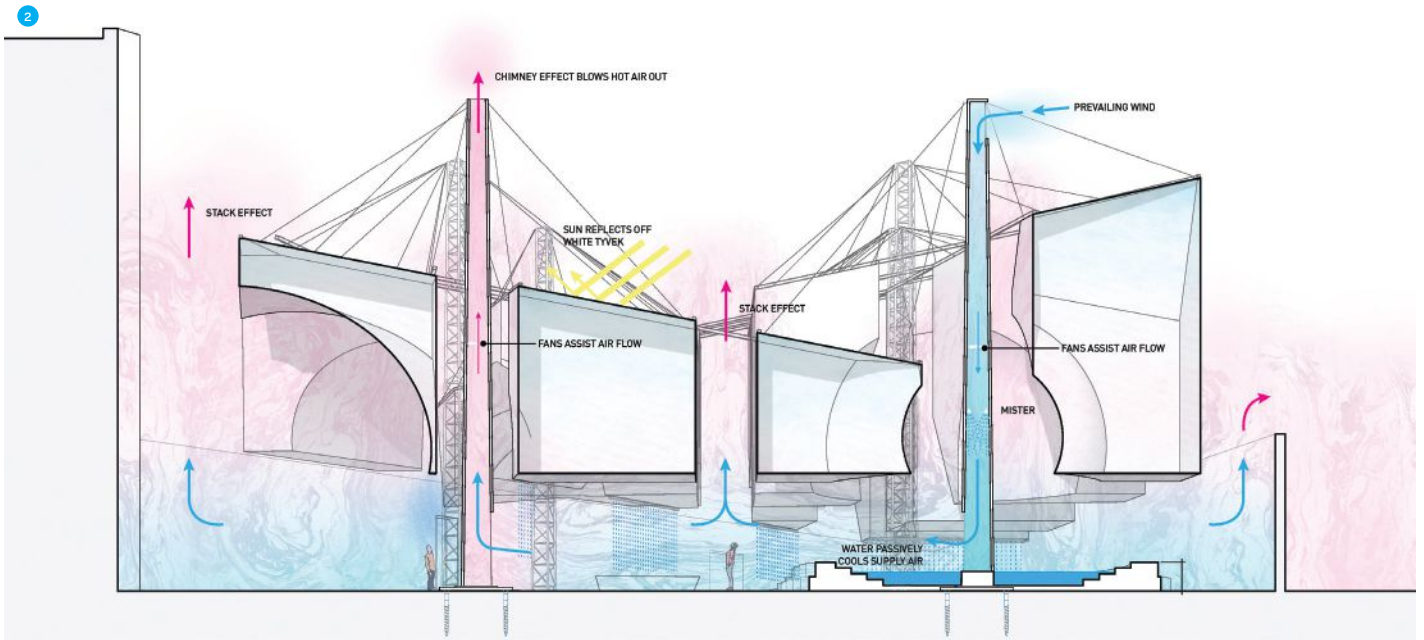
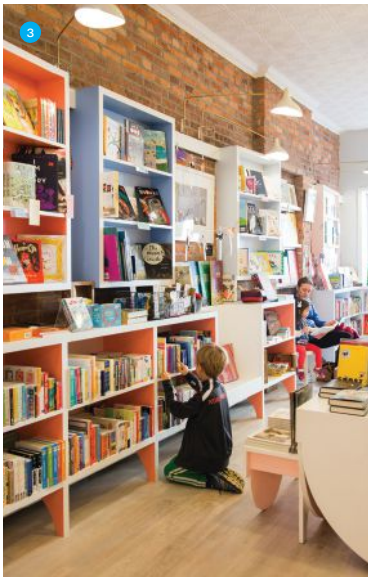
Next Progressives:
LAMAS

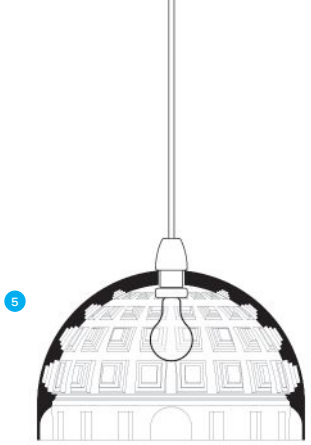






1, 2, 4, 5: COURTESY LAMAS





1. LAMAS used Google's convolutional neural network software Deep Dream on its Delirious Facade research project to create hybrid façades of Toronto structures. This exploration stems from ongoing debates on the lack of historic buildings in Toronto, diminished identity, and shifting structural appearances. 2. Conceptualized as an urban iceberg, the firm's "Underberg" runner-up proposal for the 2014 MoMA PS1 Young Architects Program incorporates contrasting curved and angular Tyvek forms suspended from 50-foot poles to create a cavernous, yet open, space, enlivened by colorful marble patterns. 3. Seeking to evoke a classic one-room schoolhouse, the design for this Brooklyn, N.Y., bookstore includes arched and quarter-arched cutouts inspired by Shaker stepladders and hidden pops of color in the shelving. 4. Stacked cube, sphere, and prism forms assemble to create an atypical food cart for Toronto restaurant Oyster Boy for the 2015 Stop's Night Market. Embellished using water transfer printing called hydrographics, the cart won "best in show." 5. Inspired by Chinese rice grain porcelain, Lee and Macgillivray pressed coffered shapes into the interior of a ceramic lampshade prototype called Pantheon. This treatment creates varying levels of translucency in the material. 6. This 4,000-square-foot North Hatley, Quebec, farmhouse comprises three distinct volumes clad in repurposed hemlock sourced from dilapidated barns in Ontario.

3: JANE BEILES; 6: STÉPHANE GROLEAU / LAETITIA BOUDAUD

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Products: Irys Modular Partition System

TEXT BY SELIN ASHABOGLU

Dimensions: Irys' bridge configurations range from 8.5'-long by 8.5'-wide to 34.4'-long-by 12.4'-wide. Offered in two heights of 8' and 8.5'.

Finishes: The bridges' ceiling, opaque walls, and flooring can be specified in a variety of finishes including wool or synthetic fiber upholstery, natural wood or laminates, and powdercoated steel or aluminum. Glass walls can be specified in electrochromic glass. Swinging and sliding door configurations are available.

COURTESY CLESTRA HAUSERMAN

Irys, Clestra Hauserman and HOK Product Design

As open office plans have become de rigueur, it's more crucial than ever to ensure that employees have quiet, private areas where they can focus. Irys is a freestanding, modular kit that makes up a variety of pod configurations. A single pod can hold up to four individuals.

Created in a collaboration between HOK Product Design—an independent division of the architecture firm—and French wall partition manufacturer Clestra Hauserman, and distributed in North America by Steelcase, Irys can be assembled in a single day and functions autonomously: Built-in LED lighting, electrical wiring, AV equipment, and a ventilation system operate independently from the larger building's systems.

Irys is assembled through single or double rectilinear archways ("bridges") that anchor attachable, enclosed glass walls on the two open sides of the pod. The two opaque walls of the bridges can be fitted inside and out with a Clestra MediaWall, room-booking modules, or whiteboard surfaces. "Whether relocating offices or making adjustments to an existing space, [Irys] gives [users] the opportunity to be as flexible as they need to be," says Daniel Herriott, director of interior design at HOK, in San Francisco.

> *Read more about Irys at bit.ly/IrysOfficePartition.*

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MISSOURI ARCHITECT 'WOULD NEVER RECOMMEND GOING BACK TO HOUSEWRAP'

Presented by: ZIPsystem™ SHEATHING & TAPE

Mike Reardon was attending a lunch-and-learn program for builders and architects in 2014 when the presenter began using "innovative" and "integrated" in the same sentence to describe an alternative to housewrap. It was a lightbulb moment for the Missouri architect and a turning point in how he would approach weather-resistant barriers for his firm's multi-family projects.

"Housewrap issues are a constant challenge on job sites," said Reardon, project manager for M.W. Weber Architects, an architectural design firm that specializes in multifamily, commercial and retail projects. "Housewrap is hard to install and can make dry-in difficult. This is not what you want on a job site.

"In addition," he continued, "I was adding square footage to my own home at the time and was using housewrap. I was experiencing firsthand just how difficult it can be, in terms of usability and making a project airtight."

ZIP System® sheathing and tape is an innovative structural roof and wall system with an integrated water- and air-resistant barrier that streamlines the weatherization process, while providing a continuous air barrier to reduce air leakage. Following the lunch-and-learn presentation on ZIP System sheathing and tape, Reardon was convinced the system could prevent the infiltration of air and water better than housewrap.

"I knew right away I wanted ZIP System sheathing and tape for our firm's projects, and it didn't take much to convince people to switch," he said. "The contractor for our next apartment project was initially sold on housewrap, but once we demonstrated how ZIP System sheathing and tape installs quicker, he was convinced."

Bramblett Hills Apartments is a luxury apartment complex in O'Fallon, Missouri west of St. Louis. The project includes 218,000

Bramblett Hills Apartments includes 218,000 square feet of ZIP System® panels.

> "The contractor for our next apartment project was initially sold on housewrap, but once we demonstrated how ZIP System® sheathing and tape installs quicker, he was convinced."
>
> – Mike Reardon, M.W. Weber Architects

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With a built-in water resistive barrier, ZIP System® sheathing and tape saves installation time by eliminating housewrap.

square feet of ZIP System panels in 204 apartments in 17 three-story buildings, 87 garages and a clubhouse.

"ZIP System sheathing and tape transformed the Bramblett job site with a two-step installation process—install the panels and tape the seams," said Eric Gowin, president of Contegra Construction, the general contracting firm. "Taping became a one-man job, and that's not possible with housewrap. We have an aggressive construction schedule—completing a new building every 30 days – and this schedule would not be possible without using products designed to perform."

Reardon said another benefit to using a structural sheathing system with built-in moisture protection is that it can be put in place regardless of the time of year. It's a promise the manufacturer, Huber Engineered Woods LLC, backs with a 180-day exposure guarantee.[1]

"The ZIP System does not appear to be negatively affected by weather during or after installation," he said. "Once the panels are in place the structure is airtight, which is critical to preventing mold and moisture from penetrating the building. I would never recommend going back to housewrap."

Tim Breece, president of Propper Construction Services, which along with TriStar Development are the owners of the project, said faster dry-in times and more predictable construction schedules are the hallmarks of ZIP System® sheathing and tape. Propper also plays a secondary role as construction managers over the development.

"ZIP System sheathing and tape is more reliable than housewrap," Breece said. "The system's water-resistant capabilities and its ability to hold up under extreme weather conditions are especially important to us.

"The continuous air barrier also is a plus, as well as fewer man hours needed to install the system," he added. "The seam tape is an obvious plus too, especially given how unpredictable Mother Nature can be in the Midwest."

Bramblett Hills was completed in 2016, and Breece is already looking ahead to his next project using ZIP System sheathing and tape. Propper Construction has more than 450 multifamily units under construction in the St. Louis area.

"ZIP System sheathing and tape has been a great problem-solver for us," Breece said. "It is almost foolproof to install and its ease of installation keeps our projects moving forward with no callbacks. It would be an understatement to say we are bullish about using the system in other multifamily projects."

Visit http://go.hw.net/Huber717 to listen to the "Code Compliant Exterior Systems for Wood-Framed Building Envelopes" CEU course, sponsored by ZIP System® sheathing and tape.

[1] Limitations and restrictions apply. See ZIPSystem.com for details.

THE EVOLUTION OF CONTINUOUS INSULATION

Presented by:

The Mission My Care Plus Building in Asheville, N.C.

By Herbert Slone, R.A.

LEARNING OBJECTIVES

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

1. Identify continuous insulation and anticipated optimized building performance resulting from its integration.
2. Recognize codes and standards such as the International Building Code (IBC), International Energy Conservation Code (IECC) and ASHRAE 90.1 requiring CI and prescriptive R-values.
3. Identify NFPA 285 requirements associated with selected CI, cladding and wall assemblies.
4. Select commonly used continuous insulation products based on material properties such as thermal performance, fire resistance, UV resistance and moisture resistance.

CONTINUING EDUCATION

AIA CREDIT: 1 AIA LU/HSW
AIA COURSE NUMBER: AR072017-3

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/AR072017-3 and complete the quiz for free as you read this article. If you are new to Hanley Wood University, create a free learner account; returning users log in as usual.

CONTINUOUS INSULATION

During the past 20 years, the building sector has seen a significant shift around the use of continuous insulation (CI). Evolving from what was once a rare practice or perceived as an advanced greenbuilding, high-efficiency option, CI is now a standard method and materials practice across most climatic regions.

So what is continuous insulation? What has been the driver behind its rise? What performance benefits has its use provided? What changes in codes and standards have resulted? What material solutions are currently used? These questions are addressed in this course.

THE DEFINITION OF CI

Think of CI as a "building blanket," wrapping the building in a layer of insulation to improve envelope/enclosure performance. It is defined in ASHRAE Standard 90.1-2013 as:

"Insulation that is uncompressed and continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior, exterior, or is integral to any opaque surface of the building envelope."

In building enclosures, the structural wall layer, often steel stud, CMU, concrete or wood stud, has elements that by structural or mechanical necessity extend through the traditional insulation layer of the wall system. Components including steel columns/beams, steel or wood studs, solid concrete or hollow core concrete masonry units (CMU) all have high conductivity elements that extend from inside to outside.

These high conductivity components penetrate through cavities and/or cores where the traditional insulation layers in the wall are located, creating thermal short circuits that may reduce the thermal effectiveness by as much as 50 percent.

If buildings are thought of as "buckets," then these thermal short circuits are essentially "holes in the energy bucket" and can place additional demand on HVAC systems, wasting energy and

costing money. These thermal short circuits can also contribute to long-term moisture accumulation, condensation, wall system deterioration and reduce thermal comfort.

Using a layer of CI to "wrap" the building enclosure in a "blanket," covers the "holes" (the short circuits), maximizing wall system performance, minimizing energy cost and reducing the likelihood of deterioration. Also, CI, extruded polystyrene (XPS) in particular, is sometimes used as the air barrier layer as well as the CI layer. XPS with tape sealed joints and penetrations has been demonstrated to perform as a code compliant air barrier layer in accordance with ASTM E2357 testing.

THE EVOLUTION OF PRESCRIPTIVE R-VALUES FOR CI

Energy standards are a main driver behind the evolution of CI in building walls from "non-existent" to more mainstream "common practice." See **Tables 1 and 2** that summarize the prescriptive R-value recommendations for CI for steel framed and mass walls (such as concrete masonry, CMU) from ASHRAE Standard 90.1 and the International Energy Code (IECC).

In the steel framed table, **Table 1**, the first value is the prescriptive recommended R-value for cavity insulation in the stud cavity. The second value is the prescriptive R-value recommendation for CI. The mass wall table, **Table 2**, has only one value which is the prescriptive R-value recommendation for CI.

WHAT IS THE DRIVER FOR THE RISE OF CI?

The first version of what was to become ASHRAE 90.1 was published in 1975. Since then it has been updated many times due to rapid changes in building technology and energy prices. **Tables 1 and 2** chart the increase in prescriptive R-value recommendations across several editions of energy design standards.

ASHRAE 90.1 first introduced a prescriptive recommendation for CI in 1999. The immediately preceding edition in 1989 had no specific reference regarding the use of CI. Beginning in 1999, the prescriptive recommendation for CI has moved further south, eventually reaching all the way to Climate Zone 1, while CI R-value recommendations for the other zones have steadily risen.

TABLE 1 Prescriptive R (minimum) Requirements for Steel Framed Walls, Above Grade

ZONE	ASHRAE 90.1 - 1999*		ASHRAE 90.1 - 2004		ASHRAE 90.1 2007 & 2010		ASHRAE 90.1 2013 & 2016		IECC 2012 & 2015	
	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential
1	13	13	13	13	13	13	13	13	13 + 5.0	13 + 5.0
2	13	13	13	13	13	13 + 7.5	13 + 3.8	13 + 7.5	13 + 5.0	13 + 7.5
3	13	13 + 3.8	13	13 + 3.8	13 + 3.8	13 + 7.5	13 + 5.0	13 + 7.5	13 + 7.5	13 + 7.5
4	13	13 + 3.8	13	13 + 7.5	13 + 7.5	13 + 7.5	13 + 7.5	13 + 7.5	13 +7.5	13 + 7.5
5	13 + 3.8	13 + 7.5	13 + 3.8	13 + 7.5	13 + 7.5	13 + 7.5	13 + 10.0	13 + 10.0	13 + 7.5	13 + 7.5
6	13 + 3.8	13 + 7.5	13 + 3.8	13 + 7.5	13 + 7.5	13 + 7.5	13 + 12.5	13 + 12.5	13 + 7.5	13 + 7.5
7	13 + 7.5	13 + 7.5	13 + 7.5	13 + 7.5	13 + 7.5	13 +15.6	13 + 12.5	13 + 15.6	13 + 7.5	13 + 15.6
8	13 + 7.5	13 + 180	13 + 7.5	13 + 10.0	13 + 7.5	13 + 18.8	13 + 18.8	13 + 18.8	13 + 7.5	13 + 17.5

ASHRAE Standard 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings. American Society of Heating, Refrigerating, and Air-Conditioning Engineers,

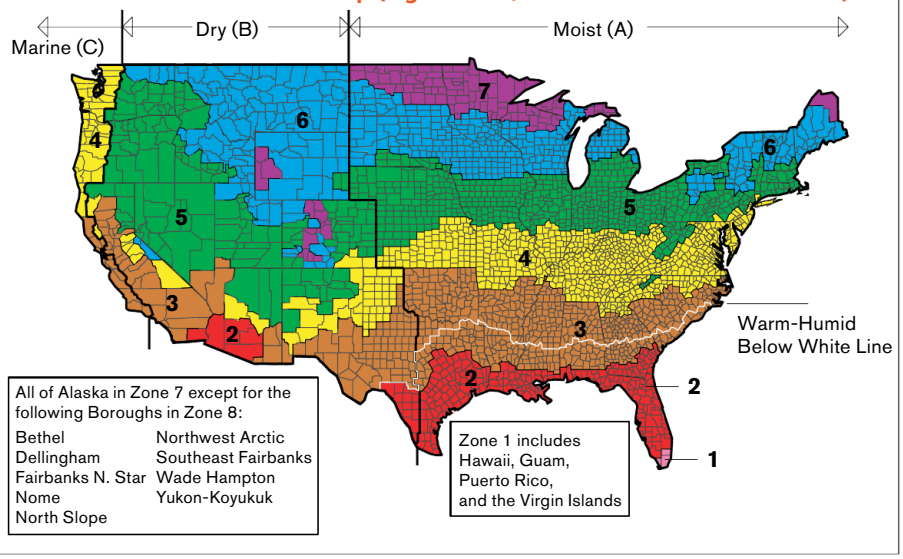
* Prescriptive R requirements are approximate for illustration purposes only. ASHRAE 90.1-1999 had 26 climate zones. In 2004 and thereafter the number of zones were reduced to 8. Since there is not a direct conversion from 1999 to 2004, the 1999 columns are an approximation based roughly on the boundaries as defined by CDD50 and HDD65 for each region.

TABLE 2 Prescriptive R (minimum) Requirements for Mass Walls, Above Grade

ZONE	ASHRAE 90.1 - 1999*		ASHRAE 90.1 - 2004		ASHRAE 90.1 2007 & 2010		ASHRAE 90.1 2013 & 2016		IECC 2012 & 2015	
	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential
1	NR	5.7	NR	5.7	NR	5.7	NR	5.7	5.7	5.7
2	NR	5.7	NR	5.7	5.7	7.6	5.7	7.6	5.7	7.6
3	5.7	7.6	5.7	7.6	7.6	9.5	7.6	9.5	7.6	9.5
4	5.7	9.5	5.7	9.5	9.5	11.4	9.5	11.4	9.5	11.4
5	7.6	11.4	7.6	11.4	11.4	13.3	11.4	13.3	11.4	13.3
6	9.5	11.4	9.5	11.4	13.3	15.2	13.3	15.2	13.3	15.2
7	11.4	15.2	11.4	13.3	15.2	15.2	15.2	15.2	15.2	15.2
8	15.2	15.2	13.3	15.2	15.2	25	19	19	25	25

* Prescriptive R requirements are approximate for illustration purposes only. ASHRAE 90.1-1999 had 26 climate zones. In 2004 and thereafter the number of zones were reduced to 8. Since there is not a direct conversion from 1999 to 2004, the 1999 columns are an approximation based roughly on the boundaries as defined by CDD50 and HDD65 for each region.

FIGURE 1 United States Climate Zone Map (Figure B1-1, ASHRAE Standard 90.1-2013)



DRIVERS FOR CI PRESCRIPTIVE R-VALUES: THE 2030 CHALLENGE

The evolution of CI in building walls from "non-existent" to "common practice" is the outcome of both common sense economics and attempts to reduce the impact of energy consumed by buildings on global climate change.

At the time that ASHRAE Standard 90.1-1999 was published there was little discussion about the relationship of buildings to the climate

issue. In the early 2000's, in a prominent national discussion lead by the influential environmental architect Edward Mazria, it was identified that buildings were responsible for about 50 percent of all the energy consumption and CO_2 emitted in the United States.

In response Mazria conceived and introduced the "2030 Challenge," an initiative that proposed that the architecture and construction communities adopt a series of greenhouse gas reduction targets for new and renovated buildings.

The targets set by the 2030 Challenge were:

- All new buildings, developments and major renovations shall be designed to meet a fossil fuel, greenhouse gas (GHG) emitting, energy consumption performance standard of 50 percent of the regional (or country) average for that building type.
- At a minimum, an amount of existing building area equal to that of new construction shall be renovated annually to meet a fossil fuel GHG emitting, energy consumption performance standard of 50 percent of the regional (or country) average for that building type.
- The fossil fuel reduction standard for all new buildings shall be increased to:
  - 60 percent in 2010
  - 70 percent in 2015
  - 80 percent in 2020
  - 90 percent in 2025

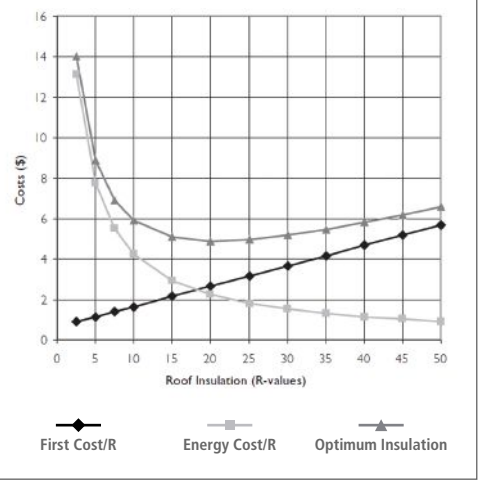
And, be carbon neutral by 2030 (meaning zero fossil fuel and GHG emitting energy is needed to operate).

Shortly after the concept was introduced it was adopted by the American Institute of Architects, and others, including state and local governments. The U.S. Conference of Mayors soon followed. In April 2007 the ASHRAE Board of Directors adopted the challenge and soon signed a memorandum of understanding (MOU) with the U.S. Department of Energy (DOE) to establish the following energy reduction targets for subsequent editions of ASHRAE Standard 90.1:

- 90.1-2010, targeted 30 percent reduction in energy cost relative to the 2004 standard.
- 90.1-2013, targeted 50 percent reduction in energy cost relative to the 2004 standard.

Of course there were many building components and mechanical systems that ultimately contributed to the overall energy reduction goals, but CI played a role as illustrated by the increasing R-values for CI in **Tables 1 and 2** during this time period.

FIGURE 2 Life Cycle Cost Analysis



OPTIMUM INSULATION

The other important driver for CI becoming more mainstream as a building practice was economics and the concept of "optimum insulation." Although it requires an initial increased investment during construction, insulation creates reduced energy costs for the life of the building. The questions then become, "How much insulation is enough?" and "What is the optimum amount of insulation?"

"Optimum insulation" is the amount of insulation that has the lowest life cycle cost (LCC). LCC is expressed as:

LCC = FC+M+R+E – RV

LCC = Life Cycle Cost ($)
FC = First Cost ($)
M = Maintenance and repair cost ($)
R = Replacement Cost ($)
E = Energy Cost ($)
RV = Resale value or salvage ($)

The concept of determining the lowest life cycle cost (LCC) is illustrated in **Figure 1**.

In addition to adhering to the public policy principles of the 2030 Challenge and the MOU with DOE, the ASHRAE 90.1 standard committee also justifies insulation levels using sound economic principles. **Figure 1** illustrates the concept showing first cost for insulation/ construction increasing as R-value increases. The principle is obvious; as one installs more insulation, the first cost of insulation increases. Equally obvious, it captures energy cost and consumption decreasing as R-value increases. The LCC is the lowest sum of "first cost" and "energy cost" at a given level of R-value. In this hypothetical example, R-20 is the lowest LCC, and is therefore the "optimum insulation" level. **Figure 1** only demonstrates the concept of "optimum insulation."

Actual optimum levels must be calculated for specific climates, specific building construction types, specific building usage patterns and specific economic assumptions regarding construction and energy costs. The concept of Life Cycle Cost Analysis and Optimum Insulation are utilized by ASHRAE in the development of Standard 90.1. However, 90.1 is a minimum standard that sometimes lags behind the upward trend of energy and construction costs, particularly when a building built today will have a useful life several decades into the future. Therefore, the path to raising awareness and increasing energy standards to include the use of CI was aligned with economic and public policy through the early 2000's.

PERFORMANCE BENEFITS RESULTING FROM THE USE OF CI

The location of continuous insulation is determined by the type of construction, climate zone, building function and ease of construction. CI may be integrated as part of many common wall designs including steel framed and masonry cavity walls, rainscreens and rain barriers, pre-cast and tilt-up concrete panels. It can also be incorporated behind many types of cladding including architectural metal, masonry, stucco and EIFS. Generally, it is easiest to construct continuous insulation on the outboard side of the wall framing to minimize complex detailing around floor lines, exterior penetrations and openings.

When located on the outboard side of the wall, CI achieves two things: 1) it keeps the wall framing warmer, meaning it is closer to the building's interior temperature, and 2) the added CI R-value shifts the dew point, to the point that it often is located outside of the framing cavity insulation. Minimizing condensation inside walls reduces the likelihood of moisture accumulation which decreases the possibility of structural corrosion and decay and the opportunity for mold and mildew to develop.

A building with cavity insulation, but no C.I.

A building with cavity insulation, and C.I.

Unfortunately, structural components (concrete masonry units, steel studs, wood studs and concrete) are better conductors than insulators. This results in thermal bridging or thermal short circuits where structural (and other) components penetrate through the wall to the exterior.

Prior to the widespread adoption of CI conventional construction practices, insulation was commonly installed between studs, in the stud cavity and in an exterior wall. Thermal imaging was performed on the two buildings above; both have cavity insulation but only the lower photo has continuous insulation. The building without continuous insulation showed increased heat flow where uninsulated steel stud framing met the exterior sheathing and other uninsulated details along the roof line, while the building with continuous insulation over its steel framing showed greatly reduced thermal bridging in the wall system.

Thermal bridging reduces the effective R-value of the wall assembly by a percentage of area where stud framing is not separated from the exterior by CI. When CI is provided over the stud framing the effective R-value of the wall is improved.

This article continues on http://go.hw.net/AR072017-3. Go online to read the rest of the article and complete the corresponding quiz for credit.

QUIZ

1. The 2030 Challenge, adopted by the AIA, recommends fossil fuel reduction for all new buildings to be increased to _____ by the year 2030.
   a. 10 percent
   b. 50 percent
   c. 75 percent
   d. Carbon Neutral

2. ____ is the amount of insulation that has the lowest LCC.
   a. High R-Value Insulation
   b. Low R-Value Insulation
   c. Optimum Insulation
   d. Mineral Wool Insulation

3. True or False: Under the most recent IECC, buildings in warm climates such as Climate Zone 1 are never required to have CI.

4. NFPA 285:
   a. Gives an exterior wall a designated hourly rating.
   b. Is a fire test standard that measures the likelihood that a wall system containing combustible components may be ignited by the fire plume emitting from a window opening, and then propagate the fire away from the point of origin either on the surface of the wall or through its core and cavities.
   c. Is a window assembly test provided by the window manufacturer.
   d. Was not referenced in IBC prior to 2015.

5. True or False: Mineral wool insulation is highly combustible and not UV-resistant.

6. When selecting continuous insulation, the designer should consider:
   a. Anticipated moisture and drainage
   b. UV exposure
   c. Cladding
   d. Fire protection
   e. All of the above

7. True or False: At lower temperatures such as 40 degrees Fahrenheit, the average R-value of Iso may be reduced from R-6 to R-2.

8. True or False: XPS is a closed-cell, hydrophobic product which makes it highly water resistant.

9. Continuous insulation may reduce:
   a. Energy consumption
   b. Moisture accumulation
   c. Growth of mold and mildew
   d. All of the above

10. Highly thermally conductive structural components include:
    a. Steel Studs
    b. Solid Concrete Masonry Units (CMU)
    c. Concrete Beams
    d. Wood Studs
    e. All of the above

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CASE STUDIES IN MULTIFAMILY HOUSING DESIGN USING EXTRUDED ALUMINUM TRIM SYSTEMS

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LEARNING OBJECTIVES

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

1. Examine design trends in multi-family housing construction.
2. Identify how extruded aluminum trim systems can aid architects in creating a modern aesthetic.
3. Describe the various profile, corner and color options available in extruded aluminum trim systems.
4. Review case studies of multifamily housing projects from three different regions of the country and examine why extruded aluminum trim systems were used on these projects.

CONTINUING EDUCATION

AIA CREDIT: 1 LU/HSW
AIA COURSE NUMBER: AR072017-1

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DESIGN TRENDS IN MULTIFAMILY HOUSING CONSTRUCTION

When it comes to selling or renting multifamily housing, taking a closer look at trends helps developers, builders, and architects seek new market opportunities and creative solutions to meet the demands.

According to the Urban Land Institute's October 2016 Real Estate Consensus Forecast, findings show expected rental growth to remain above the 20-year average growth rate of 2.8 percent. However, the growth rate is projected to decline from 3.5 percent in 2016 to 2.9 percent in 2018. Apartment vacancy rates are expected to increase from the 2015 levels of 4.7 percent to 5.3 percent in 2018. That means multifamily buildings and developments that meet increasingly tight budgets with compelling designs will have the best vacancy rates.

Extruded Aluminum Trim Systems on the Rise

As architects and designers adapt to the market trends for multifamily housing, many are increasingly turning to green products to design multifamily buildings that meet sustainability requirements and achieve a modern aesthetic. One such product is extruded aluminum trim systems. Aluminum trims can deliver on both counts, allowing the creation of a clean and distinct profile on the exterior of a building. In addition to aesthetics and sustainability, architects are often concerned about the longevity of the products they specify. For this reason, aluminum trim systems are preferred over galvanized trims. While galvanized trims are initially less expensive, they do not perform as well as aluminum trims in the long run.

Being Different Matters

The multifamily industry has become very competitive with more exterior products coming into the market. Developers are always looking for an edge to differentiate their multifamily construction from everyone else. One of the ways they are doing this is by providing consumers the sense of living in a well-designed home.

Multifamily residents are realizing the benefits of an urban living situation, where they enjoy walking in the neighborhood with amenities close by. They also want to live near the city centers that they work in. At the same time, they still want to have the feeling of coming home to a special place, not just a building that's a copy of the building next to them.

With extruded aluminum trim, architects can adapt simple materials to create a variety of expressions that help residents feel the difference their homes make in their neighborhood. Aluminum trims also allow the use of a variety of profiles and finishes, without having to vary the substrate and the waterproofing of exterior wall systems.

While developers may not see a dramatic increase in lease amounts, they are finding that a well-designed building helps limit the turnover of occupants. In turn, the buildings are easier to lease. Along with a well-designed building, developers are finding value in spending a little extra money on good quality products, such as extruded aluminum trim, that preserves the aesthetic and performance of the building over time and eliminates costly repairs down the road.

Building More for Less

In multifamily housing projects, developers and architects are challenged to take on larger scale projects, in different environments, with increasingly tighter budgets. To help achieve the project scale while controlling costs, it is important that this type of detailing is discussed early on with the general contractor and sub-contractors. A cross-functional team will often advocate for the minimal cost increase of extruded aluminum trim systems because they achieve the desired aesthetics and ease of constructability when compared to other solutions. Installing aluminum trim rather than using wood trim or cutting and ripping fiber cement boards or panels is more convenient and saves time.

Using aluminum trim over panel joints on multifamily exteriors is an architectural element and is a way of expressing the joints and defining their deliberate placement. It adds a level of architectural refinement, particularly wherever fiber cement panels or lap siding is specified.

PROMINENT REVEAL HORIZONTAL PROFILES

Located at the border of Emeryville and Oakland, this multifamily housing development on 3900 Adeline Street includes 91 residential and 10 work/live rental units.

The various profiles and sizes of trim helped architects integrate the different materials into the façade. At 3900 Adeline, trim options allowed developers to cut down larger cement panels to create an intermediate scale, as well as to reorient the corrugated metal panels.

Project: 3900 Adeline Street, Emeryville, California

Architect: Levy Design Partners, Inc.

Located at the border of Emeryville and Oakland, this multifamily housing development on 3900 Adeline Street includes 91 residential and 10 work/live rental units. The building has a partially submerged garage and the exterior design responds to the varying scale of three different neighboring characters. The units on the first level have stoops and setbacks for the townhouse and work/live units, adding scale and interfacing with the neighborhood.

"This was a large project with 101 units and a major challenge was modulating the scale and being able to address its varied context, from single family homes to other 4-story multifamily buildings," says Toby Levy, FAIA, President of Levy Design Partners, Inc. "The project had a tight budget so cement siding and panels were used on the majority of the building with accents of corrugated metal panels. The intersection of these materials was critical."

With a limited palette to select materials from, the solution was to use the sheet materials of cement panels and corrugated metal cut down in size to add an intermediate scale. "We wanted to emphasize the horizontality of the façade so we looked for more prominent horizontal reveal profiles and less noticeable vertical reveals," says Casey Feeser, AIA, architect at Levy Design Partners, Inc. A horizontal reveal board was used due to its larger size and multiple shadow lines. In addition, an H mold was used for vertical siding and an open outside corner mold was used for outside corners. These materials were made from extruded aluminum. "The reason we specified extruded aluminum trim is because it is available in many profiles and sizes," says Feeser. "This allowed us to create patterns with affordable materials to create additional interest. The aluminum trim pieces also provided a clean transition between the materials."

Aesthetically speaking, the designers wanted a variety of reveals and shadow lines. The extruded aluminum trim system made this possible. "Another benefit of using extruded aluminum trims was that it allowed us to make clean transitions and create clean corners," says Levy. To help emphasize the form, the reveals were painted to match the wall color.

The various profiles and sizes of trim helped architects integrate the different materials into the façade. At 3900 Adeline, trim options allowed developers to cut down larger cement panels to create an intermediate scale, as well as to reorient the corrugated metal panels.

"We had a positive experience using extruded aluminum in this project," says Feeser. "The different profiles offered in the market enabled us to articulate and emphasize various design choices." Extruded aluminum trim comes in many sizes and configurations. This leads to cleaner transitions between materials of different sizes and shapes. Another benefit is that extruded aluminum trim allows for the completion of the substrate and waterproofing before installation of the final finish. According to Feeser, "Using aluminum trim creates a durable solution, which will result in a longer life cycle than wood trims and a more maintenance-free solution due to no use of caulk."

The simplest way to determine which aluminum trim profiles are best for a given multifamily project is to create multiple profile samples and build small mockups to test them. Examining the different profiles early on can really affect the desired outcome in terms of aesthetics, cost and constructability.

CREATING A MODERN AESTHETIC WITH EXTRUDED ALUMINUM TRIM SYSTEMS

Manufacturers have made it possible to aesthetically trim almost any type of siding panel or plank product with a wide range of depth options. There are choices of primed, clear

TONGUE AND GROOVE CEDAR CHARMS

With excellent views of the foothills from the northeast corner of Walnut and 17th Streets in Boulder, you will find a 23-unit luxury apartment that includes three levels of residential units over below grade parking. The 28,000 square-foot multifamily building is organized around a private courtyard that provides daylight and natural ventilation to the surrounding units.

Extruded aluminum trim was specified at 17 Walnut because it made for easy execution of details in the field and it added minimal cost impacts to the project budget. Aluminum materials are known to be very durable and the trim systems can withstand the extreme Colorado environment over long periods of time.

Project: 17 Walnut, Boulder, Colorado

Architect: Studio Architecture

With excellent views of the foothills from the northeast corner of Walnut and 17th Streets in Boulder, you will find a 23-unit luxury apartment that includes three levels of residential units over below grade parking. The 28,000 square-foot multifamily building is organized around a private courtyard that provides daylight and natural ventilation to the surrounding units. It features underground parking, balconies for each unit, and contemporary interiors.

There were multiple challenges that arose during the design phase of the project. "One of the largest challenges was dealing with the ground water and how that affected the below grade parking structure," says Aldo Sebben, director of design and principal at Studio Architecture. "Due to the city requirements, if the site was to have a dewatering system the ground water would need to be treated before it was discharged." The team decided to do a reverse bathtub solution to prevent the need for a site dewatering system. In turn, this affected the thickness of the garage slab to resist the hydro-static head pressure of the water. By allowing the garage to come out of the ground by two feet, this dramatically reduced the hydro-static head pressure. As a result, this allowed the foundation system to be reduced in size, and created the design feature of the walk-up stoops at the pedestrian level.

Another challenge the design team faced was designing a contemporary project that incorporated natural materials to give the façade warmth and convey the character of the city of Boulder. The team's solution was to select an earth tone colored brick along with tongue and groove stained cedar siding for these elements. During design and development, the team researched options on how the materials could be detailed, how to maintain the contemporary aesthetic, and be easily constructed in the field. This is because the tongue and groove siding on the outside corners, in particular, were challenging. The team was concerned that mitered outside corners would be costly and complicated to execute in the field. Additionally, the design team had concerns that Colorado's extreme climate would cause the joints to pull apart over time. For these reasons the team selected an extruded aluminum trim system. "The extruded aluminum trim provided a clean contemporary detail, that did not detract from the tongue and groove siding," says Sebben. "It was simple to execute in the field. It didn't leave exposed or field cut ends of the siding and it was a more cost effective option than mitered corners." The selected aluminum profiles had laps that returned over the siding, which covered the field cuts. This provided a clean and modern look that the ownership group wanted to achieve.

One of the team's main goals was to deliver a project that was well designed, detailed and affordable. Extruded aluminum trim was specified because it made for easy execution of details in the field and it added minimal cost impacts to the project budget. Additionally, aluminum trims offer a variety of color selections, in particular the dark colors. Aluminum materials are known to be very durable and the trim systems can withstand the extreme Colorado environment over long periods of time.

The team considered a variety of outside corner profiles; some provided a reveal at the corner, but in the end the team selected a simple low profile corner. All of the inside corners of the project meet a dissimilar material and for this reason the team selected a standard J mold. The J mold not only provided a clean transition between the siding and other material, but it provided a clean smooth surface for sealant joints.

Very early on the design team determined, from an aesthetics perspective, that they wanted a modern apartment building that blended with the character of Boulder. "We knew that in order to achieve this goal that the building could be simple, but the detailing would need to be well executed in the drawings and in the field," Sebben explains. After discussions and further research, the team decided that the extruded aluminum trim system would help simplify the detailing in the drawings and execution in the field.

Based on the experience of designing and developing the multifamily housing at 17 Walnut, the team believes that extruded aluminum trim systems aid architects because it is a system that can have minimal cost impacts on the project budget, yet still provide very simple easy to execute detail at material transitions and corners. "The extruded aluminum is a durable material that can withstand minimal impacts at areas prone to pedestrian damage, and will last over long periods of time," says Sebben. "The trim system also provides a clean line at the corners that is hard to achieve with other systems and methods."

As for other lessons learned from this case study, a good design can be achieved within a budget, with careful consideration of the small details. A well-designed building with a little extra investment in extruded aluminum trims can produce extraordinary returns. Having the general contractor and their subcontractors as part of the project team early on can help identify the details, consequently creating a well-designed and constructed multifamily building.

anodized, specialty anodized, or color matched to satisfy whatever the project requires. There are thousands of design and color options, allowing architects and users to dramatically improve their building aesthetics and create modern architectural lines preferred by millennials. Extruded aluminum trim is sustainable, durable, non-combustible, lightweight and easy to use for exterior applications. Manufacturers can assist with the process of selecting and assuring the correct profile for the specific application or desired aesthetic effect.

Using aluminum trim over panel joints on multifamily exteriors is an architectural element and is a way of expressing the joints and defining their deliberate placement. It adds a level of architectural refinement, particularly wherever fiber cement panels or lap siding is specified. In recent years extruded aluminum trim has begun to replace traditional wood 1x2 and 1x4 trim on single-family homes and is increasingly preferred for multifamily structures.

Designed to work as a complementary system with fiber cement siding, extruded aluminum profiles are available in a variety of

Extruded aluminum adds durability and longevity to construction that other trim materials such as polyvinyl chloride (PVC), and the galvanized steel shown in this image, lack.

configurations. Their design, mostly driven by architects seeking cleaner details, adds a distinctive profile to exteriors of multifamily buildings. In addition, it breaks up the monotony of flat panel walls where the same siding products are used repeatedly.

To achieve a modern aesthetic, architects are advised to consult with the siding manufacturers for best practices when using extruded aluminum trims on siding products in order to ensure color, dimensional, and thickness match on multifamily exteriors.

As all building professionals know, water is the most significant factor in the premature deterioration of buildings, and proper steps should always be taken to protect the envelope. Leakage paths exist at any opening in the wall surface, whether intended or unintended. Joints between materials and around windows and doors, vents, cracks, and porous surfaces are all potential entry points for water. This is why all flashing profiles must be properly sealed with flashing membrane and all windows and door openings flashed in shingle fashion.

While extruded aluminum trim is designed with drain dams for vertical runs and shingle fashion for horizontal profiles, its primary design is for aesthetics, not as a moisture management system. Even trim with water management profiles will not stop all water from penetrating the surface of the cladding.

The primary insurance of moisture mitigation for the building envelope is housewrap, preferably a drainable housewrap. Other options are to use rainscreen along with housewrap. The architect, builder, designer and contractor are responsible for designing and installing a code compliant building envelope.

Why Other Trims Lack Appeal

Extruded aluminum adds durability and longevity to construction that other trim materials such as galvanized steel and polyvinyl chloride (PVC) lack. Galvanized steel trim is less durable. In addition, the use of bare mill galvanized steel and aluminum flashing in direct contact with most claddings will increase chances of a chemical reaction, causing not only wear but an undesirable appearance.

QUIZ

1. According to the Urban Land Institute's October 2016 Real Estate Consensus Forecast, apartment vacancy rates are expected to _____ from 2015 to 2018.
   a. increase
   b. decrease
   c. remain unchanged

2. True or False: Extruded aluminum trim systems can meet sustainability requirements and achieve a modern aesthetic.

3. While developers may not see a dramatic increase in lease amounts, they are finding that a well-designed building (that includes extruded aluminum trims) helps limit the _____ of occupants.
   a. rent
   b. turnover
   c. overcrowding

4. True or False: One of the trends for multifamily housing projects show that developers and architects are challenged to take on larger scale projects, in different environments, with increasingly tighter budgets.

5. Extruded aluminum adds _____ and _____ to construction that other trim materials such as galvanized steel and polyvinyl chloride (PVC) lack.
   a. color, weight
   b. durability, longevity
   c. insulation, moisture protection

6. True or False: Extruded aluminum trims are not typically designed to match the color and dimensions of the various siding manufacturers.

7. Most extruded shapes for architectural use are fabricated from AA 6063, an aluminum alloy with magnesium and silicon as the alloying elements. Type 6063-T5 Aluminum is commonly referred to as the _____ alloy.
   a. extruded
   b. recyclable
   c. architectural

8. True or False: Vertical and horizontal bead trim each serve as an expansion joint between panels.

9. A clear anodized finish is an _____ conversion process that deposits an oxide film on the extruded aluminum trim to make it more durable.
   a. electrochemical
   b. electromechanical
   c. electromagnetic

10. True or False: Powder coated surfaces on extruded aluminum trims are more resistant to chipping, scratching, fading and wearing than other finishes.

This article continues on http://go.hw.net/AR072017-1. Go online to read the rest of the article and complete the corresponding quiz for credit.

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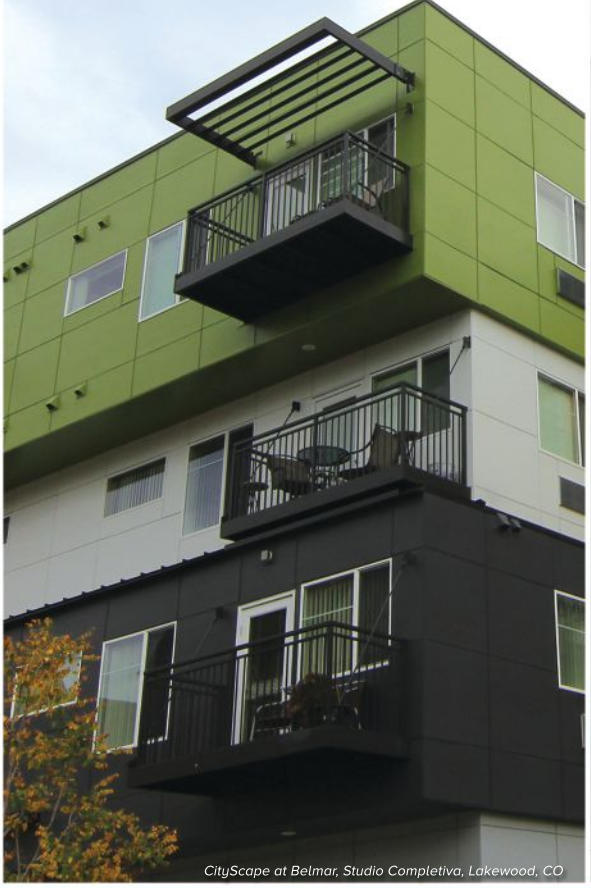
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Developers are finding that a well-designed building helps limit the turnover of occupants. In turn, the buildings are easier to lease. Along with a well-designed building, developers are finding value in spending a little extra money on good quality products, such as XtremeTrim®, that preserves the aesthetic and performance of the building over time and eliminates costly repairs down the road.

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AIA Architect

AIAVoices

PHOTOGRAPHY: TODD WINTERS

Finding Your Voice

Growing as an architect, artist, and businesswoman.

Julia Miner, AIA, was a member of the first class of women at Dartmouth College and currently runs her own eponymous design studio in the Boston area. Although her architectural chops have attracted clients in both residential and commercial sectors, Miner has also flourished as a book illustrator, painter, and teacher, by drawing on a holistic design philosophy that has been influenced by Charles Moore and Charles Schultz in equal parts—all in service of celebrating the art of architecture.

As told to Steve Cimino

After my first year of graduate school, I was told in an interview: "We can't send a girl to the construction site." And as a young professional: "You're being paid less than Joe because he has a family to support." In both cases, when they saw my reaction the statements were retracted—but it didn't change the practice.

The support and wisdom we have now—about appropriate office behavior, leaning in, understanding your self-worth when negotiating—didn't exist then. I relied more on a spiritual perspective that looked past mistakes; I forgave and moved on. The women who were vocal and took on the dark side—or sacrificed and stuck with it for high-profile practices and positions—are great role models. We owe a debt to them, as well as to everyone who has quietly worked hard with less recognition. One reason I've kept going with a woman-owned architecture business is to inspire other women to stay in the profession. I recommend working hard in the beginning and getting your license as soon as possible. Although it can seem time-consuming and expensive, we owe it to the profession to keep our licenses and credentials. Otherwise, we get lost in the sea of designers. The public needs to understand how our skills, from long years of training, matter.

The business end does not come naturally to me. I lean toward the artist side. Yet I still am working to expand my practice and collaborate with other architects late in life, after years of solo design work, art, and parenting. It helps to take potential obstacles—like age, gender, and time away—and see them as advantages: skill with nurturing and communication, a fresh perspective as a painter and a storyteller, and a goal to relate to clients on a different level than bricks and mortar.

While the recent focus on content marketing and social media is invaluable, you could spend your life connecting online and feel even farther behind. I've learned it's not about selling; it's about understanding where your potential clients are coming from and educating them about the unique way you can help them achieve their goals. AIA

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By William Richards
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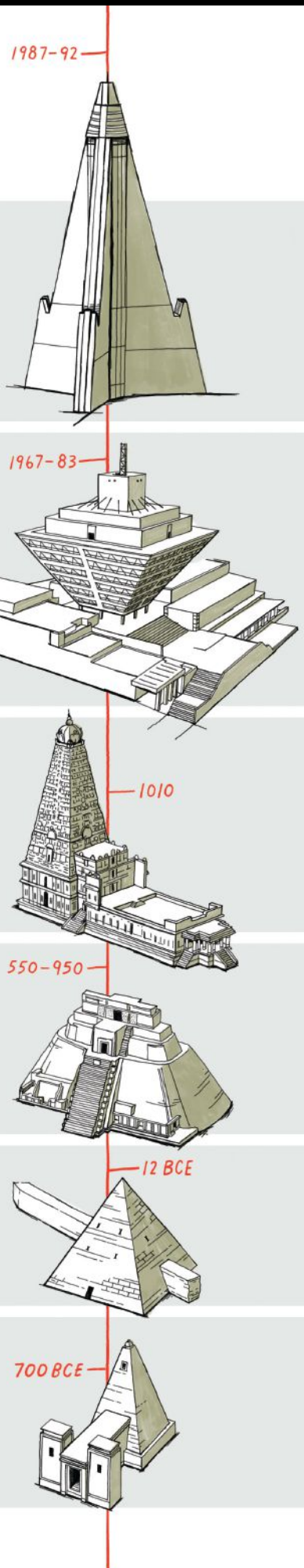


Ryugyong Hotel, Pyongyang, North Korea (designed by Baikdoosan Architects & Engineers), 1987–92. At press time, this 105-story hotel remains unopened—even though investors have continued to pump money into what some have called the "hotel of doom"—since its completion 25 years ago.

Slovenský Rozhlas, Bratislavia, Slovakia (designed by Štefan Svetko, Štefan Ďurkovič, and Barnabáš Kissling), 1967–83. Since 1985, Slovak Radio has been broadcasting from this inverted pyramid that has divided historians over the years: Is it Modernism or a kind of revival Postmodernism?

Brihadeeswarar Temple, Thanjavur, India (commissioned by Raja Raja Chola I), completed 1010. Surrounded by walls that scholars date to the 1500s, this stepped pyramid is made of solid granite that was reportedly hauled more than 60 miles to the site.

Pyramid of the Magician, Uxmal, Mexico (architect unknown), 550–950. With an elliptical base, Uxmal's tallest structure (colloquially named for Itzamna, the ancient Mayan magician god) contains chambers at three different levels.

Pyramid of Cestius, Rome, Italy (architect unknown), 12 B.C.. Bricks, mortar, and Carrara marble cladding make this a distinctively Roman interpretation of a misunderstanding of Giza's pyramidal proportions.

Nubian Pyramids of Meroë, outside Kabushiya, Sudan (architect unknown), completed after 700 B.C. Similar in function and form to ancient Egyptian pyramids, these Nubian versions ascend at noticeably sharper angles than their neighbors to the north.

ILLUSTRATION: LAUREN NASSEF

Pyramids Beyond Egypt

You can read the history of architecture solely by the pyramidal forms that are both ancient and modern. Beyond "the pyramids," by which we almost always mean those erected in Egypt between 2700 and 1700 B.C., many dynastic civilizations before and since have employed these forms to mark ritual sites, funereal structures, sports venues, radio broadcast buildings, and hotel resorts. Whether they're right-side up (as a conventional beacon) or upside down (as a feat of engineering derring-do), all pyramids are geometrical, but no two are geometrical in quite the same way. Here are six pyramids that you won't find in Egypt.

AIAFeature

The Ancien Régime's Fatal Blow

A generation ago, I.M. Pei transformed an impossibly contentious site into an iconic public space.

By Dominic Mercier

PHOTOGRAPHY: © KOJI HORIUCHI

The Pyramide du Louvre was designed to divorce itself from the surrounding buildings while also employing low-iron glass to limit distorted views of the Louvre Palace.

Greeted with hostility and derided as a modernist affront when first proposed as the main entrance to Paris' Musée du Louvre, the 71-foot-high glass and stainless steel Pyramide du Louvre designed by I.M. Pei, FAIA, now rivals the Tour Eiffel as one of France's most recognizable architectural icons. As the 2017 recipient of the AIA Twenty-Five Year Award, it has once again been recognized as a legendary project that stands the test of time.

Born of President François Mitterrand's early-'80s quest to modernize the Louvre—and memorialize his power by erecting monuments—Pei's pyramid is the form that thrust the 800-year-old Palais complex into the modern era. As one Twenty-Five Year Award juror noted, it "established a benchmark for new, modern architecture that enriches an historic setting with integrity and respect for both history and progress."

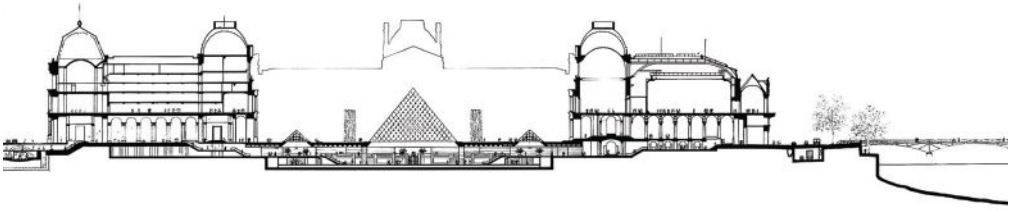
The 1980s, says Stephane Kirkland, author of 2013's *Paris Reborn: Napoléon III, Baron Haussmann, and the Quest to Build a Modern City* (St. Martin's Press), was a pivotal decade for the city when architecture and urbanism took center stage. Bolstered by a new law that introduced the systematic use of competitions for public projects, Mitterrand's Grands Projets revitalized the city—to the tune of $2.6 billion (or 15 billion francs)—and delivered a spate of contemporary architecture in line with his socialist politics. No longer were France's government building campaigns intended to consolidate and show off its power and influence as it did during the reigns of its kings and emperors. Rather, it sought to deepen the already profound connection Parisians find with their city as the ultimate expression of public space.

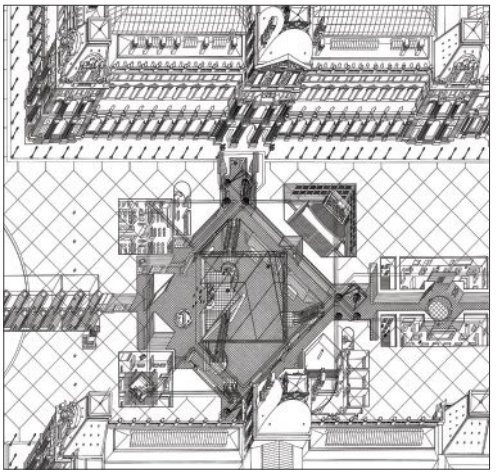
"Even though the actual architectural production of the time is equally dated, and sometimes as cringe-worthy as 1980s music or fashion, and the main protagonists of the time have pretty much stopped being active," Kirkland says, "it was an era that was of huge importance in the development that followed. If nothing else, it created sensitivity and awareness and a belief that architecture in France is a contemporary and not just historical art, even among politicians and other people key to architectural projects but without deep knowledge of the field."

Adding to the Louvre Legacy

By the 1970s, the Louvre's courtyard was packed cheek by jowl with cars while the museum's millions of annual visitors endured agonizingly long waits only to face a disorienting maze of corridors on their way to the view the collection. When he was selected as the architect, Pei faced a seemingly insurmountable challenge: reorganizing and expanding the museum without compromising the historic integrity of one of France's cherished monuments. To execute the project, Pei wove together an unprecedented amount of cultural sensitivity, political acumen, innovation, and preservation skill. As one juror noted, the project has become "an internationally renowned symbol for Paris and an example of the prowess and legacy of I.M. Pei."

The entirety of the project, known as the





ILLUSRATIONS: © PEI COBB FREED & PARTNERS

ABOVE: The Louvre pyramid greets visitors by drawing them down to a central entry point before ascending into the museum's 600,000 square feet of galleries and halls. RIGHT: I.M. Pei's addition to the site draws on the rectilinear geometry of the flanking galleries to situate the main pyramid within a cubic volume—a relationship he repeats with smaller glass pyramids along the periphery that bring additional light into the subterranean space.

AIA Feature

CONTINUED

Grand Louvre, was executed in two phases over the course of a decade. For the first phase, which gave rise to the pyramid, Pei reorganized the museum around the central courtyard, the Cour Napoléon, transforming it from a parking lot to one of the world's great public spaces. Long-gated passageways through the palace were reopened, reinvigorating the plaza and vaulting it into a vital gathering space and a bridge to the city beyond.

Anchoring the eastern end of the city's Axe Historique, the grand perspective extending from the Louvre to La Défense (the business district just west of the city limits), Pei's pyramid stands up to monuments such as the Arc de Triomphe de l'Étoile and the Luxor Obelisk. It also serves as a historical marker, says Kirkland, in that it denotes the articulation of the original axis—the skew of which was made more evident after the destruction and eventual demolition of the Palais des Tuileries in the late 19th century—and today's. While the pyramid itself does not sit on the 26-degree of the Axe Historique that follows the course of the sun's rising and setting, Pei requested that a statue of Louis XIV be placed in the courtyard along the axis.

"The test of great architecture is being responsive to the site, defining a place that is transformative," noted another juror. "Pei's addition contributes to the experience of the Louvre, creating a place that enhances the lives of all who visit the Louvre and those who never go inside as well."

Additional support space that would preserve and showcase the character of the palace was a primary goal for the project. Heading underground, Pei added 670,000 square feet below the Cour Napoléon, with an elegant lobby area providing direct access to all three wings of the museum. Natural light, which floods the space through the pyramid and three smaller iterations that surround it, is critical to the project's legacy and echoes the illumination to be found within the collection. As a corollary benefit of the expansion, the construction process unearthed a trove of medieval artifacts, original foundations, and walls, many of which are exhibited within.

Twenty-seven years since the project was completed, Pei's success has been reaffirmed by the museum's visitorship, which has more than tripled since the expansion. To accommodate the influx, the museum recently began its first renovation of the reception area directly beneath the pyramid by the French firm Agence Search. But while it is widely celebrated for its stylistic expression, the pyramid's functionality is not without criticism by specialists and architects alike, notes Kirkland. The overall scheme of entering through the central square has seen long lines snake in front of the pyramid, a condition worsened by Paris' recent security concerns.

As the crown jewel of the Grands Projets, Pei's pyramid has aged more gracefully than the Musée d'Orsay and Opéra Bastille, have not been as fortunate: *New York Times* critic Paul Goldberger, HON. AIA, deemed the former "a graceless battle between new and old" and the latter "a decent enough corporate headquarters."

"For the Louvre to live, it was necessary to adapt it to our time," Mitterrand said at the opening of Pei's pyramid. "The museum today embraces the palace without any further restriction. The collections are better presented, the necessary services better installed, and visitors better taken care of. The epicenter of the project remains the pyramid. It is the visible signal and pure consequence of necessity; it participates in a dialogue of forms that integrates light."

Despite the rancor that surrounded the design's unveiling, Pei gave France an unexpected treasure that its citizens and visitors from around the globe value as much as the priceless works of art contained within. Bringing "life, action, and beauty to what was already beautiful," as one juror noted, the project fused modernity with a swell in national pride for a historic building. In May, the pyramid served as yet another herald of France's future when it was the backdrop for Emmanuel Macron's victory speech on the evening of his election to France's presidency.

"When you ask the visitors, 'Why are you coming to the Louvre?' they give three answers," said Henri Loyrette, president-director of the Louvre from 2001 to 2013. "For the *Mona Lisa,* for the *Venus de Milo,* and for the pyramid." AIA

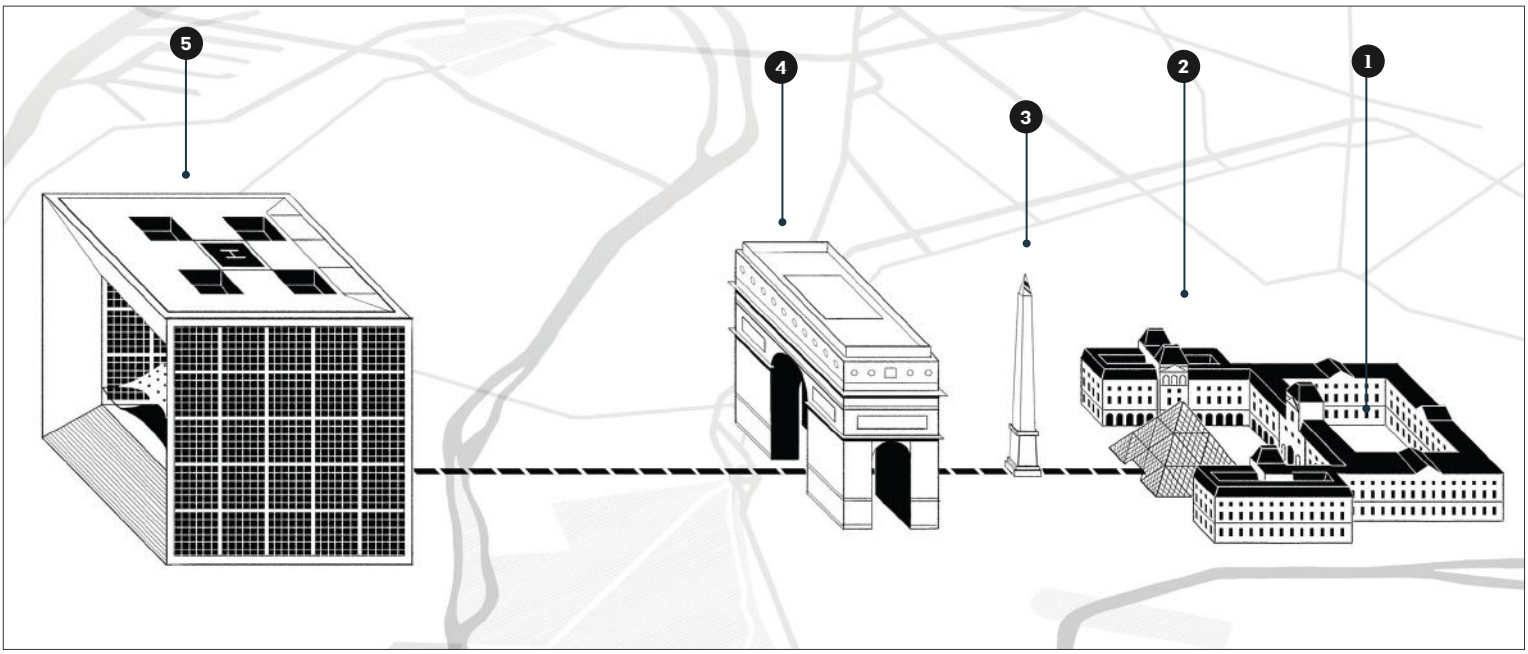


ILLUSTRATION: MICHAEL KIRKHAM

ABOVE: *L'Axe Historique (or la Voie Triomphale)* refers to a physical and symbolic line of monuments, landscapes, portals, and bridges that defines an important axis for Paris' western arrondissements. Starting with the Louvre (1) and pyramid (2), and moving west through the Jardin des Tuileries, the line includes Place de Concorde's obelisk (3), Place de l'Étoile's Arc de Triumphe (4), and La Défense's Grande Arche (5).

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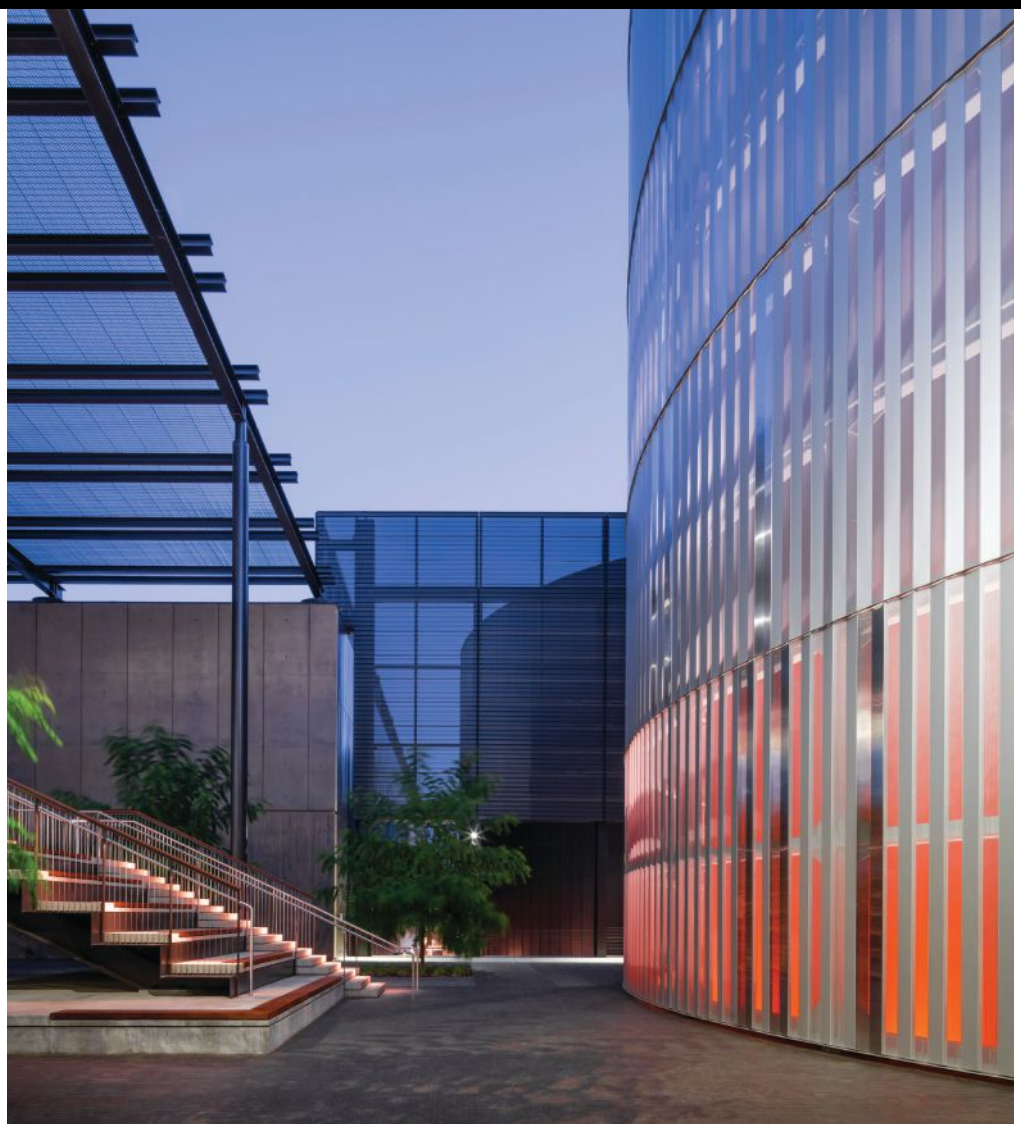
AIAFuture

Taking the Long View

Three recent COTE award-winning projects could change the way we think about energy, environment, and place.



PHOTOGRAPHY: TIM GRIFFITH

ABOVE: The Central Energy Facility serves as the heart of Stanford University's transformational campus-wide energy system.

Picture a typical energy plant for a large institution such as a hospital or college campus. Chances are your mental image is of a drab utilitarian facility on the periphery—out of sight, out of mind. Although it makes sense to place an institution's most important functions such as the emergency room, library, or student union at its center, there are consequences for hiding away something as important as energy—for ignoring where it comes from and how it's used.

The new Central Energy Facility at Stanford University has turned that convention on its head—and in the process earned a 2017 AIA Committee on the Environment (COTE) Top Ten Award and a 2017 AIA Institute Honor Award for Architecture. The main idea behind the design is that an energy plant can (and should) be educational, beautiful, and connected to the heart of the campus. Although it's hard to predict which projects will stand the test of time, it is precisely this kind of forward-thinking project—one that could influence how energy use is understood—that might someday earn it an AIA Twenty-Five Year Award.

In addition to the Stanford facility, two other recent COTE Top Ten winners—Bushwick Inlet Park in Brooklyn, N.Y., and the U.S. Land Port of Entry in northern Minnesota—have pushed the boundaries of their programs in ways that, one day, could also be deemed worthy of the Twenty-Five Year Award. Although very different, they are unified by one common principle: to reveal what was once concealed.

Positive Energy

Two contrasting design schemes are at work at Stanford's Central Energy Facility. The first is the light-filled administrative and teaching pavilion, which features glass curtainwalls and a trellis of photovoltaic panels, an elegant design for such a utilitarian purpose. This is wrapped around the innovative and highly efficient heat-recovery system, whose colorful water tanks and pipes replaced an outdated (and fossil fuel–based) natural gas system.

The three massive water tanks use a chilled-water loop to collect waste heat from campus buildings and move it to a new hot-water loop that distributes heat back to the buildings. The designers, ZGF Architects in collaboration with Affiliated Engineers, sought to make the process as understandable as possible for students and visitors: The cold-water loop pipes are light blue; as heat is recovered from these pipes, they turn dark blue. Hot-water pipes, by contrast, are bright orange and red.

"Energy plants are traditionally hidden away, stinky, and often dangerous," says Joe Collins, FAIA, a partner at ZGF. "We realized we could do more with this project than we were being asked to do. We were thinking about the mission the university has to educate. We took the position that we were going to treat this the same way we would a biomedical teaching facility in the middle of campus."

Between numerous energy-efficiency measures and the rooftop solar array, the building has net-positive energy use, and the whole facility has allowed the university to cut its fossil fuel use by 65 percent, water use by 15 percent, and greenhouse gas emissions by 68 percent. The facility is sited so that it will be the terminus of a future planned extension of an axial campus road, so the campus will grow toward it. Already, according to Collins, tours of the facility are in high demand.

"This project has eye-popping metrics," Collins says. "It's because there was a really good idea put in place [with the heat recovery system], and they could take it to scale. This is an idea that could be done all over the world."

On the Waterfront

Just as the Stanford project is designed to make energy visible and accessible, Bushwick Inlet Park makes an urban riverfront accessible.

Designed by Kiss + Cathcart, Architects and Starr Whitehouse Landscape Architects and Planners, this project transformed an industrial brownfield waterfront site in Brooklyn into a 6.2-acre green space that includes a soccer field and passive parkland down to the East River. The most striking feature is a green roof that extends from the field up and over a New York City parking facility, expanding the park

PHOTOGRAPHY: © PAUL CROSBY (RIGHT); © PAUL WARCHOL (BOTTOM RIGHT)

and creating a hill with zigzagging paths and sweeping views across to Manhattan.

"This was a neighborhood with a longstanding community that couldn't easily access the waterfront, and was very short of park space," says Kiss + Cathcart project architect Clare Miflin, AIA. "So for them to have public access was a big deal. We wanted a larger understanding of the term 'environmental.' We felt that designing an environmentally conscious project meant providing a social component that lets people be outside. Sustainability has to incorporate a lot more social justice."

Stormwater treatment was a major consideration for the design team and, again, making the process visible was important. "We decided that all water on the site should be not connected to the sewer, but instead it is filtered through tidal pools before going into the river," Miflin says. "So when the river's high, it provides a different habitat."

The original site, a parking lot with no access to the waterfront, consisted of a hard barrier between the land and the water; it has now been replaced by a small sandy beach and rip-rap. Originally, there was a pier extending from the site, which had collapsed, and the debris had formed an island. The design aim was to cut away the silt and debris between the island and the park so it couldn't be accessed. However, it silted up again, so now people can walk to and from the island at low tide—allowing city kids to learn about tidal currents and natural water processes in an organic way.

"People can now just play and explore and have a better relationship with the water," Miflin says. "They're now thinking about the East River as an estuary. It's so needed for city kids."

Crossing Over

As with the other two projects, access is also at the heart of the mission at the U.S. Land Port of Entry, located only three-quarters of a mile from the Canadian border in northern Minnesota. In this case, however, the need for access is tempered by the equally important need for security. Further complicating matters is the fact that, unlike other projects where landscape features might dictate where something is built, a port of entry needs to be located near the border no matter what. Here that meant building on a sensitive wetland. Finally, as a gateway to the United States, this kind of building needs to reflect our highest ideals, to put our best face forward.

To solve this challenging program, Snow Kreilich Architects took its cues from the land itself. For starters, the long horizontal building mimics the horizon in this pancake-flat locale. The lumber and wood industries of northern Minnesota are reflected in the black-stained cedar that clads the exterior as well as the honey-colored heartwood used in interior and

ABOVE: The U.S. Land Port of Entry in northern Minnesota won a COTE Top Ten Award in 2014. TOP: Bushwick Inlet Park on the Brooklyn waterfront, also a 2014 COTE Top Ten winner, transformed the site from a brownfield industrial strip into a public park.

AIAFuture

CONTINUED

pass-through areas. The contrast is intentional. The dark wood projects strength and authority while the lighter wood is warm and soothing. Nearly all of the wood in the project came from sustainably harvested sources.

"Coming through the port of entry is not the most calming experience, even if you have nothing to hide," says firm principal Matthew Kreilich, AIA. "There's an intensity to it. We hope the building balances that out to a certain degree."

The building basically floats on the wetlands, supported by friction piles and sitting on geo-engineered fill and fabric. To mitigate the impacts, additional wetlands were reconstructed using native plantings to help filter surface runoff. Siting was also critical in this flat landscape, to maximize solar heat gain during the notoriously brutal winters and to protect against high winds. The designers tucked the building against an existing tree grove and also added additional tree rows for protection and visual interest.

"Land ports of entry have been described as a mix of a 'Welcome to America' sign, a toll booth, and a jail," Kreilich says. "It needs to have all the security and technology you would expect, and still have that sense of openness that represents our democratic values."

Someday, preserving energy and resources might be considered a democratic value as well, to protect citizens in a world besieged by climate change. If so, these three projects will be among those that will have pointed the way forward. AIA

Kim O'Connell

PHOTOGRAPHY: © PAUL CROSBY

ABOVE: The port of entry overcame unique construction, environmental, and security challenges to produce a beautiful and sustainable project.

AIAPerspective

PHOTOGRAPHY: CARL BOWER

For a Better World

Architects can do more—and should.

Perhaps as much as any recent topic, "climate" has seemed to galvanize international action and public opinion—mostly to support measures that reduce toxic emissions, curb waste, and move the world away from outmoded, harmful energy technologies. Architecture can have great impact on meeting climate challenges, as we well know. But this is just one of the pressing issues on which architects can make a difference. We can—and must—do more.

Security. With public spaces—our streets, sidewalks, and squares—now targets of violent attack nearly everywhere in the world, architects and designers can help municipalities and police design access controls, apply needed scrutiny, and manage surveillance and security resources effectively. How? Look at the security projects completed in Washington, D.C., for the Federal Triangle by the National Capital Planning Commission, or the measures under way in New York City for the Lower Manhattan Development Corp. Examine the steps being implemented in many European cities to improve security in densely populated centers. Good design enhances security. It adds to urban amenity, livability, and the sense of safety.

Water. In addition to coping with rising sea levels and their devastating impacts on human settlements, our globe also faces major challenges in maintaining and delivering potable water. Architects can help advance the widespread use of conservation technologies, deploy many more recycling systems, and create low-water landscape designs. We can promote patterns of growth and development that protect (not harm) freshwater resources.

Housing. Communities today face questions not just of housing affordability and equity, but of basic suitability. With changed societies come changed requirements, and with new solutions to new demands come obstacles and barriers—in the form of building codes, zoning ordinances, and design criteria that no longer fit needs. Architects can help devise and promote new forms of decent and affordable shelter, with access to mobility, for all.

Productivity, health, healing, and learning. We know the health benefits of exercise, as well as the costs of inactivity. We know that rooms with sunlight and pleasant views promote better rates of recovery from illness. We know that student learning and worker productivity are improved by access to the basic amenities of sunlight, air, and the outdoors. Architects must speak out, with a conviction borne of experience and evidence, about the value of building well. And we must speak with outcomes in mind.

Design for a better world: This is both an imperative and a promise. As global challenges intensify, our profession is ever more critical to ensuring the future. We have an essential role in alleviating human suffering, reducing planetary burdens, and enhancing the quality of life. Let's renew our commitments to the power of architecture to meet great challenges, enhance the quality of lives, and build communities that are strong, safe, equitable, productive, and healthy. AIA

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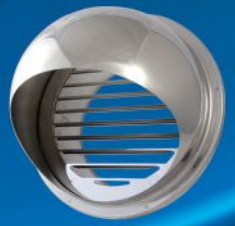

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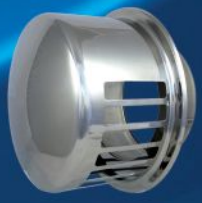

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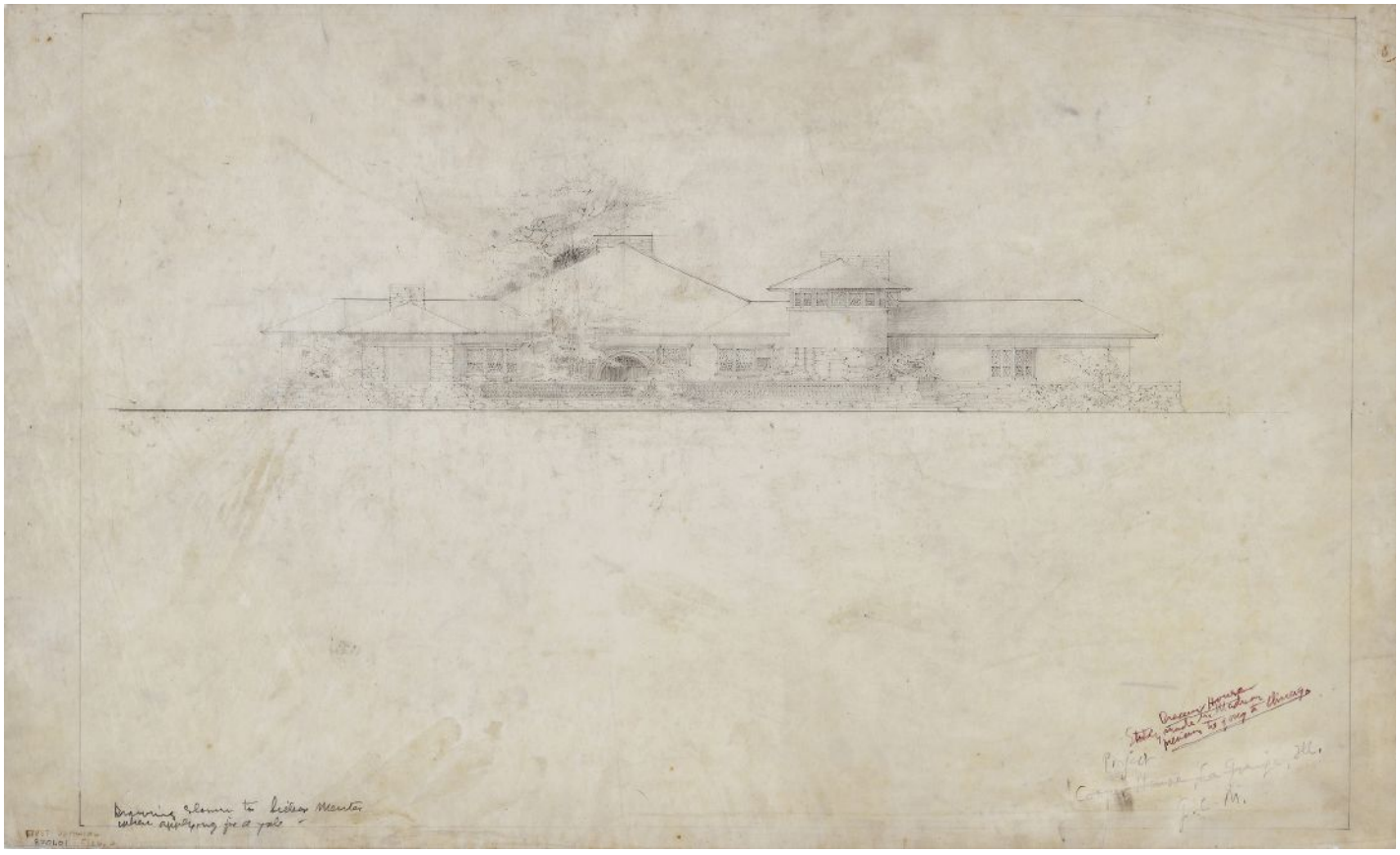
“The breadth, variety, and scholarly chorus of ‘Unpacking the Archive’ enables us to see the work of Wright as if for the first time.”

Frank Lloyd Wright at MoMA by Thomas de Monchaux

At first, the number at the lower left corner of the small drawing seems to be a trace of curatorial cataloging: 01.01.87. But then it reveals itself to be a date: Jan. 1, 1887, written in the architect's own hand: a Saturday, on which day he was all of 19 years and six months old. "First Drawing," he's written above the numbers. Faint graphite on tracing paper, it's a delicate and leafy elevation of an odd house that the actual curatorial catalog, in the form of adjacent wall text, normalizes as Victorian Queen Anne: narrow windows aligned in strips, a low conical turret, a front door engraved in a broad semicircular Richardsonian Romanesque arch. But there are other annotations in the same handwriting. "Dream House," says one in red pencil. And another, more prosaically: "Study made in Madison previous to going to Chicago." And another, crossed out and half-erased: "Project. Cooper House, La Grange, Ill." And then, boldly overwriting the lightly penciled and presumably earlier notations: "Drawing shown to lieber meister when applying for a job." Here, at last, is the legend: Here—maybe—is the very drawing that got the teenager the internship that turned him, over the subsequent five years in which worked as a draftsman for Louis Sullivan, into Frank Lloyd Wright.

The First Drawing is the very first drawing you see, just inside the entry, in the exhibition "Frank Lloyd Wright at 150: Unpacking the Archive," which runs until Oct. 1 at New York's Museum of Modern Art. In one of architectural scholarship's better ironies—given the famous mutual slighting and snubbing between Wright and Philip Johnson over Johnson and Henry-Russell Hitchcock's canonical International Style exhibition at MoMA in 1932—the museum, in partnership with the Avery Architectural & Fine Arts Library at Columbia University, acquired in 2012 the vast archive of Wright's seven-decade career that had been assembled by the Frank Lloyd Wright Foundation Archives. As curator Barry Bergdoll explains in the show's introductory text, "'Unpacking the Archive' refers to the monumental task of moving across the country 55,000 drawings, 300,000 sheets of correspondence, 125,000 photographs, and



An 1887 rendering that Frank Lloyd Wright annotated as "Dream House" and "First Drawing"

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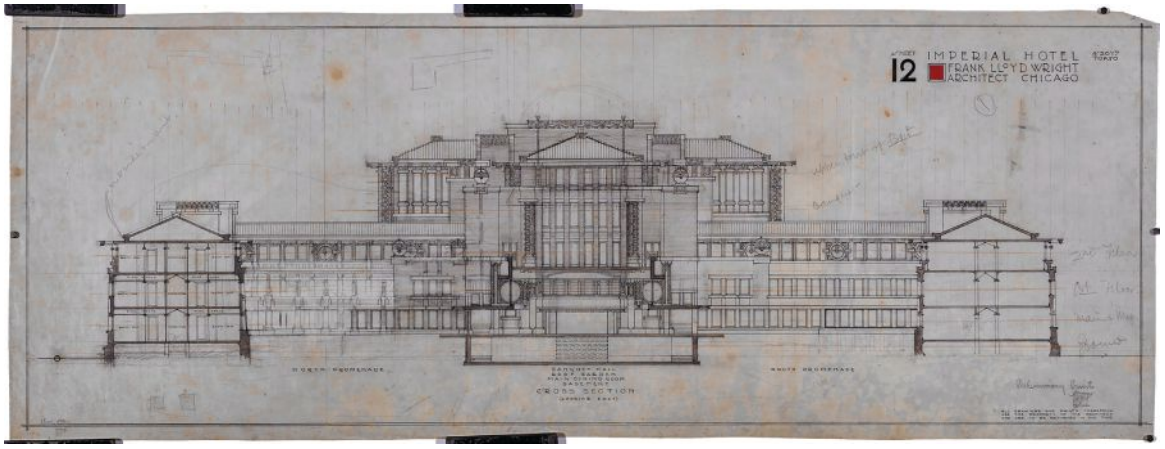
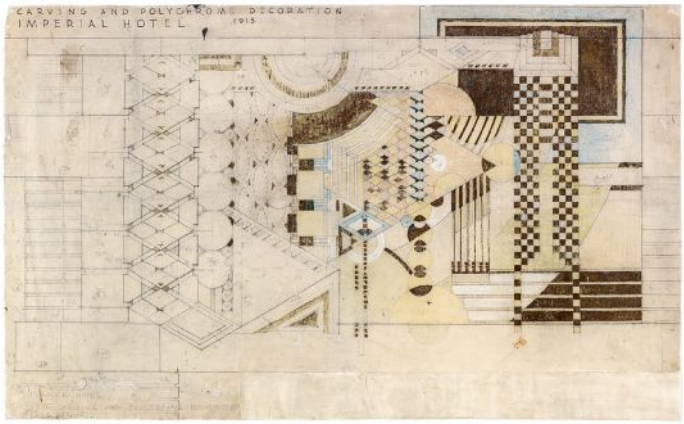


Left: A drawing of the Imperial Hotel (1913-23)

Below: A decorative detail from the hotel



2,700 manuscripts, as well as models, films, and building fragments" representing 1,000 building designs and 500 built works.

The Effort Behind the Effortless

A trove of such abundance and variety invites two approaches. The first is a kind of big-data grind: a tenacious and comprehensive project of excavation and pattern-recognition. This is the work of Avery Library curator Janet Parks, whose endeavors are highlighted in the exhibition's central gallery display, Drawing in the Studio. Parks sorts through the drawings produced by Wright's various ateliers, identifying not only the role of his hand in the workflow but also the distinguishing the handwriting and handiwork of generations of draftspeople—Marion Mahony Griffin above all—who constructed the Wright aesthetic. "There's close to half a million of pieces of paper," Parks observes in a short film accompanying the drawings on display, and yet the encounter with each piece of paper is intricate and intimate—a glimpse into the effort behind the seemingly effortless. "He's reworked it so often," Parks notes of one drawing, "that there's a cutout in the middle." "He's such a larger-than-life figure," she reflects, "that you kind of expect these vast drawings. But in fact he's quite delicate, working his way through the details. His handwriting is small."

The second approach to such an abundant archive is to go narrow but deep: to drill down into the far corners and under-reported stories to which all that paper gives new articulation. This is the approach taken in the thematic galleries, which are arranged around the central drawing display, and each of which highlight key documents and ideas identified by different scholars—each of whom, like Parks, are featured in looping films. It's touching to see and hear their energy and rigor. Architectural historian Ken Tadashi Oshima studied 800 drawings and documents around Wright's long-since-demolished Imperial Hotel in Tokyo, which opened in 1923. "One of the great finds was this book from 1924 that I had never seen before," he says, referring to *Teikoku Hoteru*, an illustrated photographic compendium of the hotel. The book was the only form in which Wright ever saw the finished building—and on which he kept reworking it, penciling over the illustrations, refining the landscaping and details. A conventional interpretation of the hotel is as a prodigious synthesis of Orient and Occident, assimilating Wright's early fascination for traditional Japanese prints with a latently Neoclassical and symmetrical master plan. But Oshima repositions the work, pointing to a single sentence in the book that asserts the building is not a synthesis of sources, but, "Neither East nor West," a unique artifact somehow suspended between global cultures. "That's part of the reframing," he observes, that the archive enables.

Problematic paradoxes and hidden histories abound. Mabel Wilson, an associate professor at Columbia's Graduate School of Architecture, Planning and Preservation, identifies an unbuilt project that, as she observes in her filmed commentary, "doesn't have a big footprint in the archive" but that carries significant historical weight: Wright's little-known 1928 redesign of the standard Rosenwald School building, part of a subsidized but segregated school-construction program for African-American students that was undertaken across the South in the first few

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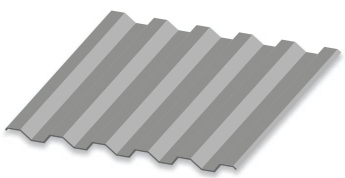

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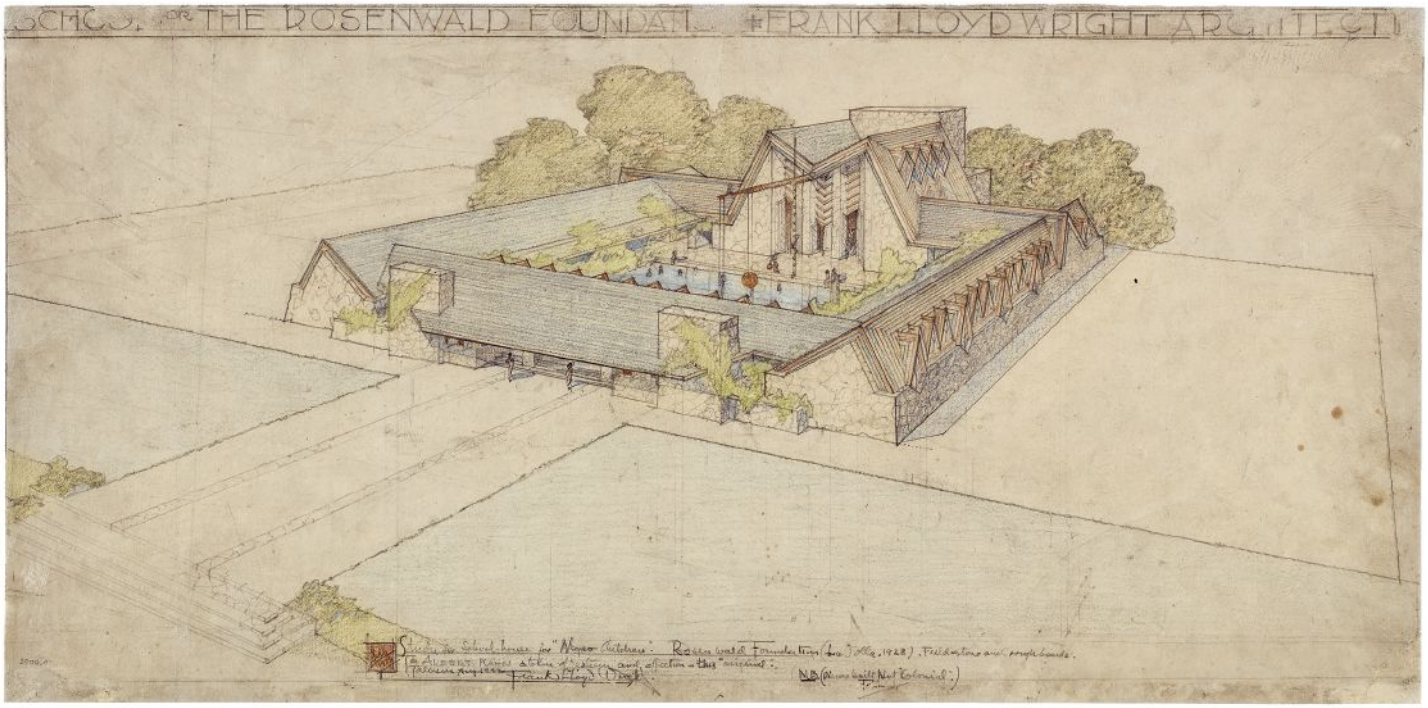

Wright's design for a Rosenwald School at the Hampton Normal and Agricultural Institute in Virginia (1928)

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decades of the 20th century by Sears, Roebuck & Co. chairman Julius Rosenwald. Wright enriched the dourly spartan schoolhouse template with a gracious patio and pool. Wilson notes that, "he was willing to adapt those ideas," from rarefied prior projects to a very different context. And yet, she observes, Wright's correspondence characterizes all African-Americans, not just schoolchildren, "as being childlike. There's a sensibility of the cultural hierarchies of that time."

In another gallery, landscape architectural historian Therese O'Malley takes on a dilemma hiding in plain sight: Wright's stylized plant motifs, which in received wisdom are evocations of the American prairie. But, "looking at the hollyhock," she notes, "it was actually naturalized at this kind of imperialistic moment when we wanted to bring them in," importing them from their native habitats in Europe and Asia—prompting O'Malley to ask, "What is an American garden?" Adds MoMA researcher Jennifer Gray, "it's also about social ecologies and political ecologies. All of these natures are very constructed."

The Emergence of Architectural Historiography

It's tempting, in our age of hacked email dumps and fake news, to look for stable truths in primary sources like the Wright archive. But what makes documents like the First Drawing so compelling is not that any of Wright's annotations—Dream House; Study; Project; Cooper House—might be the definitive one, but that all of the drawing's sequential or simultaneous identities may be differently true. This polysemous possibility is the great advantage of considering any one piece of paper not in isolation, but as part of a pattern of a half-million such pieces that might be placed next to it. For all the paper that architects, even now, produce, architectural historiography—the interpretation of documents and records—still feels like an emerging field. While fully sounding the depths of the archive will take years, the breadth, variety, and scholarly chorus of "Unpacking the Archive" enables us to see the work of Wright—who as early as 1932 was already the ubiquitous, prodigious, overfamiliar, cliché-adjacent Frank Lloyd Wright—as if for the first time.

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“The LVT would clearly be a boon to architects, stimulating construction and softening or removing the disincentive to construct higher-quality buildings.”

The Return of the Land-Value Tax by Amanda Kolson Hurley

Arden, Del., is only a half-mile off Interstate 95, but it feels a century removed and an ocean away from modern America. Half-timbered cottages and Arts & Crafts bungalows hide behind dense hedges on Arden's narrow lanes, some of which are named, like the village itself, after places in Shakespeare's plays. The main axis, cutting diagonally across the 162-acre tract, has a community center and Gild Hall (really) at one end, a 1,000-foot-long green and outdoor theater at the other. There is an old craft studio, now run as a museum, and a section known as "Little Arden," which once housed artisans who worked in the studio, the forge, and the weaving shop. If William Morris hadn't died in England in 1896, but had lived and boarded a steamer for Philadelphia, this is the utopian colony he might have started.

Morris was an inspiration for Arden, but its guiding light is revealed by a marker that sits next to a park just outside the village limits: Henry George Memorial Green. A journalist and political economist, and one of the most influential thinkers of the late 19th century, George wrote a book, *Progress and Poverty*, that sold millions of copies after it was published in 1879—more than any American book to

A house in Arden, Del.

that date, according to some estimates—and made its author a lecture-tour celebrity, a TED talk luminary of the Victorian age. George even ran for mayor of New York in 1886, coming second to the Tammany Hall candidate and earning more votes than the Republican, Theodore Roosevelt.

George's main insight was that land and capital are inherently different, so society must treat them differently. "[T]here is a fundamental and irreconcilable difference between property in things which are the product of labor and property in land," he wrote, arguing "that the one has a natural basis and sanction while the other has none." An industrialist may build a factory on his land, and have a legitimate claim to the profits from its operation, according to George. But the land itself derives its value from scarcity—the supply of land is finite—and not from anything a landowner does. Therefore any profit from the land itself is unearned and belongs by right to the public.

George attributed to private land-ownership the unfortunate paradox that rents were always rising in cities but not wages. That was why, he argued, material progress (referenced in the title of his treatise) had not eliminated poverty, as one might expect, but had actually contributed to it. George believed the only answer was to make land common property. As a capitalist reformer rather than a Marxist revolutionary, however, he did not advocate seizing private lands. "[R]ecognition of the common right to land involves no shock or dispossession," he wrote, "but is to be reached by the simple and easy method of abolishing all taxation save that upon land-values." The single-tax movement was born.

By the time George died in 1897, his acolytes had already put his ideas into practice. Three years earlier, 28 Georgists founded the colony of Fairhope, on Alabama's Mobile Bay, "to establish and conduct a model community or colony, free from all forms of private monopoly," as their constitution read. The group bought acreage along the shore and held it in common, doling out 99-year leases to new arrivals. Arden, founded in 1900, followed the same model, attracting a host of nonconformists, including the writer Upton Sinclair and the socialist activist Ella Reeve "Mother" Bloor. Arden was successful enough to birth two adjacent spin-offs, the villages of Ardentown (1922) and Ardencroft (1950).

"Why Henry George Had a Point"

For much of recent memory, there has been little in the way of single-tax inspired community building or policy-making. But now Georgism seems to be back. In March 2015, Peter Orszag, who was the director of the Office of Management and Budget under President Barack Obama, wrote a *Bloomberg* op-ed titled "To Fight Inequality, Tax Land." The next month, *The Economist*—hardly an organ of radical policy proposals—ran a story headlined "Why Henry George Had a Point." Both articles sprang from a paper given by Joseph Stiglitz, the Nobel Prize–winning economist, arguing for a land-value tax. More recently, some


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activists in the pro-growth YIMBY movement have taken up the banner of the land-value tax, or LVT. And the Labour Party made LVT part of its platform in the U.K.'s general election in June, a proposal that Conservative Party opponents assailed as a "garden tax" that "could force homeowners to sell off their family gardens to lower their bills." Over the years, however, LVT has attracted supporters from across the political spectrum, from Winston Churchill and Milton Friedman to John Dewey and Clarence Darrow.

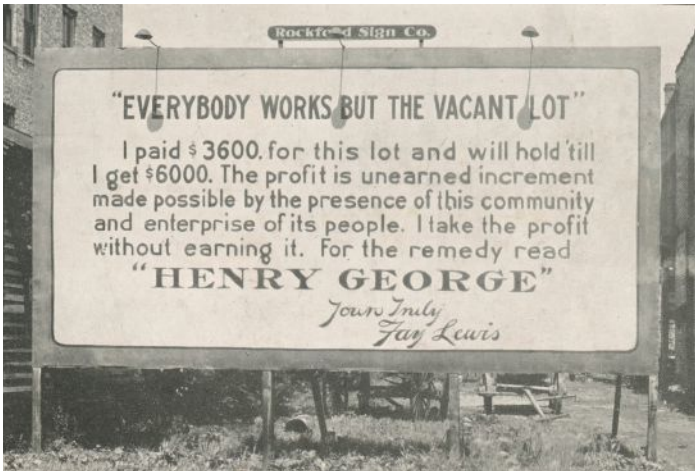
The resurgence of Henry George shouldn't come as a surprise, given how property values have skyrocketed past average incomes in many countries, resulting in punishingly high house prices and rents from Vancouver, B.C., to Sydney, Australia. In the U.S., rental income as a share of GDP hit a new peak in early 2017: There are now only 12 counties in the entire nation where a minimum-wage worker can afford a one-bedroom apartment priced at market rate. Home ownership increasingly defines the divide between the haves and have-nots. There are clear parallels with the Gilded Age context in which George was writing (and some clear differences—for one thing, land ownership is more broadly distributed now than it was then).

Arden as LVT Case Study

So what does a Georgist city look like? In late May, I sat down with Jeffrey Politis, Arden's current town-assembly chairman, in the dining room of his bright Cape Cod, overlooking a backyard with a treehouse worthy of a children's novel. We were joined by Mike Curtis, a lifelong resident of Arden and committed Georgist. (Politis, an engineer, moved to the village in 1999 knowing little about George or LVT.) Together they showed me how LVT is applied in Arden, which now has a population of about 450 and a median house price of $319,000. Impressively, the village has maintained its system of common land ownership and 99-year leaseholds for more than a century. Each leaseholder pays annual land rent to a trust. The amount depends on the size of the lot, ranging from roughly $2,000 to $7,000. Since Arden doesn't provide all its own services, most of the land rent goes to New Castle County for schools and roads—the trust pays residents' property taxes—although some of the money covers Arden's own costs of trash removal, tree trimming, and the like.

Every year, residents elect seven assessors who decide how to levy rates on the 197 leaseholds. And every year, Politis and Curtis say, it's a difficult task. The real-estate market may indicate the value of a given lot, but what portion of that amount reflects the value of the land alone? In urban and suburban areas, there are few remaining unbuilt parcels of land, so there are few comparable properties. Should leaseholders close to the village green pay more for proximity? Access to open space is an advantage—except when it's not; in the 1970s, the green was a haven for drug use, and assessors and residents once battled over what that meant for their land rent.

Is Arden more or less desirable than other communities nearby? Politis and Curtis said they weren't sure, and they didn't think that the land-rent system was much of a factor, anyway. "People who want to be in Arden, want to be in Arden," Politis said. He added that leaseholders treat their properties just like regular homeowners. Both men agreed that



A billboard promoting Henry George's single tax idea

the high ratio of open space in Arden (it comprises almost half of the total land) is a big part of its appeal. In part because of the extensive park maintenance, Curtis estimates that leaseholders pay about 20 to 25 percent more in land-value taxes than landowners pay in property taxes in nearby towns. The community in Arden has nevertheless remained protective of the village green and woods, and Curtis attributes that to the underlying philosophy of common ownership. "What land rent encourages is subconscious," he said.

In fact, Arden doesn't look anything like it should, at least in theory. Economists believe that LVT is superior to a property tax because the latter disincentivizes owners from improving a property, while the former might encourage them to make the "highest and best use" of their land, given that it is taxed at the same rate regardless of what stands on it. In other words, LVT should encourage higher density because of owners building up and adding structures to lots. Meeting the demand for urban housing with

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ramped-up construction would help keep rents and home prices in check, and could rein in urban sprawl, since fewer home-seekers would be pushed to the margins of a city. Developers who "bank" land, purchasing it and waiting for some future time to build, would possibly be nudged by a land-value tax to hurry up and get started. On paper, at least, the LVT city sounds like the kind of hyper-urbanized place that Ed Glaeser and Vishaan Chakrabarti, AIA, dream about.

Arden, however, despite various outbuildings here and there, didn't seem any denser than other towns dating to the same era of early suburbanization, like Takoma Park, Md. One reason why: the village is

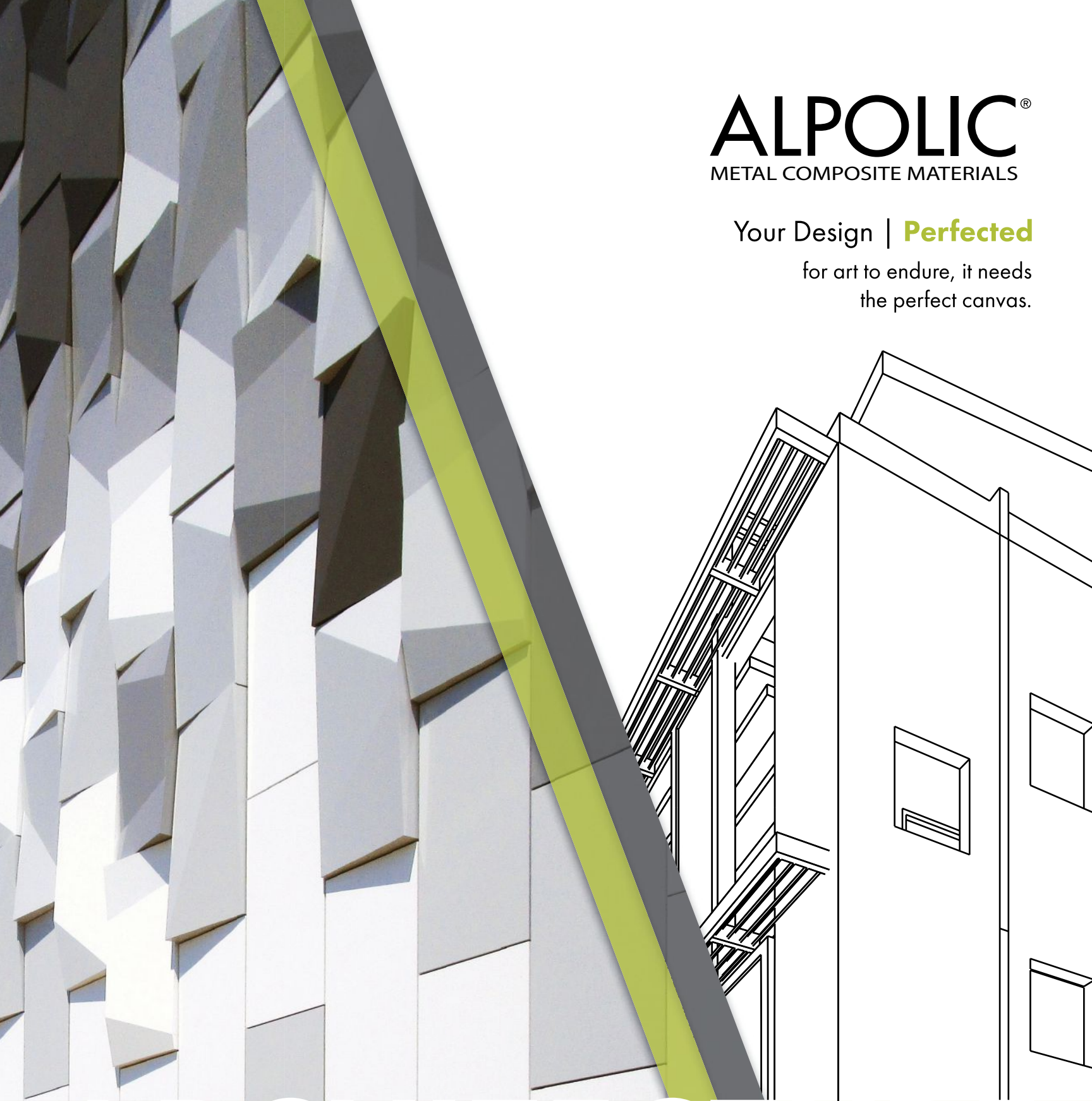
LVT should encourage higher density because of owners building up and adding structures to lots. Meeting the demand for urban housing with ramped-up construction would help keep rents and home prices in check, and could rein in urban sprawl.

subject to county zoning. A leaseholder who wanted to build, for example, a small apartment building on his or her lot, with a café on the ground floor, would bump up against the county's "Neighborhood Conservation" zone, which "protect[s] the residential character" of all the Ardens. As it turns out, reconciling a local Georgist tax paradigm with county, state, and federal laws and taxes is no easy task.

Putting LVT into Practice

Still, many municipalities have adopted some form of land-value tax. In Pennsylvania, 15 or so jurisdictions collect LVT, paired with property taxes, in a dual-tax model. A standalone LVT carries political risks, since it could hit the land-rich and income-poor—taxpayers more likely to be elderly—the hardest, unless some mechanism corrected for that. Pittsburgh has gone the furthest of any major city in the U.S., phasing in a dual tax in the early 20th century and then, in 1974, raising the land-tax rate to 3.9 times the rate on buildings. The system fell apart in 2001, however, after a dysfunctional assessment process caused rates to spike, outraging homeowners.

"Proposals to tax land values more heavily than improvement values can find support in both historical



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experience and economic theory," wrote the economists Richard F. Dye and Richard W. England in a 2010 report on land-value taxation published by the Lincoln Institute of Land Policy. Yet there is little hard data to predict exactly what would happen if a city like San Francisco or New York adopted LVT, in part because there are so many variables to consider: How the rate would compare to the property taxes of nearby municipalities; how land values would be assessed; how much public revenue the LVT would raise compared to the prior system; what the local zoning laws are; and whether the LVT is tethered to a property tax or supplants it entirely.

If implemented successfully, LVT would clearly be a boon to architects. A land-value tax would stimulate construction and soften or remove the disincentive to construct higher-quality buildings that currently exists under the property tax system. Perhaps it's no coincidence that one of the co-founders of Arden was an architect: Will Price, who laid out the village and designed several buildings there. Price also designed the fanciful and now-demolished Marlborough-Blenheim Hotel in Atlantic City, N.J., the largest reinforced concrete building in the world when it opened in 1906.

George's Missed Opportunity

After we had finished talking, Curtis offered to take me for a ride in his 1929 Model A. (I asked him if he'd restored it himself: "At my age, I don't have the time for that," he quipped.) As we slowly rumbled along the lanes in the open air, he told me about his life, pointing out the old swimming pool where he spent childhood summers. Curtis grew up in Arden. His grandparents moved from Fairhope in 1911, on the instructions of his grandmother's doctor, for the cooler climate. His grandfather was a fervent Georgist and a close associate of the man himself, and was at his bedside when George died of a stroke a week before his second attempt at becoming mayor of New York—an election that Curtis believes George was poised to win. If he had, everyone might already be paying land rent.

Curtis says he is frustrated that attempts to realize George's idea have stalled out. "Out of all the developments that have been founded since Arden," he asked, "why didn't more of them try it?" Perhaps, finally, more of them will.


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“The fact that ours is a world where walls are coming back into vogue did not much seem to worry him. Neither did it trouble most of his invited guests.”

Norman Foster Launches His Foundation by Ian Volner

The invitation was positively nuptial. Half an inch thick, on fine stock with handsome print, it declared that the inaugural symposium of the Norman Foster Foundation, "Future Is Now," would be taking place on June 1 in Madrid, Spain, in time for the official opening of the institution's new headquarters there. All of which was a bit bewildering: What was this portentously named symposium about? And what, for that matter, was the Norman Foster Foundation, which was itself unknown to many of the invitees? It seemed like a lovely wedding. If only it was clear who was getting married.

And why in Madrid? "We were looking for a base," said Norman Foster, HON. FAIA. The day before the summit, slated to feature a cavalcade of design stars, politicos, and other bold-faced names from Foster's rarefied orbit, the Pritzker Prize–winning architect (now 82) explained the rationale behind the whole vexed enterprise. His wife, Elena Ochoa Foster, is a native Madrileña, and the couple owns an apartment in the historic Castellana district. More importantly, said Foster, Madrid is "such a well-connected city," its global presence strengthened by age-old colonial ties to the New World. The appeal of the place was only enhanced when, in 2013, Foster chanced on a sensational property, an early-20th-century villa just a few minutes from his family's home, with an enchanting outdoor terrace and ample square footage for the archival materials his foundation had been quietly amassing.

While the organization has been operating under the radar, its founder has certainly not. Lord Foster of Thames Bank (a title he rarely uses, and uses even less since he resigned from the House of Lords in 2010), operates 12 offices on four continents tackling such hotly anticipated projects as the new Apple campus in Cupertino, Calif., and the vast new airport for Mexico City. "I'm always immersed in practice," Foster says, "but there are limitations." The foundation, in his view, is an opportunity to expand his reach and become a hub for transdisciplinary conversations—like "Future is Now"—as well as exhibition and storage space for his voluminous archives and collections of art and industrial design objects. "At some point I'm not going to be around," he says. "But this will go on, not just as a static archive, but one with an educational program that can make it reactive in terms of addressing issues related to change in the environment and the world."

Those issues have preoccupied the designer for decades, dating back to landmark projects like his Stanstead Airport in England (1991)—touted by Foster as the first to put the service level below the concourse, freeing up the latter to accommodate light and views—and the Torre de Collserola (1992), a giant

The villa housing the Norman Foster Foundation

television tower outside Barcelona whose 14-foot base leaves its rustic hillside almost untouched. An acolyte of Buckminster Fuller, Foster has always posited technology not just as a driver for design but as an engine of social change. "We are witnessing, globally, a world that's more connected than ever before," he declared in his keynote address for "Future Is Now" at Madrid's Teatro Real.

And yet, that same morning, the President of the United States announced that the world's largest economy would be withdrawing from the Paris Climate Agreement. Thirty-six hours later, terrorists launched an attack on London Bridge, just downstream from Foster's own Millennium Bridge. If technology really has been propelling us toward a more rational, more unified future, not everyone—as of late—appears to be cooperating.

The Spoils of a Rarefied Career

More so than any designer of his generation, Foster embodies—both in his life and his work—a certain ideal of architecture in the service of a globalized economy. His client list includes major multinational corporations (he is currently designing the London headquarters for New York financial giant Bloomberg). And he has collaborated with international NGOs on speculative nonprofit schemes, most notably his series of proposed "dome ports" to distribute much-needed aid throughout sub-Saharan Africa. His charitable activities, such as funding scholarships at London's Royal Academy of Arts and an endowed chair at Yale University, suggest a degree of largesse associated less commonly with architects and more with their clients. In professional folklore, Foster is often reckoned the wealthiest designer in the world, and if not he is doubtless very

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An exhibition pavilion, built alongside the villa, houses some of Foster's most impressive toys

Items displayed in the pavilion, including a reproduction of an Umberto Boccioni sculpture and Buckminster Fuller models

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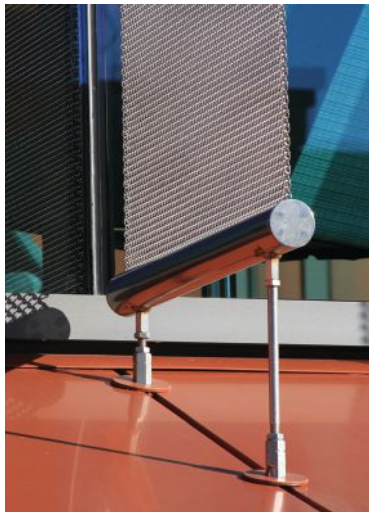

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close. He owns his own aircraft, which he flies himself; he has considerable private holdings of real estate, paintings, and sculpture; he buys and restores rare automobiles which he tools through the winding roads of the Swiss Alps, where he lives most of the year.

Many of the spoils of this privileged style of life have been socked away at the foundation's new space in Madrid. On one side of the mansion's peripheral courtyard, Foster's team has built a new exhibition pavilion to house some of his most impressive toys, including Le Corbusier's 1926 Avions Voisins motorcar, replete with its all-tartan interior and original airplane components. The pavilion itself is more than a little aeronautic itself, with its simple glass enclosure topped by a gleaming, wing-like roof of polished steel. The more substantive Fosteriana are housed in the elegant Beaux-Arts main building, where hundreds of renderings and models, some vintage and some created

Drawings and writings from Foster's archive

especially for the foundation, attest to the astonishing breadth and depth of the firm's output since its founding in 1967. Taken together, the materials illustrate Foster's techno-utopian vision for the urban prospect.

Divided into thematic sections, the displayed works show the remarkable consistency of Foster's approach. As early as 1975, with his breakthrough Willis Caroon Building in Ipswich, England, he took the givens of Modernism—the curtainwall, the typical floor, the free plan—and wedded them with a kind of euphoric, kid-with-an-Erector-Set joy for machinery: he made the darkened glass façade transparent at night, in order to show off the building's elaborate mechanical plant. In the 1970s and '80s, buildings like the HSBC headquarters in Hong Kong, with its forthright structural expression, and the Renault Center in southwestern England, bristling with taught steel cables, epitomized the period's High-

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Tech movement, which purported to advance an architecture of maximum human service and zero rhetoric. Yet Foster's work was never without symbolic content, acquiring more and more of it as his career progressed. By the time a visitor reaches the massive section model of his 1999 Reichstag renovation in Berlin, it is as clear as the building's coruscating glass dome that Foster is engaging in a concerted polemic about openness, the democratic process, and the triumph of the future over the past.

That particular future, and that particular past, is recalled once again in the foundation courtyard. Standing in a small garden plot just beyond the pavilion is a slab of graffito-tagged concrete: a portion of the Berlin Wall. The collapse of Soviet Communism is a signal political moment for Foster, a brief interval when it seemed that the march of free markets and liberal democracy would bring about a just and cosmopolitan order. It is still largely the world he sees today, as he made clear at the Teatro Real: "a more mobile society, with migrations from the rural areas of nations into the urban areas on an unprecedented scale, and migrations across continents." The fact that ours is also a world where walls are coming back into vogue did not much seem to worry him.

Neither did it trouble most of his invited guests, whose names read like a class reunion of the early-aughts global creative class. There was Michael Bloomberg, the former New York mayor and Foster's billionaire client, appearing on a panel alongside artist-designer Maya Lin and the architect himself to warn that the world must not "walk away from global trade." There was Apple designer Jony Ive, fielding repeated (and somewhat impertinent) questions from the moderator about the longevity of iPhone batteries, and confessing that what he'd most like to design for himself would be "a nice soap dispenser." There was designer Marc Newson, artist Olafur Eliasson, and CNN's Christiane Amanpour in conversation with the Netherland's Special Envoy for Water Affairs. It was, all in all, only slightly less baffling than first anticipated—a conclave of extraordinarily accomplished people discussing human progress in the 21st century, even as powerful forces were at that very moment endeavoring to drag it back to the 14th.

The Limits of Technocratic Liberalism

There was one moment of discord. During a panel on technology and design, conservative historian Niall Ferguson jumped on a passing (and by no means cogent) metaphor proffered

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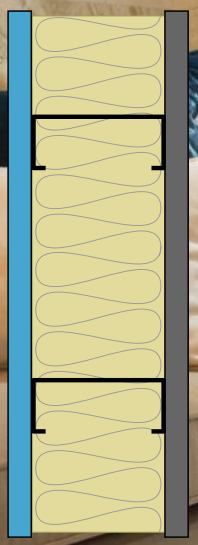

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by MIT's Nicholas Negroponte about "fried eggs and omelets." Ferguson explained that en route to the Teatro Real, a local taxi union, protesting the encroachment of Uber into the Spanish market, had struck his passing car with yolky projectiles. "This bright future will not be as bright and shiny as you think," declared Ferguson, "and the rotten eggs have only just begun flying." His remarks were greeted by a shower of applause. Amid all the technocratic boosterism, it was refreshing to hear a note of realism in the Teatro Real. It was only

Amid all the technocratic boosterism, it was refreshing to hear a note of realism in the Teatro Real.

unfortunate that Ferguson, a noted denier of social progress, had to be the one to deliver it.

The keynote for the day's final panel was delivered by Alejandro Aravena, a Pritzker-winning architect of an altogether different, if no less ambitious, social mission than that of his host. In presenting his small-bore, low-tech system for mass urban housing, Aravena noted the importance of building "good infrastructure," not "stupid infrastructure, like a wall to separate Mexico and the United States." One only wishes he had gone further—to posit an alternative between Foster's technocratic liberalism on the one hand, and Ferguson's Hobbesian reactionism on the other.

Nevertheless, Foster remains unrepentant in his outlook. Sitting upstairs in the villa, surrounded by models of his buildings, he took the long view: "There's a certain arrogance about technology and globalism, as if we invented it," he said. "It's a tradition that goes back centuries, to the beginning of civilization." What's clear in looking at Foster's work in toto—from his early childhood sketches of medieval mills to his proposals for a self-building moon base—is that his gee-whiz techno-euphoria has never been far removed from a key intellectual and political premise: the Enlightenment ideal of a society based upon reason. That may not quite account for all the good cheer of the Madrid panelists, merrily toasting the nowness of the future; but then again, Norman Foster, presently in his ninth decade, can at least be said to come by his optimism honestly. The alt-right, Brexit, terrorism? "Someone looking back in five or 10 years will say they were mad," Foster said. "They thought this was the end? It isn't even the beginning."

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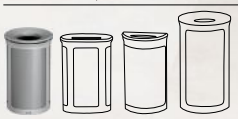

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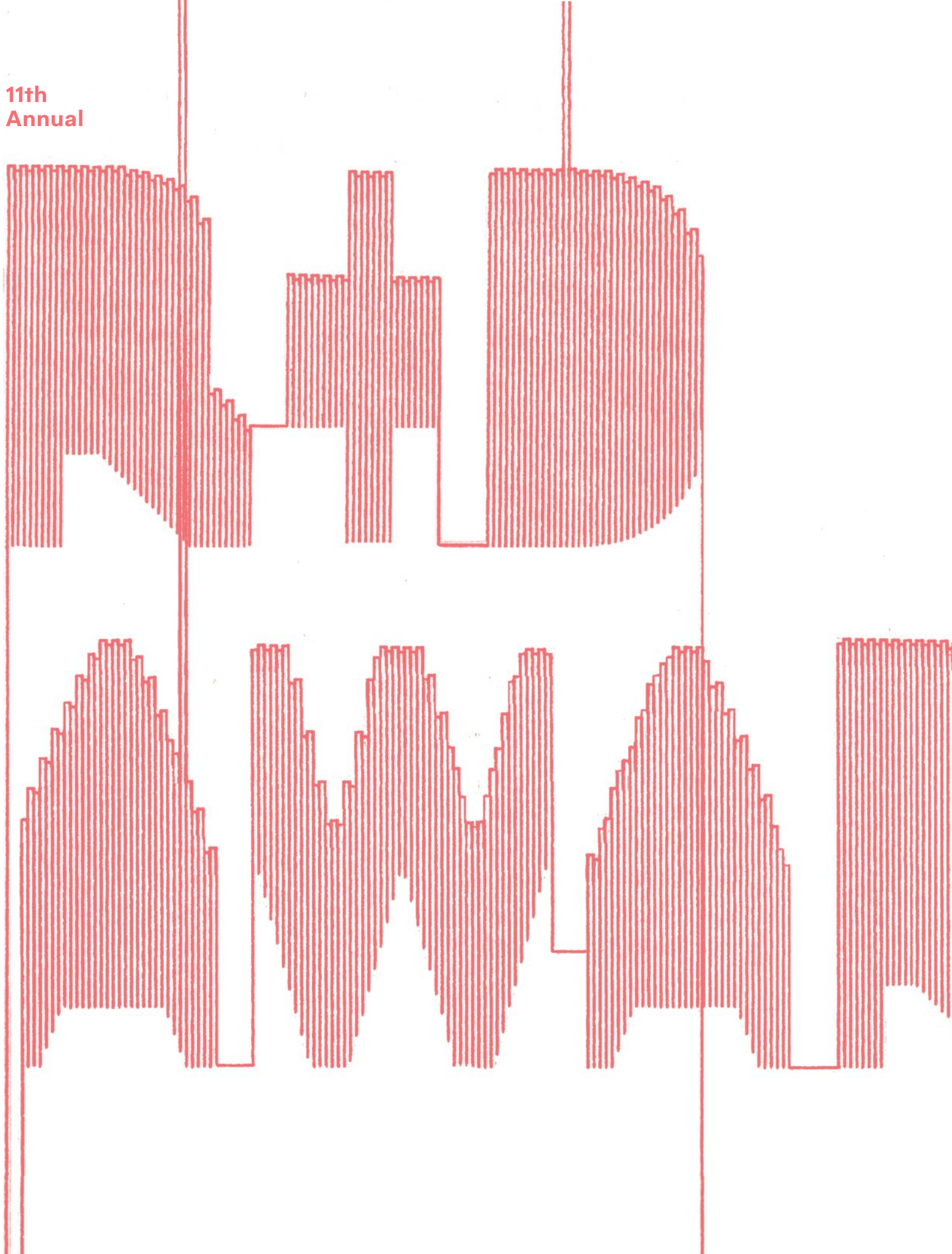

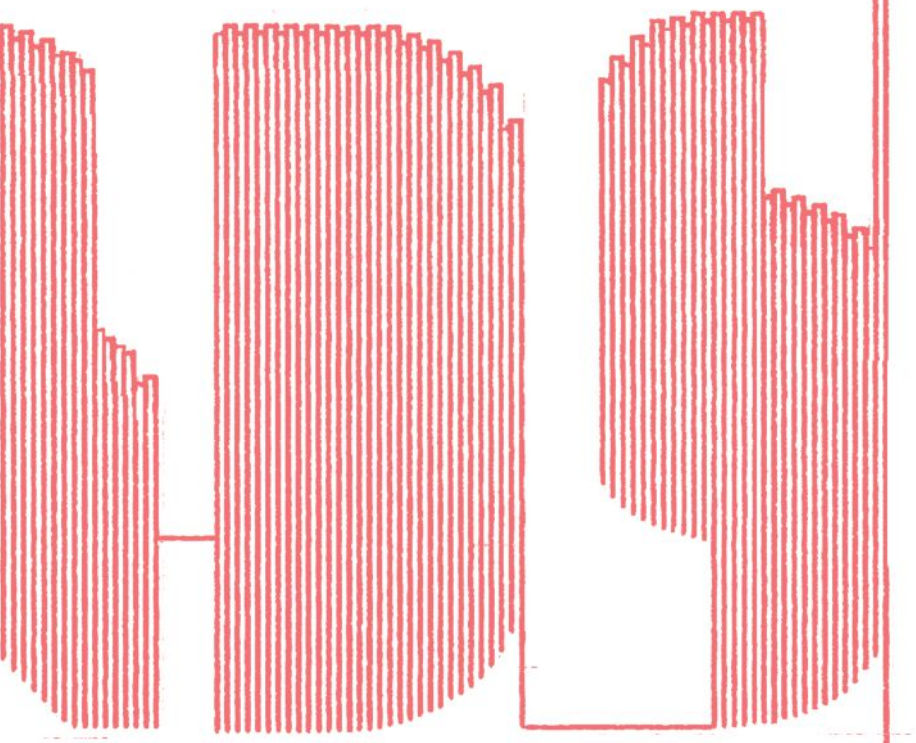

JURY

PHILLIP BERNSTEIN, FAIA, YALE UNIVERSITY
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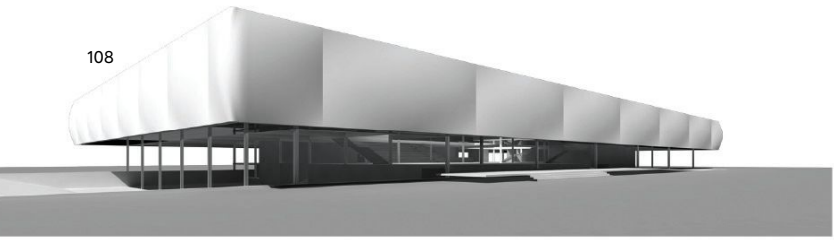
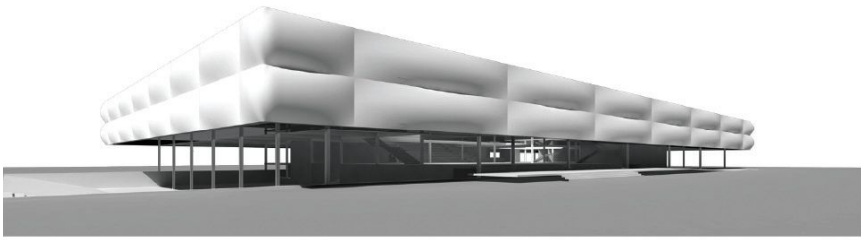
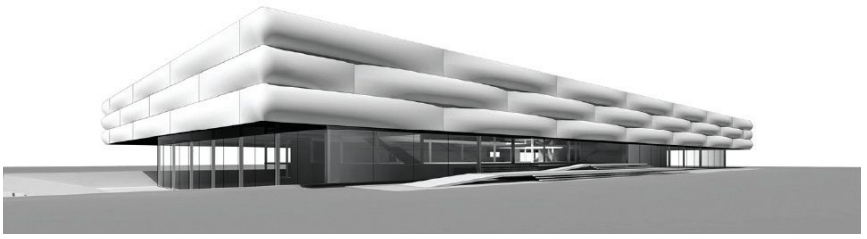
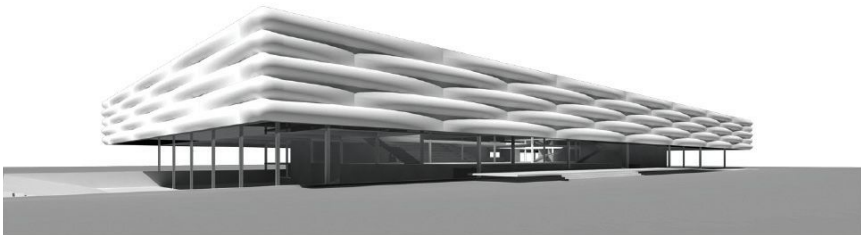
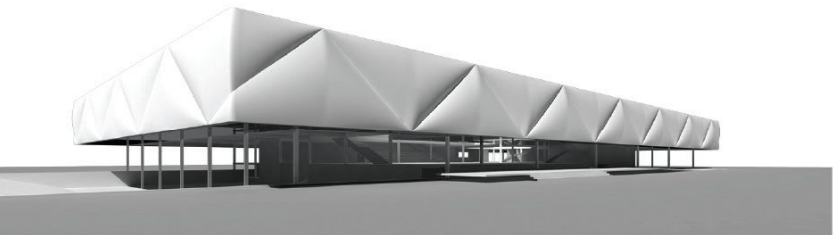
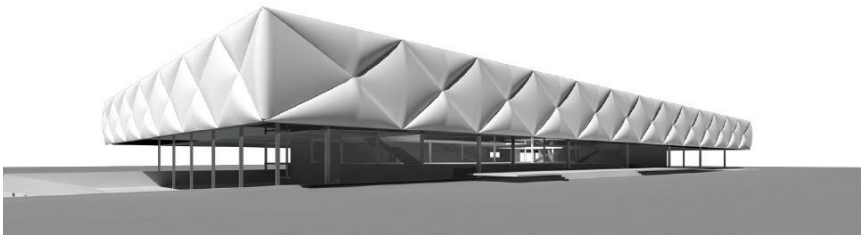
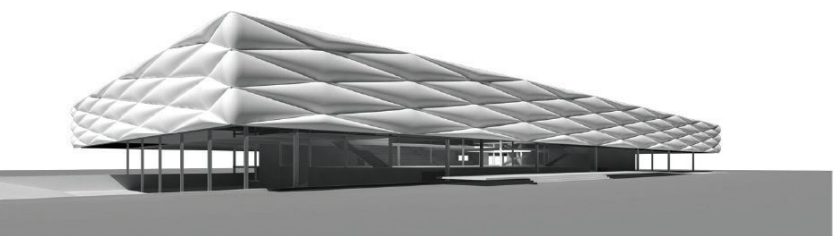
The R+D Awards celebrate investigations at the forefront of architectural technology. From the program's inception in 2007, and never more so than with this year's crop of winners, it has been clear that innovation at its most profound encompasses not only invention, but also rediscovery, refinement, and simplification. This year's jury chose nine projects, some definitively high-tech, such as a 3D-printed net-zero house, and others resoundingly low-tech, such as a CMU-curing kiln powered by direct sunlight (meaning no photovoltaics, thank you very much). Considered as a whole, the jury's selection affirms the industry's brilliant diversity of approaches, and its capacity to make the world a better place. Turn the page to learn how.

EDITED BY KATIE GERFEN AND WANDA LAU
DESCRIPTIONS BY CLAY RISEN
LETTERING BY DANIËL MAARLEVELD

> *Project credits for the winning entries can be found on page 136.*

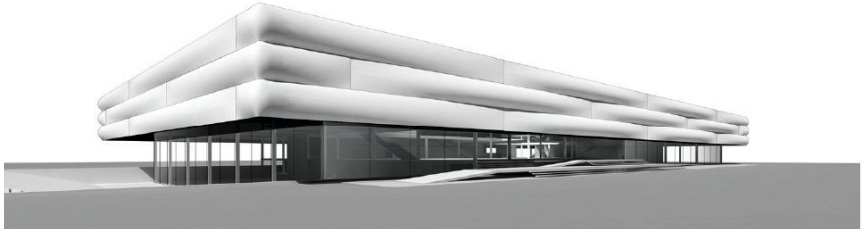



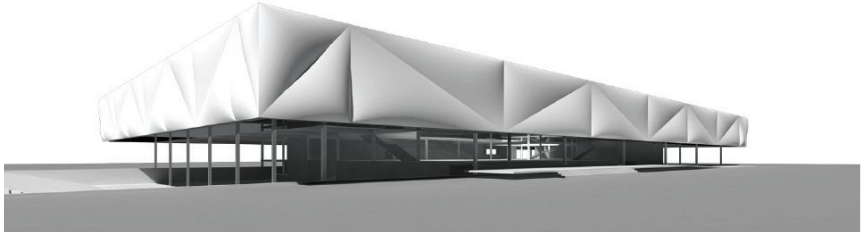



Dynamic ETFE Façade

Award Pity the architect asked to deliver a building for the Illinois Institute of Technology. The 120-acre campus south of downtown Chicago was largely designed by Ludwig Mies van der Rohe in the decades after World War II, and added to in subsequent decades by the likes of Helmut Jahn, FAIA, and Rem Koolhaas, HON. FAIA, So when the school asked one of its professors of architecture, John Ronan, FAIA, founding principal of **John Ronan Architects**, for a new center for entrepreneurship, he knew he had to deliver something special—both architecturally striking and technologically innovative.





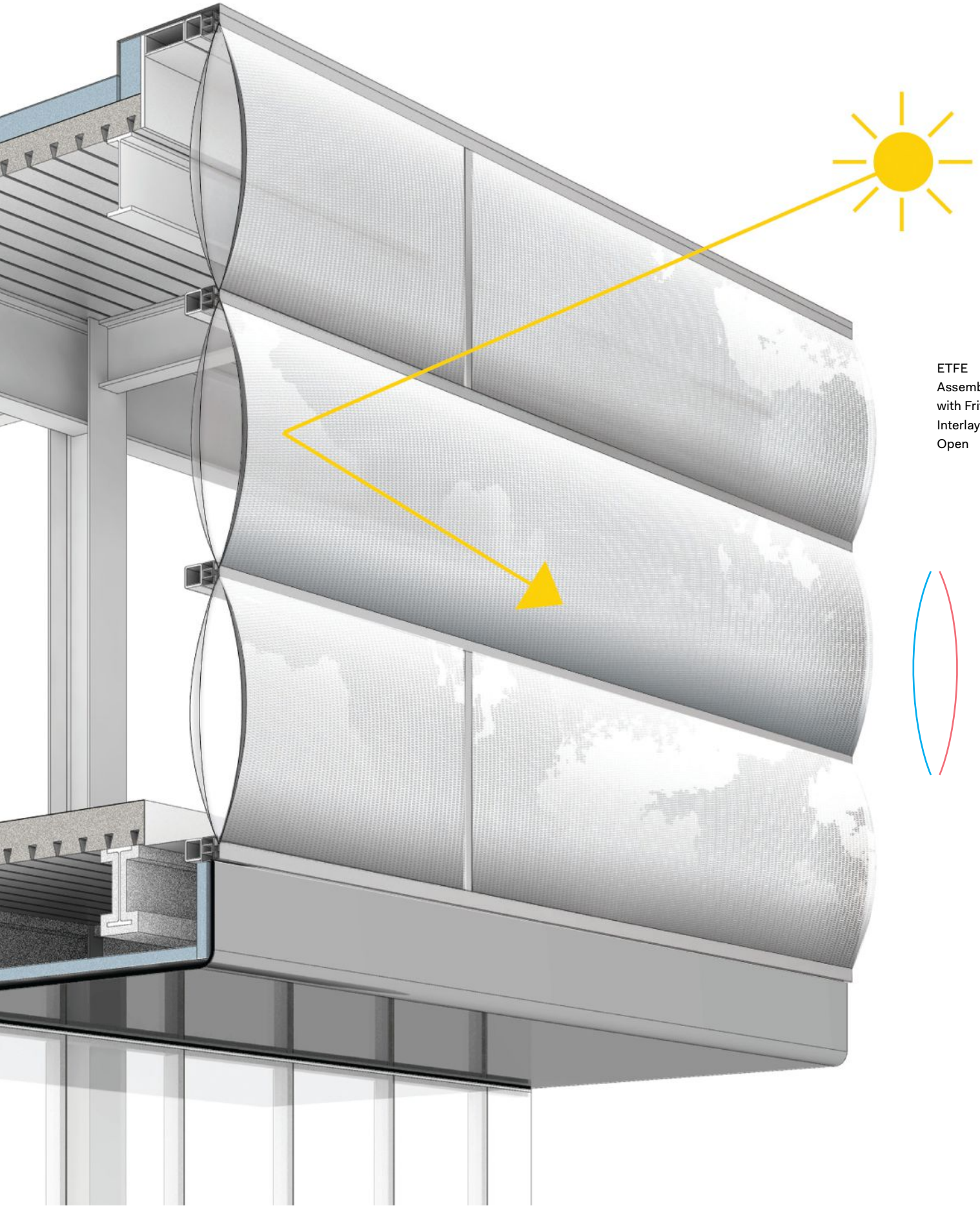
Many of the campus's Mies-era buildings are sheathed in glass, a distinctive feature that lends a skin-and-bones lightness to the master architect's industrial aesthetic. "My question was," Ronan says, "if the steel-and-glass buildings were lightweight for their time, what would be the equivalent for our time?"

Ronan decided the solution was to update that look using a material with the performance of glass at a fraction of the weight—ethylene tetrafluoroethylene (ETFE), a translucent, resilient plastic film used to cover wide spans like arena roofs. By placing four layers of ETFE alongside each other in a window, in place of glass, and then adjusting the width between them, Ronan realized he could modulate the material's insulative capacity—think of a pillow of air that inflates and deflates depending on the weather. "You can tune the building to the climate," Ronan says. "With the right sensors and controls, it can respond to the weather in real time."

These ETFE "windows," which run along the second floor, have three air chambers inside; each assembly is separated by steel mullions. When the building needs to retain heat, the chambers can be expanded using pneumatic controls, creating air pillows that give the building a soft, supple look.

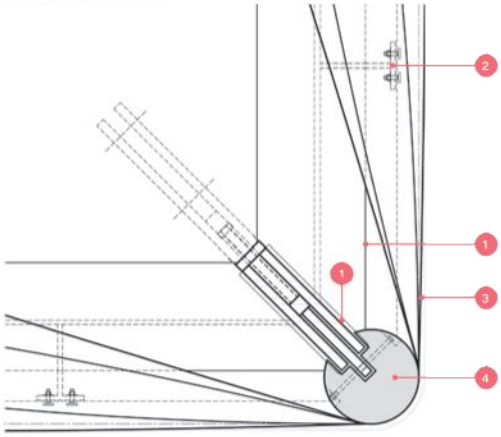
ETFE weighs about 1 percent of what glass does, which reduces the load on the building's structure while still delivering the same level of insulation as tripled-paned glass. But the differences don't stop there: "One of the qualities of ETFE is that it's acoustically transparent," Ronan says, meaning that the chatter of birds and the murmurs of passersby will filter in through the windows, blurring the line between interior and exterior. "That way, students inside will have the sense of being outside."

Ronan's building, the Ed Kaplan Family Institute for Innovation and Tech Entrepreneurship, sits at the center of the Mies campus and will be finished by July 2018. While the building's true performance remains to be seen, Ronan sees solutions like his as part of a new wave of architectural components that put less pressure on active HVAC and lighting systems, and more on the manipulation of passive effects. "I think it's the future of buildings, not just static structures but responsive ones," Ronan says. "We're going to see architecture soon that does more, so the systems do less."

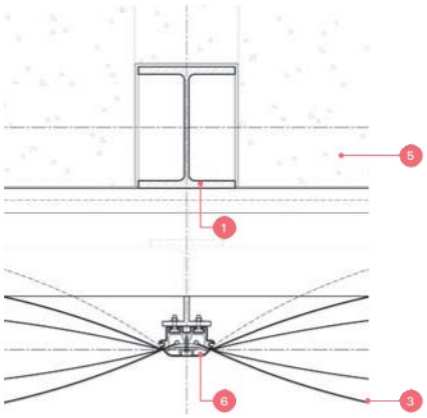


ETFE
Assembly
with Fritted
Interlayer
Open

Corner Plan Detail



Support Plan Detail



1. Painted steel substructure
2. Painted steel bracket support
3. ETFE cushion
4. Acrylic cap
5. Lightweight concrete topping slab
6. Steel mullion cap with concealed fasteners

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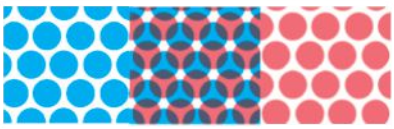
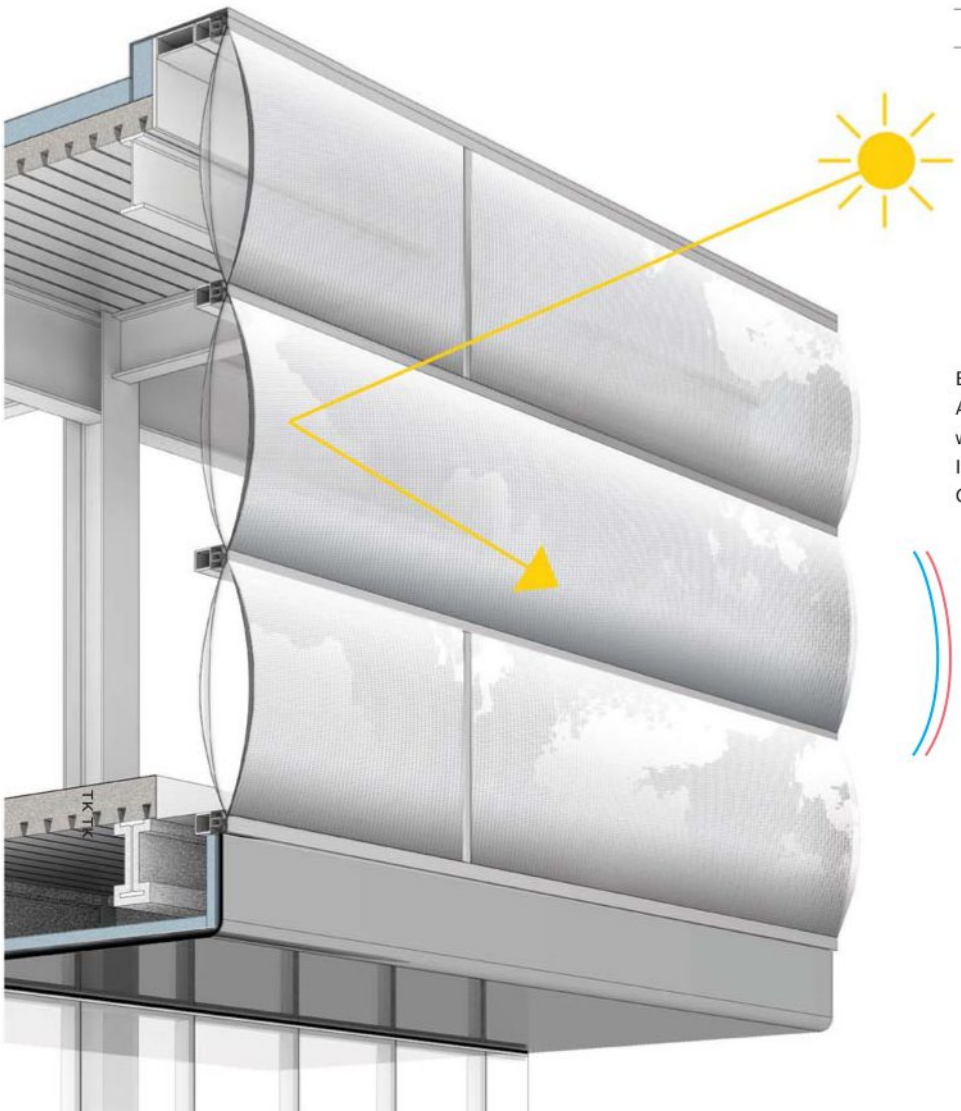
Fritted Layer Overlap Diagram



Layer 1 Layer 2

Closed Position · Open Position

	UV	VISIBLE LIGHT	SOLAR LIGHT
TRANSMISSION	0.08 · 0.10	0.24 · 0.27	0.26 · 0.28
REFLECTANCE	0.21 · 0.16	0.49 · 0.46	0.43 · 0.41
ABSORPTION	0.70 · 0.74	0.27 · 0.26	0.31 · 0.31
SHADING COEFFICIENT		0.34 · 0.47	
G-VALUE IN SHGC		0.30 · 0.41	
SHGC RANGE			0.13



ETFE Assembly with Fritted Interlayer Closed

"I appreciated how they considered varying the thermal properties of this solution, given that the thermal performance of ETFE has been the main challenge with the material."

—juror Mimi Hoang, AIA

Empathy Effect VR Study

1. Virtual reality goggles show the user what the room would look like to people with different vision-related disabilities.

Cataracts

Glaucoma

Macular Degeneration

Honorable Mention When architects design, they give a lot of thought to how people will use a space, but usually much less thought to the types of people who will use it. It's a tough problem to solve: What are the unique ways in which an elderly person, a blind person, or a child experiences space—and how should architects and other design professionals respond?

To answer that question, a multidisciplinary team at Minneapolis-based **HGA Architects and Engineers** devised a virtual reality (VR) experience that replicates how people of different ages and abilities move through an environment. VR is an increasingly valuable tool in a designer's portfolio, but Jonathan Bartling, AIA, director of HGA's Digital Practice Group, wanted to take it further. "We saw it as an opportunity to do more with virtual reality than simply showing renderings," he says. "We wanted to ask, 'How do we understand [how] people who have ailments you and I can't experience move through the same spaces?'"

The first iteration of the Empathy Effect project focuses on advanced age and the ailments that come with it. It pairs a VR headset with a body suit that hinders arm and leg movements; the headset has digital filters that mimic vision that is impaired by cataracts, glaucoma, or macular degeneration.

But the Empathy Effect is not just about impairments, Bartling says—it's about perspective. So the team has also developed an experience that replicates how a child would see a space by adjusting the height of surrounding objects relative to the headset wearer.

The result, Bartling says, is a tool that he hopes will transform the way that architects and other designers think about the spaces they build—not just for an ideal user, but for all users. "You can guess what a person's experience is," he says, "but seeing it with your own eyes is a profound experience."

"It drills into the subtle differences between different kinds of disability so that we can fine-tune the way in which we design for them. That's promising."

—juror Mimi Hoang, AIA

2. Braces at the neck, knees, and elbows limit movement to mimic the effects of joint deterioration.

3. Weights on the chest, wrists, and ankles mimic the effects of muscle deterioration.

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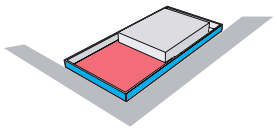
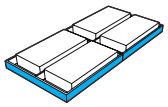
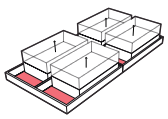
Massing Studies



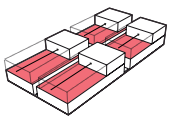
Current housing typology



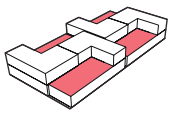
Increasing density



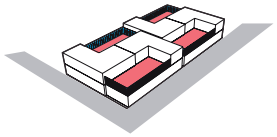
Restoring square footage



Restoring open space



Privacy from neighbors



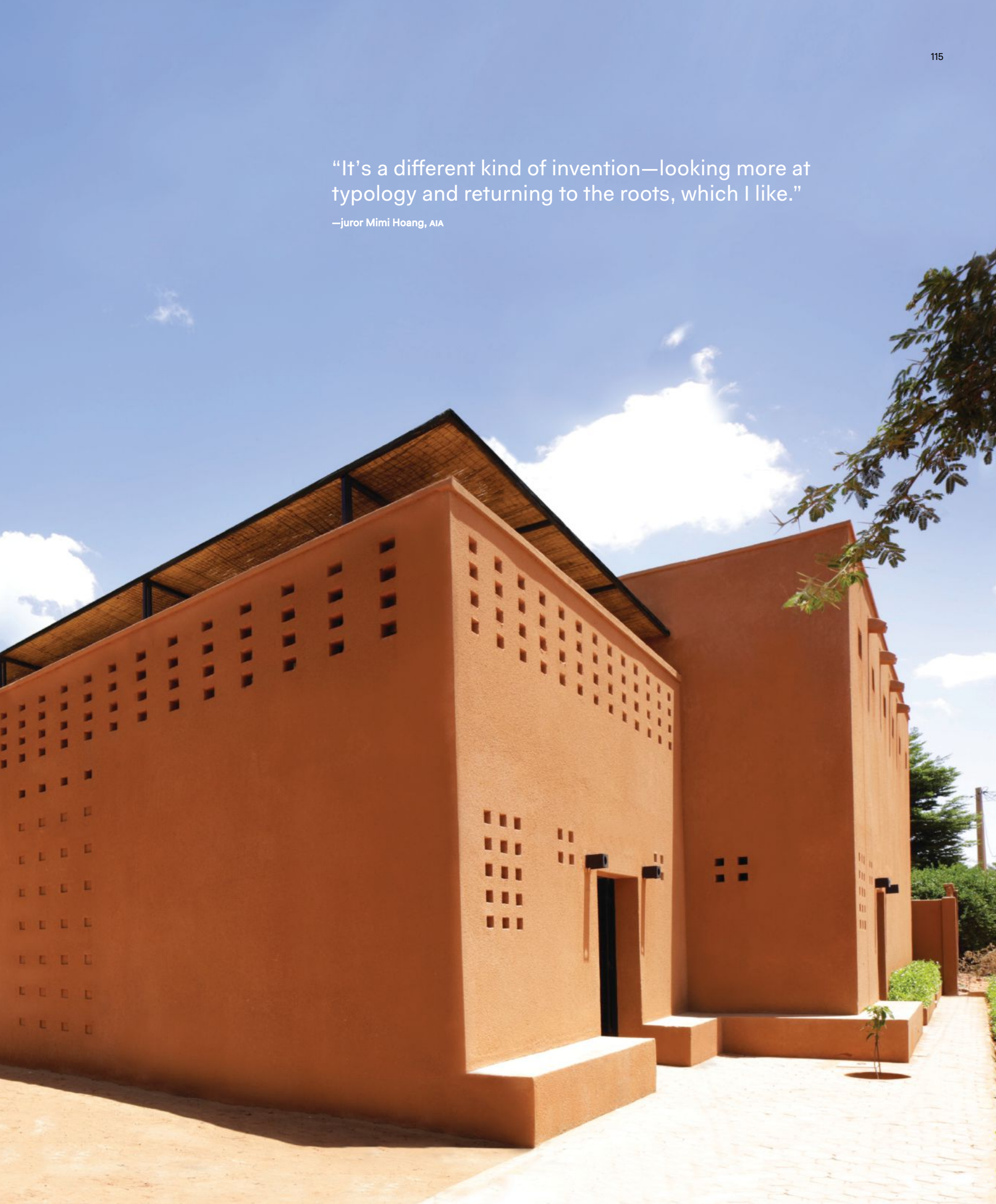
Privacy from street

- Open Space
- Privacy Shield
- Street

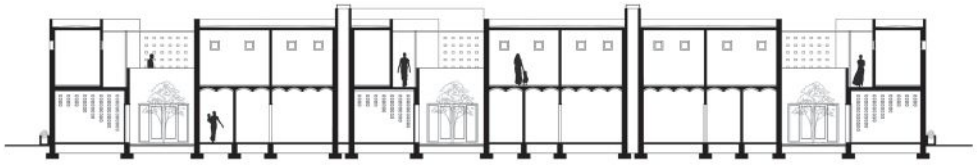
TORSTEN SEIDEL

"It's a different kind of invention—looking more at typology and returning to the roots, which I like."

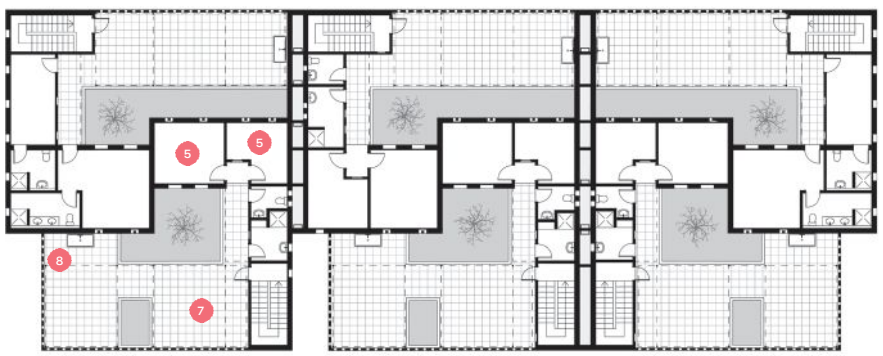
—juror Mimi Hoang, AIA



Section A–A1



Second-Floor Plan

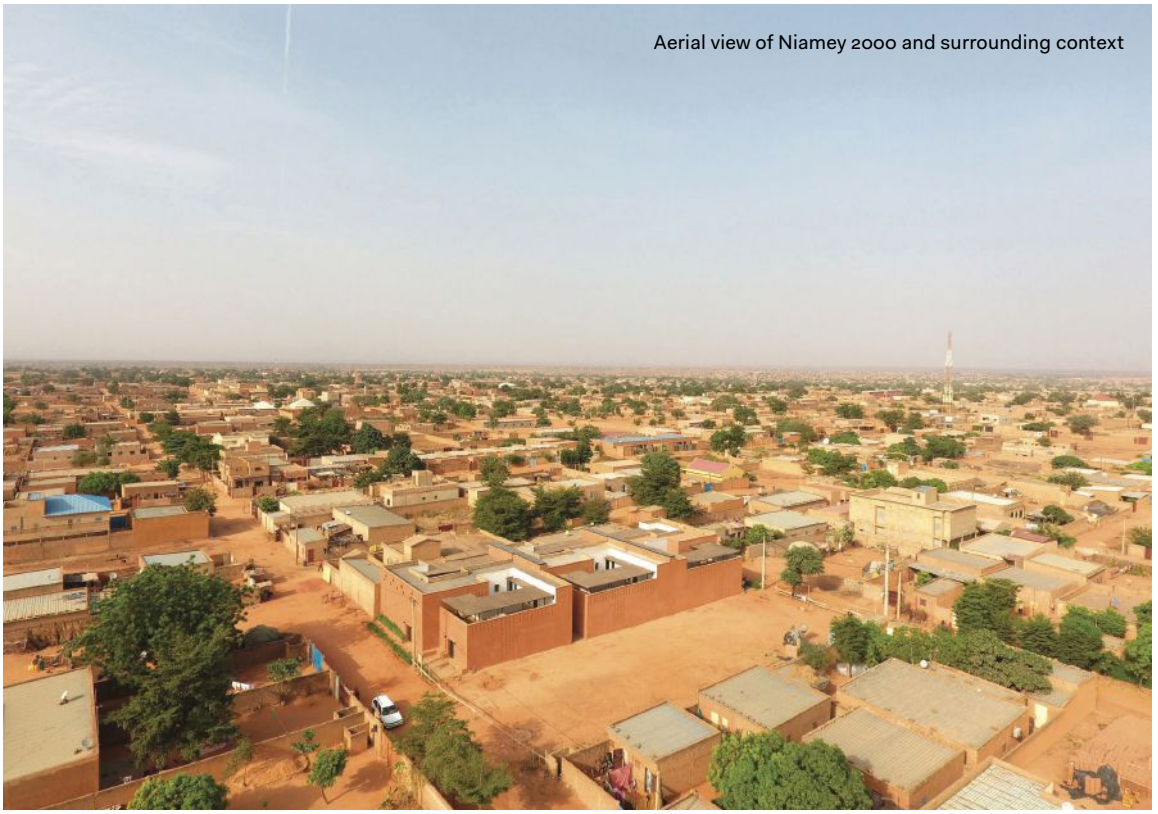


First-Floor Plan

1. Courtyard
2. Living room
3. Dining room
4. Kitchen
5. Bedroom
6. Caretaker
7. Terrace
8. Outdoor laundry

0 10 20

Award Like many cities in the developing world, Niamey, the sprawling, dusty capital of landlocked Niger, is in the middle of a housing crisis. Already home to 1.3 million people, it is expected to grow 5 percent per year until at least 2030. A big part of the problem lies with trends in the city's residential design and construction: Modern houses are built in low-density Western styles, with cinder blocks and metal fixtures that often have to be imported, driving up costs.



Aerial view of Niamey 2000 and surrounding context

Mariam Kamara, who grew up in Niamey, understands this shortage well. "I kept having conversations with people back home who were saying they couldn't even get married because they couldn't find their own home, not even a rental," she says.

Working with her thesis adviser, Elizabeth Golden, AIA, while a student at the University of Washington, Kamara hit on an idea: Why not try a different building style altogether, one that brings local materials and production methods together with increased density? She and two other designers then formed a collective called **United4Design** and set out with a goal to find a better way to do things.

The result is Niamey 2000, an 18,000-square-foot housing development that packs six family units into the space that a single conventional, Western-style unit would occupy. "If you look back at the cities in the region, they were denser at one point, but then things became spread out," Golden says. "The idea was to go back to this precolonial model."

Eschewing cement and steel, the structure is made from locally sourced and produced unfired earth bricks, which are formed with a manual block press. Not only are the bricks cheaper and more sustainable than imported materials, but they create work for Niamey's skilled laborers. Using a small number of reinforced concrete supports, the building rises two stories—in a city of mostly one-story homes—with a solidity that surprised even native Niamey residents who came for a tour. "People weren't willing to believe that a building made with earth could be that sturdy," Kamara says.

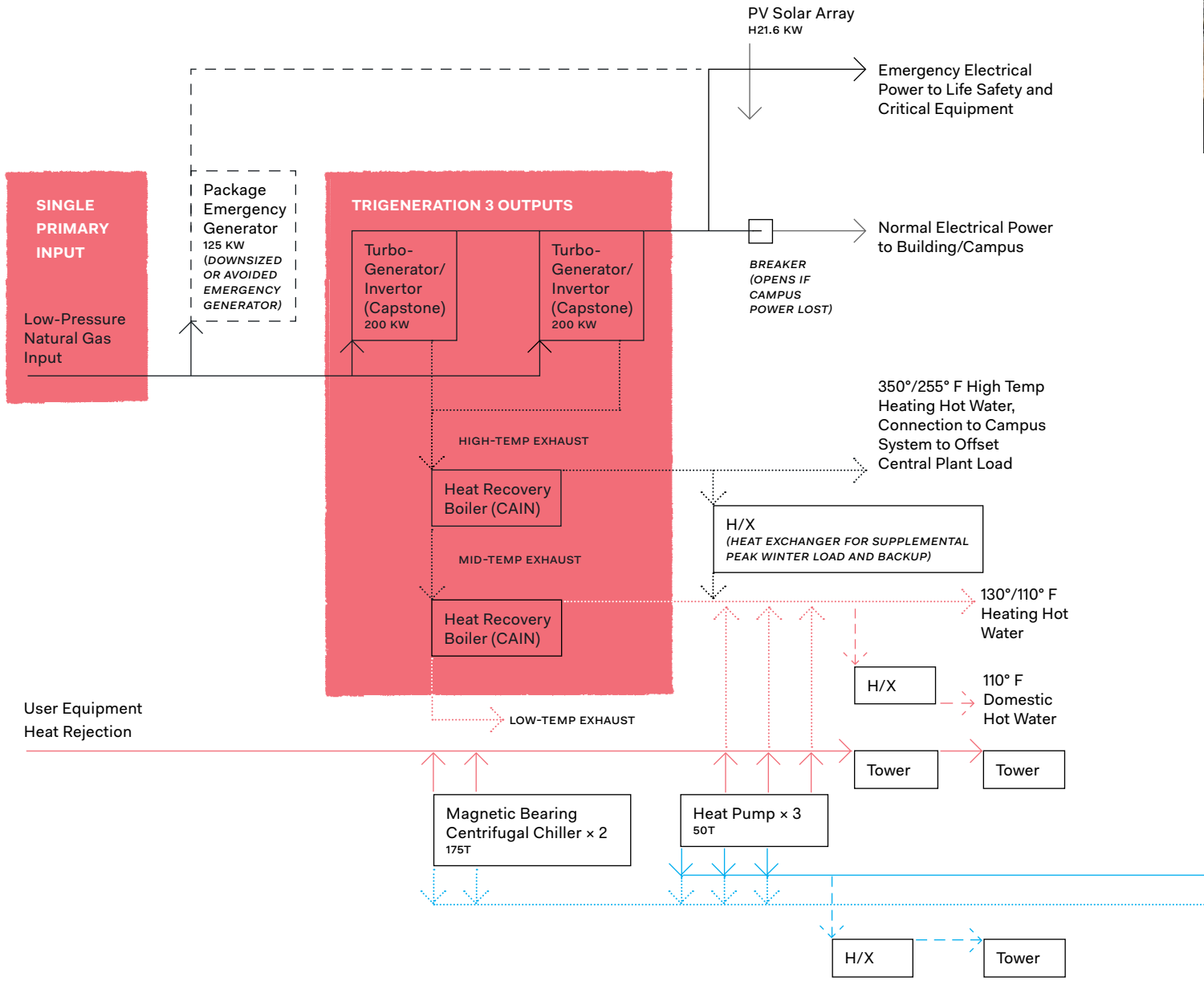
Niamey 2000 employs a series of passive cooling techniques, including breezeways and the inherent thermal properties of earthen construction. That makes it significantly more efficient than the neighboring concrete-and-steel houses. "Cement makes you literally cook inside the homes, so a lot of money is spent on cooling, if you can afford it," Kamara says.

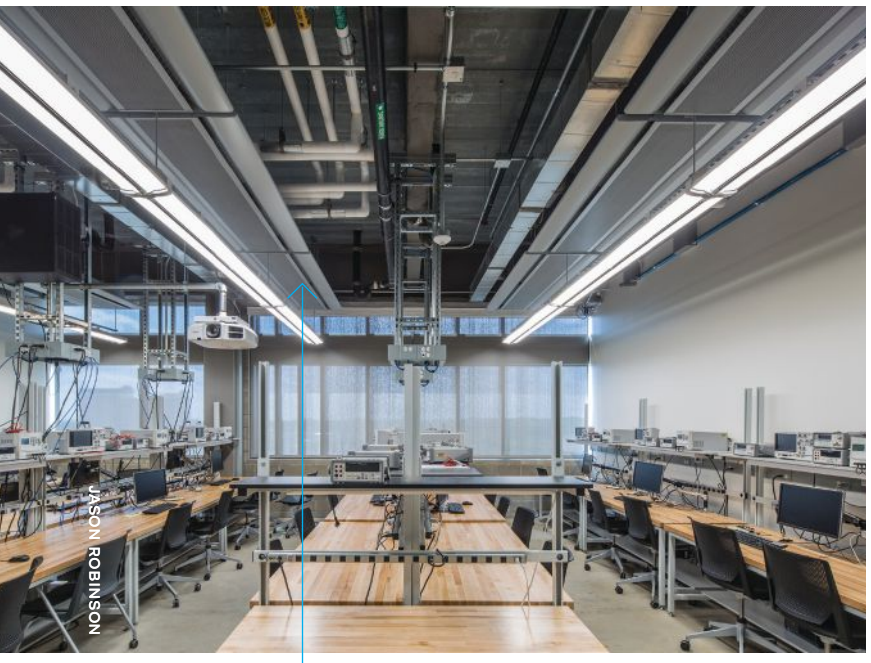
The units are arranged around a set of internal terraces that are wholly closed off from the street, providing a level of privacy that Nigerien culture expects—but that is often left wanting by modern Western designs. "Western homes have big windows, but that's not acceptable in our culture," says Kamara, who has since graduated and now has her own practice, Atelier Masomi, based partly in Niger.

Her neo-traditional approach seems to be catching on—Kamara already has four more projects underway in Niamey, including a library and a school. "There's a changing mentality in Niger," she says. "There's a younger generation that is yearning for something more contextual."

COURTESY UNITED4DESIGN

Trigeneration System




JASON ROBINSON

Chilled beams, fed by chillers powered by the trigeneration plant, cool the classrooms.

"It did a pretty good job of bringing multiple kinds of systems together for integration."

—juror Phillip Bernstein, FAIA

Honorable Mention When Oakland University first approached **SmithGroupJJR** about designing a new center for the engineering school on its Rochester Hills, Mich., campus, both sides agreed that the building should be more than just a shell with a collection of classrooms. Since the school has a focus on power systems, the obvious place to innovate was the building's electrical, heating, and cooling infrastructure. "We thought the building should be expressive of its systems, so as to be a teaching tool," says Paul Urbanek, FAIA, the firm's vice president of design. SmithGroupJJR has experience working with cogeneration systems, which transform energy wasted in electrical generation into heat—so why not go a step further with trigeneration?

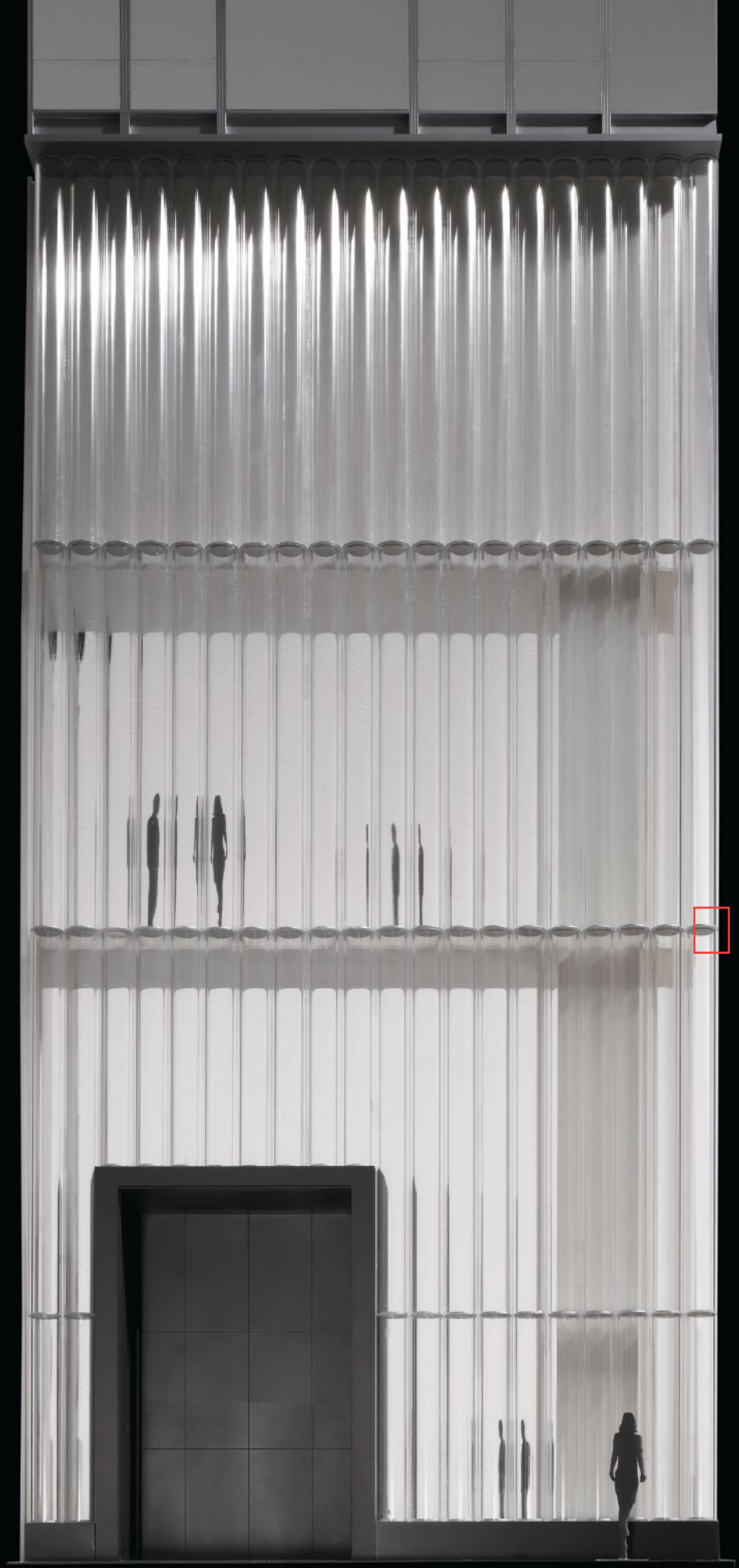
With trigeneration, the excess heat from a cogeneration plant is recycled, in part to generate chilled water for air conditioning. Usually found in extremely large systems such as city power grids, SmithGroupJJR's design is one of the first to be used for a single building.

At Oakland, the system begins with natural-gas-fed turbines that generate electricity for day-to-day operations. The high-temperature exhaust passes through a heat-recovery boiler, which churns out water heated to 350 F for heating the engineering center. Any excess energy goes back into the campus grid. The now cooler exhaust goes through a second boiler, which puts out water at 130 F, also for heating, and at 110 F for tap water. Some of that heated water powers chillers that deliver 65 F water to chilled beams in the ceilings of the engineering center's classrooms.

The result is a sophisticated technology that turns one step's waste into the next step's fuel—significantly reducing the school's utility bills in the process. "We tried to wring every drop of energy out of the system we could," Urbanek says.

60°/65° F CHW to Chilled Beams

44°/60° F CHW to DOAS and Fan Coils



1. Curved low-iron glass
2. Ionoplast interlayer
3. Evacuated air space
4. Metal plate closure
5. Compressible weather-seal gasket
6. Insulation
7. Metal frame

Vacuum-Insulated Glass Tubes

Honorable Mention

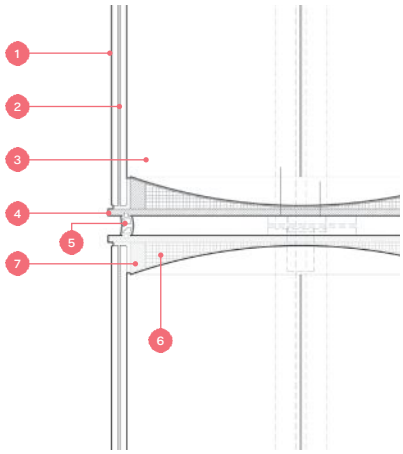
When Gary Haney, FAIA, a design partner at **Skidmore, Owings & Merrill** (SOM) set out to devise a glass wall for the Baccarat Hotel chain, he wasn't looking for a brilliant technical innovation—he simply wanted something that evoked the crystalline elegance of the Baccarat jewelry brand. "I had the idea for curved glass, a sort of scalloping effect," he says. Soon, he narrowed in on a series of custom-fabricated vacuum-insulated glass tubes—formed by two pieces of curved, low-iron glass, joined around an airless chamber, and capped at each end by metal plates—and a door was opened.

The tubes, stacked one beside the next, have structural qualities—they are self-supporting in heights of up to 15 feet—and, when vacuum-sealed and combined into a façade system, they offer an R-value comparable to that of a solid, insulated wall, despite being fully glazed. This is a big advantage considering that glazed surfaces are the single biggest site for heat loss and gain in a building. The aesthetic solution also answered a host of energy retention problems, and "pretty soon we were thinking of it as a whole system," he says.

The façade formed from the glass tubes was not ultimately included in the hotel design, but Haney and SOM are moving forward with them as a research project. Though attractive, the application isn't just a pretty face. "I could see them being used in warehouses, labs—not just storefronts," he says.

The team has been working on new iterations—for example, placing a photovoltaic rod in the middle of each tube, which receives enough focused, concentrated solar energy from the convex surface of the glass around it to generate electricity, the amount of which is being studied—and SOM has patented the design. "Taken together, it's quite a remarkable thing," Haney says. Aside from its technical qualities, "it just looks really cool," he says. "You can get full daylight, along with the insulative capabilities of a solid wall."

Vertical Unit Section



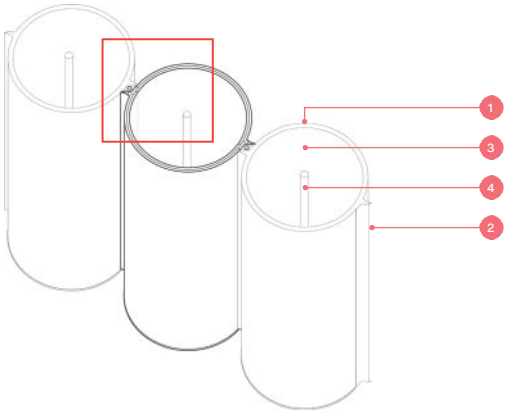
JOCK POTTLE/ESTO

“The project presents quite a beautiful solution and takes it to a scale that I haven’t seen before.”

—juror Erin Besler

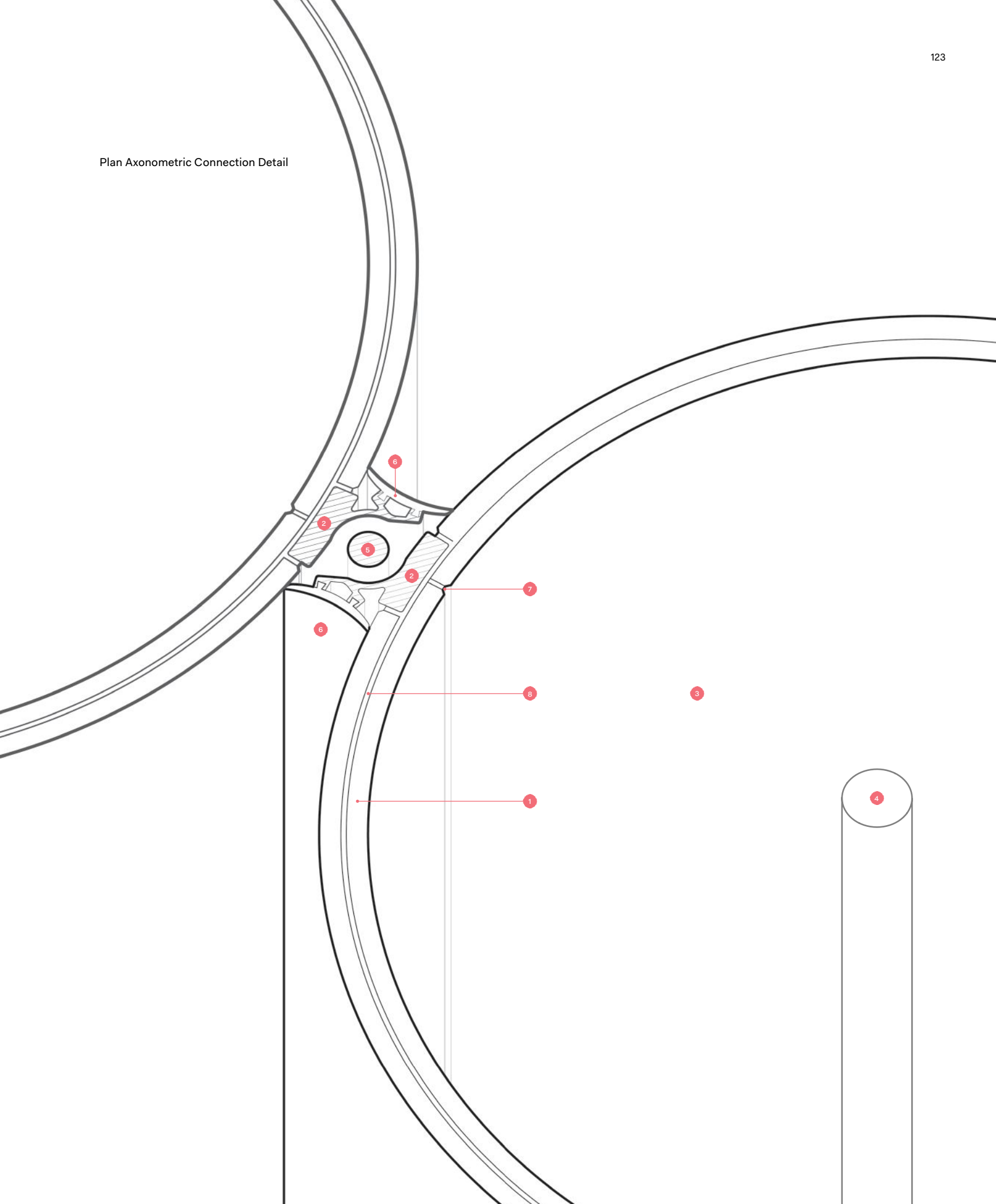
Prototype fabrication

Unit Plan Axonometric

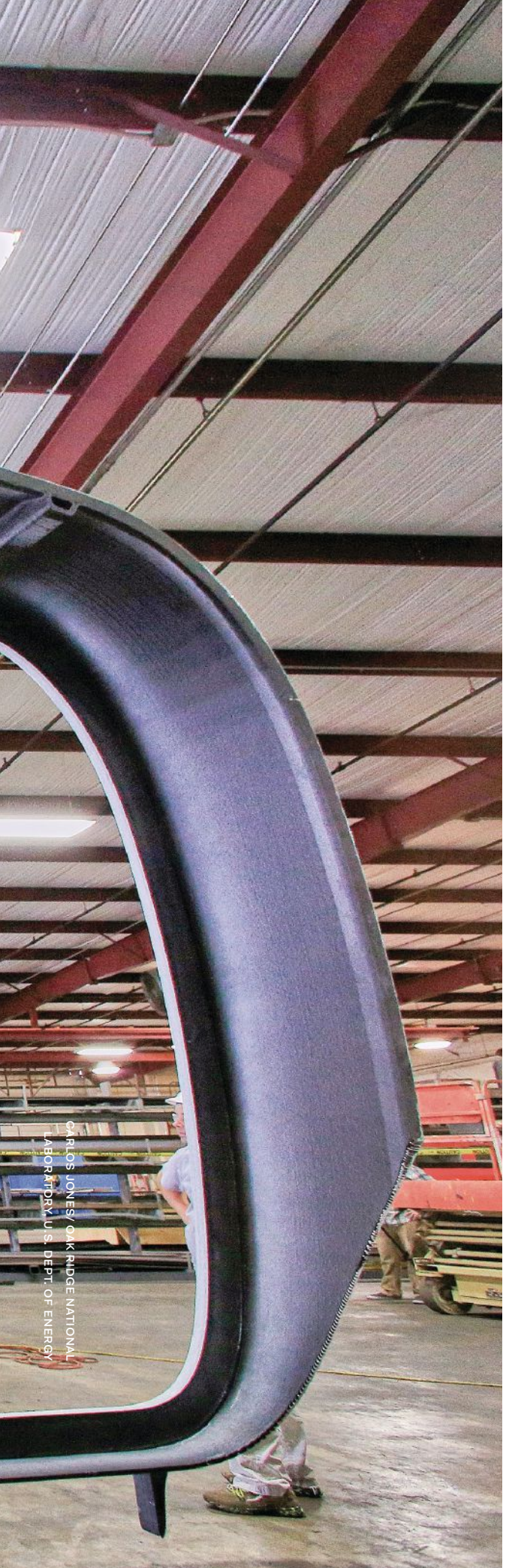


1. Curved low-iron glass
2. Vertical metal frame
3. Evacuated air space
4. PV rod
5. Hanger rod
6. Extruded weather-seal gasket
7. Adhesive bonded joint
8. Ionoplast interlayer

Plan Axonometric Connection Detail



Additive Manufacturing Integrated Energy Prototype



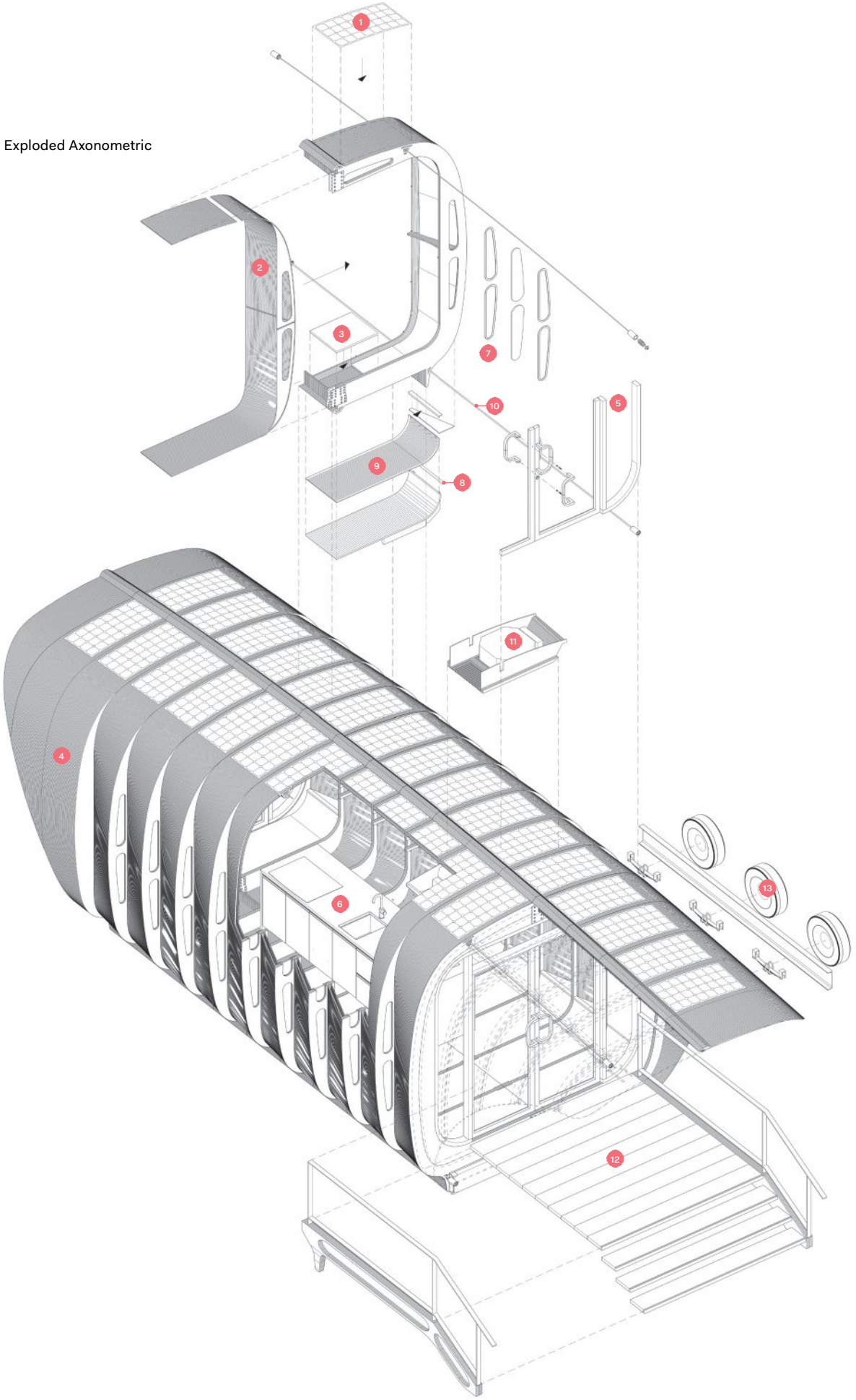
CARLOS JONES/OAK RIDGE NATIONAL LABORATORY, U.S. DEPT. OF ENERGY

"I think for the scale of the proposal, they're able to have many different aspects in great detail. An utterly compelling submission."

—juror Erin Besler

3D-printed components of the house being assembled

Exploded Axonometric



Award For most Americans, the two biggest expenses are their house and car. The same goes for the environment: The residential and automotive sectors are two of the biggest energy users in the U.S., in manufacturing, assembly, and operation.

So far, most efforts to reduce Americans' energy consumption have focused on these two market sectors separately. But starting a few years ago, a collaboration between **Skidmore, Owings & Merrill** (SOM), the **University of Tennessee, Knoxville**, and the **U.S. Department of Energy's Oak Ridge National Laboratory** (ORNL), asked: What if a house and a car, instead of being individual energy-consumption challenges, could be integrated into the same solution?

Together, the team developed the Additive Manufacturing Integrated Energy (AMIE) prototype—"additive" because it relies on 3D printing, and "integrated" because the components share energy sources. The first half of the project is a freestanding one-room house built from 3D-printed components, complete with a kitchen, living space, toilet, and Murphy bed. Instead of printing the entire house at once, the team printed it in pieces, which they then assembled in a parking lot. Additive printing obviates the need for window or door frames, and myriad other parts that normally go into even smaller structures, significantly reducing construction cost and waste.

The house draws energy from a solar array integrated into the roof. Alongside sits a black, boxy car also made largely from 3D-printed parts, which runs partly on natural gas but also uses bidirectional wireless energy transfer to draw idle power from the house—and to feed energy from either its battery or its on-board, natural-gas-powered generator back into the house when the car is not in use.

The triumvirate isn't about to put the house or car on the market, but as proofs of concept, they're invaluable. "3D printing gave us the capacity to design on the fly, and to do research on the fly," says Roderick Jackson, the group leader for building envelope systems research at ORNL.

You're not likely to see AMIE in your neighborhood any time soon, but the team hopes that its concepts filter quickly into the construction industry. "AMIE is not one silver bullet, but a constellation of fireworks," Jackson says. He and his colleagues are optimistic that 3D printing is the next big thing in the construction industry, not just because it's more sustainable, but because of its efficiencies over conventional building methods. Because AMIE's elements are printed, they can integrate a variety of functions—structure, insulation, storage, moisture barrier—into a single piece. This, SOM's Andrew Obendorf, AIA, points out, is "zero waste, in an industry that wastes 30 percent of what it uses."

CARLOS JONES/ OAK RIDGE NATIONAL LABORATORY, U.S. DEPT. OF ENERGY

1. Thin-film monocrystalline PV panels
2. Printed interior panel
3. Nanopore vacuum-insulated panels
4. Printed exterior envelope and structure
5. Kawneer insulated glass unit storefront
6. GE First Build micro-kitchen
7. Vitro Solarban Z50 glazing
8. Optolum Briteline 2LP LED light
9. Johnsonite linoleum flooring
10. Steel tensioning rod in greased sleeve
11. Mitsubishi minisplit
12. Alcoa aluminum planks
13. Steel chassis and removable wheels

CMU Fabrication and Construction in Haiti

Honorable Mention

Architect **Anthony Costello, FAIA**, has been traveling to Haiti for almost 20 years to help build in the desperately poor country, but it was only after the 2010 earthquake that he realized how structurally unsound Haitian construction can be. Many bricks used in multistory buildings aren't even kiln dried—as a result, they are so soft that they crumble in your hand. And most buildings are not laterally braced, so that strong horizontal movement—like an earthquake—knocks them over like matchstick towers.

Costello's solution to these structural issues is two-fold: First, he invented an easy-to-build kiln—powered by passive solar energy—to dry concrete masonry units made from a lightweight frame with a black polyethylene cover. Temperatures inside the kiln can reach 140 F, enough to cure the concrete bricks inside. He plans to build a full-scale version in Haiti this summer, and then begin training local artisans to use it.

The other half of the project—a design for an interlocking CMU—came from a team of students at Indiana's **Ball State University**, where Costello teaches. One of the students, Reva Derhammer, says the idea came out of one of Costello's studios, in which he asked students to examine how brick structures in Haiti failed. "The failure is always on the horizontal, because they never use horizontal rebar," she says.

The team's response, Inter-Block, works like an oversize Lego brick: each side has multiple facets so that when stacked together, regardless of orientation, they interlock, providing inherent lateral support. Internal voids and spaces on the sides allow for the typical vertical steel rebar, but Costello and team say the bricks are stable with or without mortar—a necessity in a country where construction resources can be scarce.

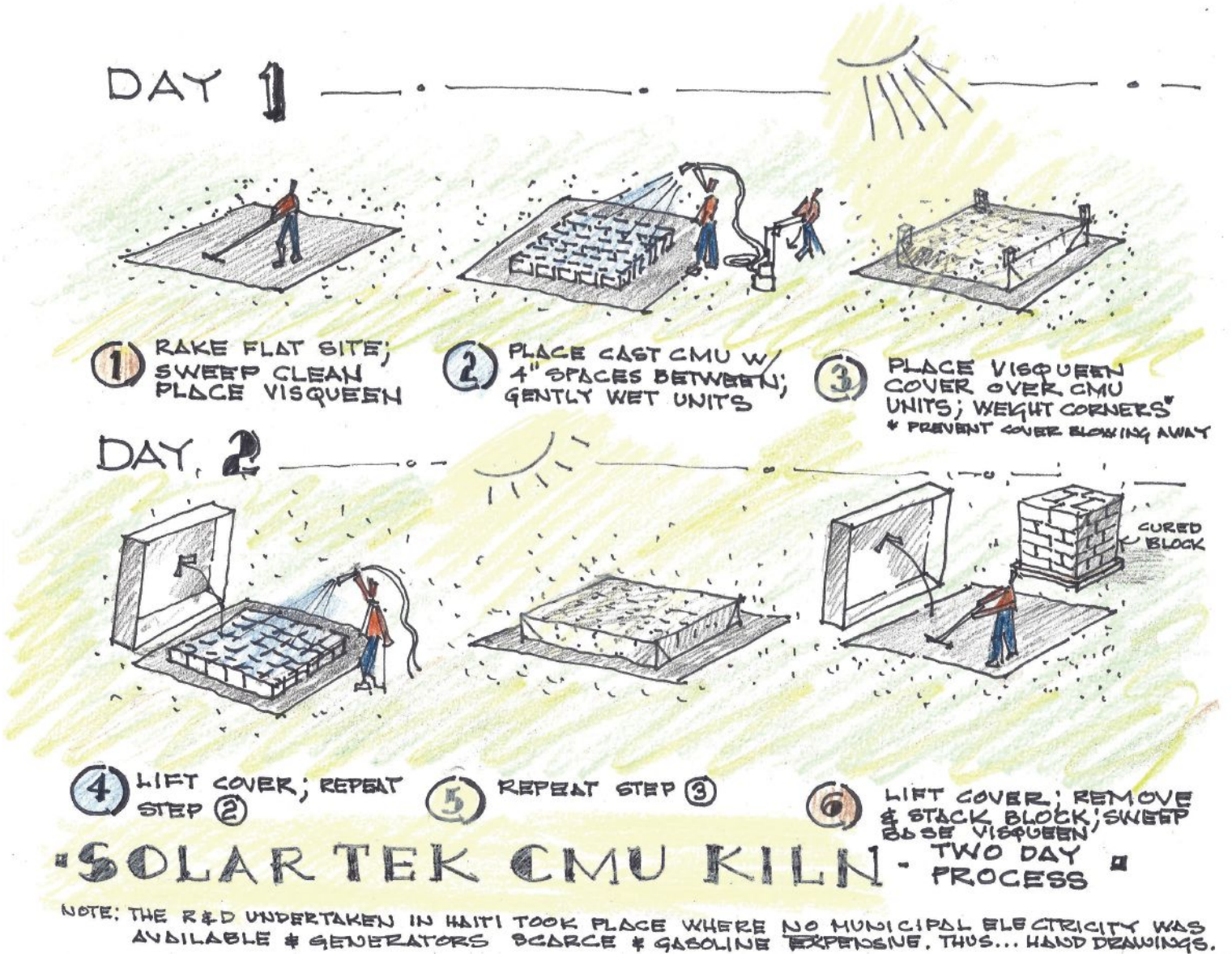
"It's so low-tech," he says, "but in Haiti, low-tech is an absolute necessity."

Inter-Block concrete masonry units

ANTHONY COSTELLO, FAIA

"This project is rigorously researched toward a specific end—to deliver capable buildings on the ground. It's a localized and elegant solution."

—juror Phillip Bernstein, FAIA



"They looked at a problem and found a really simple solution that could have an enormous impact."

—juror Erin Besler

Round Timber Trusses

Award The term "waste trees" is misleading—it refers to trees that are too thin to be milled into boards, not necessarily because there's anything wrong with the wood itself. But waste trees are a big problem: Today, about 10 percent of American forests—about 56 million acres—are overstocked and undermanaged, in part because so many trees are too small to make the timber industry's cut. That's where **WholeTrees Architecture and Structures** comes in. Based in Madison, Wis., the firm has spent 10 years developing applications for unmilled timber, opening up new markets for "using waste trees in innovative and beautiful ways," says Amelia Baxter, the firm's CEO and co-founder.

To WholeTrees, waste trees represent an overlooked opportunity. "Unmilled trees are 50 percent stronger than milled trees of the same width and species," Baxter says. They're as strong as steel in compression when you factor in the weight-to-strength ratio, and twice as strong in tension—in part because the tension fibers in the outermost rings of a tree are the first things to get cut off in the milling process. Using waste trees makes sense environmentally and financially, too. Large trees are harvested on a 30- to 60-year cycle. But small trees can be harvested on a 10-year cycle, which translates into a faster turnaround on investments and more jobs for loggers and drivers.

The firm's latest innovation, developed with a grant from the U.S. Department of Agriculture, is a high-tension wing-truss design that can span up to 60 feet and bear a load of up to 800 pounds per foot. The truss is made entirely of wood, save for steel connectors and reinforcements at major connection points that were refined through an intensive testing and research process—though Baxter says an all-timber truss is in the works.

So far, interest in the truss has come from what Baxter calls "nature-oriented institutions." For a new Madison location of Festival Food Store, an organic grocery chain, WholeTrees designed a roof structure that uses 86 of their new trusses, some up to 55 feet in span and bearing 29,000 pounds. (The design also incorporates 12 columns made from unmilled ash trees that were culled from Madison-area parks.)

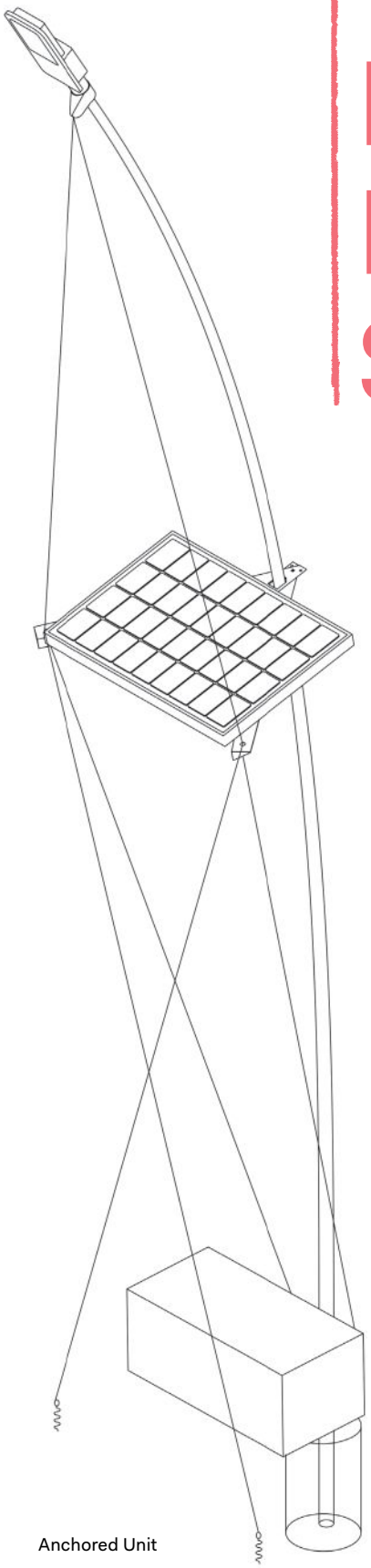
Wood construction is increasingly popular, though largely because of engineered wood products like glulam. But such products also face challenges—among them local codes. Unmilled timber doesn't have that concern, Baxter says, because it is definable as heavy timber in the International Building Code.

For the grocery store, the trusses make aesthetic as well as structural sense, and the client chose them in part as a symbol of its nature-friendly bona fides. In the future, Baxter and WholeTrees hope that all sorts of clients will choose unmilled timber—including those just as happy to cover up the wood like they would steel or concrete. "I want to get to the point where people are choosing this because it's cost-efficient with steel, not just because it looks good," she says.

Madison, Wis., Festival Food Store featuring WholeTrees' round-timber wing trusses

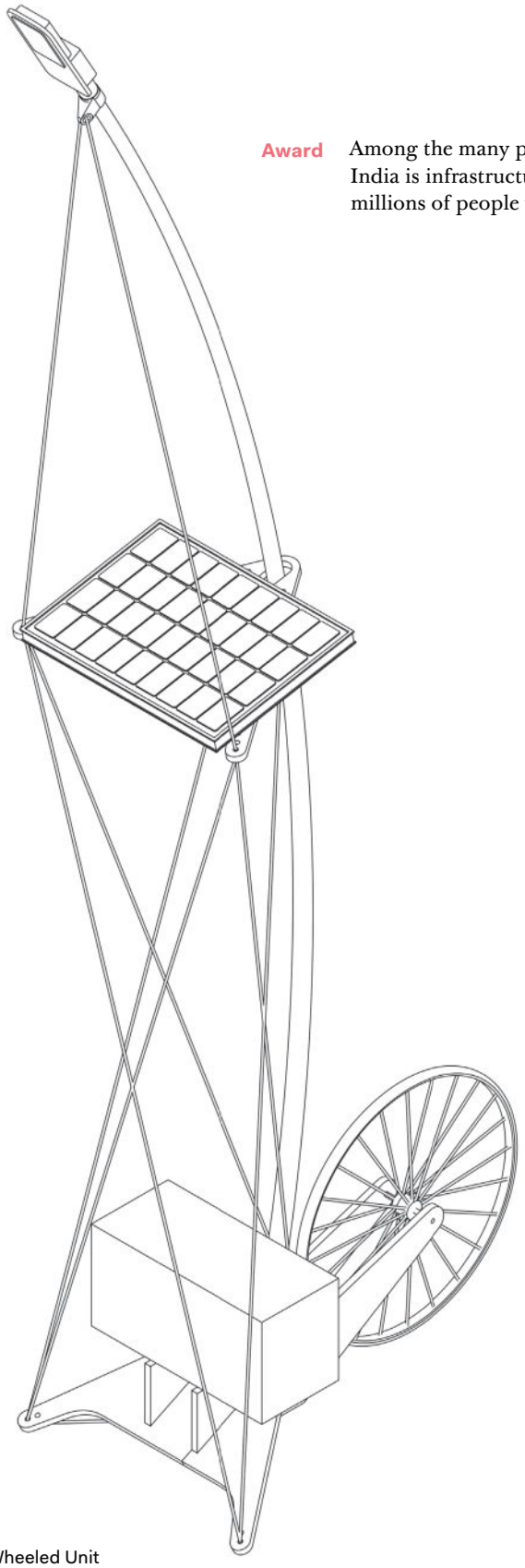
PAUL MCMAHON

Re: Lamp Lighting System



Anchored Unit

Tripod Unit



Wheeled Unit

COURTESY KENNEDY & VIOLICH ARCHITECTURE

Award Among the many problems facing a rapidly growing, rapidly urbanizing country like India is infrastructure—in particular, how to provide public services to the tens of millions of people who live in slums on the sprawling outskirts of large cities.

Part of the problem is that conventional solutions to things like public lighting are top-down and expensive, because they rely on buying imports and need to be installed as part of a larger network. "We have a lot of systems that are extremely centralized," says Huda Jaffer, lead designer at the SELCO Foundation, a not-for-profit "social enterprise" that aims to bring sustainable electricity to India's poor.

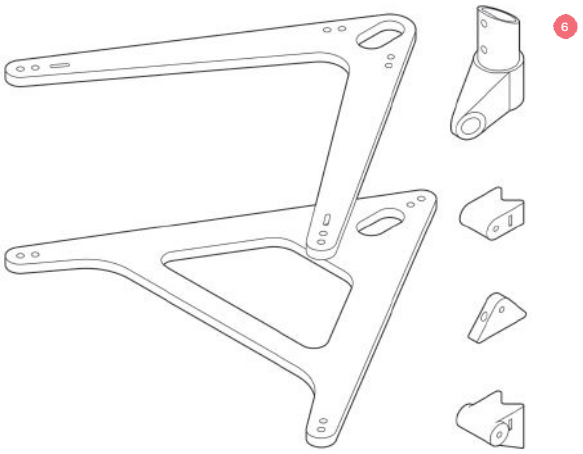
In designing a portable, locally manufacturable street lamp, SELCO, which partnered with Boston-based **Kennedy & Violich Architecture** (KVA), decided the only answer was to go greener. "We're trying to become sustainable not just on the operating energy side of things, but on the embodied energy side as well," says Sheila Kennedy, FAIA, a founding principal of KVA. The carbon-zero Re: Lamp is built around a bamboo mast, which is plentiful and can be harvested locally. Fixtures and hardware—like the battery box, LED head, and tension cables—come in a kit of parts distributed from urban centers; other components, like the LED mount, can be made locally on a 3D printer. Shades are produced by area manufacturers that make dishware from the fibers of areca palm trees, using the same manufacturing process, just with a digitally fabricated mold. When the pieces are assembled, the result is a lamp that one can buy and build for next to nothing—and that uses 250 percent less embodied energy than a steel equivalent. And it's just as strong, if not more so, says KVA designer Robert White. "The locally sourced bamboo was like a supermaterial," he says. "If I had asked for carbon fiber, I couldn't have gotten a better material."

But it's not just the environment that benefits. By decentralizing the construction and ownership of the lamps, the project encourages "streetlight entrepreneurs" to rent their products and services—say, to nighttime sports or education events. "There are lots of skilled artisans in India who are getting a dollar a day," Jaffer says. "We asked, 'How can we push a product that draws on these skills as well?'"

With lighting entrepreneurs in a village or neighborhood, suddenly it doesn't matter whether the locals are "on the grid." They can hire a light owner to come set up shop by their evening school or night market. And if parts break, they're easily replaceable.

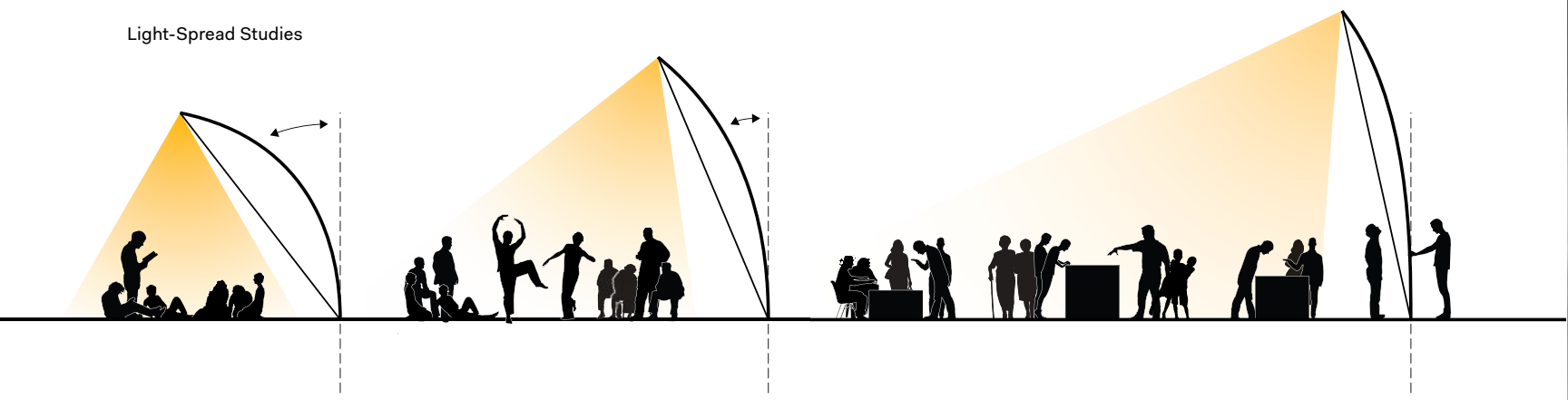
Kennedy calls such high-tech/low-tech innovation "hybridization," and she says she sees more and more of it in the developing world. These approaches are going to be absolutely critical in future efforts to integrate developing countries into the rest of the world.

Re: Lamp Kit of Parts



1. Tension cables
2. LED lamp head
3. Battery box
4. Hardware
5. Steel or plywood spreader bar
6. 3D-printed hardware
7. Areca shade

Light-Spread Studies



"I really liked the combination of solving a modern problem in a context-appropriate way."

—juror Phillip Bernstein, FAIA

Credits

Dynamic ETFE Façade for the Ed Kaplan Family Institute for Innovation and Tech Entrepreneurship, page 108
Client: Illinois Institute of Technology
Design Firm: John Ronan Architects, Chicago · John Ronan, FAIA (principal); Marcin Szef, Sam Park, Eric Cheng, Danielle Beaulieu, AIA, Laura Gomez Hernandez (project team)
Fabricator: Vector Foiltec
Structural Engineer: Werner Sobek Group, Stuttgart
M/E/P Engineer: dbHMS
General Contractor: Power Construction
Funding: Illinois Institute of Technology
Special Thanks: Ludwig Mies van der Rohe

The Empathy Effect | Mixed Reality for Design, page 112
Design Firm: HGA Architects and Engineers, Minneapolis · Jonathan Bartling (project adviser); Alanna Carter (principal); Anupam Das, Adam Hunt, Nicolas Ramirez, Tom Suess, Jared Widner (project team)
Funding: HGA Architects and Engineers
Special Thanks: Erika Eklund, Rich Firkins, Terri Zborowsky

Niamey 2000, page 114
Design Firm: United4Design, Seattle, and Niamey, Niger · Yasaman Esmaili, Elizabeth Golden, AIA, Mariam Kamara, Philip Sträter (project team)
Structural Engineer: Urbatec SARL
General Contractor: Entreprise Salou Alpha & Fils
Fabricator: Atelier de Technologie Metallique

Trigeneration System at Oakland University Engineering Center, page 118
Client: Oakland University
Design Firm: SmithGroupJJR, Detroit · Paul Urbanek, FAIA (principal designer); George Karidis (mechanical engineer); Chris Purdy, AIA (principal-in-charge); John Sobetski (senior project manager); Andy Arnesen, Laura Walker, AIA, Mike Nowicki, Sarah Wickenheiser, Kevin Gurgel, Luke Renwick, Dino Lekas, Mark Lodewyk, Chris Vanneste, Lori James (design team)
Structural and Electrical Engineer/Lighting Designer: SmithGroupJJR
General Contractor: Walbridge
Fire Protection Consultant: Jensen Hughes
Cost Estimating Consultant: Kirk Value Planners
Acoustics Consultant: Talaske

Vacuum-Insulated Glass Tubes, page 120
Design Firm: Skidmore, Owings & Merrill (SOM), New York · Mark Sarkisian (structural and seismic engineering partner); Aybars Asci, AIA (director); Teresa Rainey (director); Gary Haney, FAIA (design partner, project adviser); Christopher Olsen, AIA (associate director); Elizabeth Boone, FAIA (architect)
Structural and M/E/P Engineer: SOM
Consultants: Dentons US
Fabricator: Cristacurva; W&W Glass
Drawings: Dentons US

Additive Manufacturing Integrated Energy (AMIE) 1.0, page 124
Client: Oak Ridge National Laboratory (ORNL)
Design Firm: Skidmore, Owings & Merrill (SOM), Chicago · Phil Enquist, FAIA, (partner-in-charge of urban design and planning); Brian Lee, FAIA (design partner); Tanvi Parikh (project manager); Andrew Obendorf, AIA (senior design architect); Leif Eikevik, AIA (technical architect); Maged Guerguis (design architect); Rodrigo Buelvas (interior design architect); Lucas Tryggestad, AIA (senior technical director); Benton Johnson (structural engineer)
Project Team: ORNL, Oak Ridge, Tenn. · Roderick Jackson (group leader); Melissa Lapsa, LaTonya Jordan, Randall Lind, Pete Lloyd, Lonnie Love, Kim Askey, Jerald Atchley, Kaushik Biswas, Heather Buckberry, Scott Curran, Anthony Gehl, Johney Green, David Nuttall, Brian Post, John Rowe, Sara Shoemaker, Martin Keller, Edward Vineyard, Jimmie Wade, Robert Wagner, Steve Whitted, Donald Erdman III, Brittany Piercy, Robert Ihle, Mark Buckner, Steven Campbell, Paul Chambon, Madhu Chinthavali, Philip Irminger, Karen Nolen, Ben Ollis, Omer Onar, Burak Ozpineci, Larry Seiber, Mitch Smith, Michael Starke, Zhiqiang Wang, Cliff White, Randy Wiles, Bailu Xiao, Brandy Milun, Maxwell Bertram, Dean Deter, Norberto Domingo, Jennifer Hill; University of Tennessee, Knoxville, College of Architecture and Design, Knoxville, Tenn. · Scott Poole, FAIA (dean and professor); James Rose, AIA (senior lecturer, adjunct assistant professor, director of Institute for Smart Structures)
Academic Research Partner: University of Tennessee, Knoxville, College of Architecture and Design
M/E/P/Structural Engineering: SOM
Design, System Engineering, and Additive Manufacturing: ORNL
Construction and Assembly: Clayton Homes
Fabricator: ORNL and Tru Design
Exterior Finishing: Tru Design
Funding: U.S. Department of Energy; Governor's Chair for High Performance Energy Practices in Urban Environments (Energy + Urbanism)

Improving the Strength of Concrete Masonry Construction in Haiti and the Third World, page 128
Client: National Concrete Masonry Association; Midwest Masonry Council
Design Firm/Fabricator: Costello + Associates, Muncie, Ind. · Anthony Costello, FAIA (project adviser and primary investigator)
Student Research Assistants: Ball State University, Muncie, Ind. · Bryce Derhammer, Reva Derhammer, Alex Thomas, Reed Thompson
Funding: National Concrete Masonry Association; Midwest Masonry Council
Special Thanks: National Concrete Masonry Association; Midwest Masonry Council; Ball State University; Father Andre Sylvestre

Round Timber Structural Components: Commercial-Scale Wing Truss, page 130
Client: Gebhardt Development; Festival Foods
Design Firm/Fabricator: WholeTrees Architecture and Structures, Madison, Wis. · Amelia Baxter (CEO and co-founder), Roald Gundersen (co-founder)
Primary Investigator: Douglas Rammer (Forest Products Laboratory)
Structural Engineer: General Engineering Co. (GEC); Forest Products Laboratory
General Contractor: Tri-North Builders
Funding: USDA Small Business InnovationResearch Program; private investment
Special Thanks: Chris Gosch, AIA (Bark Design); Kent Fish (GEC); Karl Fink (Fink+Associates); Bill Bennoyer (Tri-North Builders); Chris Miller (New Paradigm Design Workshop); Adrian Pereyra (Pere Design); Alyssa Tope, Kysa Heinitz, Tom Mack, Martin Whitehead, Candace Kao, Michaela Harms (WholeTrees Architecture and Structures)

Re:LAMP, page 132
Client: SELCO Foundation
Design Firm: Kennedy & Violich Architecture, Boston · Sheila Kennedy, FAIA (principal, project adviser); Robert White (designer, primary investigator)
Project Team: SELCO Foundation, Bangalore, India · Huda Jaffer (lead designer), Varsha Sastry (product designer), Assad Jaffer (fabrication partner)
Research Assistants: MIT, Cambridge, Mass. · Joe Varholick, Charlotte D'Acierno, Danniely Staback, Anne Graziano, Ching Ying Ngan, Alice Kao
Fabricator: SELCO Foundation
Funding: The Lemelson Foundation
Special Thanks: Santhi Davedu (senior program manager at SELCO Foundation); Khyati Shukla (product designer at SELCO Foundation); Ujire Areca Manufacturer

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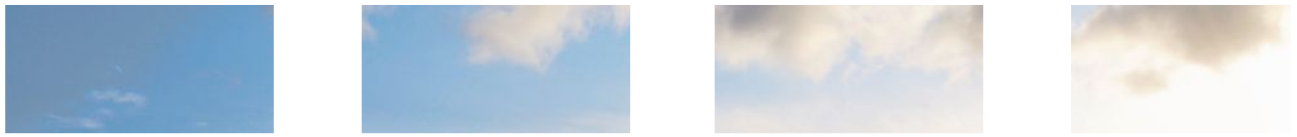

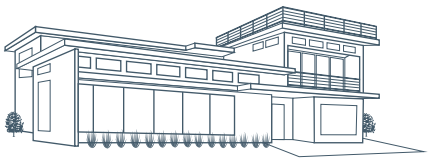

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Residential:

Latino and Latin American Artists Dissect the Meaning of "Home" in an Exhibition from LACMA, UCLA, and MFAH

MUSEUM ASSOCIATES/LACMA

TEXT BY SARA JOHNSON

A new exhibition, "Home—So Different, So Appealing: Art from the Americas since 1957," explores the idea of "home" through the work of 40 Latino and Latin American artists, such as María Elena González's *Magic Carpet/Home* (above, left), Daniel Joseph Martinez's *The House America Built* (above, right), and Abraham Cruzvillegas' *Autoconstrucción* (left). The exhibition's title stems from a piece by Miguel Ángel Rojas, itself a reference to a 1956 collage by artist Richard Hamilton. Organized in seven thematic sections, the exhibition examines societal influences on domestic life as well as the impact of a home's physical traits such as floor plans and furniture. "Home—So Different, So Appealing" runs through Oct. 15 at the Los Angeles County Museum of Art, and opens at the Museum of Fine Arts, Houston, on Nov. 19.

> *See more work from "Home—So Different, So Appealing" at bit.ly/HomeLACMA.*

The "It" Knurl

TEXT BY SELIN ASHABOGLU

1. Litze Single-Handle Lavatory, Brizo Streamlined geometric shapes define this fixture, which features textural knurling around the rotary valve just above its base. Litze's spout accommodates a water-efficient laminar flow aerator and has a 5.5" reach. Offered in seven finishes. *brizo.com*

2. LMK Industrial Single Lever Lavatory Mixer, Samuel Heath This Bauhaus-inspired faucet incorporates intricate knurling as well, on its single lever and the lip of its angular spout. Available in five finishes. *samuel-heath.com*

3. Dean Widespread Lavatory Set, THG Paris Hearkening back to the golden age of aviation, this faucet combines slim, curved details with delicately knurled fasteners that secure each valve base. The two levers measure 4.37", while the spout stands 6.25"-tall. *thg-paris.com*

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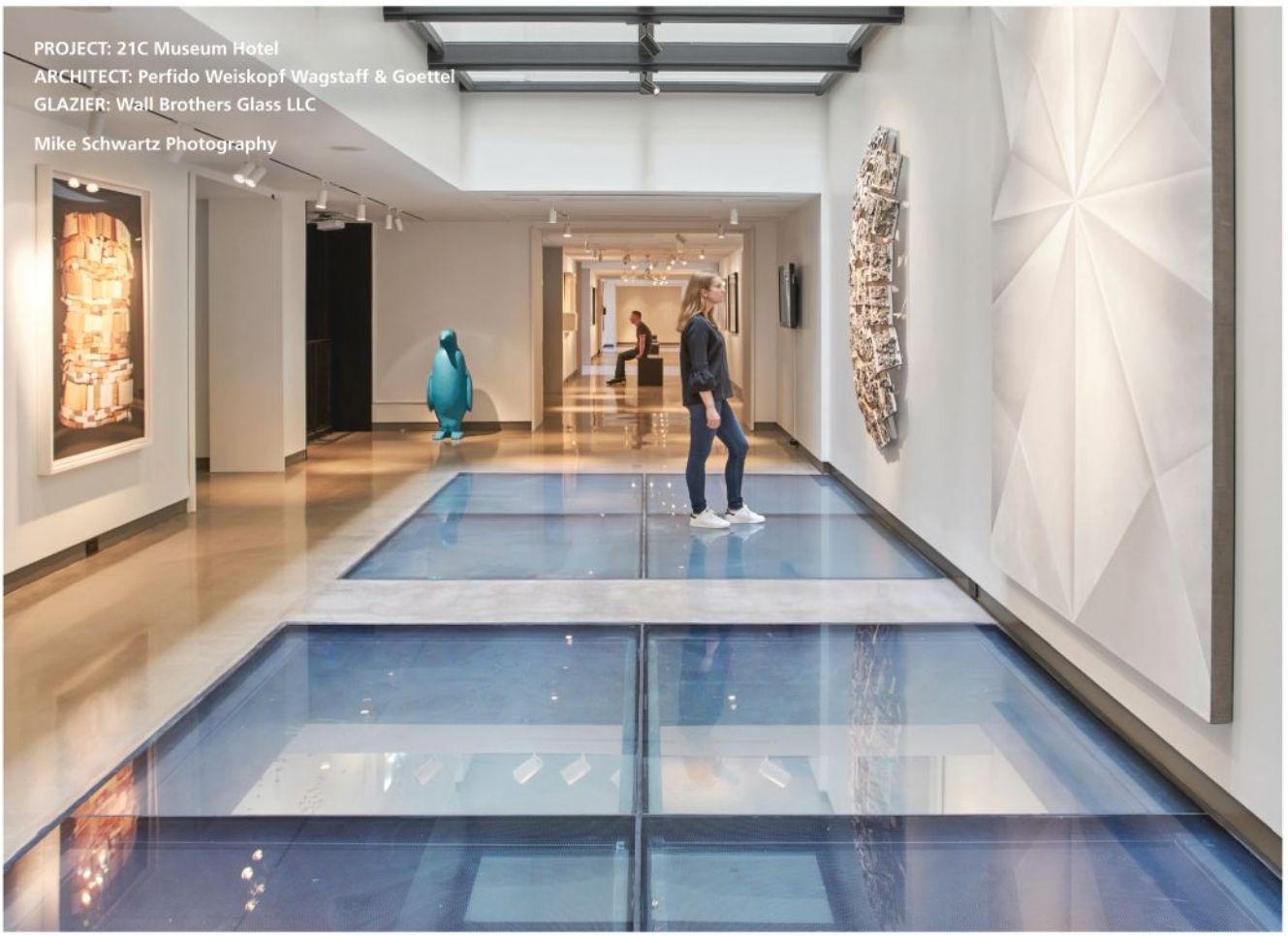

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The David and Gladys Wright House's Newest Resident: The School of Architecture at Taliesin

TEXT BY AYDA AYOUBI

Described by Frank Lloyd Wright as "how to live in the southwest," the David and Gladys Wright House rises above the Phoenix desert at the base of Camelback Mountain, manifesting the architect's distinctive design idea of organic architecture. A spiral ramp coils around the parking area, a former swimming pool, and a courtyard, leading into a sequence of living spaces that provide an unobstructed 360-degree view of the mountain range over orange trees.

Now, the single-family house the architect designed for his son and daughter-in-law will be part of the School of Architecture at Taliesin (formerly the Frank Lloyd Wright School of Architecture). Completed in 1952, the house remained the couple's residence until Gladys' death in 2008 (David died in 1997). In 2012, a real estate developer purchased the house with plans to demolish it before Zach Rawling, a lawyer and custom-home builder, stepped in and bought it.

On June 8, plans were announced to donate the house to a new supporting organization of the Arizona Community Foundation for the benefit of the architecture school, which currently has two campuses in Scottsdale, Ariz., and Spring Green, Wis.—Taliesins West and East. While the school will begin occupying the house this year, the Rawling family will not transfer ownership to the organization until it reaches a $7 million endowment goal. The organization will own the house and manage the endowment, while the school will take over the house's operation, restoration, and preservation, and use it as a community, cultural, and education center.

MARK LIPCZYNSKI

> *View more images of the David and Gladys Wright House at bit.ly/DavidGladysWrightHouse.*

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Haussmann Stories
Paris
Chartier-Corbasson Architectes

TEXT BY EDWARD KEEGAN, AIA
PHOTOS BY ROMAIN MEFFRE &
YVES MARCHAND

The Rue Championnet lies roughly half a mile north of Sacré-Cœur in Paris' 18th arrondissement. The area is marked by a seemingly endless parade of seven-story masonry façades, and the awkward angles at which the non-orthogonal streets meet sometimes leave oddly shaped vacant lots. Infilling just such a plot was the task given to Paris-based Chartier-Corbasson Architectes, and lead architect Thomas Corbasson tackled it with a creative merging of old and new.

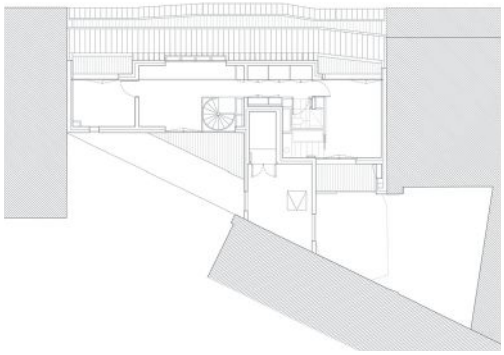
The client had unsuccessfully tried to crack the site's geometric complexities two decades ago. This time around, the program called for 12 apartments within the allowable eight-story-tall, 10,032-square-foot envelope. Each floor contains two flats, a minimal hallway, an elevator, and a spiral egress stair. All of the 517-square-foot one-bedroom units and 614-square-foot two-bedroom units open to the street façade to the north, with additional light and ventilation provided through small rear light wells. A duplex sits atop the tiny complex within the outline of a traditional mansard roof. The ground floor contains a bike room and other amenity spaces, as well as a three-car garage.

The nearby streetscapes are highly regularized per Baron Haussmann's Parisian redevelopment: masonry walls perforated by punched windows, modest classical details, and a well-developed vertical division of base, shaft, and capital delineated by traditional moldings. "I didn't want a different façade," Corbasson says. "It had to mean Paris." The firm interpreted the neighboring façades by printing a digital image, based on a photograph of one that Corbasson shot, onto composite panels that sheath the structure. Operable shutters allow light and air into the apartments. The architects used computer modeling to develop the façade's opacity, and used two types of panels: solid in front of fixed walls, and porous, with drilled apertures, for the movable units in front of windows and doors.

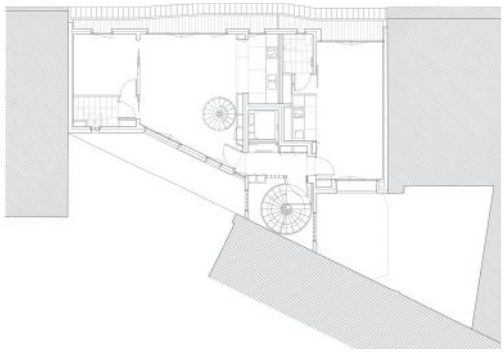
Calculating and drawing the façade's image required combining all the computers in the firm's seven-person office for three days to render the imagery. The digital document didn't just serve an aesthetic purpose; the photograph was transformed into a vector-based drawing composed of circles, which was used as a guide to drill perforations in each operable panel, ensuring the desired visual effect was attained from the street and in each apartment. Corbasson says that shutters on classical French houses admit daylight even when closed, and the same is true here.

On at least one block of the Rue Championnet, Baron Haussmann's 19th-century vision of a continuous Parisian street wall has been realized two centuries later—with a new boldly contemporary insertion that mimics old forms in new materials.

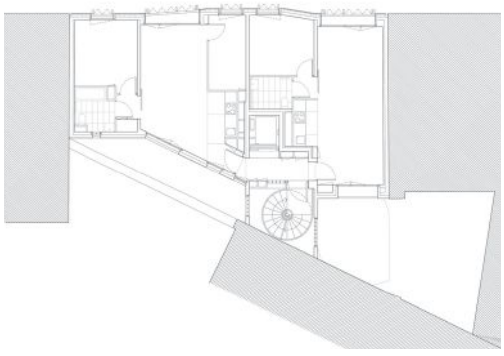
Eighth-Floor Plan



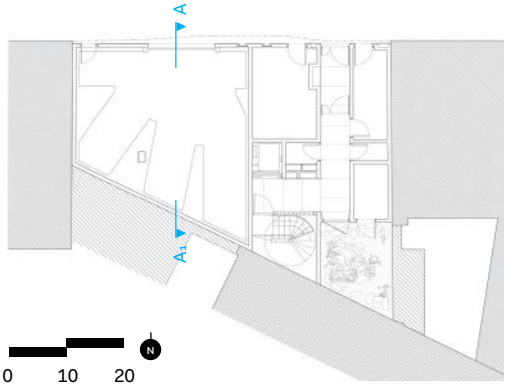
Seventh-Floor Plan



Second–Sixth-Floor Plan



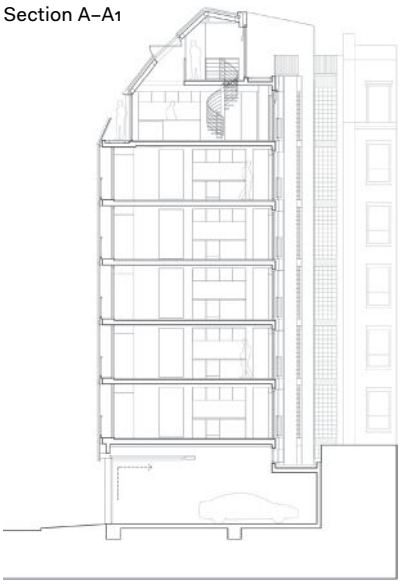
Ground-Floor Plan



Opening Page: The printed image on the composite-panel façade is based on a photograph the architect took of a neighboring Haussmann-era building.

Below: Operable panels at each apartment open balconies to light and air.

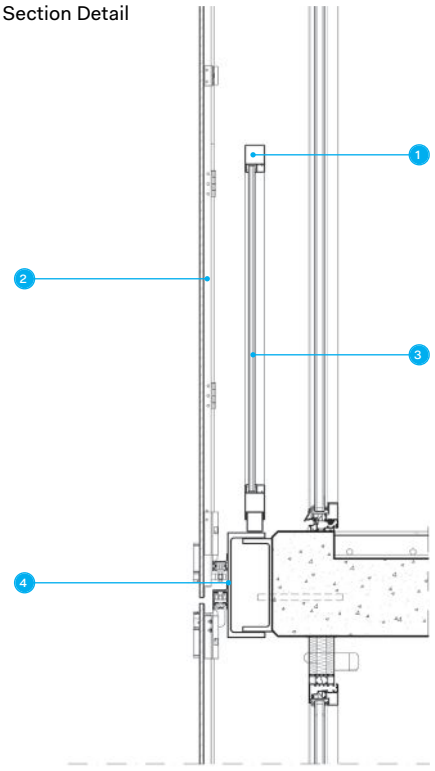
Section A–A1



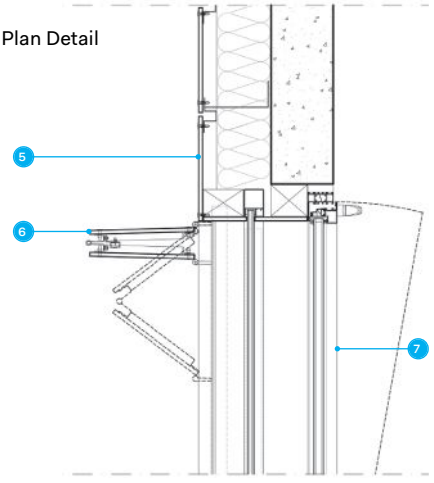
Opposite: Glass doors lead to balconies behind the operable panels.

Above: Like shutters on older French houses, the perforated panels admit light even when the windows are closed.

Façade Section Detail



Façade Plan Detail



1. Forster Presto powdercoated railing
2. Operable, perforated Trespa panel on black lacquered steel frame
3. ACG Pyrobel 16EG glazing
4. Hot rolled steel beam
5. Fixed Trespa panel
6. Operable, perforated Trespa panel
7. Glass patio door

0 0.5 1

An open living space in the top-level duplex unit

Project Credits
Project: Haussmann Stories, Paris
Client: Withheld
Architect: Chartier-Corbasson Architectes, Paris · Thomas Corbasson (lead architect); Luca Muratorio, Michelle Ramirez, Emmanuel Leroy (collaborators)
Acoustic: Alternative
Engineering: FACEA
Size: 932 square meters (10,032 square feet)
Cost: €2.1 million ($2.3 million USD)

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Editorial: Architecture Is an Antidote

Two out of three Americans are dissatisfied with "the way things are going in the United States," according to a May 2017 Gallup poll. Popular opinion could scarcely be otherwise, with mass and social media serving a 24-hour, all-you-can-eat buffet of apocalyptic drama, some of which can be legitimately tagged as *#fakenews*, and far too much of which falls under the category of nonfiction.

Nowadays, it appears, exhibiting optimism about the future, or even nostalgia for a moment in the past when the future seemed bright, is to risk being pigeonholed as disingenuous, naive, or downright crazy. Conventional techno-boosterism, as exemplified by the 1960s cartoon series *The Jetsons*—"the single most important piece of 20th century futurism," according to *Smithsonian* magazine—simply doesn't fly today, at least not without an injection of irony. Is it foolish, then, for architects to offer the possibility of a better life through design?

On the contrary. Of all the important work that the profession needs to do, nothing may be more urgent.

To be clear, when I refer to a "better life through design," I don't mean form or style, per se. It's axiomatic that architects can assemble glass, masonry, and metal into structures of great beauty: Those who do so especially well are the celebrities of the profession. Moving forward, however, success should be defined as much by how buildings work as by how they look—indeed, that is a central purpose of our annual R+D Awards (see page 106): to encourage technological excellence as an essential factor in the overall ethic of design excellence.

The advent of the steel frame inspired Louis Sullivan to coin the famous dictum "form follows function" back in 1896. Today the *lieber meister* likely would be spellbound by the efficiencies of prefabrication, 3D printing, and mass customization; by the information-processing and -sharing power of cloud computing; and by the revolutionary capacity for buildings to conserve water, produce more energy than they consume, and generally modulate their behavior in response to external stimuli.

"Function," in other words, encompasses a set of capabilities for the design, construction, and operation of buildings that Sullivan never could have imagined. All together, these technologies constitute an epochal advance in architecture, with transformative potential for society at large.

The profession must continue to put these new advantages to good use, toward the creation of a more sustainable built environment. Professional standards and culture should evolve to focus intensely upon that goal, so that, for instance, every project can pursue the Living Building Challenge, every firm feels ready to adopt the 2030 Challenge, and every practitioner has the opportunity to obtain the necessary skills.

Just as importantly, the profession needs to craft a popular narrative around the possibilities of this revolution in architecture. Instead of merely telling the world that architects are important, we should show the world what architecture is capable of achieving. This a milestone moment. We must lobby, market, and proselytize. We must sell the smart, efficient, living building with passion and persuasiveness. And in so doing, we will point the way to a better future.

STEPHEN VOSS

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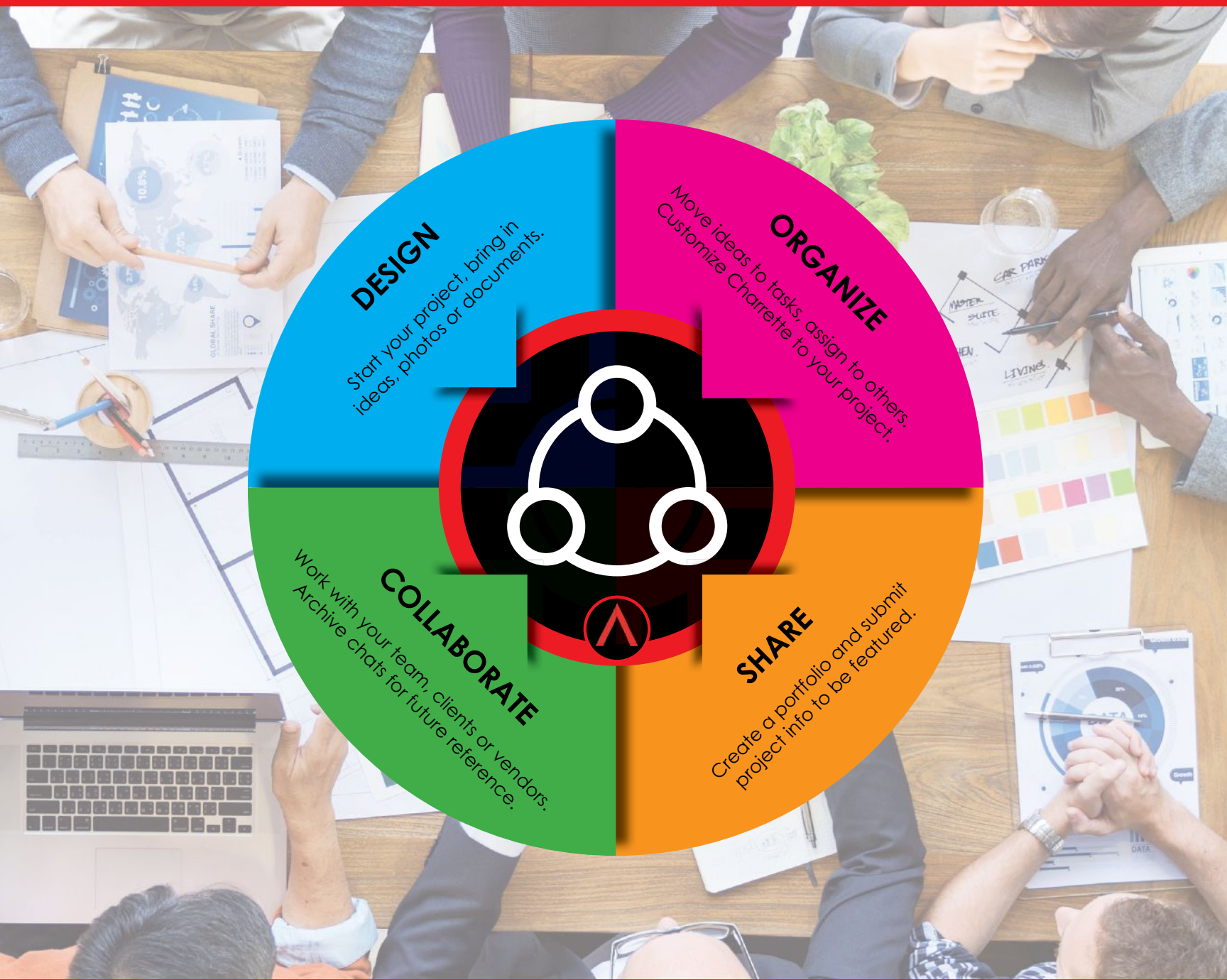

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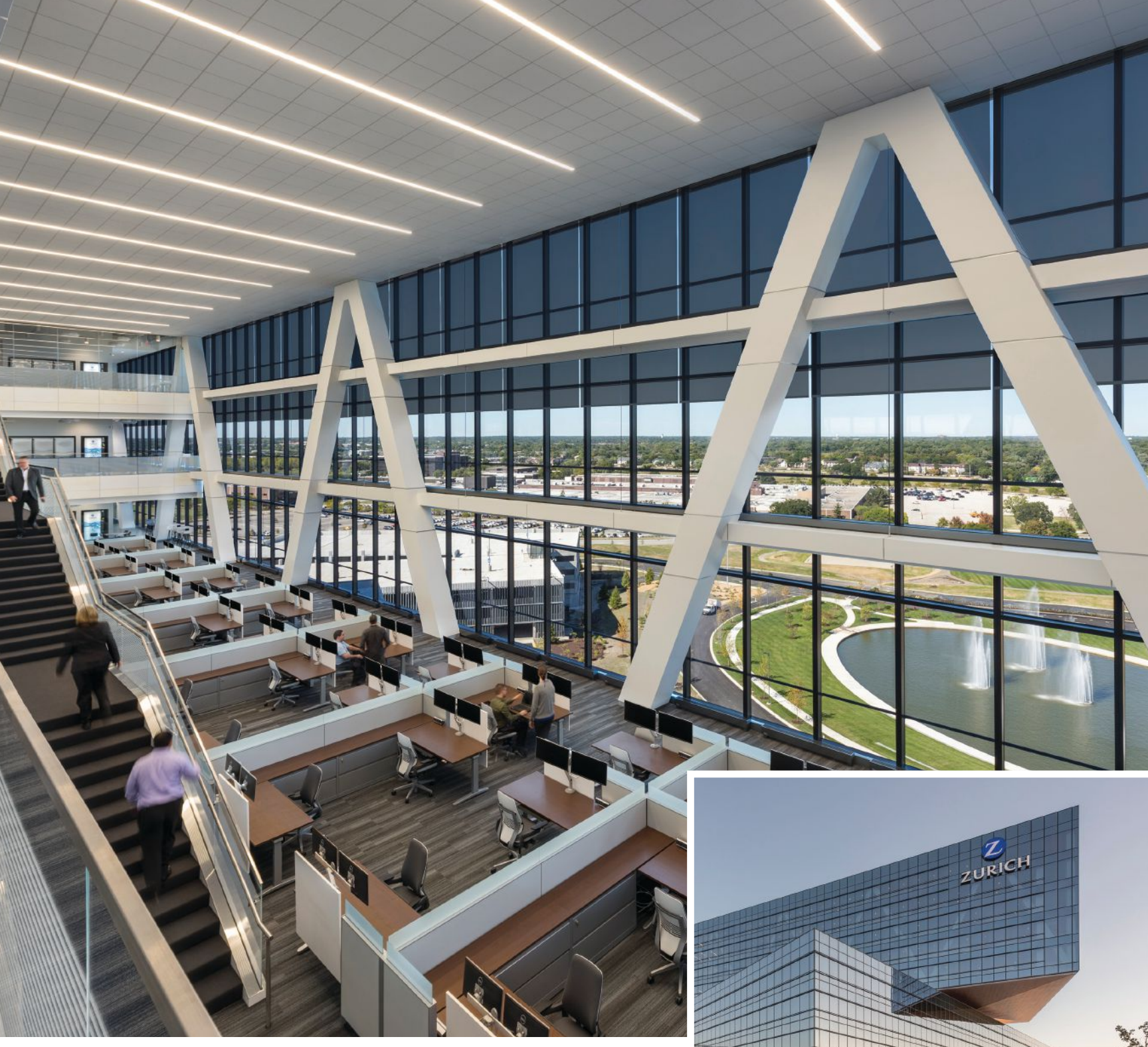

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