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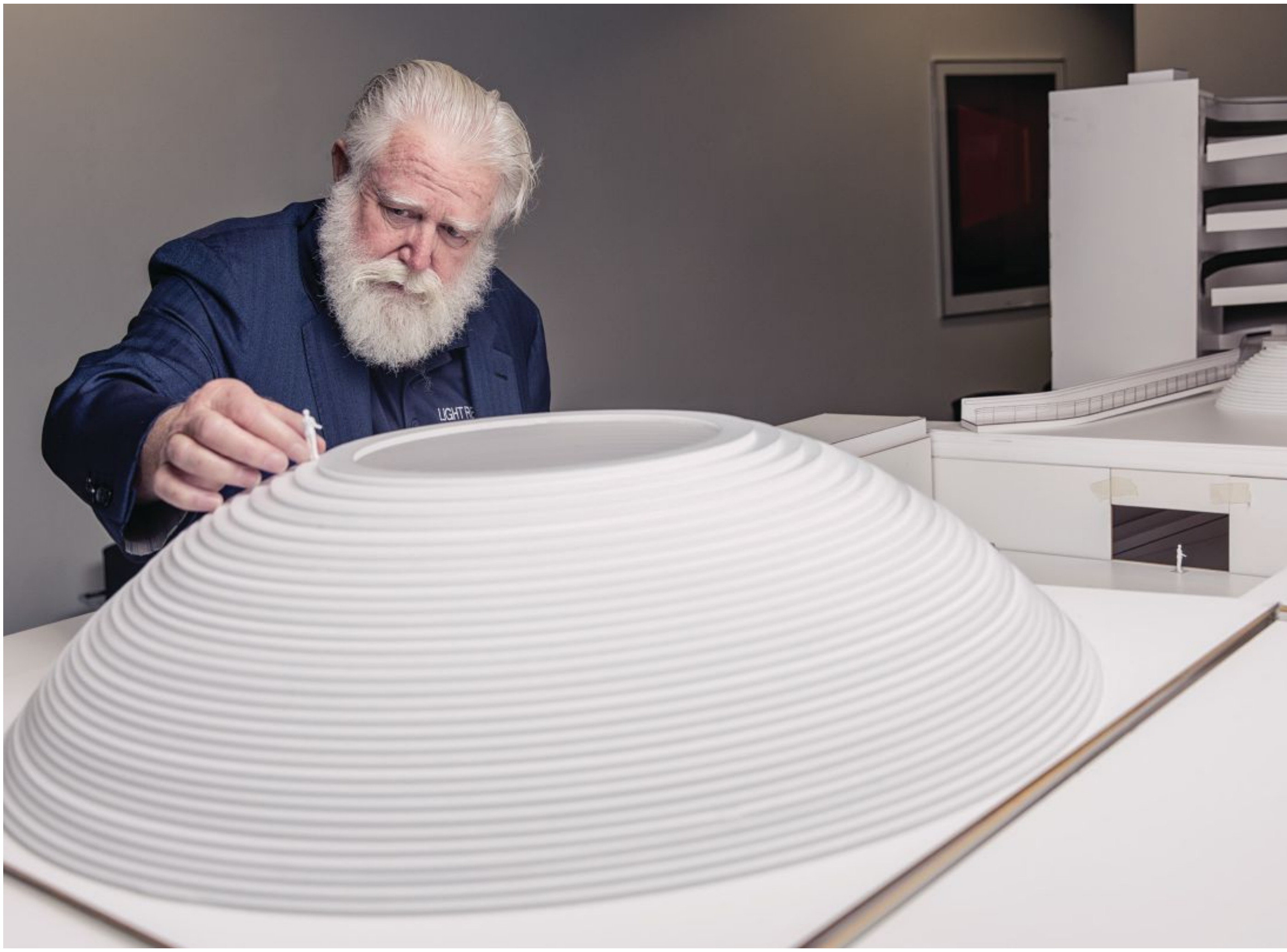

Danish Color Dome

American artist James Turrell is imparting his mastery of light upon an addition to the ARoS Aarhus Art Museum in Aarhus, Denmark. The addition, called The Next Level, is being designed by local firm Schmidt Hammer Lassen Architects, which designed the original museum building in 2004. Artist Olafur Eliasson added a glazed circular walkway, *Your rainbow panorama*, to the rooftop in 2011. The €30 million, 1,200-square-meter expansion will incorporate two of Turrell's celebrated, architectonic light installations, one titled *The Sphere* and the other (inspired by the Pantheon in Rome) titled *The Dome*. The addition is scheduled to open in 2018.

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What Once Was Gas is Now Green

As part of the huge King's Cross redevelopment plan in London, local firm Bell Phillips Architects has repurposed a holdover from the area's Victorian past as a centerpiece for the future. This two-story, 35-meter-diameter metal structure was a gasholder for the Pancras Gasworks, the largest company of its kind in London, and was in operation for 150 years before being shut down in 2000. In 2009, Bell Phillips won a competition to design Gasholder Park, adding the shimmering steel pavilion inside the structure. The gasholder was disassembled in 2011 to be refurbished, and returned to the site in 2013.

JOHN STURROCK


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Et tu, Brutalism?

Before you try to save something, understand what you are trying to save ... or at least how many. That's the driving force behind #SOSBrutalism, a call to arms for what might be the most unloved architecture style of the past century—Brutalism. The website is inventorying buildings worldwide, such as Janko Konstantinov's Post Office and Telecommunications Center in Skopje, Macedonia (above), with a browsable database that now has more than 750 entries. "More importantly," write the organizers on the site, this "is a platform for a large campaign to save our beloved concrete monsters." Use the hashtag to flag buildings and hopefully save them.

YEOWATZUP

> *Become a part of the #SOSBrutalism movement at sosbrutalism.org.*

JOHN STURROCK

It Comes in Peace

Nearly 50 years after it first arrived at Planet Earth, this 1968 flying saucer lands on the terrace of a design school in London. The Futuro house, originally designed by Finnish architect Matti Suuronen, was restored by artist Craig Barnes in South Africa, and then taken apart and shipped to the Central Saint Martins College of Art and Design campus where it was reassembled over 18 months and now serves as host to a yearlong series of performances, speeches, and other events for the college. You can visit the Futuro house on the first Wednesday of each month for £3, or book it for a private event.

Image courtesy of KTGY, Inc.

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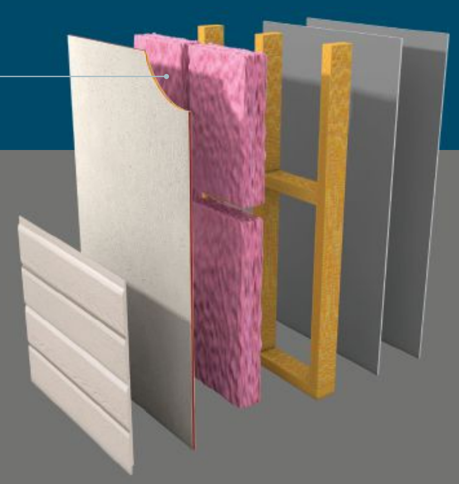

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Medieval Elevator

The centuries-old historic center of the Catalan city of Gironella overlooks the Llobregat River, which runs south to Barcelona. It also looks down, way down, on the modern portion of the city across the river. The 20-meter-tall height of the hill and wall on which the old medieval castle sits has put a crimp in sightseeing and has caused many locals to move to the newer, more easily navigable, part of the city. To mend this break in the social fabric, Barcelona-based firm Carles Enrich designed an elevator made with a locally produced steel structure, a lattice of bricks on three sides, and glass that lines the entrances at the top and bottom.

ADRIÀ GOULA


Photo © VanceFox.com, Jim Morrison Construction

Best Practices: Developing a Game Plan for Giving Back

TEXT BY BRIAN LIBBY

After Hurricane Sandy struck in 2012, New York architect Andrew Franz, AIA, began working with Architecture for Humanity on a series of charrettes for a school that was damaged in the storm. His eponymous firm has since expanded its pro bono work for other clients, such as the Union Settlement Association, a nonprofit based in East Harlem, to design classrooms and after-school facilities. "[Pro bono work] requires patience, but whatever time it costs the firm, it pays dividends," Franz says. "It infuses this sense of pride and accomplishment."

John McNulty, founding principal at Alameda, Calif.–based MBH Architects, says the timing and target for pro bono work have to be right. "When you start a business, maybe you can't easily spend a lot of time [doing pro bono design]," he says. "You're trying to scrape by and develop a reputation. When you get a little wind behind your sails and a little credibility in the marketplace, you begin to understand, 'I didn't get here on my own. It took a lot of help to make me successful. How can I use the skills I have to help somebody out?'" McNulty recalls once interviewing to provide paid architectural services for the Good Tidings Foundation, a local charity. After the interview, he sat in his car thinking for a few minutes before returning to the client's office and offering to work for free. "I just said to myself, 'This is a perfect job for us,'" he recalls.

A key to MBH's success in pro bono work is its passionate staff members, he says, but firms should not expect employees to donate their time off the clock. "You build the pro bono work into your hourly rates," he says. "We already have that money allocated. It becomes part of the recipe." The firm treats these projects just like billable work. If MBH bills for 10 percent of the project's overall cost, for example, that same percentage would still be recorded into the books as a fee even if it is pro bono. "It has all the attributes of a real project, because it is a real project," he says.

Some firms have even created their own nonprofit arms. Washington, D.C., firm Inscape Publico comprises two entities: a for-profit architecture firm (Inscape Studio) and a nonprofit (Publico) that offers pro bono design services to other nonprofits. Although Publico is the entity that works with charitable clients, all design work is subcontracted to Inscape Studio at a reduced rate, allowing Publico to avoid paying for liability insurance, administrative staff, and other overhead.

Last year, Publico provided more than 2,300 hours of pro bono work, which founder and executive director Greg Kearley, AIA, says is mainly schematic design. "If you can just advance the ball for people a bit, it makes a huge difference," he says. "We produce the vision, which they can leverage to do the fundraising necessary to move into the next stage of pre-construction, which is bringing in the engineers and consultants, and completing the construction documents." Clients are not obligated to use Inscape Studio for the next phases, he says, "but they typically do because we've built a relationship and we're very competitive with our pricing."

To get started in pro bono work, it's helpful to learn about the nonprofit ecosystem. Before founding his Inscape Publico, Kearley engaged with nonprofits by participating on a number of boards, where he learned how to

> "[Pro bono work] requires patience, but whatever time it costs the firm, it pays dividends"
>
> —Andrew Franz, AIA, founding principal, Andrew Franz Architect

launch a capital campaign, he says. "You have to understand how the parts go together."

One option for architects who want to donate their time is Public Architecture's 1+ program (previously called the 1% Program), which has institutionalized the idea of incorporating pro bono design services into practice by mapping out how to contribute 20 hours per year per person, and connecting firms with nonprofits. To help architects formalize agreements with clients, the AIA offers resources, such as contract documents that designate the scope of the project and the amount of time required for each pro bono service.

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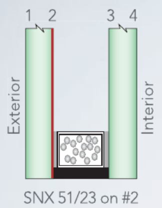

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Next Progressives: Murmur

TEXT BY DANIELLE RAGO
PORTRAIT BY ANDY J. SCOTT

Drawing on Southern California's long history of experimentation and innovation, Los Angeles–based firm Murmur, founded in 2008 by Heather Roberge, ASSOC. AIA, looks outside the discipline of architecture to the material and geometric logic of industries on the periphery of design practice, such as aerospace and fashion, to produce stimulating environments.

Also an associate professor at the University of California, Los Angeles Department of Architecture and Urban Design, as well as the director of its undergraduate program, Roberge finds ways to align her academic research with her firm's work, which ranges in scale from exhibitions and books to residential, civic, and master planning projects. "Anything that I'm interested in, I can weave into practice," she says.

Her latest installation, "En Pointe," at the SCI-Arc Gallery, features nine polygonal aluminum columns that lean on each other to create a self-supported massing with a figural and sculpted space between them. Her piece was the result of a research project she led at UCLA to unpack the genealogy of the column. "'En Pointe' was designed around a particular disciplinary problem," Roberge says: "What new spatial implications might be produced using the column, and how would a particular method of working with material make that possible." The installation is a direct, physical translation of that research combined with Roberge's structural proficiency and knowledge of aluminum's material properties.


Heather Roberge

Roberge also explored the possibilities of aluminum in her design for an above-garage addition to a midcentury ranch house in Benedict Canyon, Calif. "I wanted to extend the spatial condition of the house to the addition without borrowing the aesthetics," she says. She added a modified butterfly roof, with four planes stitched together in the middle of the new volume, and an exterior staircase connecting the ground level to an upstairs terrace. The stair's guardrail is made of pleated, perforated aluminum sheets whose forms derive from garment-making research Roberge conducted at UCLA. The aluminum is self-supporting and produces a moiré pattern that varies with lighting conditions and times of day.

The concept of producing 3D objects from 2D patterns and shapes was further explored in Roberge's unbuilt proposal for the Taipei Museum of Art, in Taiwan. "We saw the skin of the building as a cloak that could be loosely arranged around the museum volume and could cascade into the landscape to produce spaces that weren't confined to the building massing," she says.

Vortex House, Murmur's second built project, seeks to draw the landscape inward to give character to the structure and to collapse natural and artificial geometries. Each face of the five-sided house has a specific relationship to the landscape that unfolds into a panorama of vast oceanfront, ridgeline and hilltop views. Measuring 1,300 square feet in area—small by Los Angeles standards—the house is arranged around a 500-square-foot patio at its core so that each room has at least two outdoor views.

The office's current focus, a self-initiated research project for the master plan of the Veterans Affairs campus in West Los Angeles, advances the same concepts pursued in the Vortex House with the use of technology: drone photography, GoPro cameras, and vehicle backup cameras. Roberge's students at UCLA will also have a chance to craft redevelopment plans for the site, which serves more than 90,000 area veterans, as an assignment.

Regardless of whether a project is an actual or academic exercise, Roberge focuses on defining problems over trying to solve them: "I'm interested in articulating what the problem is and dealing with it in an unconventional way."

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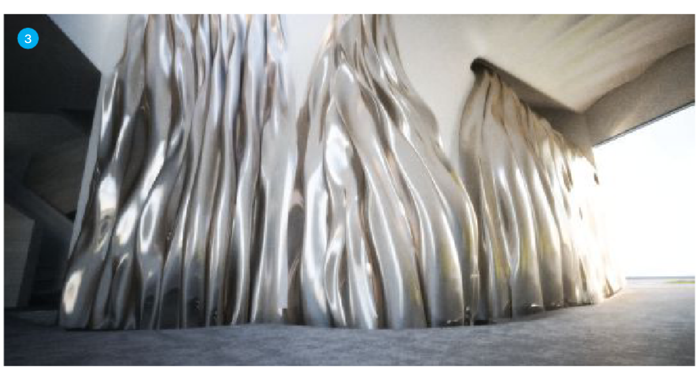

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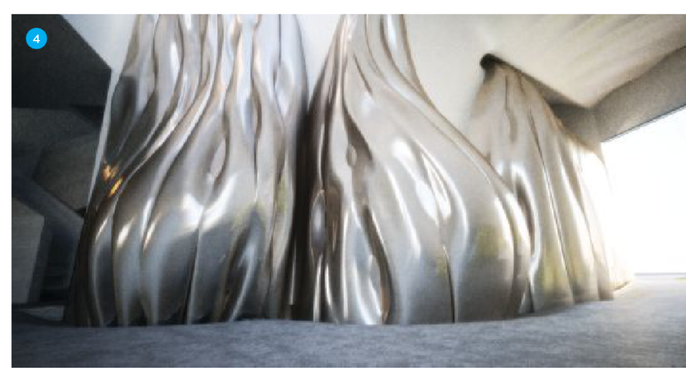

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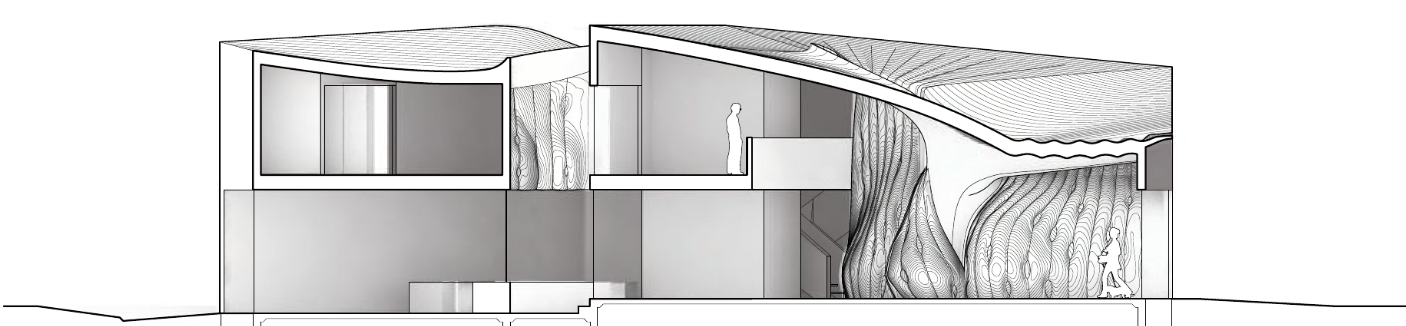

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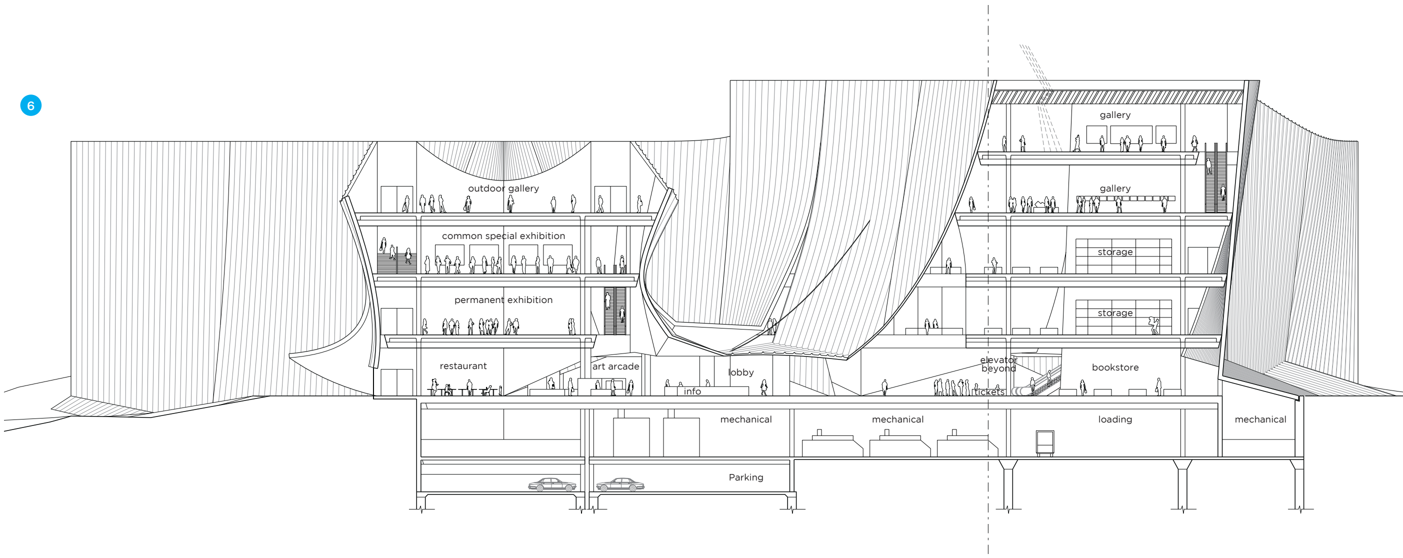

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1. Murmur's addition to the Gatins-Chan Residence in the Benedict Canyon area of Los Angeles adds a new volume over an existing garage. **2.** The pentagonal footprint of the Vortex House in Malibu, Calif., corresponds to different view corridors and other site conditions. **3–5.** Inward-sloping roof planes of the Succulent House, a speculative project in Chicago, divert rainfall into bladder-like storage that expands as the volume of water increases. **6–7.** Murmur's proposal for the Taipei Museum of Art in Taiwan draws parallels between fashion and architecture: As clothing is to the body, the building envelope is to structure. **8.** The "En Pointe" installation at the SCI-Arc Gallery features top-heavy, faceted columns that lean on each other for support and create a cohesive massing.

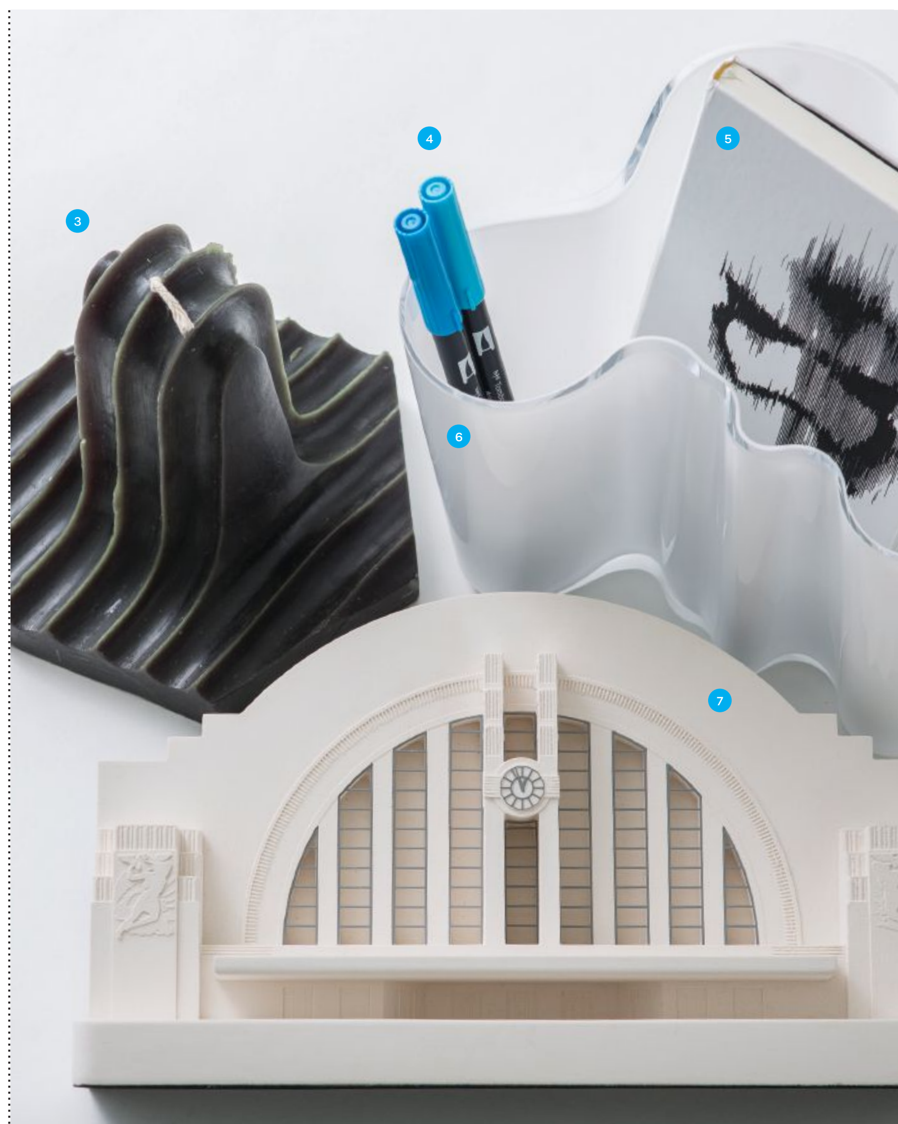
JOSHUA WHITE

Products: Architect-Approved Gift Guide

TEXT BY ALI MORRIS

Gift buying for the design-minded can be an intimidating and time-consuming task. In the spirit of giving, we asked a panel of architects and designers to share their picks for showing clients, colleagues, and more some year-end appreciation.

1. Amare, Lace Two sinuous metal bands twist to form this strikingly simple ring by Los Angeles designer Jenny Wu. From $90. *jennywulace.com* **2. Broken Ornament, Snarkitecture** This jagged gypsum-cement holiday bauble is a study in the art of destruction. $45. *shop.snarkitecture.com* **3. Reproduction No. 1, MOS Architects** One of the modernist architect Adolf Loos' first designs was a forest-scented candle, replicated for use today in wax and pine oil. $80. *shop.mos-office.net* **4. Dual Brush Pens, Tombow** Refresh your colleagues' marker stashes to ensure colorful sketching in the year to come. $3.19 each or $26.99 for a set of 10. *tombowusa.com* **5. *Star Wars* Limited Edition Notebook, Moleskine** *Star Wars* isn't just for kids, and neither are these Galactic-themed notebooks. From $24. *store.moleskine.com* **6. Alvar Aalto Collection, Iittala** Designed by the midcentury architect in 1936, this line of undulating glass bowls and vases is both functional and display-worthy. Starting at roughly $20. *iittala.com* **7. Model Buildings, Chisel & Mouse** Plaster and etched metal shape desktop-scale models of the world's best buildings, including the Cincinnati Union Terminal (shown). From $150. *chiselandmouse.com*



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Flipping the Script

What does camping have to do with cities?

Lola Sheppard and Mason White are the principals of Lateral Office, a design and research firm based in Toronto since 2005. The firm ranges from two to eight staff (depending on the project), but its areas of research and practice have remained consistent: bridging the gap between traditional and contemporary life, permeable political borders, and questioning conventional categories of architectural design. "We are equally moved by completed projects, unrealized work, and the entirely speculative," White says. "They all can enter the consciousness of practice and discipline."

As told to William Richards

We think that architects should be reactive to real-world game-changing events and interests. The larger interest of our practice has always been to pursue an architecture more entangled in its wider environment. We think pressures that are outside the building proper are exciting opportunities to reconceive architecture more generally. Designing for resilience deals not only with ecological and environmental challenges, but economic and cultural ones. We try to ask, "Can architecture become a programmatic and typological instrument for supporting these transformations?"

Our project for the Chicago Architecture Biennial is called "Making Camp"—an observation on the tradition of recreational camping. We made a very large model with five landscape conditions commonly found in mid-Canada. Within those sites, five designs offer new forms of collective camping that react to opportunities and challenges in the environment and the culture of camping. We see this as a provocation on minimal living, our over-suburbanized environment, and new notions of collectivity and nature. The myth of Canada and North America is one of retreating to the great outdoors, and camping has been the means of doing so for many people. Yet today camping is often a suburban experience in which the car, the RV, the campground, and the equipment mediate and dull one's experience of nature. "Making Camp" seeks out a more intense and immersive experience of nature.

To us, a good idea in architecture is something that just might be possible. We hope that it pushes boundaries of what is commonly accepted as possible, without tilting toward pure fantasy. We do have ambitions to build more, but we don't intend to sacrifice testing what architecture can do—and what an architect is—for the sake of realizing any given work. In other words, we don't begin with "What can we build?" but rather with "What could change the way we think of our environment?" **AIA**

→ Lateral Office is one of more than 60 official participants in the Chicago Architecture Biennial (Oct. 3, 2015–Jan. 3, 2016), sponsored in part by the AIA. Learn more at *chicagoarchitecturebiennial.org.*

AIANow

By William Richards
Art Direction by Jelena Schulz

Pencils Down

The humble pencil, in its current form, derives from a late-15th-century blueprint for a hollowed-out juniper stick, flat with an oval diameter, and packed with graphite. By the early 16th century, the pencil morphed into something very similar to what we use today—a graphite core nestled between two carved wooden halves that were glued together. Aside from being a highly functional tool, the pencil is a romantic object that is still widely produced. Even in our digital age, the pencil industry has continued to post single-digit improvements in sales over the last few years. In spite of the pencil's long history—and if we are going to be totally honest—it doesn't seem to hold the same place in the creative process as it once did. How many architects actually pick up a pencil to do serious drafting anymore? And, yet—like umbrellas—there always seems to be a pencil laying around (and they're mostly cedar today, not juniper). With a surfeit of these cedar sticks, the architect's challenge in today's studio is not what to draw with a pencil, but what to actually do with one. Here are some suggestions.

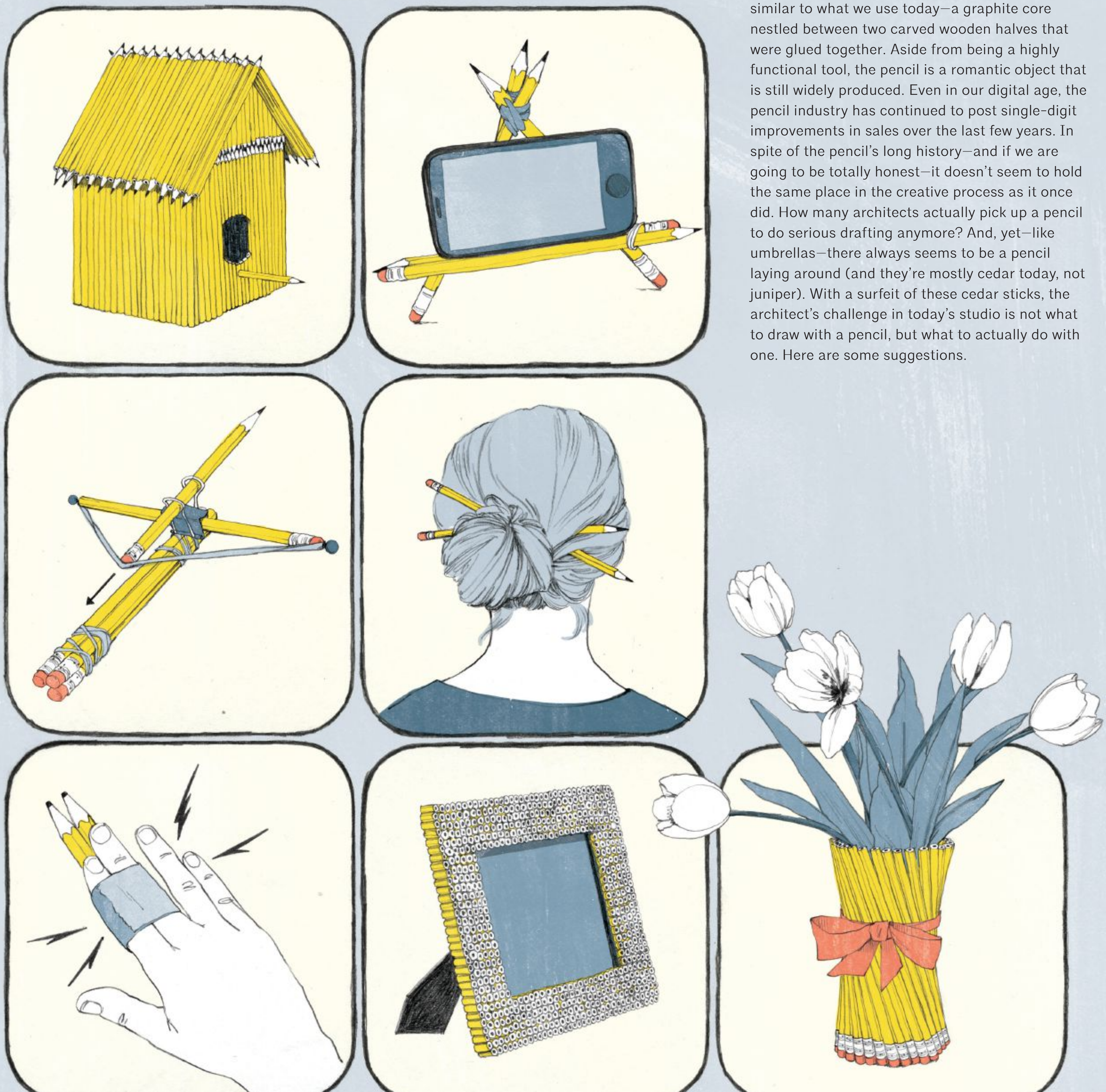


ILLUSTRATION: LAUREN NASSEF

AIADesign

Concrete Examples

A new exhibition and book detail the opportunities in Modernism's legacy.

PHOTO: COURTESY OF CARNEGIE MUSEUM OF ART

ABOVE: Workmen install the first aluminum panel on the Alcoa Building (now the Regional Enterprise Tower) in Pittsburgh, 1951. | BELOW: Mark Pasnik says that projects like the Alcoa Building are an important part of Pittsburgh's legacy and preservation's alignment with sustainability.

For Mark Pasnik, AIA, it started after architecture school—his desire to look at how architecture and planning resonate with the communities they serve. After obtaining a five-year bachelor of architecture degree from Cornell University, he augmented his design focus by pursuing a master's degree in history and theory.

"I wanted to explore less conventional methods of being an architect," Pasnik says. "That has led to a broad mix of work—architecture, of course, but also curation, books, and other ventures."

As principal of the Boston firm over,under—and after 20 years of experience—Pasnik's work seeks to demonstrate that architects can advocate for changing attitudes in their communities. That starts by looking at the impact of architecture today, as well as the impact it's had over the past two generations.

Pasnik's firm curated the exhibit "HACLab Pittsburgh: Imagining the Modern" at the Carnegie Museum of Art in Pittsburgh (on view through May 2, 2016), which studies the urban revitalization of the 1950s and '60s that transformed Pittsburgh's skyline.

"Imagining the Modern" is, on the surface, about the importance of preserving the Iron City's urban legacy. Implicitly, however, it's a critique of that legacy as a means of charting the everyday environment that impacts how Pittsburghers live and work in the aftermath of the postwar economic building boom that led to the dismantling of neighborhoods, population displacement, and partially completed buildings.

"We wanted to re-examine a moment in Pittsburgh's history that most people think is negative, but which was an important moment of reinvention," Pasnik says.

While pursuing his graduate degrees, Pasnik worked for Rodolfo Machado and Rodolphe el-Khoury as curator for the 1995 exhibition "Monolithic Architecture," and as assistant editor of *Monolithic Architecture* (Prestel, 1995), a book based on the show.

This time around, Pasnik's curatorial eye for "Imagining the Modern" is tied to his newest book *Heroic: Concrete Architecture and the New Boston* (Monacelli, 2015), which he co-authored with Michael Kubo and Chris Grimley.

The fortunes of Pittsburgh and Boston played out differently in the mid to late 20th century, but the impact of top-down urban planning and successive schemes to reinvent each city remain the same: totalizing and, in many ways, dehumanizing.

The idea behind this winter's Carnegie exhibit stems from Pasnik's central argument about midcentury urbanism: the more people know about their city's history, the better-informed they are about their city's potential. His starting point for the book is Brutalist architecture in Boston, which formed Boston's signature expression in the 1960s and mid-'70s. Pasnik's goal is to guide people toward thinking differently about this specific time period in Boston's history.

"Concrete buildings in Boston are often deeply misunderstood. The story of the city's renewal is a complex one, but not all negative," Pasnik says. "It was an era of substantial public investment and principled design—a legacy that should be better understood when tuning, rethinking, or transforming its buildings."

Pasnik hopes his work will ignite further conversations nationwide about how best to preserve the concrete construction that defines many cities' makeup.

"There's a slow-growing appreciation for concrete Modernism," Pasnik says. "Tearing down and starting from scratch isn't an intelligent way to move forward—from an environmental perspective, financial perspective, or cultural perspective. There are better options than the wrecking ball." **AIA**

Caitlin Reagan

PHOTO: PORTER GIFFORD

→ Learn more about "Imagining the Modern" at *cmoa.org/haclab-pittsburgh.*

AIAFeature

Shoring Up Is Hard To Do

The iconic Farnsworth House and the future of flood mitigation.

By Ben Schulman

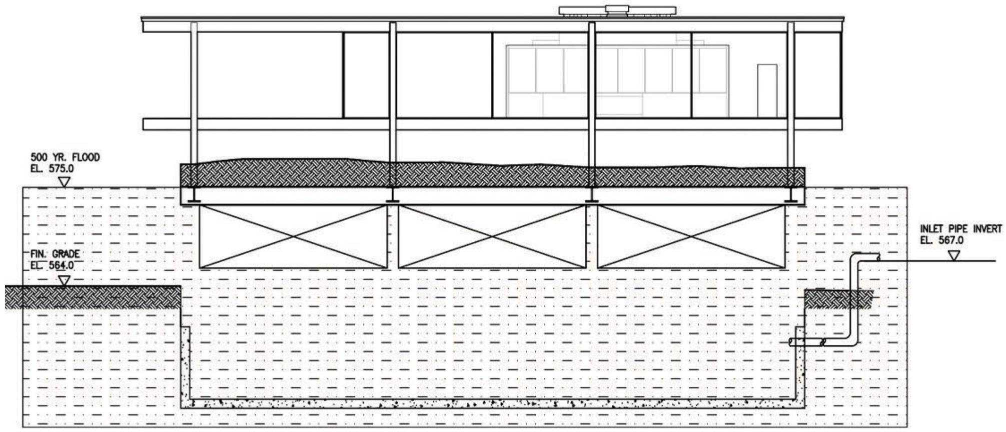
PHOTOGRAPHY: © CAROL M. HIGHSMITH LIBRARY OF CONGRESS COLLECTION

Since its completion in 1951, the Farnsworth House, situated 58 miles southwest of Chicago in Plano, Ill., has been susceptible to flooding. Its quiet elegance, delicately placed in communion with its surroundings, was designed by the German architect Ludwig Mies van der Rohe and built next to the tempestuous Fox River. Knowing his site, Mies envisioned floodwaters passing underneath the home's steel-column stilt supports, used to poetic effect to raise the interior.

But the water has not so much passed as it has infiltrated the house. The first time the house flooded was 1954, and in recent years suburban development has sprawled across the site's watershed and pushed more runoff into the adjacent Fox River, precipitating more flooding.

As suburban development and climate change exacerbate the severity as well as the frequency of these flood events, the fate of Mies' Farnsworth House is tied to two possible solutions that remove it from harm's way: a hydraulic lift system that would elevate the house during a flood (a solution that was endorsed by its owner, the National Trust for Historic Preservation, in November); or moving the entire home to a nearby, yet less flood prone, location on the site. (A third option, to raise the home on its site by placing it atop nearly 7 feet of infill, has garnered no further discussion.)

None are ideal solutions. And within the historic preservation community, they have inspired an oftentimes contentious battle



CASE 4 – 500 YEAR FLOOD AT EL. 575.0 +11.0' ABOVE GRADE

ABOVE: The likely option to save the Farnsworth House centers on hydraulic jacks that would lift the 275-ton structure during storms. | OPPOSITE: Mies van der Rohe's original design accommodates some site flooding, but not to the degree the site has seen in the past two decades.

AIAFeature

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over the proper approach to maintaining the architectural integrity of the building while grappling with changing environmental and site conditions.

The most damaging flood occurred in 1996, as a historic torrent of 17 inches of rain over a two-day period doused the area. One of the home's signature plate-glass windows was bashed in by debris, allowing a wave of silt and mud to cake the home's travertine floors and washing away works of art by Andy Warhol and Claes Oldenburg. (British developer Peter Palumbo owned the home at the time, which is now run as a museum.)

Since then, floodwaters have approached the home on multiple occasions, the most severe flooding occurring in 2008 when 15 inches of water entered the home and prompted its closure to the public. A 2013 hydrological survey commissioned by the National Trust and prepared by Wright Water Engineers, found that flooding of the area around Farnsworth was "expected to happen more or less on an annual basis and may actually occur multiple times in any given year as the river rises and falls periodically in the spring in response to snowmelt and rainfall events."

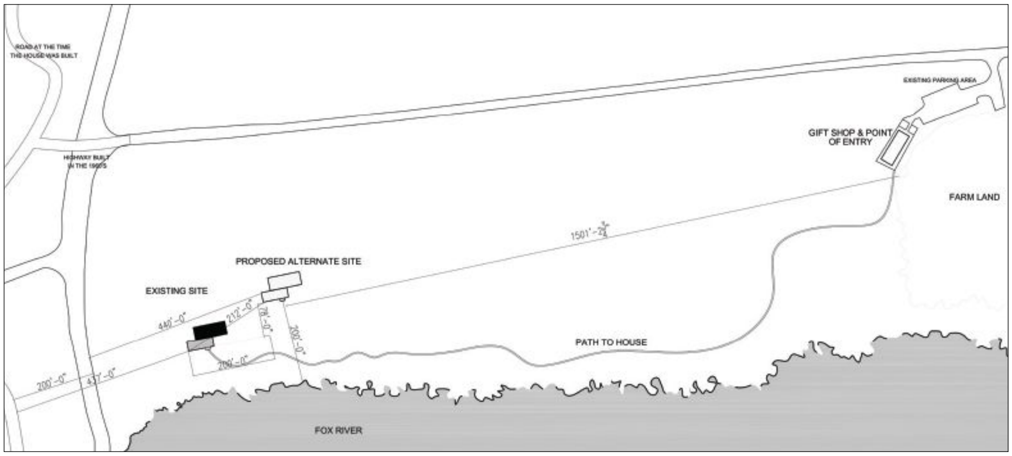
Bonnie McDonald, president and CEO of the preservation organization Landmarks Illinois (which relinquished everyday management of the property to the Trust in 2009, but still holds an easement as a result of their partnership with the Trust on the winning bid to procure the home in 2003), says that any solutions employed to preserve Farnsworth must take into account "not only today's Fox River, but tomorrow's Fox River," as a result of increasing climate change. Last June, it was widely reported that the Trust was likely to move forward with the relocation option, although after it endorsed the hydraulic jack option last month, relocation is off the table. Mindful not to speak directly to the pending decisions surrounding Farnsworth, McDonald says, "The approach to [preserving] any building is to look first to a passive approach."

Her thoughts are echoed by Katherine Malone-France, vice president for historic sites at the National Trust, who—similarly careful not to speak directly of Farnsworth—said the Trust's "early advocacy for preservation of the modern" encourages a "deep engagement" for the design principles embedded within the organization's most prominent modern residential properties, including Farnsworth and Philip Johnson's Glass House. Malone-France, who speaks of a "midcentury moment" happening within the greater public—"It's partially the *Mad Men* effect," she says, "but it is also nostalgia for Boomers, a clean aesthetic that resonates with Millennials"—noted that the Trust takes a "project-specific approach to preservation that balances honoring the original design intent" and saving the structure. (Members of the National Trust staff who work at Farnsworth House declined to comment for this story.)

Some in the preservationist community wonder at what cost the structure will be saved. The hydraulic lift solution—which involves jacking the house out of the flood plain when threatened, allowing water to collect in a "pit" underneath the home—was proposed as early as 1997 by Mies' grandson Dirk Lohan, FAIA, who performed extensive rehab work on the home after the 1996 flood and remains committed to the idea. For others, such an approach is anathema.

John Vinci, FAIA, of Vinci | Hamp Architects, winner of the 2015 AIA Chicago Lifetime Achievement Award, was one of the more vocal opponents of the hydraulic proposal. "These are all flawed solutions,"

"You have to have had the privilege of experience that I had in knowing the house and the indescribable precision to which it was designed."
—Whitney French



SITE PLAN BY JOHN VINCI

PHOTOGRAPHY: © NATIONAL TRUST FOR HISTORIC PRESERVATION

ABOVE: While the Farnsworth House has largely functioned as it was designed to let floodwaters pass beneath it, on a few occasions it has flooded completely. The most damaging flood occurred in 1996, when 17 inches of rain over two days caused the Fox River to deposit a layer of silt on the house's travertine floors. Two possible solutions to mitigate future floods, a hydraulic lift system or a complete relocation to a higher and dryer area, have divided the historic preservation community. | OPPOSITE: Advocates of relocating the Farnsworth House 300 feet upland from its current position say that such a move would improve its chances of staying dry, but critics say that such a move would compromise Mies van der Rohe's original design vision for house and site.

Vinci says, "but architecture has to have its groundings. You don't turn Mies into Rube Goldberg."

In an op-ed for *Chicago Architect* magazine [full disclosure: I served as editor of that magazine from March 2014 to October 2015], Vinci outlined his response to the hydraulic solution by mapping out a plan to move the house to a nearby meadow slightly northeast of the present site. Vinci said that this not only maintains the architectural integrity of the house but also repairs its relationship to the site by situating it some 200 feet further from a highway built in the 1960s; it would place the house roughly the same distance away from the newer highway as it was from the original road.

Vinci's proposal seemed to be the motivating force behind the momentum for relocation, but with conversation stalled, a sense of anxiety surrounds the house. A partner at Vinci | Hamp, Alex Krikhaar, AIA, who worked as a grad student under the tutelage of Farnsworth's structural engineer, Myron Goldsmith, sent an open letter to the Trust last August expressing concern over a wide spectrum of issues. Krikhaar's main objections to the hydraulic system relate to the permanent separation of the house and terrace that its implementation would necessitate, requiring the addition of new non-original structural supports. In a separate conversation, Krikhaar says, "In a work as distilled as Farnsworth, there's no room for interventions like that. The home's architecture is based on its architectural purity."

Krikhaar is also looking forward to a greater alliance with the U.S. Army Corps of Engineers about their post-1996 flood work on the Fox River Watershed Project, which calls for a series of interventions to alleviate flooding within the watershed. For its part, the Trust, in response to Krikhaar's concern, stated that their own hydrological studies have referenced previous Army Corps findings, and that "the Army Corps of Engineers will be consulted when a conceptual proposal is selected."

Others still recoil at any thought of disturbing the house. Whitney French knows the property better than most: She served as the executive director of the Farnsworth House from 2004 untill 2012.

"You have to have had the privilege of experience that I had in knowing the house and the indescribable precision to which it was designed," she says. French believes any movement of the house disturbs its absoluteness, and wonders why other approaches that involve treating the landscape, or erecting protective structures that could stand sentry against the house, aren't being explored.

During her time at Farnsworth, French oversaw the development of a cursory engineering plan drawn up by students from the University of Delft that would create a two-part, steel-gasketed structure that would rise from the ground during flooding to deflect water. "Certainly if we can engineer a device to raise the house, we can raise a device to prevent water from reaching the house," she says. "Think of the device as a reverse aquarium."

Phyllis Lambert, HON. FAIA, the author

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of *Mies in America* and *Building Seagram*, and perhaps the most authoritative voice on Mies' work, states her preference plainly: "Don't touch the house." Lambert acknowledges that flooding will most likely get worse over time but believes, "the most important thing to regulate is the rising of the water."

"If Mies were around, we could ask him [what to do]," Lambert says. "But he's not. Our obligation is to do the least damage to the house and respect the site." Lambert contends that Mies "always made a gesture to properly build in connection to the site," referencing his early work at the Riehl House in Potsdam, Germany, down to the Seagram Building, the New York office building that Lambert, the daughter of Seagram's founder Samuel Bronfman, commissioned half a century ago. Lambert believes that any manipulation of Farnsworth that would require deconstruction or the replacement of walls and glass would be akin to "taking your appendix out and putting it back in."

Although the issues threatening Farnsworth are site-specific, the questions of proper stewardship affecting the landmark resonate for preservationist projects of all stripes on all sites. McDonald, the Landmarks Illinois president, cautions that if the preservationist community as a whole "becomes complete purists where we can no longer adapt, then we run a greater risk of losing our heritage in a changing climate."

"We should attempt to bring nature, houses, and human beings together in a higher unity," said Mies van der Rohe in 1958, four years after the Farnsworth House's first flood. Even today, that statement is no great irony—he believed that architecture could provide a window from which nature could be framed and appreciated.

"If you view nature through the glass walls of the Farnsworth House, it gains a more profound significance than if viewed from the outside," Mies van der Rohe went on, describing a structure whose stilt-legs could elevate one's view of the landscape while, ostensibly, allowing water to quietly pass through the site unencumbered. Decades later, and like the stilts it sits upon, the Farnsworth House's future remains up in the air, as architects and preservationists work hard to both honor an iconic house and respect its surrounding environment. While the Trust-endorsed hydraulic lift system may seem unconventional, it highlights the capacity of historic preservation to adapt as a resilient practice that can be both innovative and reverent. AIA

AIAPerspective

PHOTOGRAPHY: CARL BOWER

Driving Force

Knowledge is today's currency.

Creativity, passion, vision, and mission drive each one of us architects to do our very best. The public appreciates our work and Look Up, the AIA's public awareness campaign, is transforming that appreciation into an understanding of the architect's value.

But to ensure a profession that is robust and sustainable, and one that can weather the ups and downs of business cycles, we must think in new ways about the economics of our work. Our profession needs to attract and retain the best and the brightest. As AIAS president Danielle Mitchell, ASSOC. AIA, says, "Students today are looking to do good and to do well." It's a phrase borrowed from the public interest design movement, but it's also a phrase that can guide the profession. It is our obligation to the next generation to build a profession that both has plenty of earning potential and positively impacts our communities.

The natural extension of this mission is to focus on value—converting our expertise and work into revenue, and converting local and global challenges into opportunities. We must be as good with business thinking as we are with design thinking. A business without profit cannot sustain itself to do good work. Competing effectively in a service industry depends on education, experience, expertise, and commitment—qualities that architects can marshal for the best possible result no matter how large or small the project, and no matter how wealthy or impoverished the client or community.

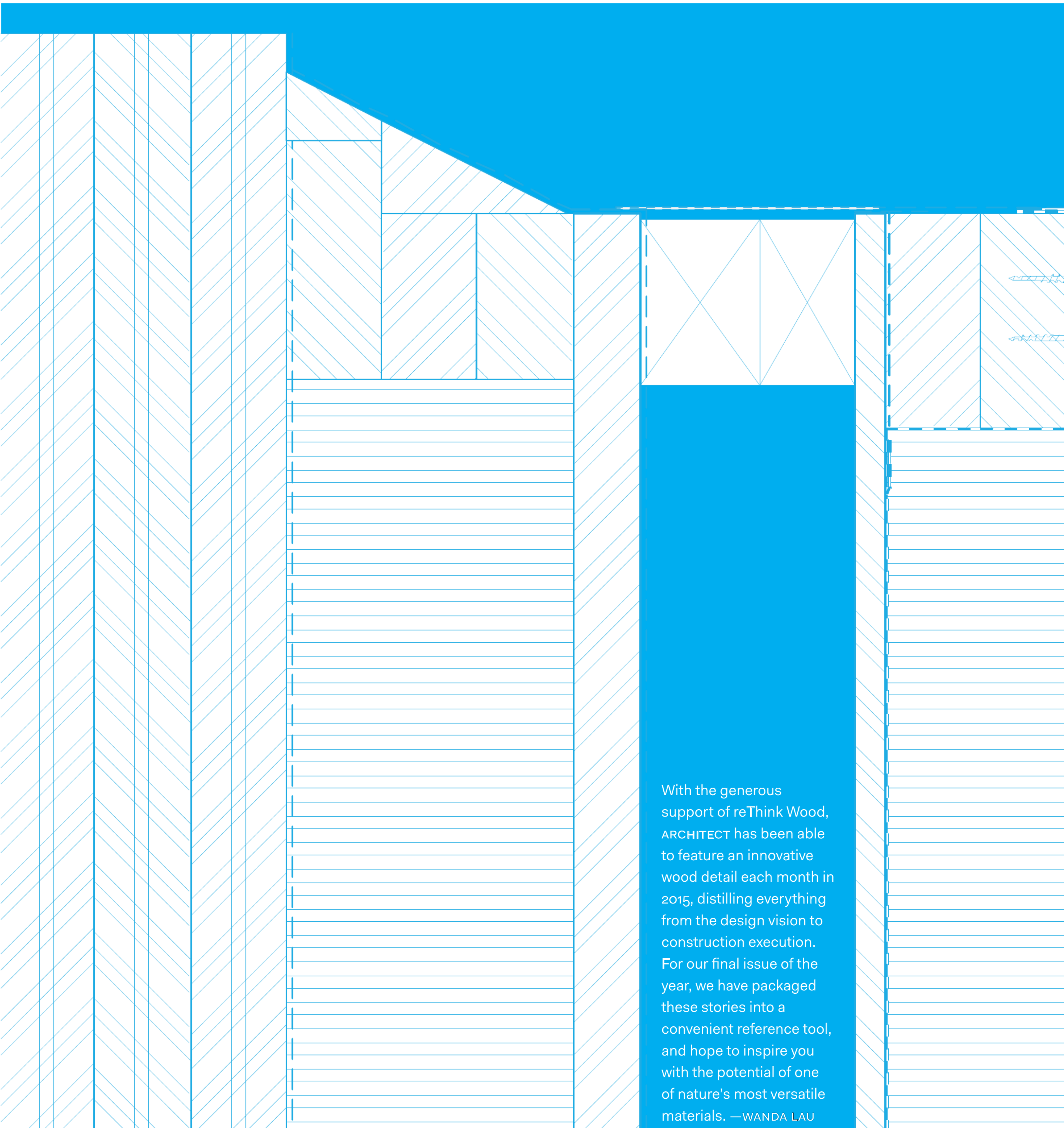
Architects are highly skilled professionals; they can and should be highly valued. In this global market, it is imperative that we continue to demonstrate our expertise and ensure that architecture continues to be a viable field. Knowledge is the currency of the 21st century, and building a knowledge base within architecture is just as critical as building a client base within firms—from solo practitioners to international powerhouses.

However, none of these efforts will mean much if we cannot support our workforce. A talent pipeline for the 21st century demands an integrated approach to education, licensure, and firm culture as well as a supportive professional community. Human capital is necessary to build that community just as financial capital is necessary to realize architecture's greatest aspirations: that architects can improve our world, one project at a time; that architects can leverage their unique training and expertise to thrive, even in uncertain economic times; and that architects are global citizens and local businesspeople who can affect positive change at any scale. AIA

Elizabeth Chu Richter, FAIA, 2015 AIA President

Special Section: 2015 Innovative Details

Humanity has a long history of using wood as shelter. Dense tree canopies—the original primitive huts—protected us from rain and the occasional predator. This primeval association has biologically programmed us to experience feelings of warmth, security, and familiarity around wood, even as we leverage timber's impressive strength-to-weight ratios to craft space in increasingly sophisticated ways. As the 12 projects on the following pages show, wood remains a fundamental building material, and architects have no lack of good ideas for how to use it.



With the generous support of reThink Wood, ARCHITECT has been able to feature an innovative wood detail each month in 2015, distilling everything from the design vision to construction execution. For our final issue of the year, we have packaged these stories into a convenient reference tool, and hope to inspire you with the potential of one of nature's most versatile materials. —WANDA LAU

Roof Shell, Kaeng Krachan Elephant Park

TEXT BY EMILY HOOPER

The Kaeng Krachan Elephant Park compound at the Zurich Zoo is capable of withstanding the 15-ton force generated by a charging occupant, but that didn't stop local firm Markus Schietsch Architekten (MSA) from imparting an aesthetic delicacy to the structure. Completed in 2014, the 90,900-square-foot structure currently hosts eight Asian elephants, each weighing between 2 tons and 5.5 tons, in a nature-inspired habitat topped by a 73,200-square-foot shell roof made primarily from wood.

From a distance, the undulating, freeform shell looks like a giant tortoise shell with its intricate patterning and silver-hued patina. Spanning 260 feet, the complex assembly comprises 550 uniquely shaped, cross-laminated spruce panels stacked in three layers connected by more than 600,000 21-centimeter-long nails. Each panel layer is offset at a rotation of 60 degrees to divide the force distribution along the wood grain.

The panels were pre-scored to guide the on-site assembly process in which the Aichach, Germany–office of Metsä Wood CNC-milled the panels, and carpenters from the Swiss construction firms Implenia Holzbau and Strabag Holzbau gradually bent them over scaffolding-pipe structures to achieve a bending radius between 40 meters and 80 meters (131 feet and 262 feet) for the entire roof system.

The shallow roof also features 271 apertures, creating the dappling effect of a tree canopy. The openings were precisely pre-cut in the top panel layer, but hand cut in the bottom two layers in situ.

Overall, 30 percent of the shell is open. ETFE cushions form raised skylights in each aperture, while the edges of the skylights are clamped into an integrated aluminum gutter that keeps the membrane profile above the timber shell and facilitates water drainage. Rainwater and snow runoff are harvested from the roof to irrigate plants and fill the elephants' pools.

An outermost layer of laminated veneer lumber protects the entire roof assembly. These panels were left unfinished to showcase the wood's natural patina. "When the roof is dry from the sun, it's almost a reflective silver, and when it's wet from rain or dew, it's almost black," says MSA partner Philipp Heidemann, the project architect. "We like that the material is almost like a living thing."

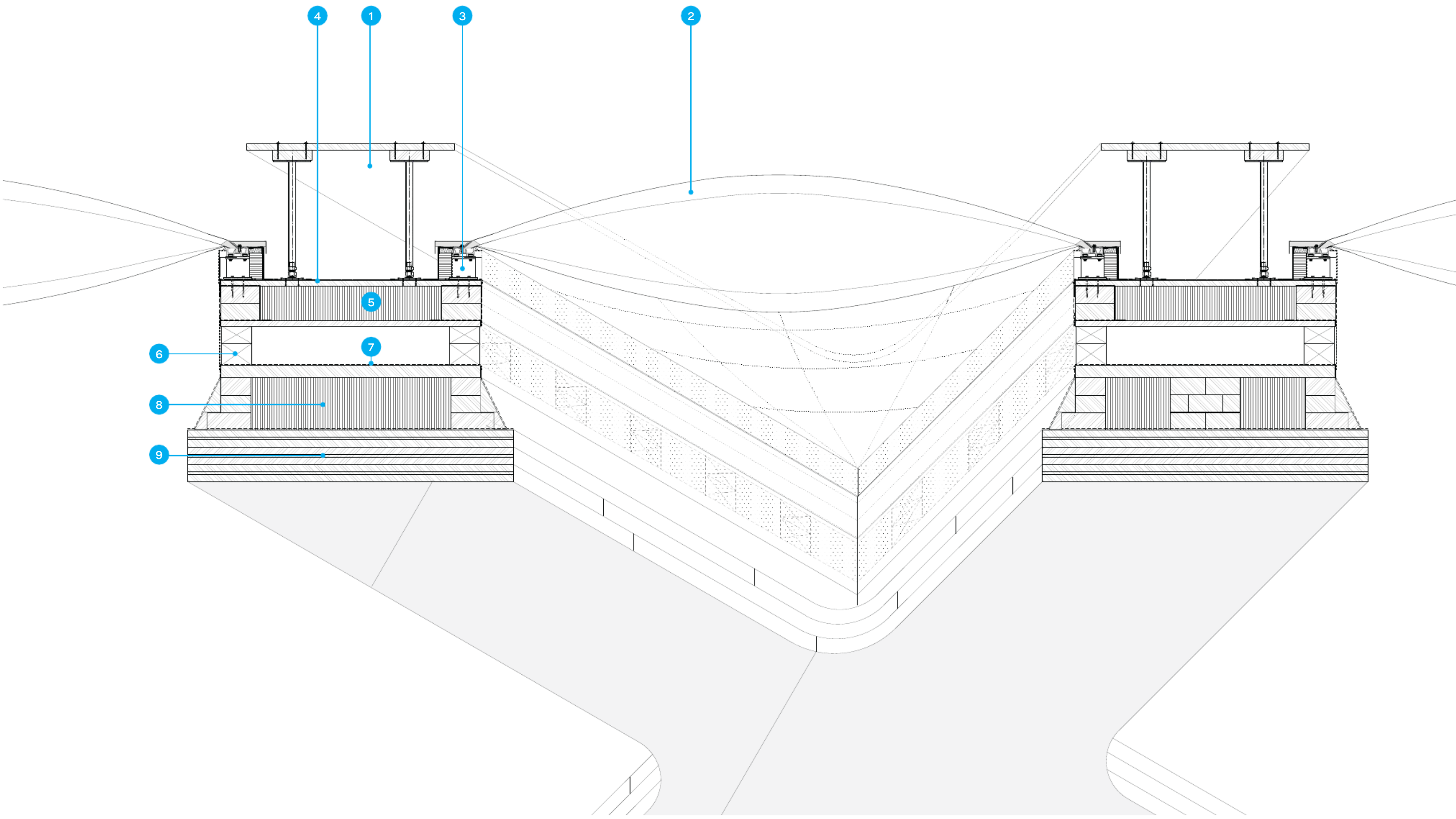
MSA didn't want the compound's façade to look clunky or overwhelmed by the load of the roof, Heidemann says, so the firm undulated the roof edge to "make it look more natural and ... to correspond to program underneath." Working in Rhino with Grasshopper plug-ins, MSA modeled the rippling surface to experiment with different variables, such as the size and location of the skylights, to improve structural efficiency.

A reinforced-concrete tension ring, supported by concrete slab walls clad in glulam spruce panels at the low points of the roof along the building's perimeter, prevents the shell from splaying. At these points, it transfers loads into a concrete slab foundation, which in turn is supported by a series of subgrade, steel-reinforced, prestressed concrete piers.

The lamella-like façade of the Elephant Park appears to dissolve into the roof, thanks to the weight distribution of a double-hinge structural system. One hinge occurs in the timber fins, or columns, and the other in the beams that connect the shell to the façade; as a result, the façade can adjust slightly in response to thermal movement and to roof loads.

At one side of the center, an arch spans over a mezzanine level that serves as event space. The programmed visitor's area along the periphery also restricts the elephants' access to the delicate façade, manufactured by German steel-construction company Züblin Stahlbau, which cannot withstand their strength.

"These elephants can push up to 6 tons with their head plates and pull up to 3 tons [from a standstill]," Heidemann says. "The sphincter muscle in their trunks can open screws. If something is loose, they will not only play with it, but they will also teach the others so groups of elephants will begin unscrewing their habitat." As a result, the magnificent mammals have direct access only to the house's northwest-facing, steel-reinforced concrete wall.



1. 33mm Kerto Q LVL protective panel
2. ETFE cushion, three-ply with hail-proof layer
3. Integrated aluminum gutter
4. Sarnafil TG 76-18 Felt roof membrane
5. 160mm mineral fiber insulation
6. Wood blocking
7. Roof underlayment
8. Box girder wood and insulation
9. Cross-laminated spruce panels, three layers

ANDREAS BUSCHMANN

Wall Section, Centre De Congrès à Mons

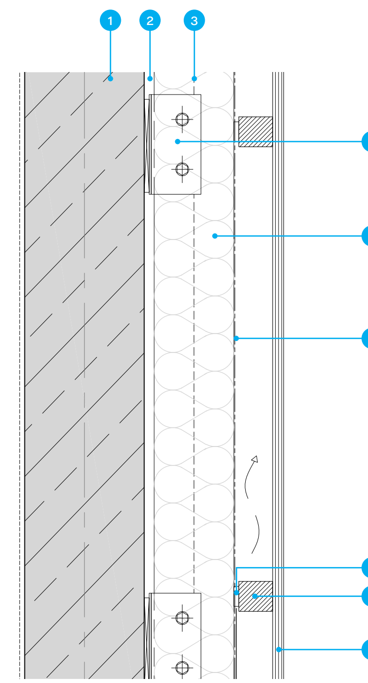
TEXT BY JENNY JONES

As one of the two cities named a European Capital of Culture for 2015, Mons, Belgium, is investing in a development that will transform the medieval municipality into a modern economic hub. At the heart of the master plan is the Centre de Congrès à Mons, a convention center with a spiraling floor plan and wood-and-aluminum skin to match. The juxtaposed materials represent the blending of the city's old and new districts, which can be viewed from a platform inside the cantilevered prow topping the structure.

Designed by New York–based Studio Libeskind with local firm H2A Ingénieur Architecte & Associés as the architect of record, the 12,500-square-meter (134,550-square-foot) center houses meeting rooms and three auditoriums. On its exterior, the lower walls of the encircling envelope are clad in wood lamella, while its upper walls are adorned with anodized aluminum bands in a luxurious champagne hue. "We wanted to use two different materials that harmonize but are still slightly different in color and finishes," says Studio Libeskind principal Stefan Blach, whose team modeled the project using Rhinoceros 3D and AutoCAD.

Robinia wood, also known as black locust, was a natural choice for the lamella: In addition to being regionally abundant, the wood does not require treatment, Blach says. "It ages naturally … so it gets this silvery, beautiful surface."

Totaling 1,900 square meters (20,450 square feet), the array of linear slats creates a pattern that is 62 percent wood and 38 percent negative space. The designers wanted the wood lamella to appear uniform but they had to accommodate the center's ribbon windows. To that end, they hung Robinia boards over the windows, like framed louvers, Blach says. "We created the impression of a continuous surface that just changes its texture where the windows are."



1. Reinforced concrete ribbon wall
2. 20mm construction tolerance
3. 160mm mineral insulation
4. Metal bracket
5. Aluminum rafter (beyond), curved to match wall
6. Self-adhering waterproofing membrane
7. 10mm EPDM pad (1.2m o.c.)
8. 60mm × 60mm Robinia wood lattice
9. 22mm × 6m Robinia wood board, 100mm or 140mm wide (100mm or 200mm o.c.)

HUFTON + CROW

Multipurpose Roof, The Pinch

TEXT BY JENNY JONES

In the village of Shuanghe, Yunnan, China, the curved gable roof topping the Pinch, a public library and community center, is a hybrid of forms and functions. The wood surface acts as a pedestrian ramp, playground, and seating for people-watching in the neighboring plaza below. It is also a symbol of the rural village's rise over adversity.

In September 2012, a series of earthquakes struck the southwestern China province, killing more than 80 people and destroying thousands of buildings, including the school and nearly every residence in Shuanghe. As part of its recovery efforts, the government developed a plaza in the heart of the village. Olivier Ottevaere and John Lin, who are respectively an assistant professor and an associate professor of architecture at the University of Hong Kong (HKU), secured a grant from HKU to design and construct the 80-square-meter (861-square-foot) Pinch.

Located approximately 13 feet below the village's main elevation, the plaza has a concrete retaining wall that Ottevaere and Lin repurposed as a bearing wall for the Pinch. The wall also lets the Pinch's 123-square-meter (1,324-square-foot) roof become an accessible pedestrian bridge. The surface's "gentle slope allows people to descend down into the plaza," Ottevaere says.

Three exterior walls and the building's roof, which echoes the shape of the nearby mountains, are framed in timber as a nod to the traditional houses that once dotted the landscape, before the earthquakes. "We thought, 'Instead of abandoning this material ... why don't we prove that we can use timber in a modern way?' " Ottevaere says.

The team specified birch that had been pressure-treated to resist the elements, fungus, and insect infestations. Trucks transported the wood approximately 250 miles north from Kunming Dianmuju Shangmao Co., a timber mill in Kunming, Yunnan's capital, to the project site. Local construction crews hand drew the shapes of the Pinch's 17 roof trusses on the plaza's concrete floor. These templates were then used to construct the trusses from 4.3-inches-wide-by-1.3-inches-thick boards, which are connected with 1-centimeter-diameter stainless steel bolts. The trusses range in size from 4.9 feet wide by 9.8 feet tall to 19.6 feet square, and are spaced approximately 3 feet apart.

After assembling the trusses on the ground, the crews raised them upright by hand. One end of each truss bears on the concrete retaining wall, while the other rests on one of 17 timber columns. Steel brackets connect the trusses to the retaining wall and the columns, which anchor into the building's concrete foundation.

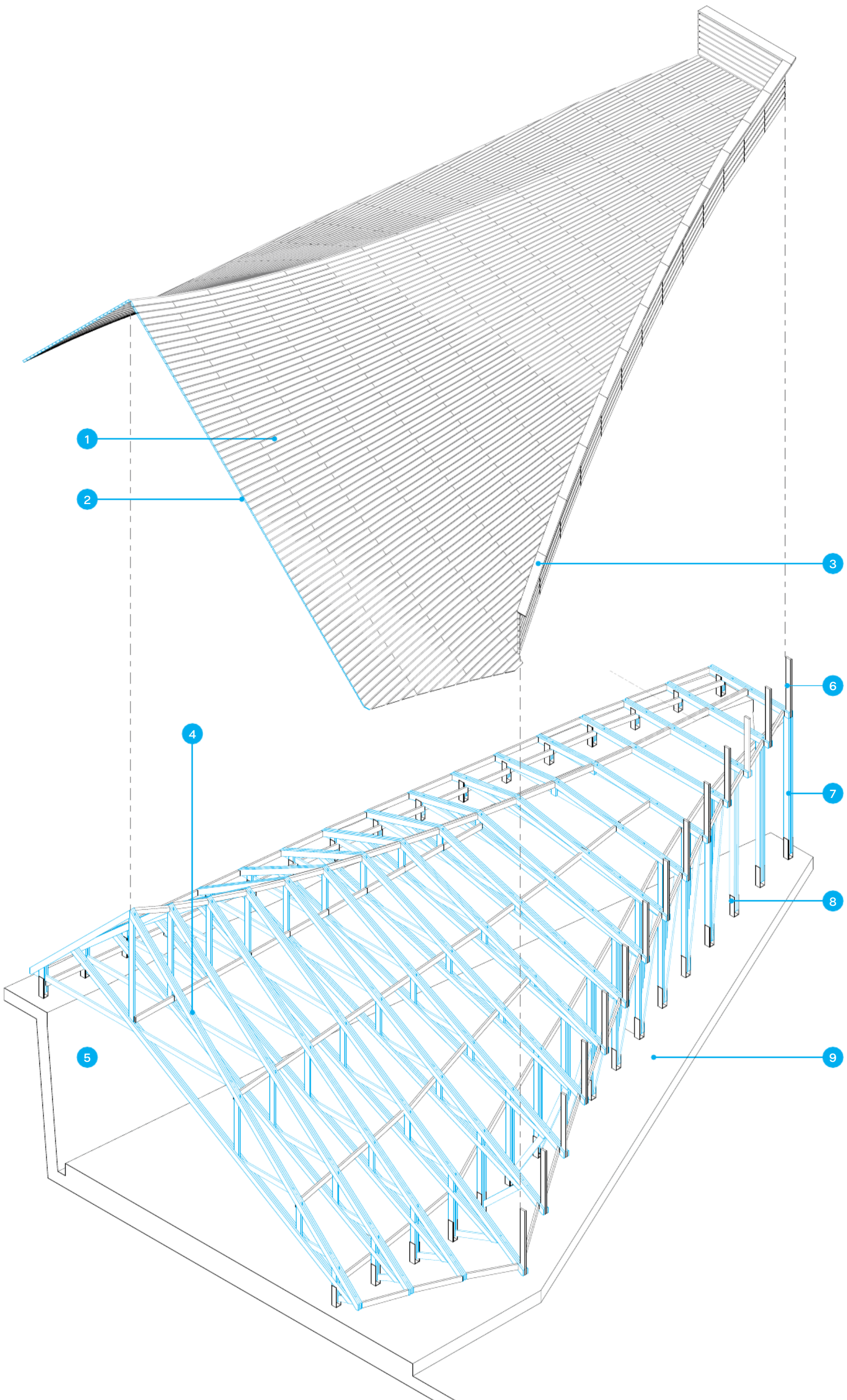
Once the trusses were in place, crews nailed 64 3.3-foot-by-6.6-foot aluminum sheets over the trusses and injected silicone sealant in the lap seams. They then screwed 16.4-foot-long, 4.3-inch-by-1.3-inch wood decking, spaced 0.80 inch apart, over the aluminum panels. A 3.6-foot-tall railing, similar in look to the decking, traces the plaza-side roof edge. The railing's posts align with the columns below.

The designers used the modeling software Rhinoceros and physical mock-ups to determine the roof's three-dimensional geometry, which is created using the straight decking members. The modeling helped assess how much the roof decking could torque between trusses, Ottevaere says. The boards "are buckling in two directions: length and the width," he says.

Twenty bands of 39-inch-wide polycarbonate corrugated sheets hang from the library's exterior wood framing. Several sheets are operable and act as doors that open to the plaza.

Inside the building, the exposed wood structural system serves another essential purpose. Wood bookshelves hang from 13 of the 17 roof trusses, with space around them for circulation. Each bay contains three shelves, approximately 35 inches long and 8 inches deep, that hold approximately 200 books, for a total capacity of 2,400 books.

Fundraising for the project began in September 2012. The project was completed in April 2014 at a cost of 130,000 renminbi (approximately $20,000). Ottevaere says that the Shuanghe community and the children immediately embraced the Pinch. "Once they moved all of their books in, it was theirs," he says. "[It's] a monument to the earthquake and the rebuilding effort."



1. 4.3" × 1.3" × 16.4' wood boards (0.8" o.c.)
2. 3.3' × 6.6' aluminum sheets (not shown); silicone sealant in lap seams
3. 4.3" × 1.3" × 16.4' wood rails
4. 4.3" × 1.3" × 16.4' wood truss members connected by Ø1cm stainless steel bolts
5. Concrete retaining wall
6. 3.6' tall wood post (3' o.c.)
7. Timber column (3' o.c.)
8. Stainless steel bracket
9. Concrete foundation

EMA PETER

Superdesk, Barbarian Group Office

TEXT BY JENNY JONES

While the open-office concept of the Barbarian Group's new headquarters in New York City is not unusual, the undulating "superdesk" that fills the space certainly grabs the attention of visitors. Designed by Los Angeles–based Clive Wilkinson Architects (CWA), which designed the interactive marketing firm's entire office space, the 4,400-square-foot desk weaves through, up, down, and around the 20,000-square-foot office on a path that is both whimsical and deliberate. "These grottoes that are created when the table lifts up are a direct reaction to the lines of circulation that need to happen through the space," says CWA associate Chester Nielsen.

The 1,100-foot-long desk measures 11.5 feet across at its widest point. An integrated utility tray delivers power and data cables to the 125 workstations set up along the length of the desk, which can accommodate up to 170 people. "It's very flexible," Nielsen says. "You just add more task chairs."

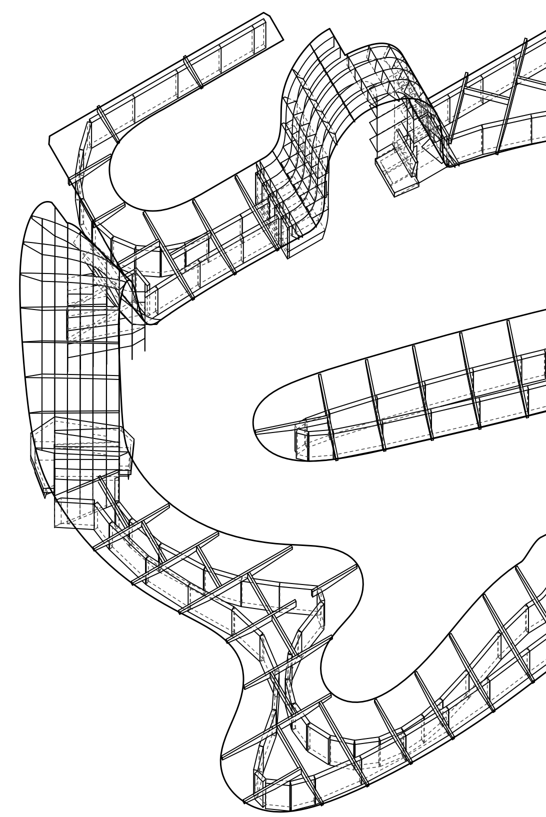
Simple construction materials kept the cost of the desk low and moreover gave it a raw look. The desktop comprises a combination of medium- and high-density fiberboard and is supported by pony walls built from 2×4 framing and plywood. Cut plywood pieces make up the ribs of the arch.

The designers used Rhinoceros and Autodesk Revit to create the desk's geometry, from which custom fabricator Machineous manufactured the desk's components in its Los Angeles studio. Repurposed automotive industrial robots, which Machineous obtained from robot resellers or directly from the manufacturers, cut 500 plywood pieces with high-speed, spiral-flute milling bits to form the desk's six arches.

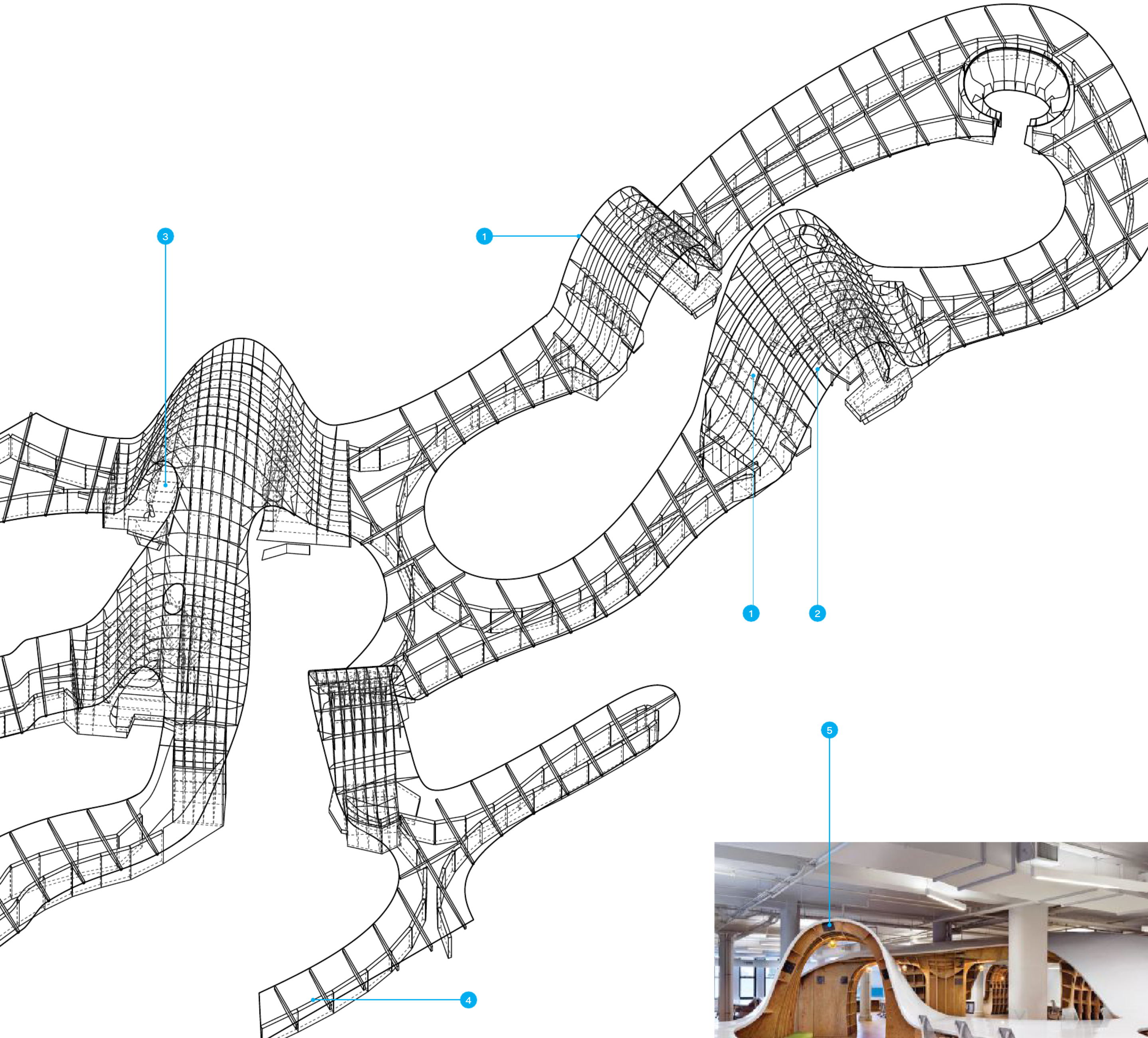
The components were then shipped to the Barbarian Group's office, where Machineous and New York–based GC Contractors fit together the pieces like a jigsaw puzzle, with 4-inch steel plates providing additional rigidity and Elmer's wood glue and screws securing everything together. "It was essentially like a huge Ikea table because you have all the numbers, and you know where the numbers fit into each other," Nielsen says.

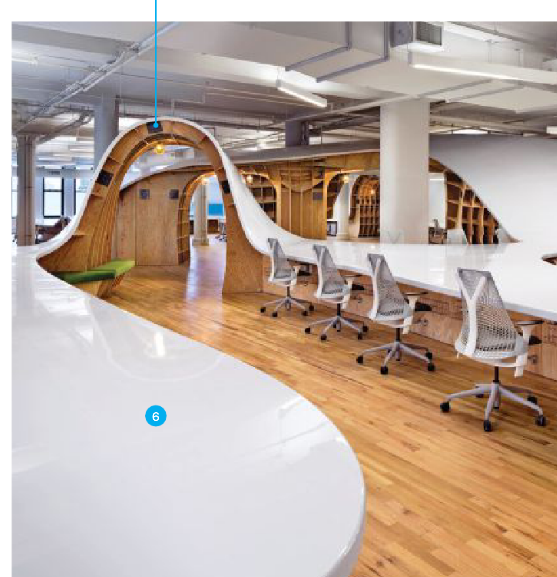
After sandwiching the fiberboard pieces together and sealing the seams with Bondo, the construction team covered the entire desktop with a water-based pearlescent white paint to create a seamless working surface. Los Angeles–based artist Casper Brindle then covered the desktop with a surfboard-inspired topcoat. The water-based, eco-friendly resin was poured continuously for 24 hours to maintain the desktop's continuity. "[T]hey started at one end, and ... rotated teams throughout the 24 hours," Nielsen says.

The superdesk has become a symbol of the company's evolution from a small firm to a legitimate player in the interactive marketing industry. "They've gotten everything that they have needed out of this project," Nielsen says. "I'm proud to say that ... part of their recent success [is a result of] the workplace."



1. Arches for privacy and circulation
2. Plywood arch ribs
3. Upholstered seating
4. 2×4 framing and 4×8 plywood sheets
5. 4" steel plates
6. Medium- and high-density fiberboard worktop with paint finish and a resin topcoat





MICHAEL MORAN/OTTO

Lattice Roof, Onagawa Station

TEXT BY TIMOTHY A. SCHULER

It only took a matter of minutes for a tsunami wave to reduce the former Onagawa Station to a pile of rubble. The one-story, tile-roofed train station in Miyagi Prefecture, Japan, was just 50 miles from the epicenter of the magnitude-8.9 earthquake that sent a series of 10- to 20-foot-high waves crashing into Japan's main island of Honshu on March 11, 2011.

Four years later, a new train station stands in Onagawa, this one designed by Shigeru Ban, HON. FAIA. The airy, three-story, 900-square-meter (9,682-square-foot) structure was sited about 500 feet inland from the original building footprint. Topped with a gently sloped, tensile-membrane roof inspired by the outstretched wings of a seabird, the cedar-and-steel-pipe-beam structure serves as a symbol of the community's resilience. At night, the illuminated station casts a warm glow through the translucent white membrane, "symbolizing a reconstruction of the town from the disaster," says Yasunori Harano, project architect for Shigeru Ban Architects.

The taut roof form is supported by a wooden lattice, a signature of Ban's work. The lattice members, which are left exposed, are made of laminated veneer lumber (LVL) arches constructed from Japanese larch, which is native to the country and appears in everything from furniture to boats to utility poles. Harano and the project team needed to warp the 2-foot-wide LVL beams to achieve the desired curvature and roof height, but at 90 millimeters (3.5 inches) thick, the lumber wasn't bending properly. The designers turned to local timber subcontractor Key-Tec Co. to slice the LVL lengthwise and warp each half separately before layering them back together during the construction.

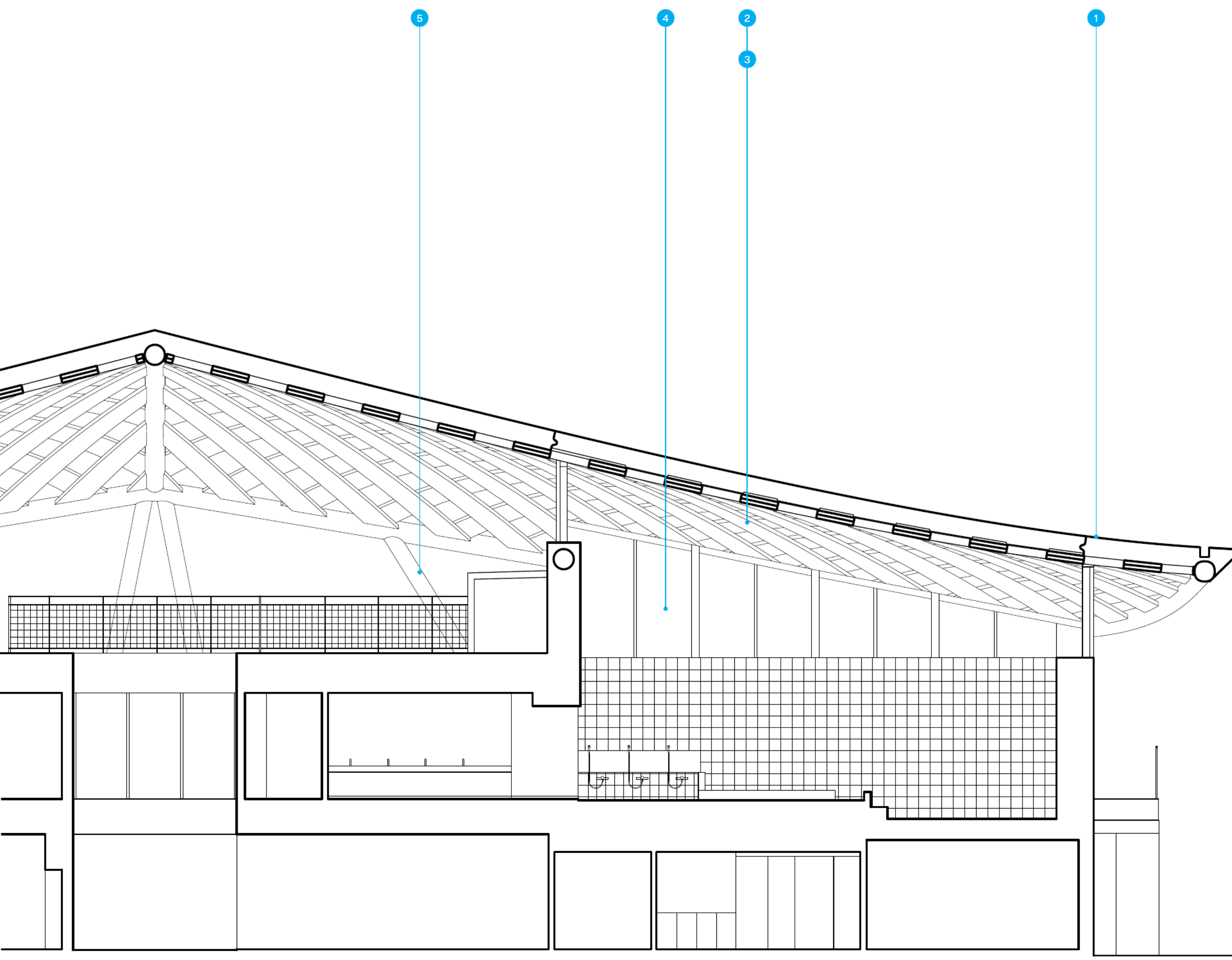
This created a new challenge. The stacked LVL layers needed to be connected with custom wooden bolts, but to drill the bolt holes after the wood was warped would "take time and lack in accuracy," Ban says. Subsequently Harano's team created a 3D model of the lattice structure that included the final location of each bolt in the curved LVL beams to determine where to drill the 16-millimeter-diameter holes in the pre-bent wood.

The final roof structure features 76 crisscrossing arches, with many spanning more than 55 feet. Each arch intersection in the lattice is secured with the same custom bolts that connect the stacked LVL layers. The wooden bolt heads, which are left visible and slightly paler in tone than the LVL, are arranged in alternating geometric patterns.

The building's completion earlier this year coincided with the reopening of the Inishomaki Line, reconnecting the seaside town of Onagawa to the rest of the country. By combining the train terminal, a bathhouse, retail spaces, and a third-floor platform from which visitors can admire Onagawa Bay, Ban hopes the station will serve as a gathering place for the community and a symbol of its resilience and recovery.

1. White membrane roof
2. 24" × 3.5" LVL curved beam, sliced into two layers and stacked
3. Ø16mm wood bolts (not shown)
4. Curtainwall glazing
5. Structural support members

HIROYUKI HIRAI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Moment Connection, Nest We Grow

TEXT BY JENNY JONES

Inspired by the character of Japanese larch forests, students from the College of Environmental Design (CED) at the University of California, Berkeley, designed a timber grid structure for their winning entry, Nest We Grow, in the fourth Lixil International University Architectural Competition. An elegant, recurring moment connection detailed by the team with Kengo Kuma & Associates and Oak Structural Design Office, both in Tokyo, ensure the rigidity of the four-story, 919-square-foot facility.

Led by CED architecture professors Dana Buntrock and Mark Anderson, FAIA, the team used SAP 2000, Rhinoceros, and AutoCAD for conceptual design. Oak Structural Design calculated the building's anticipated loads with the Rhino model.

Nine larch timber columns anchored in concrete footings provide the building's primary structural support. Each column is a composite of four 6×6 glulam timbers, held together by nine steel plates and 40 bolts. The students worked with CED associate architecture professor R. Gary Black to size the columns. The resulting 12-inch-square columns rise 29.5 feet, recalling the verticality of Japanese larch forests.

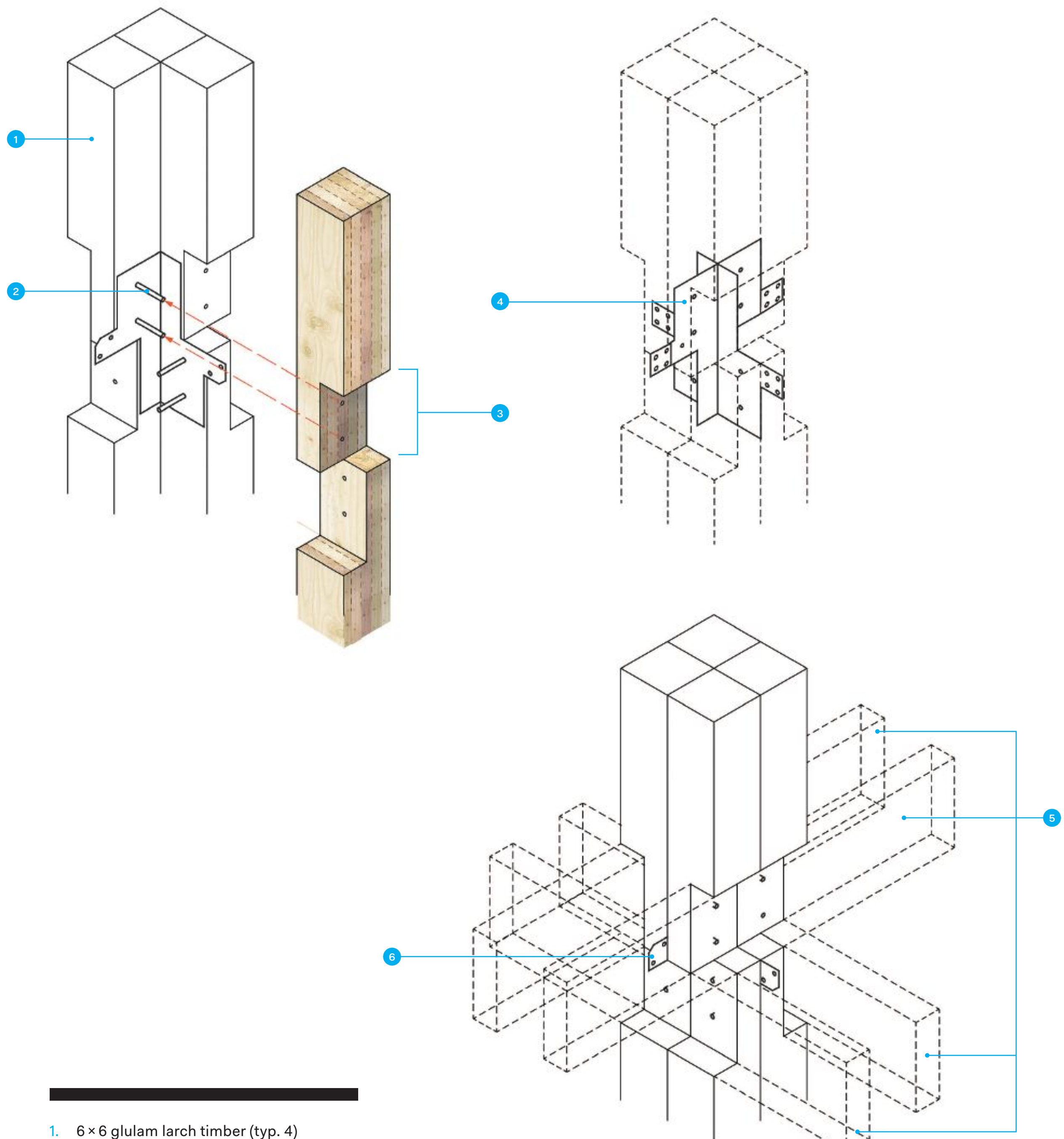
At each floor level, two perpendicular pairs of glulam larch timber beams intersect each column. The beams nest into 3-inch-wide-by-10-inch-deep notches in the columns. "We knew we needed to make a deep enough notch in those columns to fit the beams [and] generate that moment connection," says Baxter Smith, an M.Arch. candidate and design team member. Classmate Yan Xin Huang adds, "The notches are the size of the beams ... so the surface is flush." The bolts that hold the composite columns together also secure the beams, completing the rigid moment connection, Smith says.

On Nest We Grow's first and second floor levels, cross-bracing members bolt into tabs of the sandwiched steel plates. This cross-bracing combined with the moment connections and catwalks at the third- and fourth-floor levels provide the necessary lateral resistance against seismic and wind forces.

Hokkaido, Japan–based Takahashi Construction Co. sourced the wood locally for the glulam members, notched the timbers to create the moment connections, and assembled the composite columns in its workshop. Construction of Nest We Grow began in September 2014. Local craftsmen hoisted the structural members into place using cranes, and then secured the components together by hand. A transparent polycarbonate skin around the structure provides for weatherproofing.

Per the design competition brief, Nest We Grow is intended to bring people and food together at the Lixil JS Foundation's Memu Meadows research center in Taiki-cho, Hiro-gun, Hokkaido, Japan. The team hopes the permanent structure, which opened in November 2014, fulfills this goal, Smith says. "We want to build a sense of community."

SHINKENCHIKU-SHA



1. 6 × 6 glulam larch timber (typ. 4)
2. ø16mm, 330mm bolts (40 per column)
3. 12" × 3" × 10" notch (typ. 4 per moment connection)
4. 0.24" steel plates, 11" × 16.5" or 11" × 17" (typ. 2)
5. 3" × 10" glulam larch timber beam (typ. 4)
6. 0.24" steel plate tab for cross-bracing

Nearly 400 southern yellow pine glulam beams, columns, and trusses in lengths of up to 34 feet were used to help support façade and ceiling areas. Glulam components dramatize the strength, suppleness, and beauty of natural materials, contributing to a warm, staff-friendly environment. Here the interior courtyard is pictured through the two-story glass wall that separates it from the central lounge. Flanking office wings form a U-shaped structure, sheltering the courtyard. Note the role of glulam columns as exterior and interior structural and design elements. Louvered wood sun shades and rooftop overhang work to help mitigate solar heat gain and glare while maximizing interior daylighting.

Wood: Transforming Workplace Health & Wellness

Hidden in a nearly forgotten woodland glade in the heart of Wilmington, N.C., the 36,000 square foot Live Oak Bank headquarters sits lightly in the arboreal splendor like a shimmering Tolkienesque "cathedral of wood." New and tenured bank staff now claim a workplace that's second to none for personal performance, comfort, and efficiency.

Question: When is a bank not a bank?

Answer: When it's the Live Oak Bank in Wilmington, N.C.

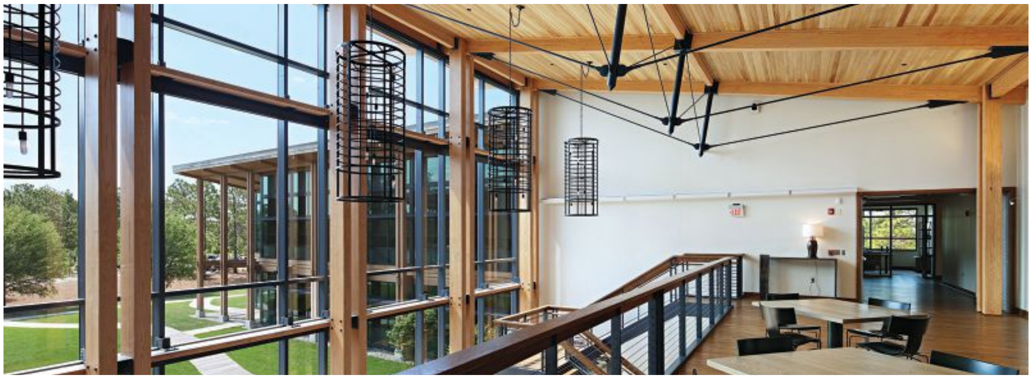
This acclaimed, remarkably successful commercial bank is headquartered in a 36,000 square foot, $10.8 million, two-story U-shaped structure. Because the bulk of the Live Oak Bank's business is transacted and serviced online, you won't find a marble lobby, teller windows, or drive-up ATMs. What you will find is an emphatic emphasis on employee health and wellness with abundant natural light, easy outdoor access, fitness and dining amenities, broadly-accessible technology, all cast in the natural warmth and familiarity of wood.

LEADING WITH WOOD

"The bank's senior leadership wanted a bank that reflected the natural beauty of North Carolina," says project architect Laura Miller, AIA, LEED AP of regional architectural firm LS3P, headquartered in Charleston, S.C., with five regional offices including one in Wilmington.

"The people that work there are some of the smartest I've ever met. They work long hours. Employee retention and happiness also weighed heavily in the owner's requirements."

Wood's leading role in crafting a winning aesthetic was never in doubt.



The dramatic play of wood provides a relaxed, unbank-like setting to help attract and retain top financial talent to the Wilmington area. Meeting all fire safety regulations and other code requirements wasn't an issue. In fact, city of Wilmington officials were openly excited by the project according to the architect, and "thrilled with the way the owners respected the land and the design character of the Wilmington area."

Low daylight-friendly custom-milled workstation panels and the ceiling's wood-laminate panels and glulam support beams create an inviting workplace where nature is never far from view. The project cost fell well within the budget allocation, even allowing for the extra level of presentation effect the owners sought in headquarters design and construction.

NATURAL ADVANTAGE

"The owner wanted the headquarters to feel like it had always been there. Cypress as the cladding material offers this rich, warm tone that silvers-out over time. Like the forest around it, the building will naturally age.

"The building interior features wood laminates in the ceiling with custom millwork for the workstations. Oak is used for the flooring and southern yellow pine is used for the exposed glulam columns, beams, and trusses," Miller observes. Large, exposed glulam columns serve as major design and structural elements across the building's exterior and interior.

Glulam (glued laminated timber) was chosen because it is stronger and stiffer than dimensional lumber. Pound for pound, glulam is stronger than steel. For example, glulam beams can span long distances with minimal need for intermediate supports. This strength advantage offers designers nearly unlimited design flexibility for long-span projects. Southern yellow pine was specified because of the species' inherently denser, more robust physical characteristics.

The LS3P design team worked closely with the general contractor from the beginning, helping them coordinate specification details with the glulam manufacturer and millworks. "It was a team effort from start to finish," Miller notes.

STAFF-AFFIRMING

Today the naturalness and tranquility of the building still gives the designer pause. "Many times when I go over there, none of the lights are on, except for task lights. Controlled natural light is all they need. The overall feeling is just lighter and happier. The proximity of nature and the use of natural, locally-sourced wood lift spirits and enhance productivity."

SIGNATURE LOOK

The bank's senior leadership endorses that view: They just took delivery of a second, larger facility also clad in cypress with southern yellow pine glulams used throughout.

"The bank's senior leadership knows what it takes to attract and retain top talent. This facility sets out to not only do that, but also raise the bar for other Wilmington-area businesses." A rising tide of design excellence helps lift good fortune for all.

Owner Live Oak Banking Company

Architect LS3P Associates,
Charleston and Wilmington

Civil Engineer Norris & Tunstall Engineers

General Contractor Clancy & Theys
Construction Company

Structural Engineer Woods Engineering

Mechanical Engineer CBHF Engineers

Plumbing Engineer CBHF Engineers

Electrical Engineer McFadyen Engineers

Landscape Architect LACC International

Photographer
© Mark Herboth Photography, LLC

Location
1741 Tiburon Drive
Wilmington, N.C.

Awards

WoodWorks Wood Design Award
(2015 Jury's Choice Award)

AIA Wilmington (Design Excellence Award)

IIDA Carolinas DesignWorks Awards
(Corporate Award)

Lower Cape Fear Stewardship Development
(Outstanding Stewardship Award)

Prefabricated Module, Private Grotto Sauna

TEXT BY JENNY JONES

The outer island in Ontario's Georgian Bay is mostly undeveloped where a private owner commissioned Toronto-based Partisans to design an artificial grotto. The 800-square-foot sauna appears to be carved from the shore and has a "very simple geometry, rising and being born of this rock," says Partisans co-founder Alexander Josephson.

The firm worked with Mississauga, Ontario–based contractor EllisDon to survey the site using a Leica 3D-scanning device, collecting 90 million data points. The team manipulated the scan with Autodesk ReCap and modeled the structure with Rhinoceros and Grasshopper.

Instead of specifying western red cedar, a popular choice for saunas due to its warm hue, the team used custom-cut and dried northern white cedar because of its quality, aroma, and abundance in the area. "It also has some knots in it, so there's a bit of character to the wood," Josephson says.

Inside the sauna, 117 curvilinear wooden panels line the walls. Toronto-based Millworks Custom Manufacturing (MCM) CNC-milled the panels, which each are distinct in shape. Cut from raw wood blocks up to 4 feet by 8 feet, the 7.5-inch-deep panels range from 10 inches square to 48 inches by 114 inches; the larger pieces were joined after milling. Custom 8-inch-by-4-inch-square, 11-gauge galvanized steel brackets inconspicuously hold the panels together, creating a smooth, sinuous space.

The sauna's exterior walls and roof are clad in approximately 280 square-cut cedar planks up to 15 feet long. Their distinct carbon color comes from *shou sugi ban*, a Japanese wood-charring process, which Josephson says "was analogous to what was going on inside the space, which is obviously a hot room."

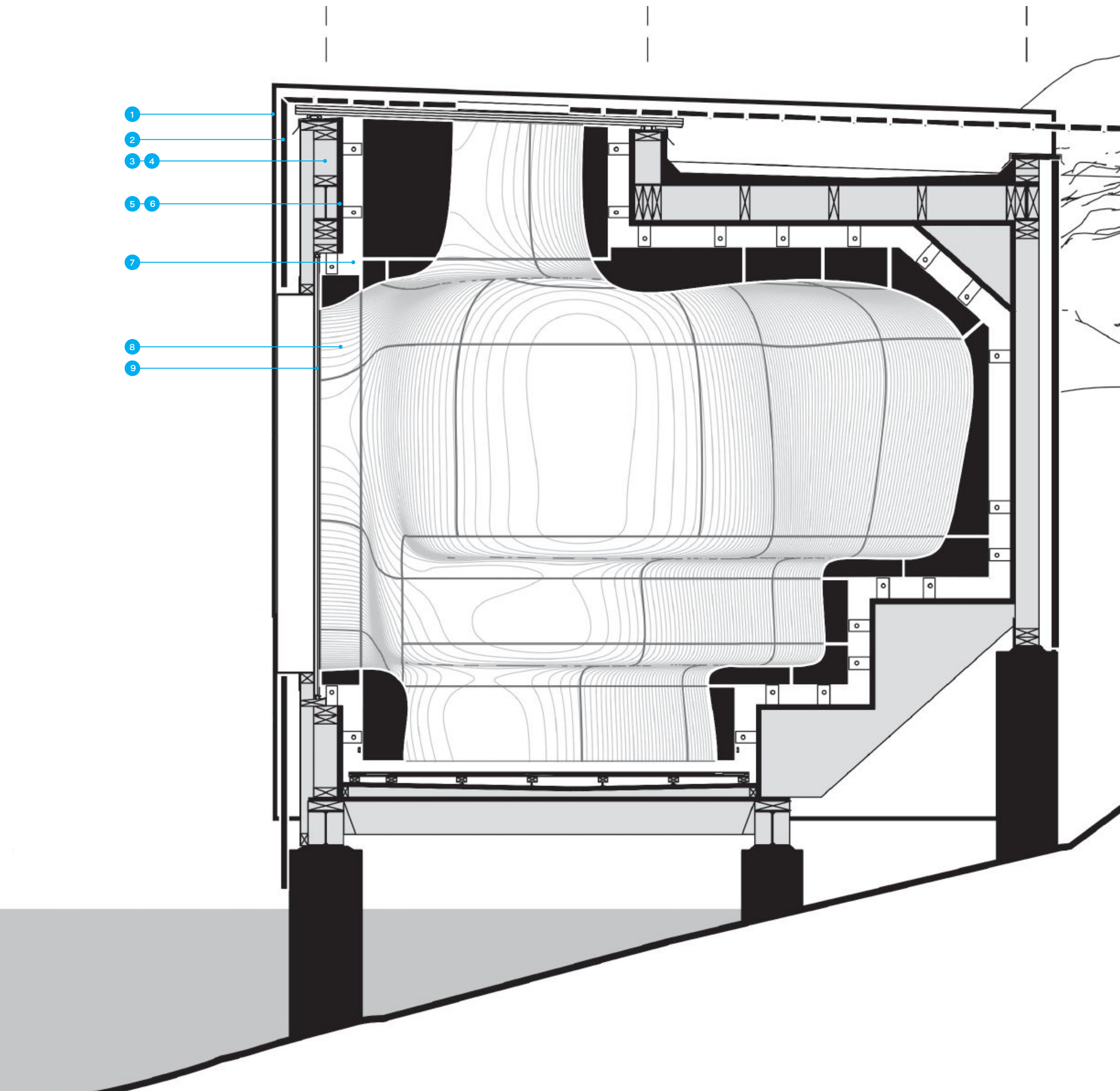
The planks are sealed for weather protection and attach to cleating on the structure's exterior using adhesive resin, as well as brad nails and screws up to 3 inches long. A screen prevents insects from nesting behind the planks. Ontario-based Jordan Group Construction used dynamite with blasting caps to remove a few cubic meters of rock to prepare the rugged site for the sauna's high-performance concrete foundation, which is engineered to withstand drifting ice floes in the winter. Reinforced footings, 12 inches wide, are pinned and grouted to the rock using 24-inch-long rods.

Given the environmentally sensitive nature of the site, MCM assembled and tested the sauna structure in its own loading dock in Toronto before transporting the built unit to the remote island. A crane lifted the sauna from the barge and placed it onto the foundation.

The Jordan Group secured the sauna to the foundation with grout and ¾-inch-diameter, 9-inch-long bolts. On-site construction took just 12 days, which Josephson attributes to the thorough digital scanning and modeling work at the project's outset. "We planned the whole thing very accurately," he says.

1. Cedar plank cladding
2. Water-resistant barrier
3. Closed-cell spray foam insulation
4. Structural steel cage with wood framing
5. Plywood sheathing
6. Sauna foil vapor barrier
7. Plenum, 2" to 4" wide
8. Cedar paneling
9. Porthole window

JONATHAN FRIEDMAN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Auditorium Ceiling, The University of Queensland

TEXT BY EMILY HOOPER

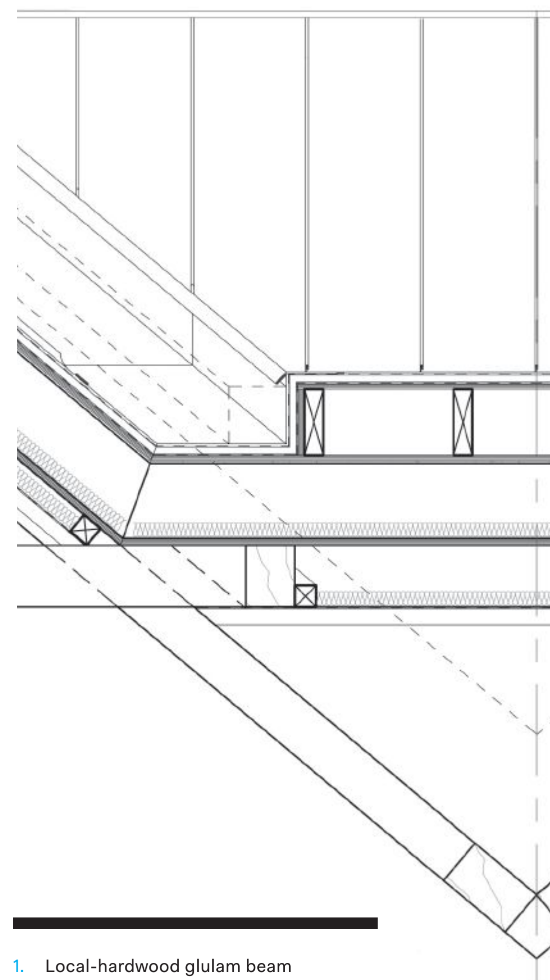
At the Brisbane, Australia, campus of the University of Queensland, local firms Hassell and Richard Kirk Architect collaborated on the Advanced Engineering Building (AEB), a 237,000-square-foot learning facility with large-scale manufacturing and civil engineering research labs, and passive design features with real-time performance monitoring.

The AEB's triple-height, 500-seat GHD Auditorium is enclosed in glass on two sides, connecting inhabitants with lake views. The interior is finished in local timber to provide a warm aesthetic and, with the aid of custom-designed acoustic glass reflectors, to transmit sound without electric amplification. Supporting the 3,300-ton roof are glulam trusses constructed from local hardwood species, manufactured by Hyne Timber 160 miles up the coast in the city of Maryborough. The trusses run upwards of 82 feet long and stand between 13 and 16 feet tall in the accordion-style roof. Chord members are constructed from glulam beams made from local hardwoods and measure about 3 inches wide. The beams are laminated together and fastened with slotted steel plates and exposed steel bolts. To suppress acoustic echo, a series of 1½-by-¾-inch wood strips, planed on all sides, bridge the space between trusses.

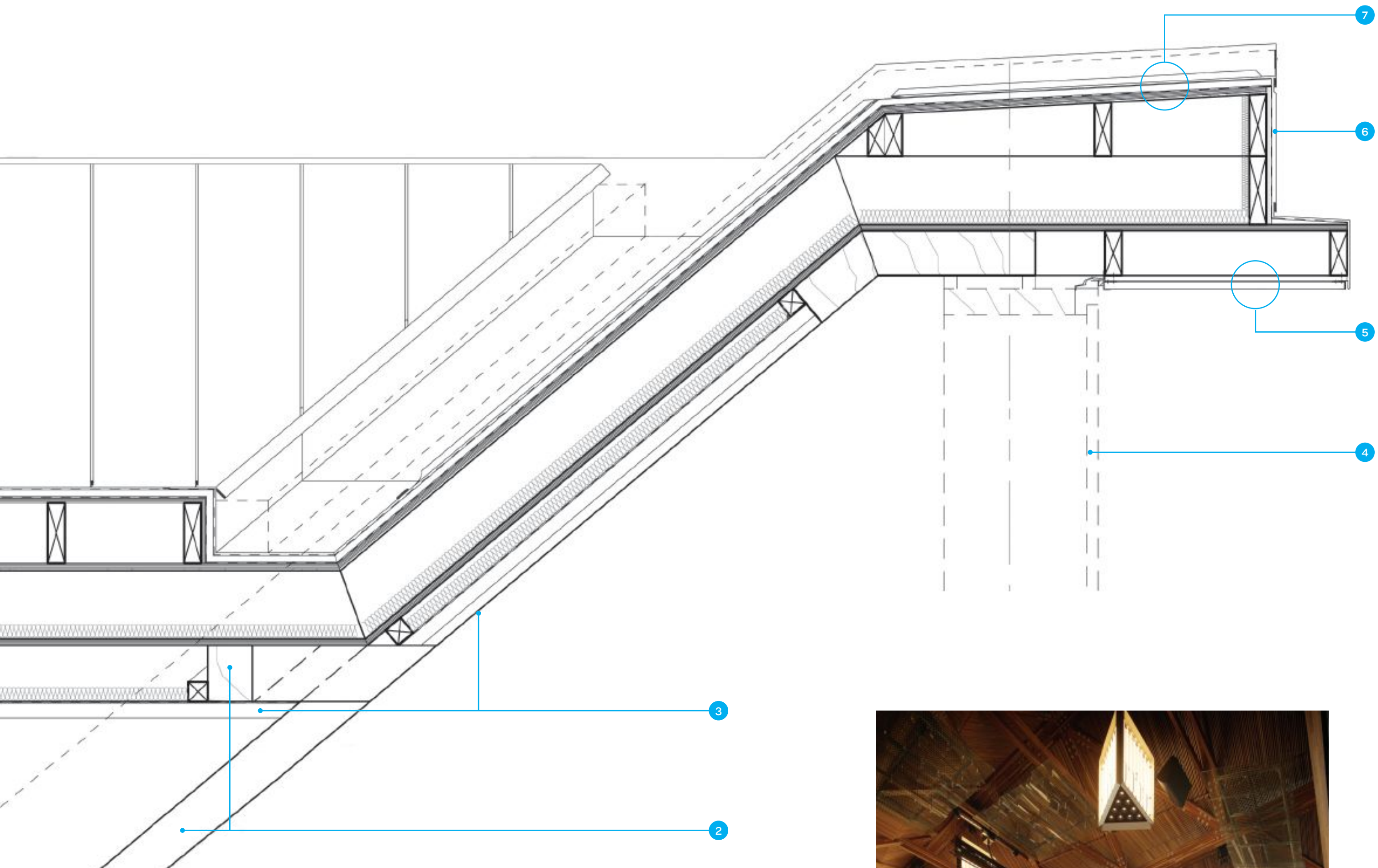
The design optimizes acoustic performance while demonstrating the versatility of timber as a large-scale load-bearing element. "As the home of engineering at the University of Queensland, the structural requirements for the roof were deliberately exposed and expressed in an interesting and evocative way," says Mark Loughnan, principal at Hassell. To maintain clean views of the roof structure, the designers specified a clear, fire-retardant paint finish on the trusses that eliminates the need for a sprinkler system.

The size and weight of the roofing system required special considerations for installation. The trusses were prefabricated off site and then broken down for transport to the university. The trusses were then reassembled at ground height with 1-inch galvanized steel bolts grouped with 16-millimeter steel plate cleats and boxes and 5-millimeter-thick washers. The completed structure was hoisted up over two concrete walls by two large cranes.

The auditorium uses other regional wood varieties, such as Rosewood—a termite-resistant species—in door and window trim, and recycled *Eucalyptus pilularis*, or blackbutt, for flooring due to the hardwood's ability to withstand heavy foot traffic. "The use of local Queensland timber became central to developing sustainability initiatives beyond the singular energy strategies typically targeted in large projects," Loughnan says. "The legacy of the project is to demonstrate the potential for innovation beyond the current established targets and promote an underused, but inherently sustainable, local industry."



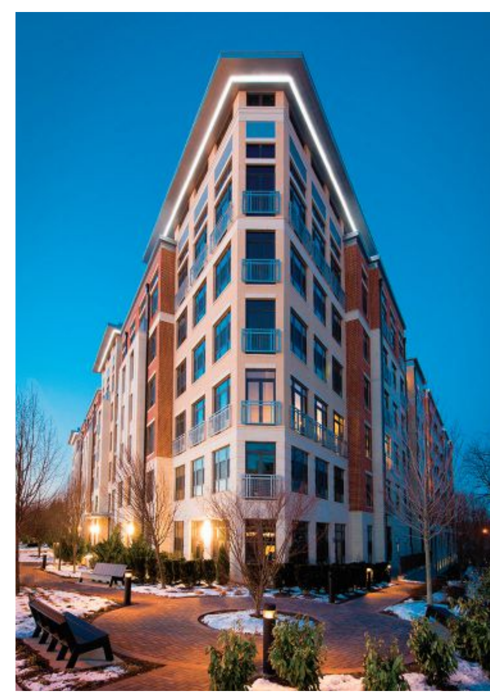
1. Local-hardwood glulam beam
2. Local-hardwood glulam truss chord
3. 1½" × ¾" wood-strip ceiling panels
4. Glazing
5. Soffit
6. Fascia
7. Roof cladding



SCOTT BURROWS

WOOD: SAFE, SMART, AND SUSTAINABLE

Solaire Wheaton is a six-story, 232-unit Class A luxury apartment community in Wheaton, MD that serves as the centerpiece to an ambitious new eight-acre transit-oriented urban environment minutes from Washington, D.C.



Solaire Wheaton is a 361,000 square foot Type IIIA five-story wood-frame construction structure over a cast-in-place concrete podium with two levels of sub-grade parking. Residents enjoy dedicated access to many amenities, including a private resort-style swimming pool, landscaped courtyard, a fitness center, Wi-Fi café, demonstration kitchen, and easily-walkable proximity to a Metro (subway) station and new Safeway and Costco stores.

CODE COMPLIANCE

Building codes require all building systems to perform to the same level of safety, regardless of material used. Wood-frame construction has a proven safety and performance record for fire protection, and the addition of sprinkler systems, fire-resistance-rated wall and floor/ceiling assemblies, and open spaces around the building can be used to increase the allowable size of wood-frame structures.

The building conforms to all applicable building codes and housing standards including the IBC, Uniform Fire Code, International Energy Conservation Code, Fair Housing Act, National Fire Alarm Code, Code of Maryland, ADA, and various city and county ordinances.

Building with wood reduced the total project cost per square foot to $87.18, placing it at the low-end of a national average of $85 to $125 for most commercial or multiple unit projects.

Residential **Long-term stay multiple-family facilities (R-2) and Short-term (R-1)** (i.e., apartments, convents, dormitories, fraternities and sororities for R-2; hotels and motels for R-1) NFPA 13 Sprinklers 100% Open Perimeter				
	Type IIIA	**Type IIIB**	**Type VA**	**Type VB**
Maximum stories	5	5	4	3
Maximum building height (ft)	85	75	70	60
Total building area (at maximum permitted stories) (ft^2)	270,000	180,000	135,000	78,750
Single floor area (ft^2)	90,000	60,000	45,000	26,250
Total building area (ft^2), single-story building	114,000	76,000	57,000	33,250
Total building area (ft^2), two-story building	180,000	120,000	90,000	52,500

2015 IBC allowable heights and areas for residential wood construction
Source: American Wood Council

WHY WOOD?

Wood is safe. The property represents best practice in active and passive fire prevention and suppression. As outlined in Section 602.3 of the IBC, Solaire Wheaton utilizes fire-retardant treated wood at all exterior walls that are rated at two hours or less.

Wood costs less. Wood supports the economics of an urban multi-family project. The architect estimates wood framing is just 80 percent of the cost of metal framing at the same unit density. Building with wood reduced the total project cost per square foot to $87.18, placing it at the low-end of a national average of $85 to $125 for most commercial or multiple unit projects. Today, podium construction is an increasingly popular choice in the Washington D.C. metro area because of affordability, speed-to-market, design flexibility, and investment return.

Wood is versatile. Solaire Wheaton is designed wedge-shaped with a flat, sun-reflecting thermoplastic polyolefin membrane roof to minimize building heat. The design aesthetic echoes the look of New York's famous Flatiron Building, contributing to the classic, upscale urban aesthetic.

DENSITY

Solaire Wheaton is built on a tight (1.76 acre) site. With 232 alcove studios, one- and two-bedroom units, the owner achieved 131.82 dwelling units per acre.

SUSTAINABILITY

The project is LEED Silver-certified by the U.S. Green Building Council. Prior to construction, materials from the demolition of the previous structure were largely recycled and diverted from landfills.

AMENITIES

The five floors of wood-framed apartments incorporate a wide range of luxury features including granite countertops, stainless steel appliances, wood flooring, large windows, and private balconies. The apartment community is surrounded by a diverse assortment of restaurants, a wide variety of shopping options, many nightlife venues, and rapid access to Washington D.C. by public transportation and on-site Zipcars.

Architect & Landscape Architect: The Preston Partnership

Owner: The Washington Property Company

Construction Manager: Clark Builders Group

Interior Design Architect: SR/A Interior Architecture & Design

Structural Engineer: Cates Structural Engineers, Ltd.

MEP Engineers: Summit Engineers, Inc.

Civil Engineer: Macris, Hendricks, & Glascock, P.A.

Photography: John Cole

Fan Vaults, Pancho Arena

TEXT BY EMILY HOOPER

The organic architecture movement in Hungary grew in the late 20th century as a protest against the Brutalist architectural styles favored by the ruling Communist Party. When current Prime Minister Viktor Orbán commissioned a landmark soccer stadium at the Puskás Academy, just outside of Budapest, he "was firmly committed to the concept of organic Hungarian architecture," says Tamás Dobrosi, principal at local firm Doparum Architects.

The 3,400-seat Pancho Arena, which hosts league matches and tournament games, maintains the style of the athletic academy's campus, which was master planned by Imre Makovecz, a prominent proponent of organic architecture. The 130,000-square-foot arena harmonizes with the natural environment, from the fan vaults that spread like tree branches to the use of timber as the primary building material.

Like a forest canopy abutting a clearing, the roof cantilevers 43 feet over spectators and is supported by glulam columns rooted into concrete piers every 20 feet with the use of 36-millimeter-diameter threaded rods anchored 5 feet into the concrete and affixed with synthetic resin. These primary supports arc up and fan out, with steel elbow-bracket reinforcements. As the supports extend farther from the piers, their depths increase to accommodate the accumulating cantilevered load.

Secondary intersecting beams connect to the primary beams via radial glulam crutches. The resulting hybrid timber-and-fan-vault construction is based on gridshell principles.

In the first design iteration of the roof, modeled in Graphisoft ArchiCAD, nearly every support had a unique radius, which was cost prohibitive to manufacture. In their second pass, Doparum grouped members of a similar bending radius for more efficient milling, Dobrosi says. For example, the team revised all members that initially were 33 to 43 feet tall to have a bending radius of 38 feet, the average.

A CNC router cleared boreholes and slots for the heavy-duty screws and hardwood-peg joinery in the glulam members. The steel fittings that anchor the beams to the concrete piers resist the tension forces in the primary beams toward the roof's open edge, and resist the compression forces in the beams toward the base of the roof.

In plan view, the roof was built in rectangular segments, with each section being self-supporting. Once the corners of the roof were completed, five carpentry teams simultaneously worked inward to construct the remaining sections.

In total, nearly 1,000 tons of wood were used to form the vaulted structure. Austrian timber manufacturer Rubner Holzbau manufactured about 80 percent of the GL28 and GL32 pine beams—both mid-grade varieties of glulam—and Hungarian specialty timber mill Sokon completed the remaining fabrication and construction. Structural engineer László Pongor analyzed the system's capacity.

1. Primary glulam beam, 9½", 25", or 41" deep
2. Glulam crutch, 9½" or 17" deep
3. Secondary glulam beam, 7" to 25" deep
4. Reinforced concrete pier (20' o.c.)
5. Wood decking
6. Waterproofing membrane
7. Air cavity and pressure-treated purlins
8. Pressure-treated sheathing
9. Slate roof

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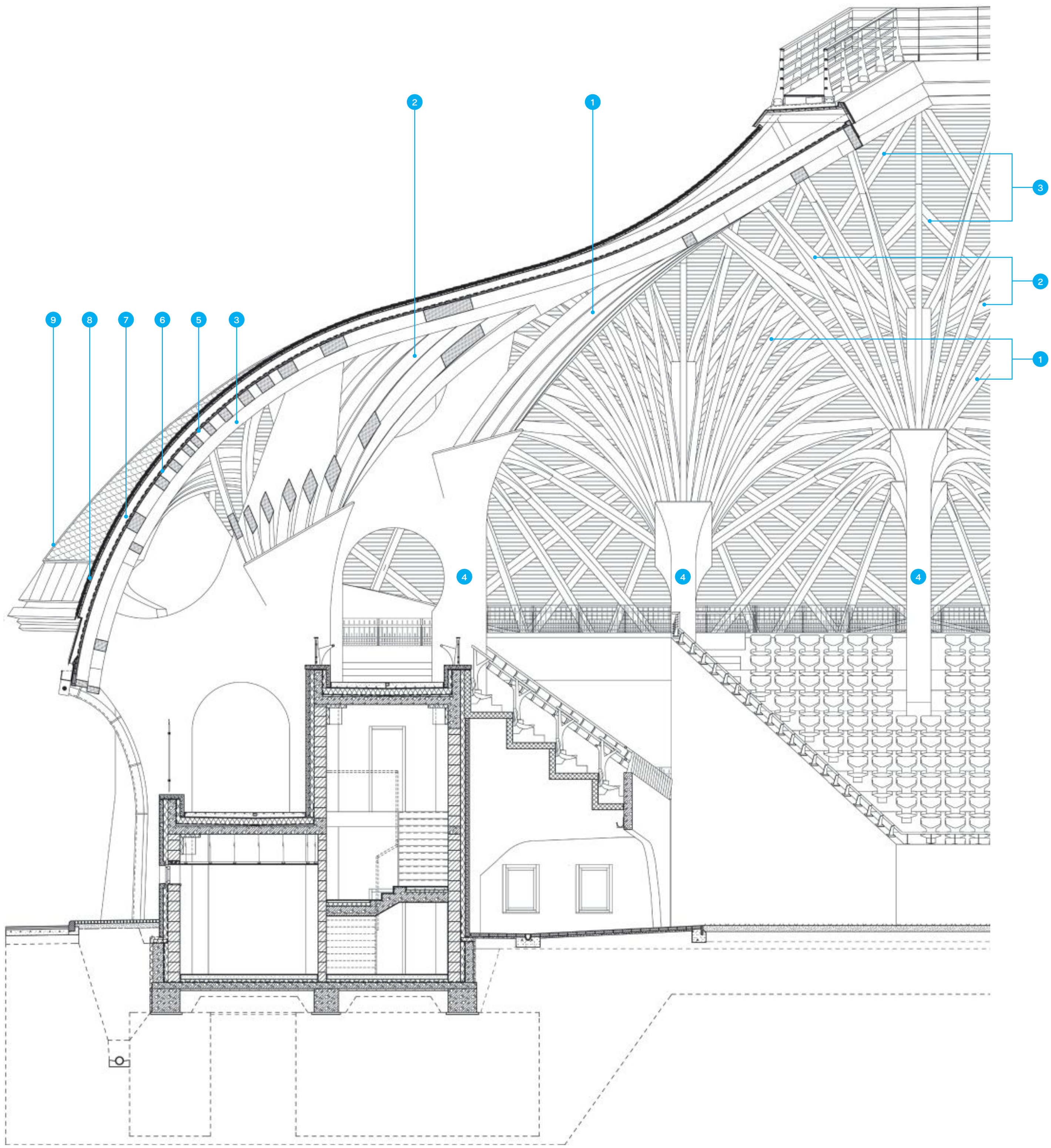

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Mass Timber Construction, Wood Innovation and Design Centre

TEXT BY EMILY HOOPER

One of the world's tallest wood building constructed in modern times, using contemporary techniques, can be found on the campus of the University of Northern British Columbia, in the city of Prince George. The eight-story, 96-foot-tall Wood Innovation and Design Centre (WIDC), designed by Vancouver-based Michael Green Architecture (MGA), contains 51,000 square feet of office and educational space that sit atop a concrete raft slab. Leasable office space occupies the top three floors while the lower levels are dedicated to the university's proposed Master of Engineering in Integrated Wood Design program. At ground level, a double-height, triple-glazed curtainwall with laminated veneer lumber (LVL) mullions connects an interior sheathed entirely in wood to the street outside.

The building was designed to showcase the aesthetic and structural capabilities of wood in commercial construction. MGA principal Michael Green cites Japanese temples and Egyptian tombs—tall timber structures that have stood for millennia and still function as public space today—as examples of low environmental impact buildings with longevity.

Mass timber construction—a term that encompasses the use of prefabricated wood components such as LVL, cross-laminated timber (CLT), laminated strand lumber (LSL), and glue laminated timber (glulam)—supported two goals of the project. It is strong enough to support the WIDC's post-and-beam structure and lateral-load resisting system, and it supports an exceptionally long life cycle. The building's dry construction—meaning it was free of concrete and wet materials—will allow the wooden components to be taken apart and reused. Glulam beams, varying in size based on their location, transfer structural loads to glulam columns, which are 14 inches by 14½ inches on the ground floor and 12 inches by 11½ inches on the upper floors. This post-and-beam superstructure is secured by glued-in rods, 2 millimeters to 16 millimeters in diameter, and stainless steel washer plates. The beam-to-column connection is made using a proprietary, pre-engineered aluminum dove-tail connector.

Four-, 6½-, and 9½-inch-thick CLT panels comprise the walls, stair, and elevator core. Three-, 5-, and 7-ply CLT panels make up the custom, staggered design in the floor and ceiling that shelters—and hides—all building services, and is fortified by two layers of 13-millimeter plywood and semi-rigid fiberglass board insulation. Carpet and ¼-inch needle-punched polypropylene fiber underlayment provide additional sound insulation on floor planes, while wood slats, fiberglass batt insulation, and acoustic ceiling hangers help insulate ceilings.

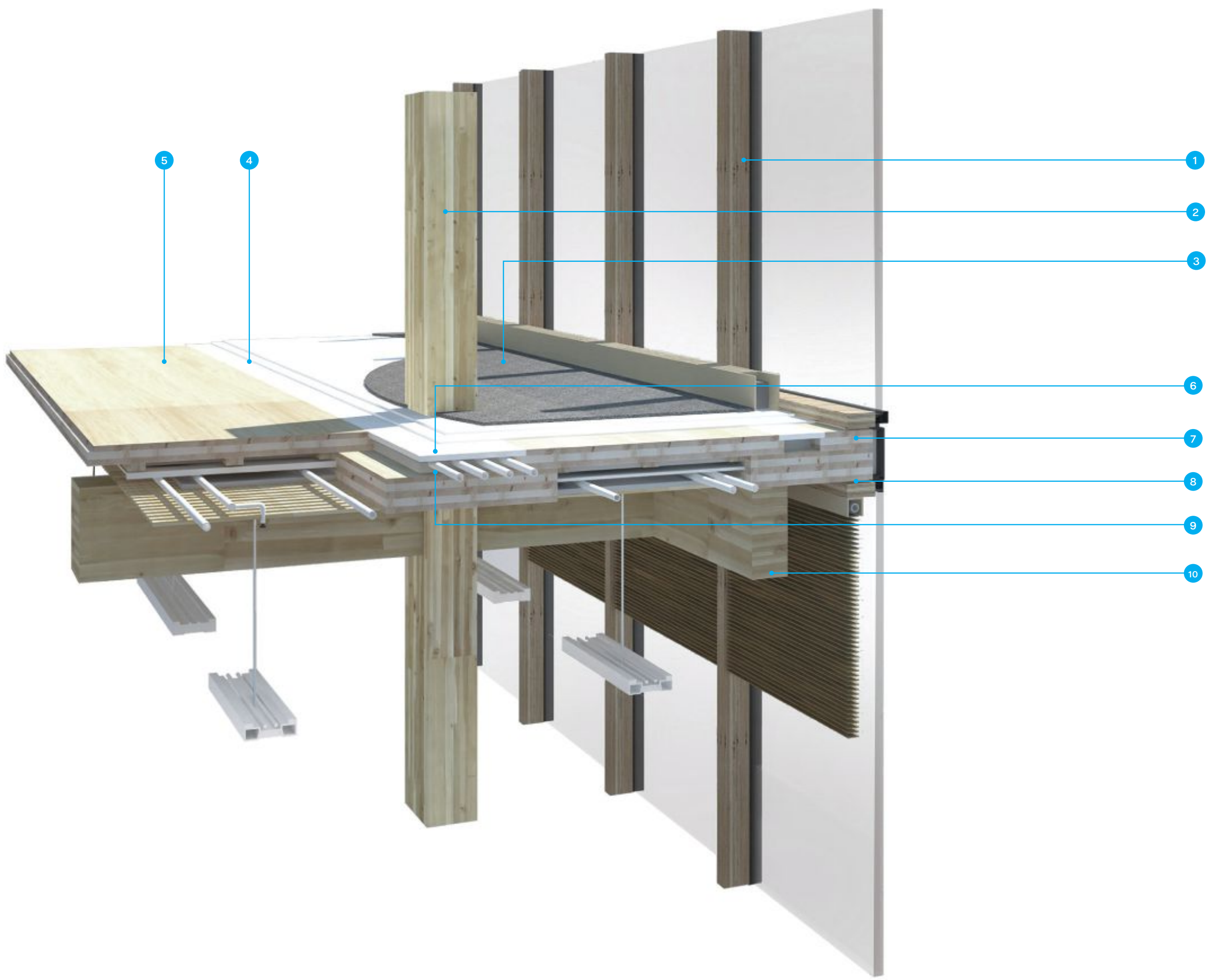
Structurlam and Brisco Wood Preservers—both located less than 500 miles southeast of Prince George—supplied the mass timber products, which were made of British Columbian spruce pine fir. "We always work with local manufacturers to elevate the game for high-tech solutions," Green says.

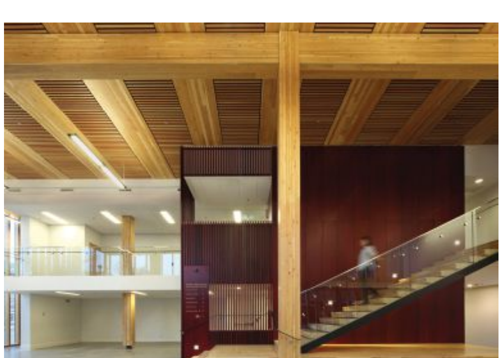
Currently, the city's building codes restrict lumber construction to lightweight framing for residential construction up to six stories, and nonresidential buildings up to four stories. However, the province granted an exemption to the WIDC project, which was crucial to its realization, Green says. "Innovation in other industries doesn't wait the way construction does," he says. "Advances in software don't wait, and climate change and environmental issues can't wait either."

Building outside of the codes became an opportunity to educate and collaborate. Green partnered with contractor PCL Constructors Westcoast early on, and worked closely with MGA's lumber suppliers. Since the building core—including the exit stairs—are constructed from CLT, fire and smoke separation engineering was physically tested and demonstrated for city officials.

MGA's modular design for the WIDC can be used in buildings up to 30 stories. The firm is working with a U.S. developer on future timber towers.

"We wanted to encourage building code officials, developers, and contractors to get excited about this," Green says. "We wanted to show the world how building [with lumber] will work in the future. With just a 16-month design/build process, I almost can't believe we pulled it off."





EMA PETER

1. Laminated veneer lumber mullion
2. Glulam column, 12" × 11½"
3. Carpet
4. ¼" acoustical underlayment
5. 99mm three-layer CLT panel
6. 13mm plywood (two-ply)
7. 99mm three-layer CLT panel
8. 169mm five-layer CLT panel
9. 25mm semi-rigid glass-fiber insulation board (two-ply)
10. Glulam beam, dimensions vary

Building Structure, St. Edward Catholic Church

TEXT BY JENNY JONES

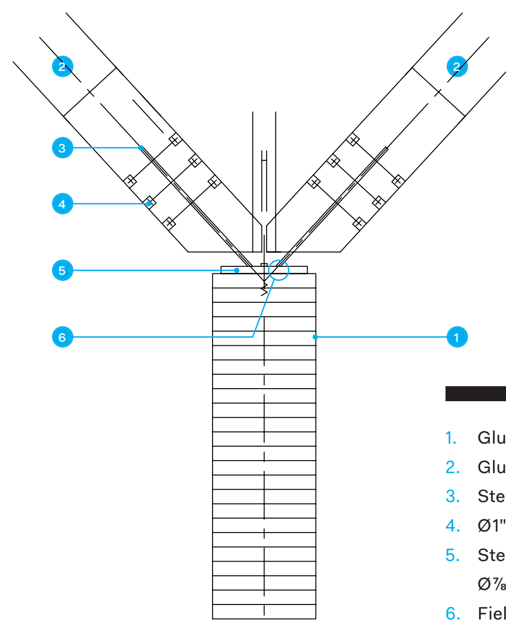
In Keizer, Ore., the prayers of St. Edward Catholic Church's parishioners were answered when Portland, Ore.–based DiLoreto Architecture employed a series of structural glulam arches to help meet their $4 million budget for a 12,000-square-foot contemporary Gothic-style church.

Six pointed arches made of locally sourced Douglas fir rise 38 feet atop concrete plinths, spanning the 65-foot-wide nave. Two additional pointed arches cap the ends of the nave at the sanctuary entrance and altar. "When ... you're surrounded by these arches, [it harks to the idea] that structure makes space," says lead designer Brian Melton.

As symbols of radiating energy, 14 to 16 angled glulam struts act like flying buttresses to transfer the building's dead loads—the sanctuary roof, the soaring clerestories, and the lower roof—to each main arch. As many as three struts and three knife blades converge at points along the arches.

DiLoreto worked with Portland-based WDY Structural + Civil Engineers to position the struts using SAP2000. The process was "extremely difficult," Melton says, because each strut orients in three dimensions and originates from different points along the arches' curved forms.

Since its completion in February 2014, the church has become a beacon in the community, as was typical in Gothic times, Melton says. "I hope that the space is uplifting and enhances their spiritual connection to God and to their community for generations."



1. Glulam arch, 36" × 12"
2. Glulam strut, 6¾" × 7½"
3. Steel knife plate, ¼" × 5" × 18¾" in ⅜" kerf
4. Ø1" bolts, countersunk 1" and plug (typ.)
5. Steel plate, ¾" × 5¼" × 1'3" with four Ø⅞" × 8" lag screws at 4" o.c.
6. Field weld (typ.)

GEORGE KING

Tapered Entrance, Tubakuba Mountain Retreat

TEXT BY TIMOTHY A. SCHULER

Perched on the side of Mount Fløyen, 1,000 feet above Bergen, Norway, Tubakuba is a tiny mountain cottage designed to provide an immersive experience in nature just minutes from the city center.

Completed in the summer of 2014 by the Bergen School of Architecture, under the supervision of instructor Espen Folgerø, who is also a designer with local firm OPA Form Architects, the 150-square-foot cottage's most distinct feature is its entrance, which resembles the bell of a tuba crafted from wood—Tubakuba, as one might guess, literally translates to "Tuba Cube." To enter, users must clamber, *Alice in Wonderland* style, through a 6-foot-long tunnel that tapers from 6.5 feet wide at the cube's façade to 2.25 feet at the tucked-in entry. Upon unlatching a miniature door, guests emerge in an airy cabin with built-in sleeping areas and expansive views of the city and the surrounding fjords.

Ninety-five percent of Tubakuba is constructed from wood, pieced together from three types of timber. The interior, including the flooring and two curvilinear benches for sitting and sleeping, is mostly plywood made from Scots pine (*Pinus sylvestris*) and birch (*Betula pubescens*). The exterior is clad with European larch (*Larix decidua*), two walls of which have been charred using the Japanese method *shou sugi ban*. The charring process, in which planks were stood on end around a small brick furnace, helps to inoculate the wood against pests, fungus, and rot.

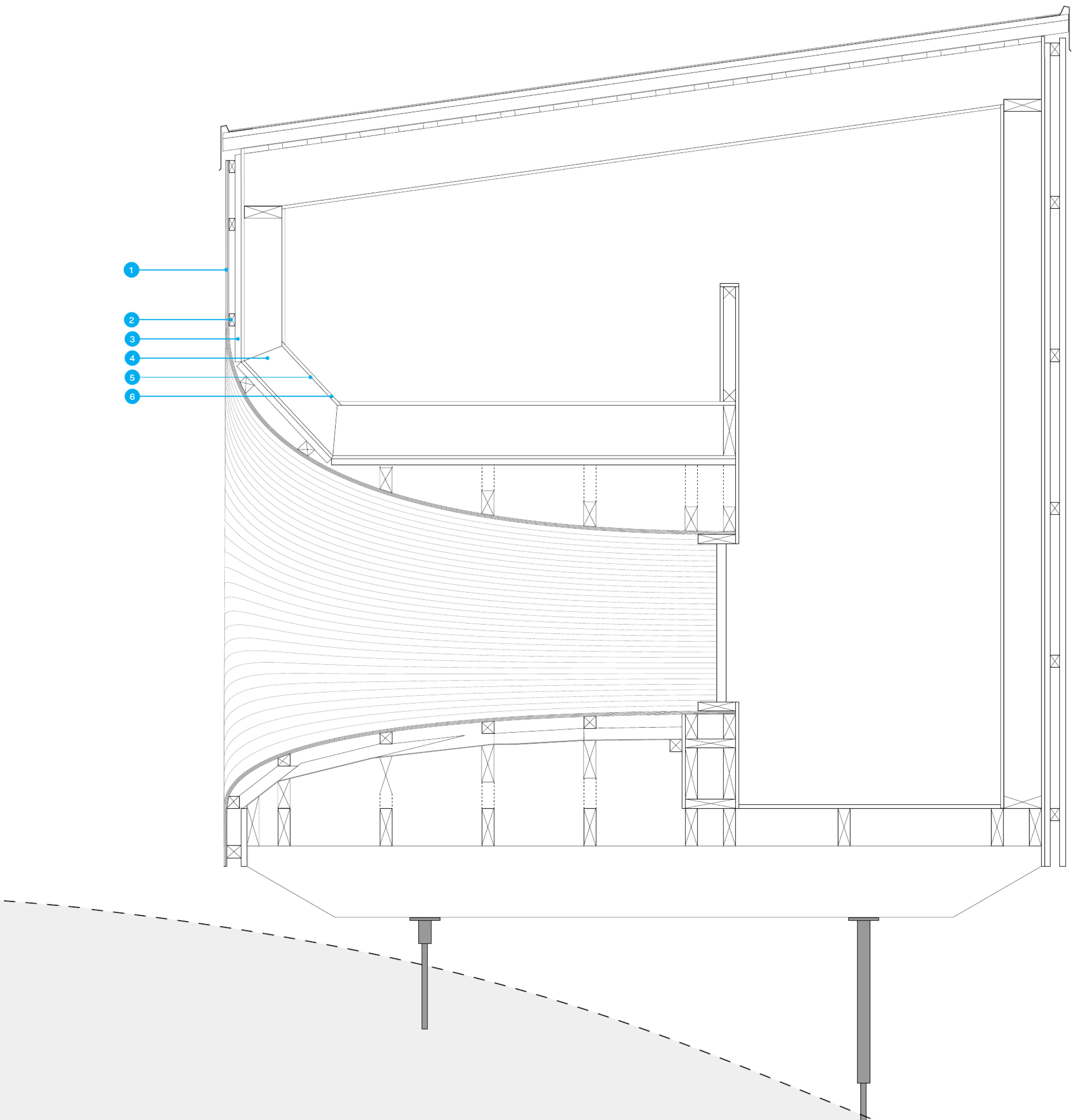
Building the façade tunnel required experimentation. The students used pine off-cuts—roughly 13 feet long, 3 inches wide, and 3 to 4 millimeters thick—from a local sawmill. But the wood remained too brittle to bend to their specifications. So the students built a long bathtub and, using a series of heating elements reclaimed from residential water boilers, submerged each plank into a 140 F bath for 15 minutes, softening the wood the way a chef softens lasagna noodles.

Once the wood became pliable, team members fastened the planks to a 12-sided, timber-lattice "rib cage" of 2×2s using nails and polyurethane glue. "When we glue them, they become this laminated sheet so that [when] they dried up, they wouldn't crack," Folgerø says. However, the first batch of pine did crack, even after soaking. The team identified the frequency of knots in the wood as the cause, returned to the sawmill, and selected each plank by hand before purchasing.

Once the entry was complete, the wood was finished with linseed oil for weather protection. The walls of the cabin, which is heated only with a wood-burning stove, also comprise a vapor barrier, a 6-inch structural wood frame with wood-fiber insulation, and a wood-fiber windproof plate.

Tubakuba, which can be reserved through the local parks district, has almost become too popular, Folgerø says. "I think New Year's Eve is booked until 2020."

1. 3mm to 4mm pine off-cuts, 3" × 13', with custom bend
2. 1" blocking
3. 12mm wood fiberboard, by Hunton Fiber
4. 6" stud frame with wood-fiber insulation
5. Vapor barrier, Wütop by Würth (not shown)
6. 12mm plywood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Tapered Entrance,
Tubakuba Mountain Retreat

This page: Tubakuba on Mount Fløyen overlook

Opposite: View of Tubakuba entrance from the northeast

THIS PAGE: GUNNAR SØRÅS; OPPOSITE: ESPEN FOLGERØ

DESIGNING WITH VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

MAXIMIZING AESTHETICS, OCCUPANT COMFORT, AND ENERGY EFFICIENCY

LEARNING OBJECTIVES

At the end of this program, participants will be able to:

1. Describe the basic technology and components of variable refrigerant flow systems.
2. Examine the design benefits of variable refrigerant flow systems.
3. Understand applications for variable refrigerant flow systems.
4. Identify how variable refrigerant flow systems can contribute to energy efficiency goals.

CONTINUING EDUCATION

CREDIT: 1 LU/HSW

COURSE NUMBER: ARdec2015.1

Use the learning objectives to focus your study as you read this article. To earn credit and obtain a certificate of completion, visit http://go.hw.net/AR1215Course1 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.

By Paige Lozier

VRF OVERVIEW—FLEXIBLE, EFFECTIVE, INNOVATIVE

According to the EPA, at least 45% of energy use in commercial buildings is attributable to cooling and heating expenses. In addition, commercial buildings with conventional ducted HVAC systems often experience significant duct loss leading to wasted energy within the building. Variable Refrigerant Flow (VRF) zoning systems provide more precise comfort control and energy efficiency to buildings of all shapes and sizes, as compared to conventional HVAC systems. They serve a wide variety of commercial applications, from cooling or heating a large building with multiple floors to a small medical suite with multiple patient rooms, and everything in-between.

Conventional HVAC systems condition the air at a remote location and then move it to areas where it is needed. This medium loses its ability to precisely cool or heat where required, contributing to additional cost and inefficiency during operation. VRF, on the other hand, moves conditioned refrigerant to a specific space, or zone, where conditioning is required. The "variable" in VRF refers to the ability of the system to control the amount of refrigerant flowing to the indoor units, enabling the use of multiple indoor units of differing capacities and configurations connected to a single condensing unit. VRF systems increase efficiency by providing cooling or heating only to the individual zones where conditioning is required, offering on-demand cooling and heating while reducing energy consumption.

A two pipe VRF zoning system moves refrigerant to the zone to be cooled or heated, so the temperature of that area can be more accurately controlled; they are generally used in commercial applications and offer capacities from 3 to 30 tons. When using a two-pipe heat recovery system, a building owner can simultaneously cool certain zones while heating others, recovering heat energy that would have otherwise been wasted. VRF systems incorporate a variable capacity inverter-driven compressor within the outdoor unit connected to a network of indoor air handling units. Every feature of a VRF system, from the compressor speeds, the linear expansion valve setting and the fan speed, has been optimized to provide the greatest efficiency.

A VRF system consists of outdoor condensing unit(s), indoor air handling unit(s), a branch circuit controller (if operating in heat recovery mode), and corresponding central system and individual zone controllers.

VRF SYSTEM COMPONENTS

Outdoor Units

Design flexibility, personalized comfort, and energy efficiency are the foundations of the variable refrigerant flow cooling and heating system. A VRF system consists of outdoor condensing unit(s), indoor air handling unit(s), a branch circuit controller (if operating in heat recovery mode), and corresponding central system and individual zone controllers.

The condensing units are available as air-source or water-source, and provide heat recovery or heat pump operation. They are compact and modular in order to effectively meet distributed capacity requirements, which also frees up space within the building or on the rooftop. This smaller footprint offers overall flexibility of placement. When placed on a rooftop, the smaller units take up less area that designers can reclaim for usable space. Through the use of hyper heating inverter technology, VRF systems are designed to provide year-round comfort in even the most extreme climates; they can provide 100% heating capacity at 0˚F outdoor ambient temperature and 83% heating capacity at -13˚F.

VRF air-source outdoor units are compact and modular in order to effectively meet distributed capacity requirements, which also frees up space within the building or on the rooftop.

Indoor Units

There are multiple styles of indoor air handling units that meet varied room design and aesthetic requirements, including ductless and low profile ducted units. Ductless units can be wall-mounted, ceiling-recessed and suspended, or floor-standing with an integrated return to save additional space. This integrated return also measures the return air temperature to better maintain overall zone temperature conditions. Low profile ducted units include ceiling-concealed, vertical, and floor-standing options. Each results in a minimal footprint while maximizing the building's usable space. Up to 50 indoor units can be connected to each condensing unit at up to 130% or 150% of the unit's rated capacity, depending on the system type and design diversity.

Branch Circuit Controller

Certain VRF systems have the ability to provide simultaneous cooling and heating, using the building's own environment to save energy and deliver personalized comfort to its occupants. These systems, also called heat recovery systems, use a branch circuit (BC) controller to intelligently distribute refrigerant throughout the building. The BC controller captures rejected heat energy from one zone, and applies it to a different zone that requires it, distributing surplus heat energy throughout the building rather than expelling it outdoors. The BC controller performs the work on its own, bypassing the outdoor unit and saving electricity.

Controls

VRF systems offer individual set point control, providing personalized comfort to building's occupants. The controllers provide a wide variety of functionality to satisfy each zone's conditioning requirements, including temperature control, operating mode, fan speed, and setback settings. A flexible controls network allows you to select the level of control that fits the needs of your application.

The different levels of controllers are individual zone control, centralized system control, and advanced building automation control. Zone controllers provide monitoring and operation of up to 16 indoor units through an intuitive interface mounted locally within the zone. Centralized controllers manage up to 50 indoor units and are available in web-based or touch screen options.

Advanced building automation controls go even further, enabling building managers to remotely control up to 2,000 indoor units from a single web interface. Managers can set and monitor operation, mode, temperature, and

A branch circuit controller allows a VRF system to provide simultaneous cooling and heating, using the building's own environment to save energy and deliver personalized comfort to its occupants.

fan speed, among other settings, as well as create an operating schedule that's tailored to the needs of the occupants and the building. Intuitive controls monitor system functions and provide operating status information for easier diagnostics. They can even integrate additional mechanical systems from multiple manufacturers to offer a seamless building control experience.

INVERTER TECHNOLOGY—MODERN TECHNOLOGY FOR SUSTAINABLE DESIGN

VRF systems take energy efficiency to a whole new level, consistently producing upwards of 25% energy savings when compared to conventional HVAC systems. The greatest contributor to system-wide energy efficiency is the use of an inverter-driven compressor, a highly responsive, highly efficient component that ensures the system seamlessly adjusts to capacity fluctuations. Power consumption is reduced because the system operates only at the levels needed to maintain a consistently comfortable indoor environment.

Inverter-driven compressors vary their motor speed to match indoor space conditioning requirements. Conventional HVAC systems with only two main states—ON and OFF—are less efficient, less effective, and less comfortable for building occupants. To manage indoor conditions with a VRF system, space temperature can be measured at the indoor unit or at the zone controller within the space via remote sensors that scan the room and adjust airflow based on the temperature readings.

To better understand the inverter-driven compressor concept, let's compare its operation to a car's cruise control. Just as a car's cruise control speed is set by its driver, the room's occupant chooses their optimal temperature set point. While on long stretches of road, the car's engine works automatically to maintain the speed as you drive up and down hills and around curves. An inverter-driven compressor adjusts to maintain the desired temperature set point.

After it has been achieved, an inverter-driven compressor modulates its speed to match temperature demand, thereby consuming only the minimum energy that is required. Compare this to a conventional single-speed compressor that starts and stops, much like a car in city traffic, consuming more energy and reducing compressor life.

TOTAL INSTALLED COST ADVANTAGE

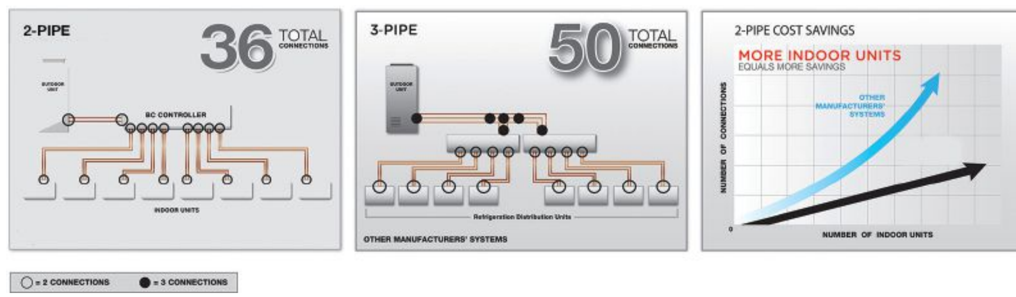
Now that you have a basic understanding of the components and technology behind VRF systems, let's discuss the advantages they offer in reducing installation complexity along with overall lifecycle costs. The cost of an HVAC system is more than just equipment and installation. The total cost equation should also include design, equipment, installation, available usable or leasable space, operating costs, maintenance requirements, and ultimately replacement. VRF systems take less time to install and require significantly less maintenance over time than conventional HVAC systems. With conventional HVAC systems there are potential hidden costs, such as installation tooling, rigging, and labor; potential electrical and/or structural modifications in a building; complexity of connecting outdoor and indoor units via ductwork in a plenum or wall space; and controls integration among multiple manufacturers. VRF systems effectively change the equation.

Manufacturers offer two-pipe and three-pipe VRF systems. The two-pipe VRF solution reduces the cost and complexity of installation, as a two-pipe system requires significantly smaller diameter piping, freeing up plenum space, plus fewer piping and wiring connections. In addition, connecting indoor and outdoor units is accomplished by refrigerant lines versus major runs of ductwork.

Two-pipe VRF systems are engineered to be compact and lightweight to simplify the installation process. They can fit in existing service spaces, eliminating expensive tear-down and reconstruction often encountered with conventional HVAC options, thus saving the customer up front while delivering higher efficiency and ease of maintenance for years to come. VRF systems are up to 31 percent lighter than chilled-water systems, so they are easier to handle and less costly to transport. The indoor and outdoor units can be transported in an elevator. Moreover, the structural load can be distributed across an existing structure or mounted on the ground.

There are multiple styles of indoor air handling units that meet varied room design and aesthetic needs, including ductless and low profile ducted units.

Photo courtesy of Joe Loehle Photography



Manufacturers offer two-pipe and three-pipe VRF systems. The two-pipe VRF solution is designed to be compact and lightweight and reduce the cost and complexity of installation and maintenance, all equating to lower life cycle costs.

This reduces the cost of rigging (cranes and lifts) and in many cases eliminates the need for structural roof reinforcement.

The total installed cost of a VRF system can be less than or equal to the total installed cost of most conventional systems. Also, maintenance is greatly reduced and requires no special trades to perform the simple functions of changing or cleaning indoor unit filters and cleaning outdoor unit condenser coils. This all equates to lower life cycle costs.

DIFFERENTIATING SPLIT-DUCTLESS SOLUTIONS FROM VRF

Split-ductless solutions are also available and are generally installed in residential and light commercial buildings, providing single- and multi-zone applications. Split-ductless systems are sometimes referred to as mini-split or multi-split systems. Like VRF, split-ductless systems deliver conditioned refrigerant directly to the zone, or zones, requiring cooling or heating. They are comprised of a compact outdoor unit and one or more indoor units depending on the application. Split-ductless cooling and heating offers home and business owners a cost-effective way to replace inefficient window units, space heaters, and electric baseboard heaters. They can be installed in home additions, new construction, condominiums and apartments, or to eliminate hot spots and cold spots in specific rooms, among other applications. Split-ductless systems can even be a fit for commercial buildings that currently use ducted forced-air systems, such as bank branches and retail spaces.

One of the biggest reasons homeowners switch to split-ductless cooling and heating is overall cost savings. Split-ductless systems use the same inverter compressor technology as VRF systems, offering significant energy efficiency advantages. Split-ductless systems deliver conditioned refrigerant directly to the space requiring cooling or heating, eliminating the inefficiencies of moving conditioned air through ductwork. Multi-split systems also allow owners to create "zones" in their home or building so they no longer have to cool or heat rooms that aren't occupied.

VRF systems provide even greater advantages over ductless multi-split systems, as they permit more indoor units to be connected to each outdoor unit and provide additional features such as simultaneous cooling and heating in heat recovery mode.

DESIGN SOLUTIONS WITH VRF—DESIGN AND INSTALLATION FLEXIBILITY

How would you design if you could forget about bulky ductwork and complex HVAC systems? Imagine the buildings you could create by deploying VRF zoning systems, which make it easier to design your building, let you be more innovative, and allow your building to reflect more of your creativity. VRF systems feature small refrigerant lines, leading to smaller chases, ductless options, and other elements that create additional floor-to-ceiling height, allowing designers to reclaim up to 10% of the space in their buildings traditionally sacrificed to conventional HVAC systems.[1] In addition to more interior space, VRF systems free up space on rooftops for greater usable space and possible amenities such as a rooftop patio or pool.

Freeing Up Space

Designed to blend into their environments, multiple styles of discreet, compact indoor units can be installed in varying locations, including recessed within the ceiling, high or low on walls, or on the floor, providing more design options than other systems. The system easily scales to occupant density and changes in the building's design or configuration. System configurations allow for architects to design to the aesthetic versus sacrificing interior design based on limitations of conventional central ducted HVAC systems.

In addition, the compact components of VRF systems can be installed in smaller indoor and outdoor spaces. Smaller refrigerant piping takes up much less plenum space than round or rectangular air ducts or 4-pipe chilled-water piping. No ductwork, or limited short runs of low-profile ductwork, means higher ceilings and more natural light, or more floors in the same building envelope with less space required between floors. In some cases, equipment and mechanical rooms can be smaller or potentially eliminated due to the compact nature of the system.

Designing for Sound Control

A noisy air-conditioning system can be a distraction for building occupants and lead to complaints from tenants. Operational sound levels of VRF systems are significantly lower than those of conventional central forced air or chiller/boiler systems.

Sound levels in the outdoor units are greatly reduced due to the inverter-driven compressor's modulation to meet the conditioning needs of the building. In addition, the compressor is housed in its own compartment encased in sound-damping insulation to further reduce noise. The condenser fan rarely runs at full speed and is designed for quiet performance.

These compact and quiet indoor and outdoor units can be placed virtually anywhere, as sound levels for the outdoor units operate as low as 58 dB(A) and indoor units as low as 22 dB(A). This is perfect for spaces that require minimal disruption, like classrooms, places of worship, libraries, or hospitals.

VRF APPLICATIONS

When it comes to occupant comfort and building design flexibility, there are indoor units for all applications that can be customized to the size and shape of the room, as well as the amount of space conditioning required. Whether inside a hotel room or a college or university dormitory, units can be discreetly placed behind walls, above entryways, or concealed beneath an exterior window to complement the design aesthetics.

This article continues on http://go.hw.net/AR1215Course1. Go online to read the rest of the article and complete the corresponding quiz for credit.

QUIZ

1. Which system moves conditioned refrigerant to a specific space, or zone, where conditioning is required?
   a. Conventional HVAC
   b. VRF

2. True or False: VRF systems increase efficiency by providing cooling or heating only to the individual zones where conditioning is required, offering on-demand cooling and heating while reducing energy consumption.

3. Which component of a VRF system captures heat energy from one zone that doesn't need it, and applies it to a different zone that does, distributing surplus heat energy throughout the building rather than expelling it outdoors?
   a. Condensing unit
   b. Indoor air handling unit
   c. Branch circuit controller
   d. Zone controller

4. Which type of controller enables building managers to remotely regulate up to 2,000 indoor units from a single PC?
   a. Zone
   b. Centralized system
   c. Advanced building automation

5. True or False: Inverter-driven compressors deliver precise capacity to every zone, as the technology varies compressor motor speed to match indoor space conditioning requirements.

6. Which of the following is a benefit of a two-pipe VRF system?
   a. Lightweight
   b. Smaller diameter piping
   c. Compact components
   d. Does not require ductwork
   e. All of the above

7. Compact and quiet indoor and outdoor VRF units can be placed virtually anywhere, as sound levels for the outdoor units operate as low as _____dB(A) and indoor units as low as _____dB(A).
   a. 10, 10
   b. 58, 22
   c. 35, 2
   d. 100, 150

8. True or False: Installing a VRF system can supplement the overall load of an existing HVAC system without adding large, noisy outdoor units and additional ductwork.

9. Under which LEED v4 category can VRF systems earn points?
   a. Water Efficiency (WE)
   b. Materials and Resources (MR)
   c. Energy and Atmosphere (EA)
   d. Indoor Environmental Quality (EQ)
   e. Both C and D

10. True or False: VRF systems can help net zero buildings achieve their energy consumption goals.

SPONSOR INFORMATION

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Mitsubishi Electric Cooling & Heating is the leading brand of ductless mini-split and Variable Refrigerant Flow (VRF) technology in the United States. Our energy-efficient, award-winning M-Series, P-Series, and CITY MULTI® systems provide a wide variety of residential and commercial building solutions, including zone and whole home and whole building cooling and heating.

CHEMISTRY AND THE BUILDING PROCESS FOR ARCHITECTS

Presented by:

LEARNING OBJECTIVES

At the end of this program, participants will be able to:

1. Understand how chemistry enhances performance in the building industry.
2. Explain the concept of risk verses hazard when considering the use of chemistry-enhanced building products.
3. Understand regulatory and testing requirements for chemicals.
4. Discuss the future of chemistry in the building industry.

CONTINUING EDUCATION

CREDIT: 1 LU/HSW

COURSE NUMBER: ARdec2015.2

Use the learning objectives above to focus your study as you read this article. To earn credit and obtain a certificate of completion, visit http://go.hw.net/AR1215Course2 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.

By Andrew Hunt

Chemistry is an important, but often not fully understood, component of the modern building industry. Architects, designers, builders, and occupants may not recognize the myriad benefits that chemistry provides to the built environment. Although each of us comes into regular contact with products made possible by chemistry, few understand materials science, building science, and chemical engineering, or how these fields help provide a safer, healthier, more comfortable living environment.

CHEMISTRY AND OUR MODERN WORLD

Everything consists of chemicals. There are no "chemical-free" products—chemistry makes up all things. Everything in the known universe is a special mixture of the 118 elements found on the periodic table. The science of mixing these ingredients is called "materials science," and when it comes to improving the health and welfare, comfort, security, and safety of people and our planet, there are few disciplines more critical.

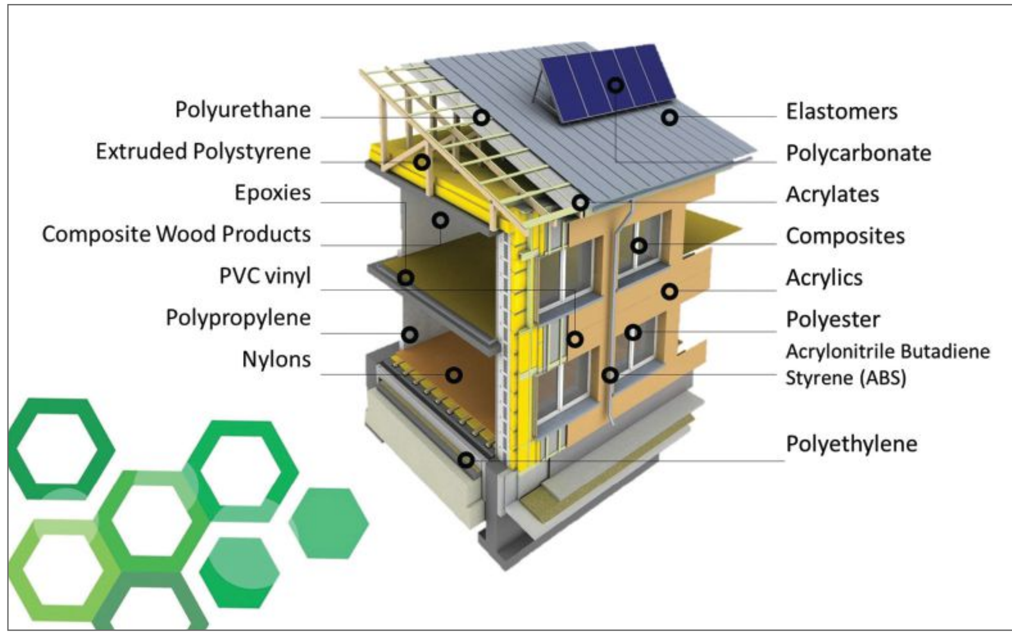
Materials science is an interdisciplinary field that deals with the discovery, design, and development of new and innovative materials. It is the characterization of the physical and chemical properties of materials. Materials science is essentially the study of "stuff"—and how stuff is put together. Through the study of chemistry and materials science, we can better understand and improve a material's properties and performance.

Chemistry and materials scientists not only help create the things we use every day, they also improve the world around us. To better understand how materials science impacts our lives, consider some of the benefits provided by innovations in chemistry:

- In health care, chemistry contributes to advances in life-saving medical devices and equipment, as well as the pharmaceuticals and vaccines that play a key role in keeping us healthy. Through testing and study of different chemical compounds, doctors and researchers gain an understanding of how certain medicines affect human health, as well as the side effects, positive and negative reactions, and long-term implications of medicines and treatments. Commonplace medical procedures, such as open-heart surgery and cancer treatments, are only possible because of the efforts of materials scientists to bring new and better products to market.

- One of the most dramatic changes in recent history has been the rapid and expansive adaptation of communication devices. Today, most Americans can easily access information from the palm of their hands—news and current events, weather, traffic, and entertainment updates are available in real time, as are missives from friends and family. Our planet is connected electronically thanks to portable hand-held devices with digital displays and battery-powered components made possible by chemistry. Materials scientists developed the innovations that make our cell phones, tablets and laptop computers lighter, more durable, and able to send and receive information effectively.
- Innovations in materials science also enable cutting-edge advancements in transportation. Modern, lightweight plastics and composites already make up 50 percent of the volume of today's automobiles, which makes cars lighter and more fuel efficient. Electric cars with rare-earth metal batteries and cars with hybrid engines powered by electric batteries made possible by chemistry are becoming more common.

In today's built environment, there is strong demand for materials that are high-performing, cost-efficient with a lower environmental impact, that are easy to install and maintain, and that add to the aesthetics and design creativity that architects demand. Below are some examples of how the products of chemistry enable these demands to be met:



Enhanced Product Performance

Today, builders, designers and architects demand high-performing, technically sophisticated building products and materials that also are easy to install and maintain and that will retain both attractiveness and durability over their lifespan. For example, in roofing, plastics and coatings enable the huge, yet lightweight, domes that cover sports stadiums. New, dramatic architectural features such as accented skylights that won't crack or get brittle are made with lightweight, durable clear plastics. Skylights with built-in nano-gels also have insulating properties to enhance energy efficiency.

In windows and doors, color and design options increase. New chemistry innovations include "smart" coatings that can change colors based on the angle at which they are viewed. Some of these same smart coatings also have pigments engineered to reflect the infra-red heating rays and provide cool metal roof coatings or shingles that are up to 40 degrees F cooler than those without cool coatings. These features can add interesting aesthetics to building design, changing the look from the daytime to the evening.

Chemical innovations in insulation can strengthen structures, providing protection against severe weather impacts. Insulation also can minimize and discourage mold growth and reduce dust and allergens, thus improving indoor air quality. The energy-saving benefits of insulation products are described below.

Energy and Resource Conservation

The products of chemistry improve energy efficiency in our offices, homes, schools and factories. For example, plastic products used in roofing, insulation, exterior claddings, and windows can save up to 467.2 trillion BTUs of energy per year, enough to power 4.6 million homes annually. Insulation materials made possible by chemistry help save more than 200 times the energy needed to make them.

At the same time, chemical products also enable new technologies to generate and store energy, including photovoltaic solar panels that rely on silicone-based chemistry, and wind power turbine blades made using plastics and chemical additives that help deliver renewable energy to our nation's power grid.

Materials science has made new, innovative functional uses for materials in the buildings sector that might have otherwise go to waste. For instance, one innovation in building has been the adoption of manufactured wood products. Structural composite lumber, parallel strand lumber, laminated lumber, and oriented strand lumber are created by layering dried wood strands or flakes with a moisture-resistant chemical adhesive. In rafters, beams and floor joists, composite wood products often outperform conventional lumber. Structural wood products provide more accurate and architecturally sound building materials, and they also make use of materials that might otherwise be discarded.

Affordable and Cost-Effective

Building owners and occupants want high-performing products that are also cost effective. Expanded material choices made possible by chemistry provide consumers with a wider selection of affordable, cost-effective products. For example, new chemistry-based materials can replicate the appearance of natural products like wood or stone.

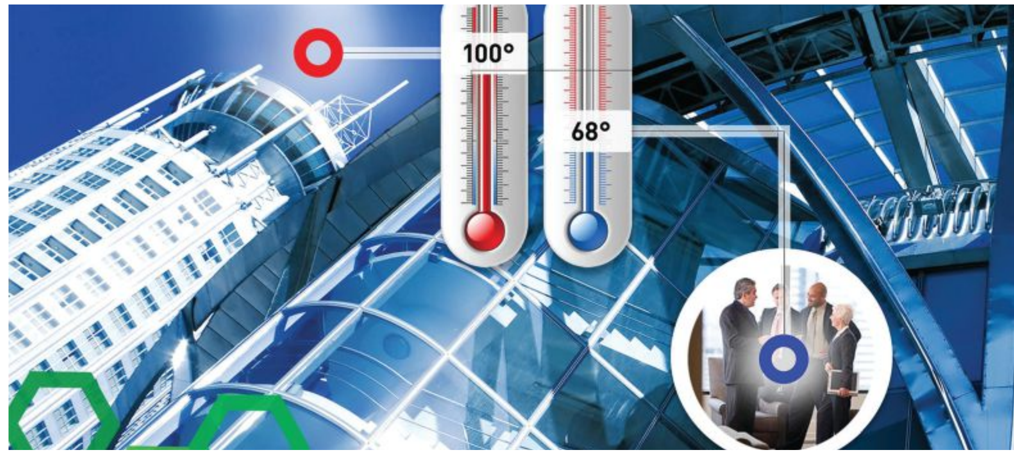
Chemicals are everywhere in the built environment, including the following popular building materials:

- Polyurethane: Used in spray foam insulation, roofing
- Extruded Polystyrene: Used in wall insulation panels
- Epoxies: Used in floor installations, countertops, and anywhere adhesion is important
- Composite Wood Products: Used in kitchen cabinets, outdoor deck tiles, fence panels
- PVC/CPVC: Used in siding, pipes, wire/cables, fencing/decking/railing, windows
- Polypropylene: Also used in siding
- Nylons: Used in carpeting
- Elastomers: Used in roof coatings, also caulks and sealants
- Polycarbonate: Used as glazing in skylight windows
- Acrylates: Used in caulks and sealants
- Acrylics: Used in paint
- Polyester: Used in bathroom countertops, tubs, and sinks; "artificial stone"
- Acrylonitrile Butadiene Styrene (ABS): Used in tub and shower surrounds, pipe/fittings, plumbing fixtures
- Polyethylene: Used in plastic pipes and fittings

In addition, due to increased durability, the products of chemistry can have lower maintenance costs, enhancing their value over the long term. For example, cleaning today's high performing floor or carpet treated with stain-resistant chemicals can be easier as spills can be wiped up with less chance of staining. Enhanced durability also can make building components more resilient and able to withstand extreme weather events like hurricanes or catastrophes such as fires and floods. As well, the ever-increasing need to keep costs down via low maintenance in build-outs relies on developments in materials science. The ability of a material to withstand a salt-water environment without rotting or rusting is one good example. The better a structure is designed, specified, and built, the longer it lasts.

ENHANCING BUILDING PRODUCTS WITH CHEMISTRY

In the commercial building environment, chemicals enhance performance in a range of products and applications, from flooring, furnishings, and lighting, to insulation and heating and cooling systems, to adhesives, epoxy linings, paints and coatings and sealants. Following are a few examples of how chemistry can enhance a variety of building products:



Windows

Single-pane glass windows do little to reduce the amount of energy that passes between the outside environment and inside of the home. But framing and glazing options have made major advancements, thanks to a better understanding of how air moves from the outside in and inside out through windows. Chemistry has helped minimize air movement in two important ways: 1) The glazing has expanded to multi-pane sealed units (double or triple instead of single), filled with krypton or argon inert gases in between each layer, and 2) Vinyl window frames feature chambered extruded designs to trap air and minimize its movement through the frame, making windows framed with vinyl extrusions very energy efficient.

Other improvements include low-e coatings applied directly to the glass surfaces and the films suspended between the interior and exterior glazing layers. While there are many different types of low-e coatings, most are microscopically thin, virtually invisible, comprised of metal or metallic oxide. Uncoated glass has an emissivity of 0.84, and some higher performing low-e coatings can reduce emissivity to 0.02.

Lower emissivity windows provide increased comfort and energy efficiency. Reflective or mirrored coatings applied to windows reduce transmission of solar radiation by blocking light. While they improve the solar heat gain coefficient (SGHC) rating, they also greatly reduce the visible transmittance (VT). Reflective coatings usually consist of thin, metallic layers, and come in a variety of colors including silver, gold, and bronze. Because of the reduced solar heat gain, these coatings are more common in hot climates to control solar heat gain. In addition, specifiers can now 'tune' the window surfaces to reflect differently on different sides of the building, based on orientation to the sun. West- and east-facing windows can reflect more heat and energy and UV light (to avoid the bleaching effect of sun on interior furniture and fabrics), and north- and south-facing windows can let in more visible light and heat if needed in winter.

Polymer cladding over wood window frames can protect the wood from degradation caused by moisture, salt, sun, mold, and bugs. Additives to caulks and sealants used to reduce air and water leakage at the boundary between the window frame and the rough opening keep them pliable and in place for many years.

Air sealants

Air leakage can have debilitating consequences for buildings. In the summer, leaks can draw warm, humid air from the outside to inside, and in the winter, the same leaks can push warm air from inside the building into cold envelope cavities. Once inside the wall, warm, moist air condenses on contact with cooler surfaces, resulting in excess moisture that can lead to mold, rot, and even structural damage. This is in addition to increased heating and cooling costs, along with wear and tear on HVAC equipment that, all together, can create a host of problems for occupants, from high energy costs to indoor air quality issues due to mold and rot.

Through experimenting and testing a wide range of chemicals and approaches, chemists and materials scientists have developed sealants and low-pressure nonexpanding foam to effectively control and manage the differences in air pressure between the inside and outside of a building. A sealant can be used to seal gaps smaller than ½-inch wide and in irregular gaps. When applied with care, modern and improved sealants can create a tight seal around the shims used to install window and door units.

For larger gaps, low-pressure foam can be used to quickly and efficiently seal a gap between wall framing and windows or door units. Polyurethane-based insulating foam sealant can fill, seal and insulate small gaps up to 1 inch wide. It is important to use low-pressure foam because ordinary expanding foam can swell with enough force to distort the jambs and cause problems operating windows and doors.

Caulking and sealing joints and penetrations on the exterior cladding of a building are critical to help keep water from entering a building. Siding must be properly sealed in order to protect the building from water damage and the rot, mold, and poor indoor air quality that can result. The sealants and caulks made from foam stay flexible over a long lifespan so they don't crack and shrink with age, oxidation and UV radiation from the sun. Also, additives allow these sealants and caulks to bond properly in cold weather, allowing for the construction cycle to be extended and maintenance to be done in winter.

Piping

Leaky pipes can cause a lot of damage quickly and quietly. Tough, flexible plastic piping manufactured using a variety of chemicals have a significantly greater life expectancy than metal counterparts and are less likely to corrode and leak. Polyvinyl chloride (PVC) piping is the most widely used plastic piping material. Other materials used in the manufacture of plastic piping include chlorinated polyvinyl chloride (CPVC), polyethylene (PE), cross-linked polyethylene (PEX) and acrylonitrile-butadiene-styrene (ABS).

QUIZ

1. Which science looks to improve products by experimenting with elements from the periodic table?
   a. Elemental Science
   b. Materials Science
   c. Enhanced Science
   d. Mixology Science

2. How do advancements in materials science positively affect the building and construction field?
   a. Reduced energy consumption
   b. Resource conservation
   c. Safety
   d. All of the above

3. In windows, what is emissivity?
   a. Windows that are placed at a higher altitude
   b. A product that missed its safety check at the manufacturing site
   c. Off gassing from manufacturing
   d. The ability of a window to radiate energy

4. What are argon and krypton used for in windows?
   a. The void space between multi-paned windows is often filled with these gasses, reducing heat transfer
   b. Modern windows are coated with these gasses to reflect sun rays
   c. Traditional windows used these gasses to reduce costs
   d. They act as a sealant between the window frame and the casing

5. What chemical advancement has been made to air seal larger gaps in the home up to 1 inch?
   a. Wider shims
   b. Heavy duty weather stripping
   c. Low pressure non expanding foam
   d. Argon filled caulking

6. True or False: VOC's should never be used in the building process.

7. How do scientists evaluate risks and hazards?
   a. Elemental Science Handbook
   b. Potential exposure
   c. Food based studies
   d. Building industry experts

8. What is the primary agency responsible for regulating chemicals in commerce?
   a. Chemical Commission Council
   b. Organic Compound Agency
   c. Scientists Association
   d. Environmental Protection Agency

9. What is the main reason that chemicals are added to building materials?
   a. Improved odor
   b. Improved performance
   c. Overseas manufacturing
   d. Improve production times

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This article continues on http://go.hw.net/AR1015Course2. Go online to read the rest of the article and complete the corresponding quiz for credit.

CAST STEEL STRUCTURAL CONNECTIONS

AN ELEGANT SOLUTION FOR ARCHITECTURALLY EXPOSED STRUCTURAL STEEL THAT CAN ALSO PROVIDE COST SAVINGS.

Presented by:

CASTCONNEX innovative components for inspired designs

Architecturally exposed structural steel used on buildings of all types can now also be true design statements due to the availability of cast steel connectors in the US and Canada. Photo courtesy of CAST CONNEX

LEARNING OBJECTIVES

At the end of this program, participants will be able to:

1. Investigate the design potential and innovative opportunities that steel castings can contribute to architecturally exposed structural steel (AESS) applications.
2. Identify and recognize the various steps involved in the casting manufacturing process including industrial design, detailing, tooling, casting and machining, and to understand and accommodate the lead times associated with custom castings.
3. Differentiate between the various common types of cast steel connections and their appropriate uses in different settings.
4. Assess through case studies how steel castings have been used in structural design to maximize architectural benefits, simplify fabrication and speed erection.

CONTINUING EDUCATION

AIA CREDIT: 1 LU

COURSE NUMBER: ARdec2015.3

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/AR1215Course3 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.

By Peter J. Arsenault, FAIA, NCARB, LEED-AP

Structural steel has been a material of choice for a wide variety of building projects for over a hundred years due to its comparatively light weight and excellent structural capabilities. The industry surrounding the production of structural steel sections and the fabrication and erection of steel buildings has evolved in this time and created a fairly sophisticated and easily accessed network of companies, organizations, and individuals. Architects have embraced the benefits of this material and its industry since it allows a certain amount of design flexibility and freedom while often helping construction budgets. This has led to an increasing trend in building design to use structural steel as an exposed design element. Such a design approach requires special attention to make the steel look acceptable not only along the body of the exposed members, but particularly at the connection points. Those connections can often be characterized by an array of bolts, stiffener plates, welds, and other structurally necessary elements which produces an aesthetic that, if left unspecified, is more utilitarian than artistic. Happily, that is no longer the case when the decision is made to use cast steel components. Standardized or custom cast connectors are readily available which provide dramatic geometric freedom in structural steel shapes, thereby enabling artistic designs to be realized.

THE METAL CASTING PROCESS

Casting molten metal into a form is a common process that has been used historically for many metals including bronze, copper, and steel. In fact, all structural steel starts its life being cast into an ingot or other industrial shape. That steel is then hot rolled or cold formed into the final shape of the structural steel members we are more familiar with such as wide flange sections, angles, channels, hollow structural sections, etc. This rolling / forming process works well for continuous or linear shapes, but not for other, non-linear, custom shapes. Hence, the creation of such specialty steel components relies on using a mold to pour molten metal into thus forming the desired shape without rolling or forming.

A common misconception regarding steel castings is that they are brittle because they are sometimes confused with cast iron. This is not the case in cast steel products which are just as ductile as rolled structural steel products, if not more so. The main difference between standard rolled structural steel shapes and steel castings is the production process which results in their final yield strength. Hot-rolled or cold-formed products attain their yield strength through the rolling or forming processes, whereas steel castings are heat treated after they are cast to attain the desired mechanical properties. In a normalized condition, low alloy steel castings can be readily produced with yield strengths in the range of 30 to 40 ksi. By introducing quenching and tempering processes, yield strengths of 50 ksi and greater can be attained. In Europe, a process called secondary heat-treatment is now being used to attain yield strengths as high as 150 ksi in castings to be used in special structural applications.

The typical process for the creation of all cast steel products occurs at a metal foundry and is essentially the same regardless of the size or complexity of the casting. The process starts once a particular shape is designed and analyzed for structural integrity. Then a full size, three dimensional rigid replica or pattern is made of the component out of cut wood, plastic, or similar material using a computer numerical control (CNC) process. Next, chemically-treated sand is placed around the finished pattern in two halves. When the sand has cured and stiffened, the pattern is removed by opening and then re-closing the halves, thus leaving a hollow, stiff sand mold that replicates the pattern exactly. In preparation for casting, the surfaces of the sand mold are treated with a ceramic-based coating. The sand and ceramic coatings are selected by the foundry for their ability to withstand the high temperatures of molten metal.

Architecturally exposed structural steel used on buildings of all types can now also be true design statements due to the availability of cast steel connectors in the US and Canada. Photo courtesy of CAST CONNEX

With the mold readied and secured in place, the specified metal is heated in a furnace until it reaches its molten state. It is then carefully poured into the sand mold and allowed to cool until it solidifies into shape. After the cooling is complete, the casting is removed from the sand mold by breaking away the sand. This means that the mold is destroyed in the process but the original pattern remains which can be reused to make multiple identical molds. Hence the process can be repeated as often as needed to make as many identical products as desired.

Using this common and time proven process, cast metal products are readily produced in virtually any size from very small to very large. Further, the shape and complexity is limited only by the imagination of the designer and the limits of the materials being used. There are of course certain design parameters that make for a better casting than others, but those are fairly well known and understood within the industry. Small, simple cast steel products include things like small cable connectors or cast hardware or decorative elements. Large, complex ones include multi-angle, multi-force custom structural elements for buildings.

CAST STEEL STRUCTURAL CONNECTIONS

Cast steel has been in use for quite some time in a variety of applications. Railroads use cast steel couplers for connecting freight cars to locomotives. Industrial equipment such as mining trucks use steel castings to make different parts including the entire load bearing frame for improved durability and resistance to impact loads. When it comes to buildings, steel castings have been commonly used for valves and fittings.

The use of cast steel as part of a structural system first occurred in the late 1970's in the construction of offshore oil platforms. These platforms consist of a complex framework of tubular steel members that commonly used welded connections. Problems arise, however, since the structures and their welded member connections are subjected to strong wind and wave action at sea. Given the constant loading and the complexity of the welded joints between the members (anywhere from 2 to 8 members intersect and must be connected to transfer forces), these connections are susceptible to fatigue failure. In response, the concept of a rigid "cast steel node" was developed. This alternative employed casting manufacturing to handle the complex geometry of the junction point thereby smoothing out the stress concentrations in the connection and moving the welded joint away from the region of geometric complexity. Further, the geometric freedom afforded through casting enables thickening the metal where necessary, as opposed to welded fabrication whereby connections are built up from plates. The use of cast steel nodes in this way improves the high-cycle fatigue performance of these connections by more than an order of magnitude. Although these nodes are purely functional, the smooth, more organic and sweeping appearance of these junctions made them a prime candidate to eventually be applied in architectural construction on land.

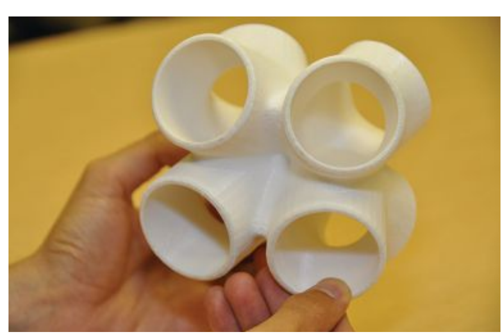
One of the first architects to make substantial use of steel castings in the design and construction of an onshore building structure was the firm of Renzo Piano and Richard Rogers. In the mid 1970's they designed the Centre Pompidou in the Beaubourg area of Paris, France. The intentionally exposed structure created a post-modern, high tech design style with structural steel cast elements used to tie different structural elements and portions together. These castings were used as much for the structural integrity of the building as they were for the desired aesthetic. Since

The Pompideau Centre in Paris, France was one of the first buildings in Europe to use architecturally exposed structural steel incorporating cast steel components. Photos courtesy of Terri Meyer Boake

then, cast steel structural connections have become common in architecturally exposed structural steel (AESS) designs throughout Europe. In North America, however, their use has lagged behind primarily due to the historical focus of US-based steel foundries on mass production rather than "jobbing" customized production. However, the recent advent of various standardized cast steel components meant for use in building construction has led to an interest by the US foundry industry to support the architectural community in providing both standardized and custom designed steel castings.

Some of the beneficial characteristics of cast steel connections that have been realized in buildings include a dramatic increase in geometric and aesthetic freedom compared to conventionally fabricated connections. Structurally, they provide improved connection stiffness, strength, and fatigue resistance. During construction, they provide simplified fit up, fabrication, and erection. Given all of this, when does it make sense to consider cast steel connections in a building design? Their characteristics make them a preferred choice whenever architecturally exposed structural steel (AESS) is part of the design, particularly if round Hollow Structural Section (HSS) members are the primary structural members being used. They also work quite well for connections in exposed timber frame construction. There are several other building design conditions that also make cast steel connections a preferred choice to solve and simplify loading and connection issues, such as:

- When the building design requires complex connections due to complex geometry (i.e. many members framing together at a single location and/or at sharp angles where weld access would be an issue)
- For arduously loaded connections or when increased connection stiffness is needed
- When material fatigue is a critical connection criterion
- When the connection has to satisfy a special performance requirement, like blast or seismic resistance



The proper design of cast components allows for metal to be thicker or thinner within the piece as structural loading may require. Photos courtesy of CAST CONNEX

The analysis and decision on whether or not to use steel castings are best incorporated early on in the design process. Standardized cast connections can be reviewed in consultations between the architect, structural engineer, and a manufacturer's representative. Sizing and selection can often be made from available online or printed literature much the same way as other steel products. However, the building design may give rise to the need for a custom casting if standard ones are not appropriate. Given the specialty nature of such a custom casting design, they are often procured as a design-build item with all parties involved in the process. In this case, specialty casting engineers work directly with the building design team to fully integrate the building design needs with the best practices of casting fabrication. In this way, all, casting requirements and building design parameters can be properly assessed and accounted for. Such well integrated casting designs not only enable highly unique architecture and connection detailing, but they can also simplify fabrication, improve construction tolerances, ease erection, and thereby lower the overall cost of the installed steel structure.

In the process of reviewing how the cast connections join with the main structural elements, it is important to avoid the misconception that steel castings are not weldable. Again, this comes from incorrectly drawn parallels to cast iron. The reality is that cast steel grades can be selected for any number of mechanical properties, including weldability. In fact, welding is the primary and most common means for joining a cast connection piece to an AESS element since the joint can be ground smooth and finished to appear as a continuous member. In particular, The American Institute of Steel Construction (AISC) publishes standards and guidelines such as AISC 360-10 which lists ASTM A216 Grade WCB as a cast steel grade useful for steel structures. However, there are currently no cast steel grades listed as prequalified base metals in standard welding guidelines so welding procedure specifications must be qualified accordingly. In particular, preheating is required for welding very thick castings and common good welding practices should be exercised.

TYPES OF CAST STEEL CONNECTIONS

While all cast steel connections will share the attributes and production process already discussed, different types of connectors are made for different building design conditions. The four most common types are universal pin connectors, architectural tapers, high strength connectors, and custom cast connectors.

Universal pin connectors are standardized cast products that are welded to the end of a hollow structural section (HSS). Photos Courtesy of CAST CONNEX and Terri Meyer Boake

UNIVERSAL PIN CONNECTORS (UPC)

In many cases, the ideal structural connection from an architectural perspective is not a welded or bolted plate, rather it is a "true-pin" connection. While that ideal shape is difficult to achieve with flat or rolled steel, it is easily achieved with cast steel. Hence, universal pin connectors (UPCs) have become readily available in many sizes as standard, off-the-shelf cast connectors for AESS. They have become popular in a number of design schemes because they allow for a final appearance that provides elegance, simplicity and consistency.

The primary benefit of a true pin connection is that it allows for any geometric angle of connection which is particularly useful in cross bracing or other angular structure situations. And since the pin rotates freely until secured in place, field adjustment of the pin and angle is easily accommodated. On a broader basis, UPCs are readily used at the ends of any structural element carrying tension and/or compression, meaning that they are suitable for use at the ends of columns, braces, struts, ties, or any other common structural element where a true pin load connection is desired. They have often been used as part of the overall structural system for entrance canopies, to connect web members of large trusses, as support connectors in specialty stairs, and at the ends of exposed braces that are part of the building's primary lateral force resistance system.

QUIZ

1. The creation of specialty steel cast components relies on:
   a. hot rolling steel into the desired shape
   b. cold forming flat steel
   c. an initial ingot of formed steel
   d. a mold to pour molten metal into thus forming the desired shape

2. All of the following are true about cast steel products EXCEPT:
   a. they are heat treated to attain their desired properties
   b. they are brittle
   c. they can have yield strengths between 30—150 ksi
   d. they are as ductile as rolled shapes, if not more so

3. Off shore oil rigs use cast connections instead of welded connections to overcome:
   a. fatigue failure
   b. welding out at sea
   c. complex geometry
   d. none of the above

4. The characteristics of cast steel connectors make them an excellent choice whenever which of the following are used:
   a. architecturally exposed structural steel (AESS)
   b. Hollow Structural Section (HSS) members
   c. exposed timber frame construction
   d. All of the above

5. True or False: In the process of reviewing how the cast connections join with the main structural elements, it is important to remember that steel castings are not weldable.

6. The primary benefit of a true pin connection is that:
   a. it allows for any geometric angle of connection
   b. it provides a rigid fixed in place angle pre-determined in fabrication
   c. it is only fabricated according to custom
   d. it uses only one piece to form a connection design specifications

7. All of the following apply to cast architectural tapers EXCEPT:
   a. they are easily welded to the end of round HSS tubes
   b. joints can be ground smooth to create an elegant finished structural element
   c. it involves cold or hot forming/bending flat plate into a conical shape.
   d. they create an aesthetic where the overall HSS member appears to be more slender

8. True or False: Cast steel high strength connectors are standardized brace end connectors that accommodate a bolted double-shear connection between round HSS braces and a typical corner gusset plate

9. The best cast connection solution for complex connections subjected to arduous loading from a variety of structural members aligned in different directions is:
   a. a Universal Pin Connector
   b. an architectural taper
   c. a high strength connector
   d. a custom designed connector

10. True or False: An experienced casting designer typically assumes full engineering responsibility for the castings and may even procure the castings.

This article continues on http://go.hw.net/AR1215Course3. Go online to read the rest of the article and complete the corresponding quiz for credit.

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“Those familiar with Mecanoo and Rawn may expect more of a shock in D.C. than in Boston. But Rawn has not approached the project with a light hand, but rather with a rainbow fist.”

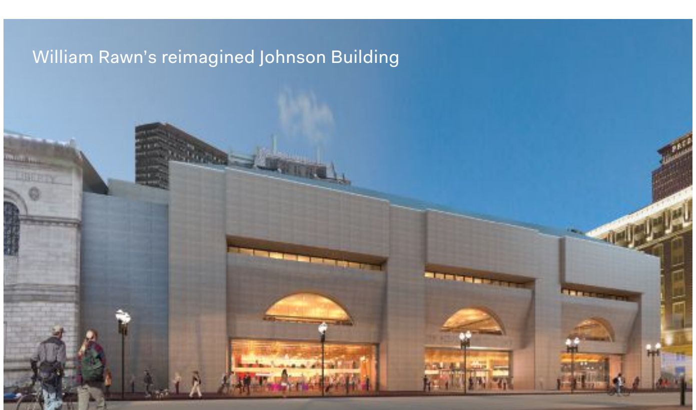
A Tale of Two Modernist Libraries by Alexandra Lange

The Johnson Building at the Boston Public Library (BPL), designed by Philip Johnson, and the Martin Luther King Jr. (MLK) Memorial Library in Washington, D.C., designed by Mies van der Rohe, were both completed in 1972, and both share a similar trait: their rigidity. Neither Johnson's nor Mies' best work, the two buildings nonetheless exhibit all the hallmarks of the sometime collaborators' respective styles: in Johnson's case, the granite wallpaper he favored that decade; in Mies' case, the dark steel exterior cage. Both buildings feature grids repeated in plan, in elevation, in lighting, and in section, tying the structures together but also limiting movement, flexibility, and sight lines.

As much as the buildings have aged, they have also been undone by fundamental shifts in our expectations for libraries. "That was the zeitgeist: A public library was not really for the public. You were protecting the books from people," says Francine Houben, HON. FAIA, founding principal at the Dutch firm Mecanoo. "Today, libraries are about people who want to get knowledge, and you can do that in many ways."

Awe is out, delight is in, along with color, visible staircases, and support for ever-changing technology. To that end, William Rawn Associates has embarked on a $78 million, 155,900-square-foot renovation of the Johnson Building. The firm completed the second floor in February; the opening-up of the first floor will be completed next summer. And in D.C., Mecanoo and Martinez + Johnson Architecture have just finished schematic designs for the $198 million renovation of the MLK Library, which will increase its public space from 151,522 square feet to 237,851 square feet. The site will close by the end of 2016 for three years of construction.

A Mecanoo rendering of the MLK Library



William Rawn's reimagined Johnson Building

David Fixler, FAIA, a principal at EYP and president of Docomomo New England, calls the Boston project the "Seattle effect for major urban public libraries." He refers, of course, to OMA's trailblazing Seattle Central Library, now over a decade old. And indeed, the challenges faced by contemporary libraries are neatly outlined in OMA's proposal for that project: "Unless the Library transforms itself wholeheartedly into an information storehouse … its unquestioned loyalty to the book will undermine the Library's plausibility at the moment of its potential apotheosis."

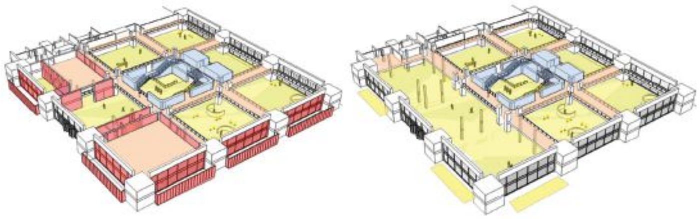
It's much easier, of course, to meet that challenge with a new building than with a landmarked modernist one. In discussions with the leadership and renovation architects of the libraries in Boston and D.C., I was struck by their apparent frustration with the neutral, square-cornered wrappers of both buildings. But the architects have found a way through the restrictions, bringing flow and circulation to the boxes and transforming this pair of white elephants.

The Rainbow Fist

Those familiar with Mecanoo and Rawn Associates may expect more of a shock in D.C. than in Boston. D.C. Public Library (DCPL) executive director Richard Reyes-Gavilan points to Mecanoo's blingy Library of Birmingham in England as proof that the firm's "got chops." But Rawn's office has not approached the Johnson Building with a light hand either, but rather with a rainbow fist, introducing a full spectrum of vivid colors to the original neutral palette.

The Johnson Building, a circulating library, boasts children and teen rooms, a technology center that for many patrons is their only access to the Internet, a business library, and an auditorium. Of Johnson's initial design, William Rawn, FAIA, says, "an armory was the model—no windows—which fortunately the library trustees rejected." In that scheme, blank walls on the first floor flanked a shadowy entrance maw (you can imagine the elegant brass portcullis), and the third story featured tiny apertures perfect for shooting arrows at your enemy. "My first design was more medieval, you see," Johnson told one of his biographers, Hilary Lewis, "but the board hated it."

TOP: COURTESY MECANOO; BOTTOM: COURTESY WILLIAM RAWN ASSOCIATES, ARCHITECTS, INC.



Original floor plan for the Johnson Building (left) and William Rawn's redesign

The library as constructed was less stagy, with a cornice that carefully lined up with that of the BPL's adjacent palazzo-like 1895 McKim Building (designed by McKim, Mead & White), and glazed openings above and below the arches. Still, it became known as "the fortress." Johnson added floor-to-ceiling glass on the first floor—darkly tinted, of course—and blocked them off with tall, rectangular granite slabs, set a hand's breadth apart, that enclosed tiny exterior courtyards. If you peered between the slabs you might be able to see a person, or a book, but it was difficult. "There were trees [in the courtyards], and you could see them peeking out" over the granite, says David Leonard, BPL's interim president, "but they were more effective in that view than [as seen from] the interior."

When Johnson participated in the 2000 process to landmark his building, he made sure the granite slabs, the central granite-lined atrium (known as Deferrari Hall), and the granite-lined lobby connecting the atrium to the street were part of the designation. "Those slabs were unpopular in the city for 40 years," Rawn says, "but no one had the guts to take it on."

The enclosed courts did have their defenders. "[It] was a somewhat magical experience inside the library, where you had a garden next to you or in the background while you read or sat in a meeting, despite being in the middle of the city," says Docomomo New England vice president Gary Wolf, AIA.

Nonetheless, Rawn, backed by library leadership, decided to take on the slabs. The firm studied Johnson's writings and work for clues about how to maintain his principles, if not his materials. The library and city brought preservation groups into the planning process early, arguing that removing the granite enclosures was necessary to create a welcoming, contemporary space. In 2013, the Boston Landmarks Commission unanimously approved the major changes to the façade, requesting further review only of the new window mullions and greater attention, in the landscape plans, to Johnson's tripartite façade division.

The firm's plan removes most of the enclosures and replaces all of the glass with low-iron panes. Landscape architects Reed Hilderbrand are designing the streetscape, which will include a "civic table," chairs, and lighting suspended to create a lighted outdoor room. "The idea of a library today is not a bunker within the city, but services connected with peoples' lives," says Clifford Gayley, FAIA, a principal at Rawn. For the Johnson Building, that means "having primary services right along the street, eliminating the granite walls in the lobby, making the glass clear, and bringing furniture and trees out on the sidewalk, which makes that feel like a space, not a windswept corridor." In the 1970s, the library faced a parking lot across Boylston Street, as well as vacant storefronts; today, Boylston is bustling, and it is the library that is deadening street life.

With approval from the landmarks commission, the architects also will eliminate Johnson's lobby, combining the three sidewalk-front bays into an enormous public living room, akin in scale and materials to the one the firm added to the nearby Cambridge Public Library building in 2010. A wave-like wood ceiling will run from end-to-end down Boylston, tying the new hall together and dampening noise from the stone floors. As users enter, the right-hand side will be a new books area, with outlets, easy

The new children's section in the Johnson Building

chairs, and low shelving. The left side will be a retail space (occupied by a café and a satellite studio for local public station WGBH).

Possibly more important, however, will be angled paths, cutting across the corners of Johnson's nine-square grid, that will allow greater visual and physical access across the generous expanse of the library. A widened corridor on the east reaches the McKim Building, whose famous courtyard can now be glimpsed as a marker. An opening to the west leads to a double-height fiction area, which will be hung with large glowing lanterns.

On the second floor, where Rawn recently completed renovations, I worried the new ROYGBIV surfaces would be too much, an overreaction to the existing oatmeal palette. But the scale and toughness of the interior can handle the rainbow. The children's room doubled in size and was moved upstairs, where it occupies two sections of Johnson's grid, bordered by a curving purple wall topped with faceted glass. Teens have a separate space in back, in which the concrete slab is exposed and antique typewriters from BPL's

LEFT: COURTESY WILLIAM RAWN ASSOCIATES, ARCHITECTS, INC.;
RIGHT: ROBERT BENSON

iPic Theater • Boca Raton, Florida • Designer: ID & Design International, Inc. • Architect: DDG • Photo: iPic Theaters collections top the stacks, giving it a funky, *Friends*-era coffeehouse feel. The front of the second floor is devoted to nonfiction, with two banks of cherry-red stacks flanking a lounge area with low shelving, long tables, and lounge chairs set against a striated orange carpet. Johnson's grid of fluorescent tube lighting has been set askew, tacking across a red ceiling. As visitors move from the front of the building to the back, the colors cool off—purple, lime, and a Bristol blue—turning Johnson's tic-tac-toe plan into a festive tartan.

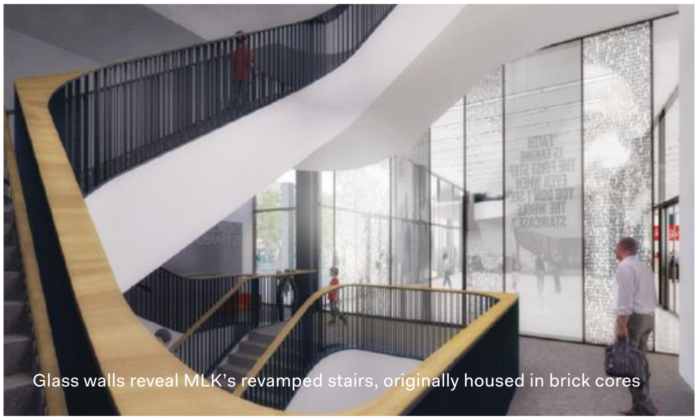
Johnson's architecture had weight and presence; even now, when those qualities are less culturally appealing to the library, they provide a solid box for the explosion of new roles. Will this go-round wear and date, like Johnson's granite wallpaper? Probably so, but for now, it is indeed busy, warm, and welcoming, and it is hard to believe many would wish the barricades back.

Learning to Love MLK

"For Washington, Mies is not important, it is really Martin Luther King," says Mecanoo's Houben. "The building is very much hated by everybody. I understand why, but the longer we work on the project and start dreaming about how we can change it, I am extremely positive about the building." Why the hate? As in Boston, much of it comes down to walls. While the library has a classic Miesian black steel, floor-to-ceiling glass exterior, through which grids of fluorescent lights are visible, those windows were largely reserved for books and not people. Vertical circulation took place in four bricked-in cores, dark and also potentially dangerous, and many of the offices and meeting rooms were also windowless, tucked into another brick box at the center of the building on floors two, three, and four. All of the spaces had similar ceiling heights and materials palettes.

Mecanoo interviewed the original project architect for MLK, Jack Bowman, and visited Mies buildings in Chicago, Germany, and the Czech Republic. "We went to Berlin, where the Neue National Gallery is also renovated, and there you learn that most people bring the building back exactly to the way it was,"


A reimagined MLK, featuring "red elephants" with services and seating


Glass walls reveal MLK's revamped stairs, originally housed in brick cores

COURTESY MECANOO

Houben says. "That's impossible in Washington."

Mecanoo decided to approach the project in the same way as the historic 1793 church in Amsterdam that they turned into the Trust Theater: as an architectural carapace, into which they could insert reversible elements. These include four new cores, two of which contain wide, glass-fronted Aalto-esque staircases; a curvaceous rooftop addition containing an auditorium not visible from the street; a herd of "red elephants," two-story structures in the first-floor Digital Commons that have seating on top and services below. And, in another big move, the firm will add a double-height reading room to Mies' third floor. The DCPL's Reyes-Gavilan has specifically requested a decorative ceiling, similar to Mecanoo's map for the firm's recently completed Delft Station Hall, to give the reading room updated grandeur.

Because the building's exterior and first-floor spaces were landmarked in 2007, the design had to run a gauntlet of agencies. The Historic Preservation Review Board focused on retaining the building's exterior appearance and interior elements, like the striking clock at the center of the Great Hall, and questioned Mecanoo's desire to take away Mies' brick walls around the cores. Would this move, intended to make the stairs more appealing, disrupt Mies' hierarchy of solid vs. void? Mecanoo will replace the brick with a coated glass, still to be determined, that renders it at least semi-opaque, distinguishing it from the transparent "Mies glass" of the original. Meanwhile, as an illustration of the bureaucratic tangle, the Commission of Fine Arts enthused about the introduction of greater openness. The architects are in the process of getting the schematic design approved by the various agencies, before moving on to the final design phase.

Houben says they are still working out the design details, but many of the inserts and custom, archipelago-like seating units share a common language of blond wood, radius corners, and red. (That's "Calder red," like the Flamingo outside Mies' Federal Plaza in Chicago.) She imagines a different lighting scheme for each floor above the first, with cloud-like fixtures in the expanded children's room (colorful, but less representational than the one in Boston) and a "reading ribbon" of lights under the Starbucks-style raised bench along the curtainwall on the second floor. All this diversification reflects the change in the program from the 1970s: as in Boston, there's a café and grab-and-go books section by the door, separate children and teen spaces, the auditorium, and the rehearsal rooms. There are books and archives, up on the third and fourth floors, but they have become role players rather than the protagonists in the library's everyday theater.

Mecanoo is also planning a series of cuts into the "endless horizontality" of the Mies space, introducing views, light, and even a sense of play. The basement level will be transformed into the de rigueur fabrication lab, along with music and dance studios. A curving opening into the floor of the Digital Commons at the western (less public) end of the library will provide visual access. The firm will open up the back of the Great Hall to create a stepped performance space, ideal for orienting the hordes of schoolchildren who visit.

On the third floor, an oblong opening creates a Grand Reading Room in the east wing, overlooked from above. On the fourth floor, the underside of the auditorium intersects the Miesian grid like a sculpture. On the roof, the auditorium, surrounded by a ribbon of glass, is rendered as a series of red and orange seats. Local firm Oehme, van Sweden & Associates will do the landscape. "If you look at a lot of Mies buildings, the green is important, and we have no green here," Houben says.

"A Treasured Space"

Mecanoo's renovation of the MLK Library will likely have a subtler, though no less revolutionary effect than the Boston project, opening the building up, warming it up, creating sections and sight lines that never existed before. The firm is also envisioning café tables and a book swap under the library's front portico, which today is primarily a gathering place for the homeless. Reyes-Gavilan hopes the new building, located near so many national landmarks—the Smithsonian Castle, the Washington Monument—"will be the treasured space for the local city."

Even as Houben professes her love for Mies' architecture, the project subverts the relentlessness of the original design, making it impossible for you to be confused about which city, and which floor, you might be on. The brief was clearly to roll out the welcome mat, and indeed, make Mies more like Seattle. Mecanoo has done this in a respectful but not deferential manner, all the more unusual in an environment pitched toward preservation.

Now that Foster + Partners' scheme has been discarded, Mecanoo has been hired to renovate the two midtown buildings of the New York Public Library. How the firm will make those buildings "more public" remains to be seen, but in Boston and D.C. that meant designing spaces that are more transparent, more accessible, more casual, and more colorful. Bold and flexible in their interpretations of preservation, the MLK and BPL projects should turn these libraries into beloved buildings, while maintaining space for their original loyalty, to the quiet reading of books.

“Thirty years after its completion, Fortress Marriott is finally meeting the street. Call it the triumph of the glitz.”

Times Square (Finally) Grows Up by Karrie Jacobs

Back in August, there was a classic New York City dust-up: dozens of scantily clad women with their breasts painted, generally in patriotic colors, were posing for photos with Times Square tourists in exchange for tips. "What happened was there's five days in a row of naked ladies on the cover of *The Daily News*," recalls Tim Tompkins, president of the Times Square Alliance, a nonprofit that is a tireless booster for the area. Whether or not this latest panhandling scheme—a bawdy offshoot of Times Square panhandlers dressed as Sesame Street's Elmo or Sanrio's Hello Kitty—merited its own media blitz is hard to say, but it was clearly making money for the tabloids.

Reports of the scandalous behavior of the desnudas, as the ladies are known, finally prompted the city's police commissioner, William Bratton, to suggest getting rid of the pedestrian plazas where they were plying their trade. The city's previous mayor, Michael Bloomberg, had installed the plazas in 2009, closing portions of Broadway to traffic. *The New York Times* quoted a radio interview with Bratton: "I'd prefer to just dig the whole damn thing up and put it back the way it was," he said—a stance that seemed to get some support from Mayor Bill De Blasio.

"I'm, like, reeling right now," is how Paul Steely White, executive director of Transportation Alternatives, an organization that advocates on behalf of bicyclists and pedestrians, responded to Bratton's idea in a *New York Times* interview. Which is how most New Yorkers felt, or at least anyone remotely concerned with the importance of public space: outraged by the possibility that this wildly successful recasting of the most famous place in New York City—with upwards of 350,000 daily visitors and 39 million visitors a year—could be bulldozed because of a little nudity. "We thought that was crazy, and we said so," Tompkins recalls. "And then every public space and transportation advocate in the city, if not the world, said, 'This is crazy.' "

The irony of the desnudas controversy is two-fold. First, the reason that the police couldn't somehow make the naked women go away is that Times Square isn't a public place in the normal sense of the term. Broadway, pedestrianized or not, is still a street, not a park or a plaza, and streets, it seems, are a gray area, subject to "legal ambiguities," according to the alliance.

The other twist is that much of Times Square as it existed prior to the late 1990s was, in fact, condemned and bulldozed to rid the area of all manner of vulgarity. A premier entertainment destination that, by the 1970s, was overrun with peep shows, porn theaters, massage parlors, and other disreputable enterprises, Times Square was reconceived, tabula rasa, as just another midtown office district with a few nice venues on 42nd Street for, say, Shakespeare.

Rockefeller Center South

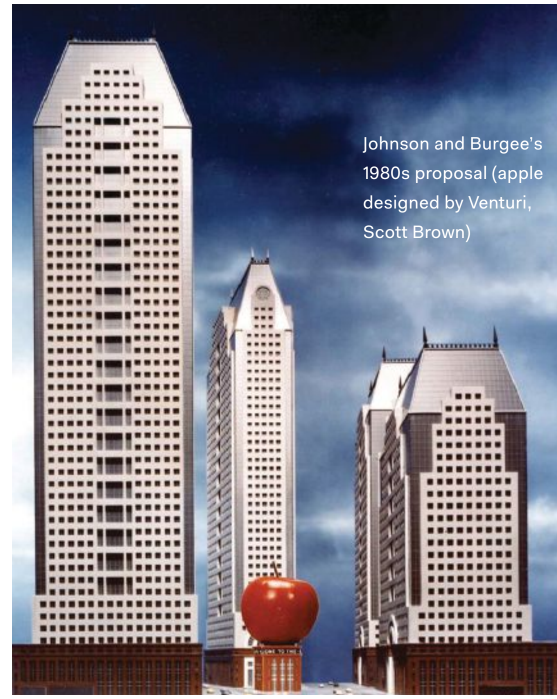
Schemes for remaking the area had existed since at least the John Lindsay administration in the 1960s, but the project didn't gain traction until the early 1980s when developer George Klein got the nod from the New York State Urban Development Corp. to build a quartet of new office towers at the intersection of Seventh Avenue, Broadway, and 42nd Street.

A rendering by Philip Johnson and John Burgee, FAIA, for a cluster of four sober-looking, limestone-clad office towers—not a hint of signage—topped with mansard roofs and fussy little iron finials, was released in December 1983. The plan also called for the demolition of 1 Times Square, the tower that opened—with fireworks—as *The New York Times* headquarters on New Year's Eve in 1904, establishing the annual holiday tradition. In addition, the block of 42nd Street between Seventh and Eighth Avenues was to be largely cleared of its old theaters and remade into a glittering stretch of wholesome amusements leading to a gigantic merchandise mart at the west end. Critics largely hated the plan, which was widely regarded at the time as the

Times Square visitors take in the scene from the red steps of the TKTS booth and Snøhetta's granite benches

GIORGIO GALEOTTI


1 Times Square in 1908


Johnson and Burgee's 1980s proposal (apple designed by Venturi, Scott Brown)

death of Times Square. As the late Marshall Berman, a political theorist and observer of urban life, framed it, the four Johnson towers had been part of "an immense, abortive plan to turn Times Square into 'Rockefeller Center South.' "

When the stock market crashed in 1987, it put the project on hold for decade. In the interim, a group of designers had an insight: The genetic makeup of Times Square could inform major commercial real estate developments. Rebecca Robertson, who'd worked for the city as a planner, took over the 42nd Street Development Authority, a subset of the state agency overseeing the entire project. Initially charged with studying the future uses of the theaters within the redevelopment district, she hired Robert A.M. Stern, FAIA (then on the board of the Walt Disney Co.) to help. In in the early 1990s, Robertson and Stern began to hammer out an interim plan for retail and entertainment along what the team called The New 42nd Street. The project, which also involved graphic designer Tibor Kalman and his firm, M&Co, devised "42nd Street Now!" a strategy for codifying the honky-tonk aesthetic of the area.

The real beauty of the plan was its pragmatism. It called for placeholder businesses to keep the major development sites active until it was time to build. A brew pub (with a rooftop mock-up of a Concorde, a British Airways ad) opened on the plan's Site 1, where a 50-story tower by Skidmore, Owings & Merrill was competed in 2002, and Disney opened a store in a one-story building where Kohn Pedersen Fox Associates' 5 Times Square stands today. A couple of ornate historic theaters, like the New Amsterdam (leased by Disney) and the Victory, were preserved and restored. One, the 1912 Empire Theater, a one-time burlesque house, was moved 170 feet on steel rollers down a stretch of 42nd Street entirely devoid of buildings, to serve as the entryway to a soon-to-be-built 25-screen multiplex.

By the time the economy was ready to support the construction of those four gigantic towers, there was a new rulebook issued by the Empire State Development Corp., a set of "design controls" that actually inscribed "the glitzy, bright lights environment of Times Square" into law. The rules set a minimum for the amount of signage on any façade facing Times Square, and towers were required to decorate the skyline with a "distinctive top."

The first of the four towers, 4 Times Square, developed by the Durst Organization and designed by Fox & Fowle (now FxFowle), was completed in 1999. The building, which was fairly staid looking on its east side—the side facing away from Times Square—was otherwise smothered in signage. The other towers followed suit, spurring a video arms race. The new Edition Hotel, for example, designed by PBDW Architects and now under construction at the corner of 47th Street, promises to be wrapped in "one of the largest, uninterrupted outdoor LED media walls in the world." The truth is that the glitz is now the economic engine of Times Square, generating hundreds of millions of dollars of annual advertising revenue for building owners, in some cases more than landlords net from leasing office space. The most extreme example is 1 Times Square. Empty but for a Walgreens on the ground floor, the tower takes in over $23 million a year in advertising revenue.

A Tranquil Oasis

So Times Square—or a strategically amped up version of itself—was saved, but it was still not exactly a public place. There were no café tables under Cinzano umbrellas, no park benches, no fountains. But that began to change under Mayor Bloomberg.

Back in the bleakest moment of New York City's modern history, the 1970s, there was one successful small-scale attempt at revitalizing Times Square: the TKTS booth, a trailer, supposedly temporary, dispensing half-priced Broadway tickets. In 1999, when the Van Alen Institute finally staged a competition to design a permanent booth, the winner was a bold scheme by an Australian firm, Choi Ropiha (now called Chrofi), that housed ticket sales in a box office situated beneath a set of bright red structural glass steps, south-facing bleachers where people could sit, relax, and take in the spectacle.

It took the better part of a decade for glass technology to catch up with the concept, which was constructed under the supervision of New York–based Perkins Eastman. When the steps finally opened in 2008, they did something extraordinary; they provided a (somewhat) tranquil oasis in the midst of pure cacophony. I often take my grad students from the School of Visual Arts to analyze the dissonant scene. Sometimes I use 19th-century aesthete John Ruskin's writings on "truth" in architecture to inspire the students to see what relevance his view of "honest architecture" circa 1849 might have in a place largely defined by the deceits of advertising. Other times I have them interpret the scene via Robert Venturi, FAIA's ideas on "complexity and contradiction." Either way, I ask them to really focus: to see the architecture behind the LED displays, the sky framed by signage above them, and meditate on the collective power of the jumbo images.

The opening of the red steps was followed by the Bloomberg administration's decision to close Broadway in Times Square to traffic. Initially, the pedestrian plazas seemed like a prank, defined by paint on the pavement and furnished with beach chairs. Eventually, the beach chairs were replaced by café tables. And in 2010, in a move that was as political as it was urbanistic, Snøhetta was hired to make the plazas permanent. The grandest symbol of Bloomberg's effort to redistribute the pavement would literally be cast in concrete.

Snøhetta, based in Oslo but well established in New York (it designed the National September 11 Memorial Museum Pavilion), realized that it was madness to try and compete with Times Square. Instead, the firm came up with a restrained

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The Marriott Marquis in the 1980s

arrangement of charcoal colored pre-cast concrete pavers, embedded with "nickel-sized steel discs that will capture the neon glow from the signs above and playfully scatter it across the paving surface." Their design also involves a series of 10 minimalist granite benches variously configured for sitting, leaning, or reclining—the first one was installed in November (the project will be completed sometime next year)—plus things like conduits to supply power for outdoor performances in locations along Broadway's path. The concept, according to Snøhetta, is "uncluttered pedestrian zones and a cohesive surface from building front to building front."

The firm is doing something that seems almost as alien to Times Square as those Philip Johnson towers were; it is employing subtlety and refined taste. "When we think about public space we think a lot about generosity," says Claire Fellman, a Snøhetta director and landscape architect. "Like how to make a space that feels welcoming, that invites people in to occupying a space in their own way."

When I huddle on the red steps with my students, I like to tell them the story of the Marriott Marquis Hotel, located between 45th and 46th Streets. Designed and developed by Atlanta-based architect John Portman, FAIA, it famously was a fortress of unadorned concrete when it opened in 1985. It turned its back on Times Square, aesthetically and literally. The lobby, for example, was sequestered on the eighth floor. The revolving restaurant and bar at the top of the hotel offers a wonderful panorama of New York's spires, but absolutely no view of Times Square below. In

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an interview at the time of the hotel's opening, *New York Times* architecture critic Paul Goldberger, HON. AIA, asked Portman why it had no relationship with its surroundings. Portman replied: "Paul, there was nothing there to relate to. What am I going to relate to, Howard Johnson's across the street?"

Sadly, the Howard Johnson's Portman mentioned closed in 2005, the bizarrely endearing coffee shop replaced by an American Eagle store, but the native aesthetic of Times Square proved so powerful—and so lucrative—that it eventually overran Portman's citadel with signage. Late last year, the hotel even got a new billboard, eight stories tall and spanning the entire block, using, according to the press release, "24 million pixels to create the most Ultra-High Definition display in the world." And, now, for the very first time, glassy street level retail is being built along the Broadway side of the hotel (retail rents have quintupled in Times Square since 2009). Thirty years after its completion, Fortress Marriott is finally meeting the street. Call it the triumph of the glitz.

A Real Public Place

Meanwhile, the mayor has backed off from the threat to reopen Broadway to traffic in Times Square and has instead established a task force, led by Bratton and chairman of the City Planning Commission Carl Weisbrod, and including Tompkins and others, to hammer out enforcement issues. "We're having this conversation about what kind of Times Square we do want," Tompkins says. The task force has determined that if the pedestrianized zones of Broadway can become a real public place, they can lose their legal ambiguity and be easier to regulate. Beyond that, the Times Square Alliance has recommended dividing the area into different zones: "general civic" for cultural and political activities, "pedestrian traffic flow" for easy walking, and conspicuously small "designated activity" zones available to "fake Buddhist monks," "costumed characters," "desnudas," and others. Hard to say whether this highly structured approach will work.

For years, there were dire predictions about what Times Square would become after all the new towers were erected and all the new themed restaurants and mega-multiplexes opened: boring, sanitized, Disneyfied. What I take from the desnudas scandal is this: Times Square is many things, but Disneyland is not one of them. The upshot of this story, the crazy, wonderful thing, is that it's not the thoughtful urbanistic gestures—the red steps, the pedestrian plazas, Snøhetta's carefully considered pavers and benches—that finally forced Times Square to be taken seriously as a public place; instead it was a roving band of nearly naked women.

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Environment + Natural Resources Building II
Tucson, Ariz.
Richärd+Bauer Architecture

TEXT BY JOHN MORRIS DIXON, FAIA
PHOTOS BY BILL TIMMERMAN


1064

The program and site for this Tucson, Ariz., research building would not seem to encourage formal invention. A constricted rectangular plot needed to accommodate some 155,000 square feet of technical facilities, which did not provide much leeway for architectural expression. But Phoenix firm Richärd+Bauer Architecture transformed that bit of leeway into a vivid metaphor for the forces of nature.

The Environment + Natural Resources Building II (ENRII) at the University of Arizona opened in September. The site is strictly bounded by streets to the north and south, an earlier Environment + Natural Resources building to the west, and a parking garage to the east. Rather than leave open space on any of these sides, the project team decided to fill the whole rectangle to the edges with a boxlike volume.

As a result, none of the structure's four faces was suitable for a grand entrance, but the garage does incorporate a two-story-high recess, originally intended as a bus drop-off. So the principal entrance to the new building faces the garage and shares that found space. Alternative entries are located on the other three sides. Principal James Richärd, AIA, takes some satisfaction in "deconstructing the usual entrance sequence."

After ruling out a prominent entrance, the architects and clients considered a central atrium, but a large volume of enclosed conditioned space would have violated the program's mission to provide research that leads to the sustainable management of natural resources and energy conservation. The design team instead decided to organize the building around a full-height open-air space with the constricted proportions of a local geographical feature: the slot canyon.

Rather than mimicking a natural canyon's qualities, the architects abstracted its salient characteristics: Irregular boundaries, defined by cantilevered upper-floor walkways, cast the range of light and shadow found in a canyon. Planting beds at every level bring scattered greenery, and paved paths and concrete benches reinterpret the contours of eroded stone. Swooping stairs encourage walking between floors.

The manmade origin of this canyon's forms is evident in its compositions of straight lines and circular arcs. "There is always a challenge in developing a conceptual response to a natural setting," Richärd says. "It requires interpretation and abstraction; we developed a geometry that recalled the experience of an [actual] canyon without being slavish to it."

Vertical steel angles screen the balconies, playing down their horizontal edges and recalling the precipitation that forms streambeds. The building's north and south faces are clad in the same vertical members, which help moderate the desert sun in the spaces within. The carbon steel will change color as the mill scale falls away, from near black to a dark reddish brown—relating to the campus's characteristic terra-cotta-colored masonry but with a richer, more neutral tone. The curtainwalls behind the screens contain limited windows among glass-faced insulated panels.

Above the ground-floor auditorium, café-commons, and lecture hall, the upper floors primarily house office spaces with regular layouts that reflect the rectangular geometry of the exterior walls and support the building's program, which involves mainly computational analysis. A roof-level conference room boasts expansive views, and paved decks and gardens allow for some open-air research.

Ovoid rooms, which house functions such as teaching labs and seminar/conference rooms, punctuate the orderly office layouts, and are placed irregularly along the open corridors that ring the central canyon. The swerves of the canyon in plan expand upon the curves of these gathering spaces.

Given the client's environmental mission, every aspect of the structure's energy performance was considered; it is currently seeking LEED Platinum certification. Office spaces are concentrated along the north and south façades, where they can benefit from the shading. East and west elevations house elevators and utilities, which serve as thermal buffers. A post-tensioned flat-slab concrete structural frame acts as the building's principal thermal mass, damping diurnal temperature variations, and displacement ventilation from the raised floors distributes conditioned air. The extra ceiling-to-floor depth aligns with that of the balcony planting beds, so there is one continuous level of "terra firma" (as Richärd puts it) inside and out.

Laying out the structural columns presented a challenge because of the building's irregular floor plans. So the design team placed all columns along consistent north–south lines, then adjusted their locations along those lines in response to the demands of the ovoid rooms and the varying balcony cantilevers.

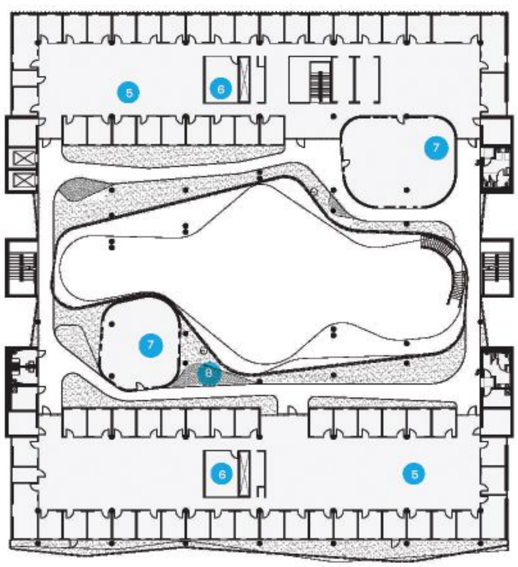
Interiors are sleek with predominantly white surfaces, designed to maximize light dispersal and enable occupants to personalize their spaces. While the canyon's geometries reappear in the auditorium and other shared spaces, any further visual references to the surrounding natural world have been left outside.

All told, the architecture of ENRII is derived from a demanding program, not imposed upon it. And having designed two other structures for the university, Richärd can attest to the school's understanding of design's appeal for students and instructors. Across the campus, and as seen here, "there's a focused effort to create distinctive environments," he says.

Previous Spread: North façade

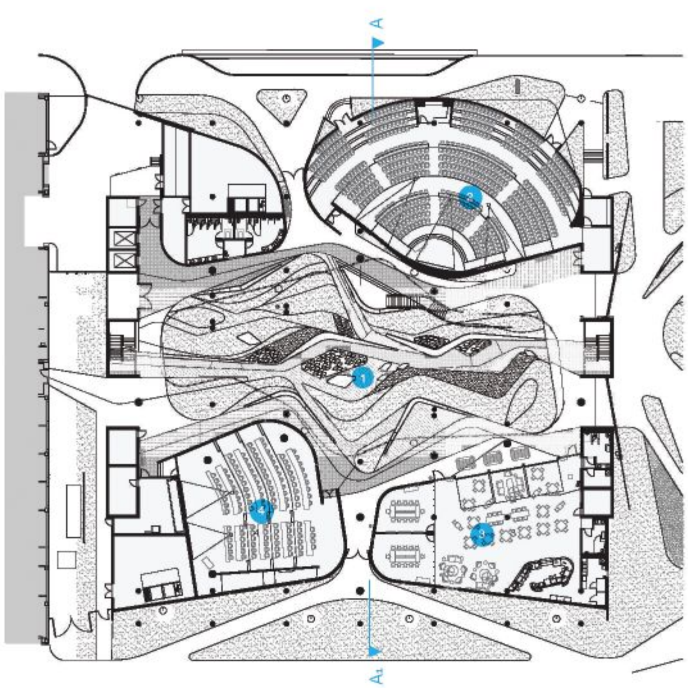
This Page: View into courtyard from west entrance

Third-Floor Plan

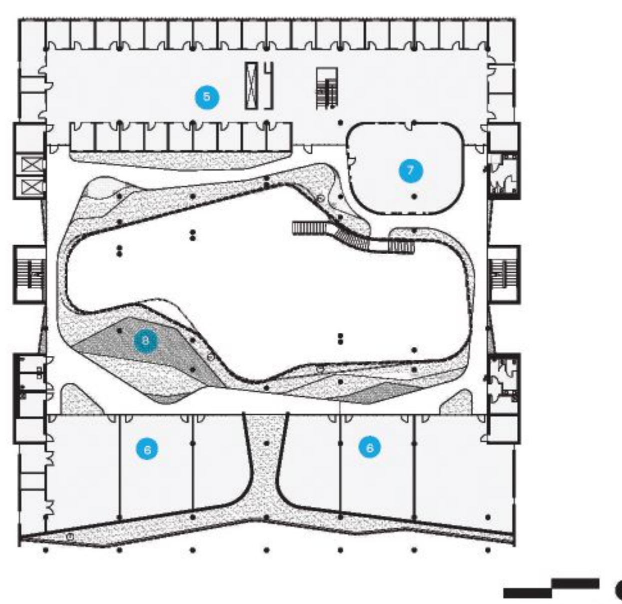


Fourth-Floor Plan

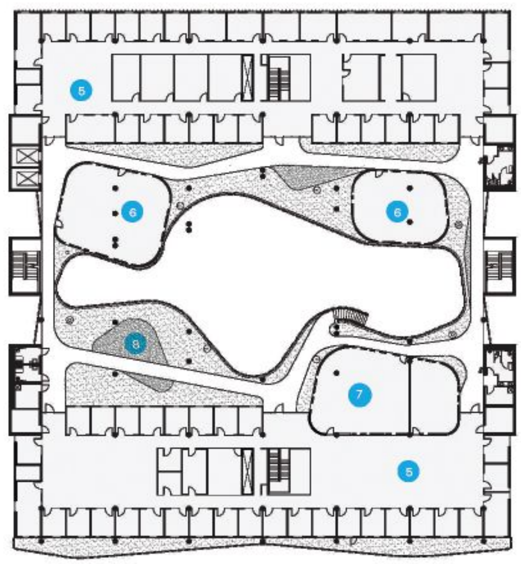
Ground-Floor Plan



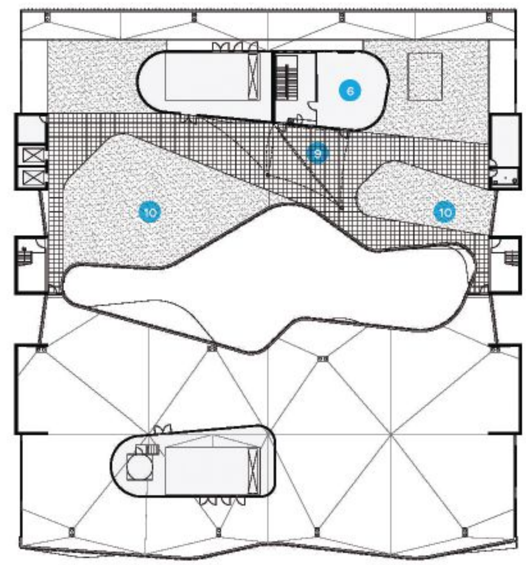
Second-Floor Plan



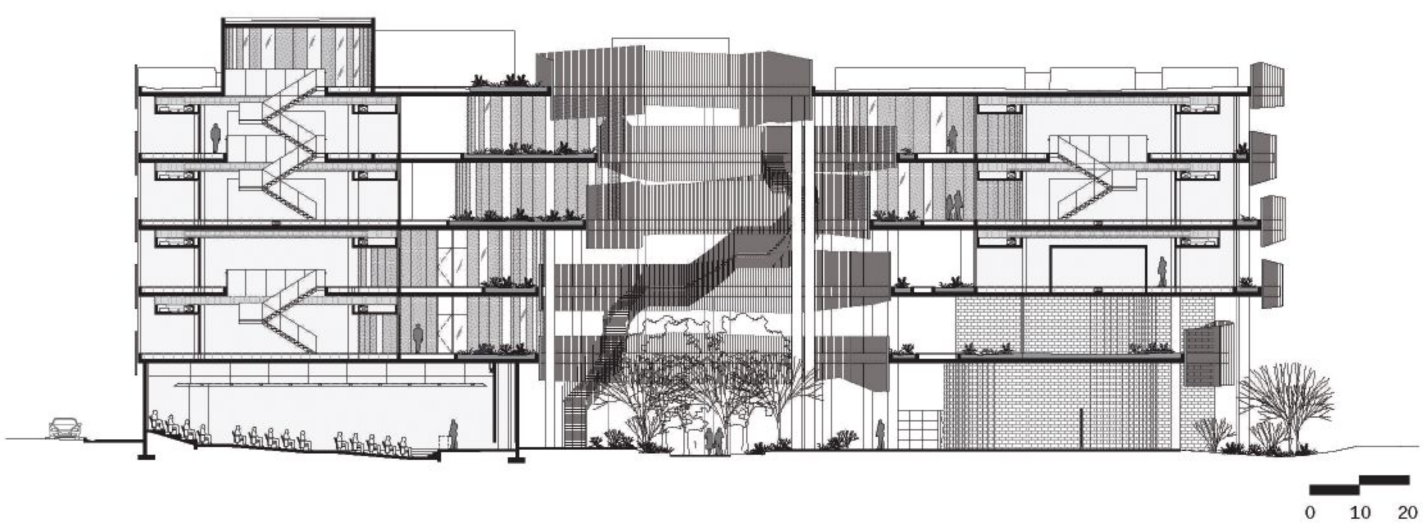
Fifth-Floor Plan



Roof Plan



Section A–A₁



1. Courtyard
2. Auditorium
3. Café-commons
4. Lecture hall
5. Office
6. Seminar/conference room
7. Teaching lab
8. Outdoor seating
9. Roof deck
10. Garden

View of courtyard from third floor, looking northwest

This page: Café-commons on ground floor

Opposite: Staircase in fifth-floor office space, leading to rooftop conference room

Project Credits

Project: Environment + Natural Resources Building II, Tucson, Ariz.
Client: The University of Arizona
Design Architect: Richärd+Bauer Architecture, Phoenix, Ariz. · James Richärd, AIA (principal architectural designer); Kelly Bauer (interior design); Stephen Kennedy, AIA (project manager and project architect); Nick Nevels (senior project architect); Andrew Timberg, AIA (project architect); Mark Loewenthal (staff architect and BIM/Revit); Maura Gonzalez (interior designer)
Architect of Record: GLHN Architects & Engineers, Tucson, Ariz.
M/E and Civil Engineer: GLHN Architects & Engineers
Structural Engineer: Turner Structural Engineering
Landscape Architect of Record: McGann & Associates
Landscape Architect: Colwell Shelor Landscape Architecture
Contractor: Hensel Phelps
Size: 155,031 square feet
Cost: $50 million

St. Pius Chapel and Prayer Garden
New Orleans
Eskew+Dumez+Ripple

TEXT BY EDWARD KEEGAN, AIA
PHOTOS BY WILL CROCKER

When the archdiocese of New Orleans decided to build a new chapel at St. Pius X parish, in the city's Lake Vista subdivision, they weren't looking to expand the 1963 church building, but rather to create a separate—and much smaller—space for quiet contemplation. So the team at local firm Eskew+Dumez+Ripple (EDR) set about designing a grace note: a 571-square-foot freestanding chapel and attached prayer garden that sit in the shadow of, but are not dwarfed by, the existing 13,850-square-foot church. In fact, the distinctive faceted geometry of the copper-roofed church influenced the new chapel's sculpted form.

"How do we show appropriate respect for the architecture, but build something new that can carry its own weight?" EDR partner Mark Ripple, AIA, asked at the project's inception. And especially when the mandate was for something so small and distinct: "A Eucharistic adoration chapel is a very specific Catholic design program," Ripple says, meant for quiet reflection in the presence of the Blessed Sacrament.

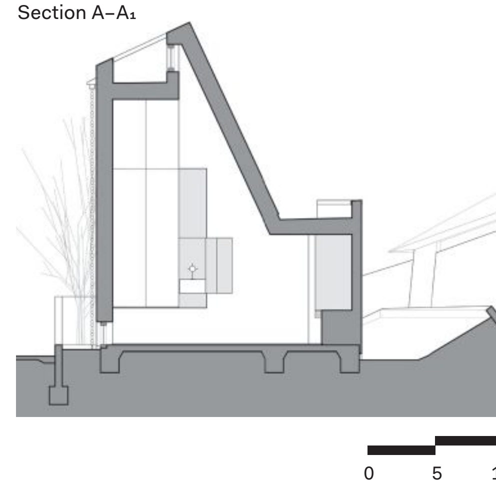
The result is two volumes: An 8-foot-tall foyer that leads to a 18-foot-tall worship space in which "the tabernacle is unequivocally the focus," project architect Christian Rodriguez, AIA, says. There's not even a crucifix: The architects imply a cross form with canted white walls grazed by daylight from a side window.

The design fosters a sense of the intimate and eternal, with natural light entering from three sources—the tall, thin window to the left of the tabernacle, a clerestory above the worshipper's heads, and a low window that gives a focused view to the outside. "You can see plants wiggle in the wind," Rodriguez says. "It provides a bit of relief and a connection with nature."

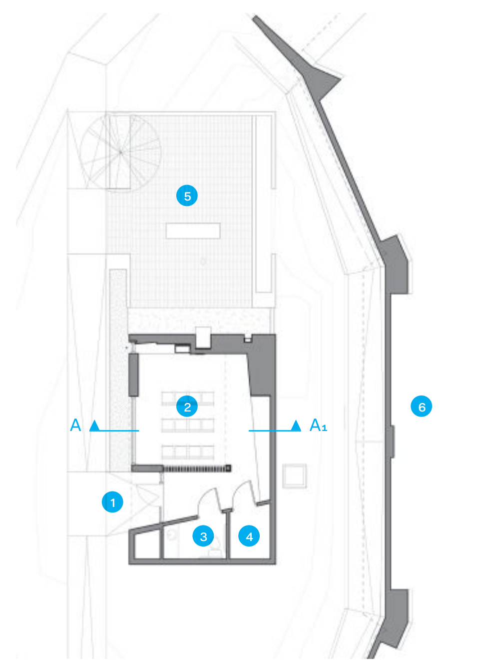
The overall palette of materials is equally simple, to balance the sense of the sacred with a tight budget. The exterior is predominantly cement plaster with copper details—the inverse of the main church's exterior. Inside, the floor is an engineered stone, and gypsum board is used for the walls and ceilings. Walnut veneer is deployed in a screen between the entry and sanctuary, as a counter for reading materials, and to frame the tabernacle. What wasn't part of the initial program is the prayer garden to the north of the chapel, which was added so that its absorbent planting beds could help with flood control—an important consideration in Lake Vista, which is built on land reclaimed from nearby Lake Ponchartrain.

"Good church architecture encourages you to put the secular behind," Ripple says. EDR's chapel manages to achieve this goal by deftly creating a small structure that evokes the eternal through a compelling interplay of form and light, focusing the attention of the parish community upon the ineffable.

Section A–A₁



Floor Plan



1. Entrance
2. Chapel
3. Restroom
4. Mechanical
5. Prayer garden
6. St. Pius X Church (existing)

0 5 10

Previous Spread: View from south, showing main entry and Sto Corp. exterior wall system

This Image: Prayer garden to northwest, with Stepstone pavers and a bench from Wausau Made

Chapel interior with walnut veneer millwork and Ergon Engineered Stone flooring

Project Credits
Project: St. Pius Chapel and Prayer Garden, New Orleans
Client: Archdiocese of New Orleans
Project Team: Eskew+Dumez+Ripple, New Orleans · Mark Ripple, AIA (principal); Christian Rodriguez, AIA (project architect); Robert Kleinpeter, Lynn Ostenson, Aseem Deshpande, AIA (project team)
Mechanical/Electrical Engineer: Mazzetti
Structural/Civil Engineer: Robert A. Bouchon, Consulting Engineer
Geotechncial Engineer: Gillen Engineering
General Contractor: Voelkel McWilliams Construction
Size: 571 square feet (chapel); 1,258 square feet (including prayer garden)
Cost: $458,000 (including site work)

Riverfront Park & Ascend Amphitheater
Nashville, Tenn.
Hodgetts + Fung with Hawkins Partners and Smith Gee Studio

TEXT BY NATE BERG
PHOTOS BY MATTHEW CARBONE

For more than 30 years a thermal energy plant sat just blocks from the heart of downtown Nashville, Tenn., on the Cumberland River, burning garbage. When the plant closed in 2004, city leaders wanted to give the 11-acre site a flashy new life. Various projects were proposed, including an office complex and a baseball stadium, but nothing garnered local support. In 2007, the city decided to turn the riverfront land into a park.

Nashville being the home of country music, it wasn't long before the park's plan was amended to include one additional amenity: an amphitheater. But the city's then-mayor Karl Dean wanted to ensure the amphitheater didn't detract from the park, according to Hunter Gee, AIA, principal at local firm Smith Gee Studio, the project's architect of record. "From very early on there was almost a mandate that we reduce the visual impact on the city skyline," says Gee. That was interpreted to mean punching a hole through the building to allow continuous views of downtown.

Having never built an amphitheater, Smith Gee Studio hired Hodgetts + Fung, known for its work renovating the Hollywood Bowl near its office in Los Angeles. "It's very unusual for an amphitheater not to have a solid back to it," says Craig Hodgetts, FAIA.

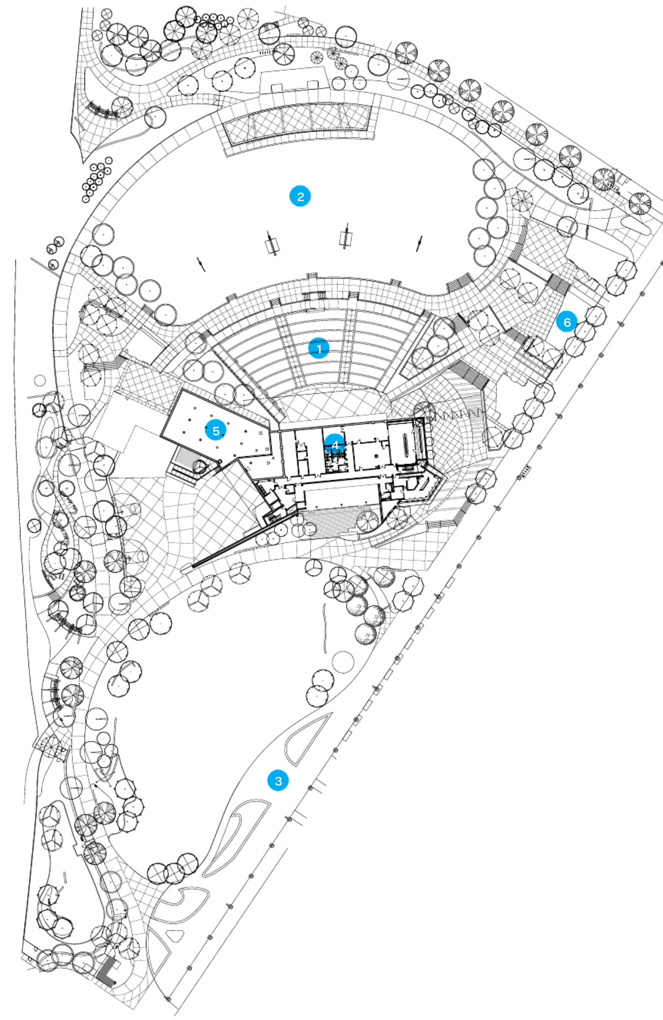
Inspired by Nashville's plentiful 19th-century limestone buildings but also by its country music heritage, Hodgetts + Fung's design uses the stone for the stage's base and draws inspiration for the structure from the curving lines of 1960s-era Gretsch amplifiers.

"It's a stripped down but elegant machine," Hodgetts says. "Nothing is forced. There's a pragmatic reason for just about everything that you see."

To the audience, the roof structure appears to rise out of the stone plinth at the front left of the stage, its metal trusses and screening climbing up then leaning sharply to the right, as if to point to the Cumberland River just across the train tracks. The stage itself is a big open room, with catwalks and rigging built into the walls and roof, along with integrated acoustical material. Beneath the stage, a large event space looks back toward the city, and catering facilities and a dining hall can accommodate 250. Outbuildings on the site are in the same family of forms.

Per the mayoral mandate, the amphitheater and its grassy seating for 7,000 blend into the park surroundings, with interlaced walking and cycling paths connecting to the riverfront. "This isn't just about there being a world-class amphitheater," says Kim Hawkins, principal of Nashville-based landscape architecture firm Hawkins Partners, which created the West Riverfront Master Plan to guide the site's redevelopment. "It's about there being a park within which an amphitheater sits."

Site Plan

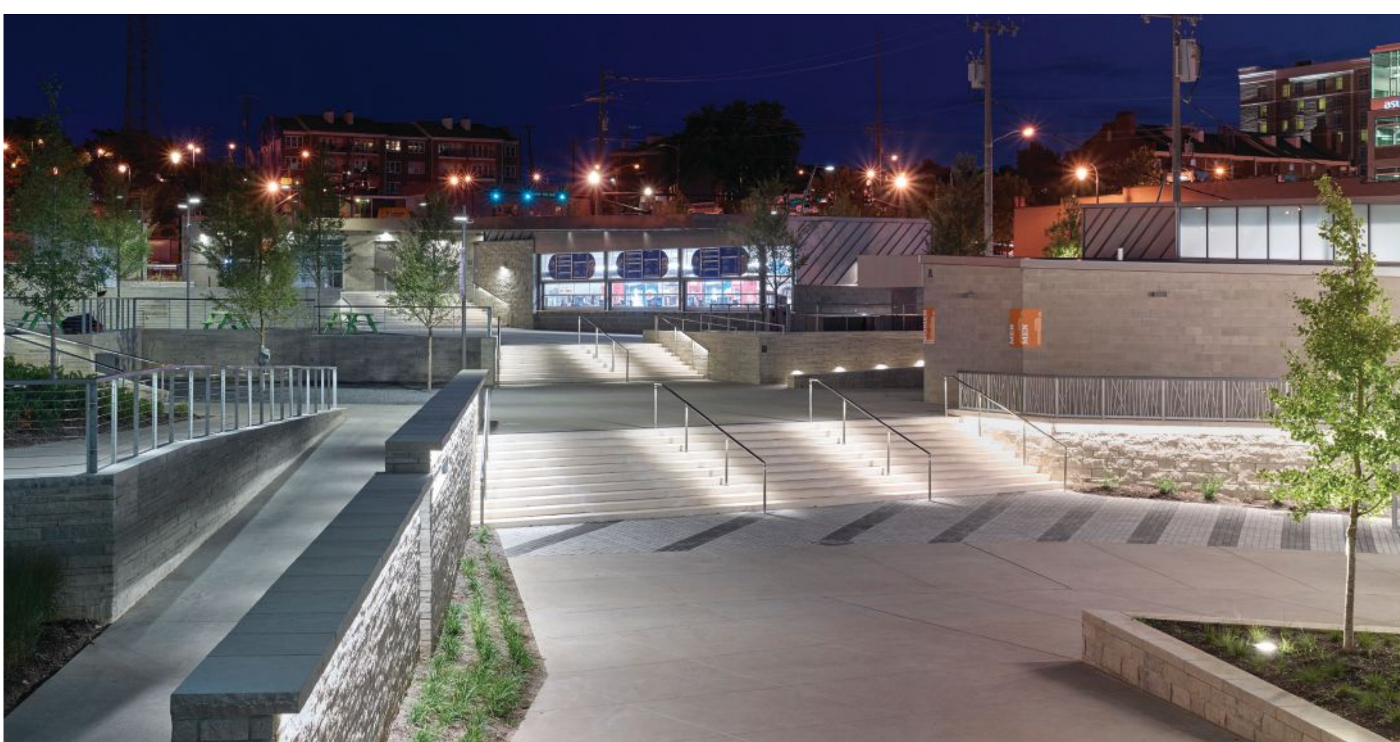


1. Seating
2. Lawn
3. Pedestrian and bicycle paths
4. Stage enclosure
5. Rainwater harvesting
6. Concessions

0 50 100 N

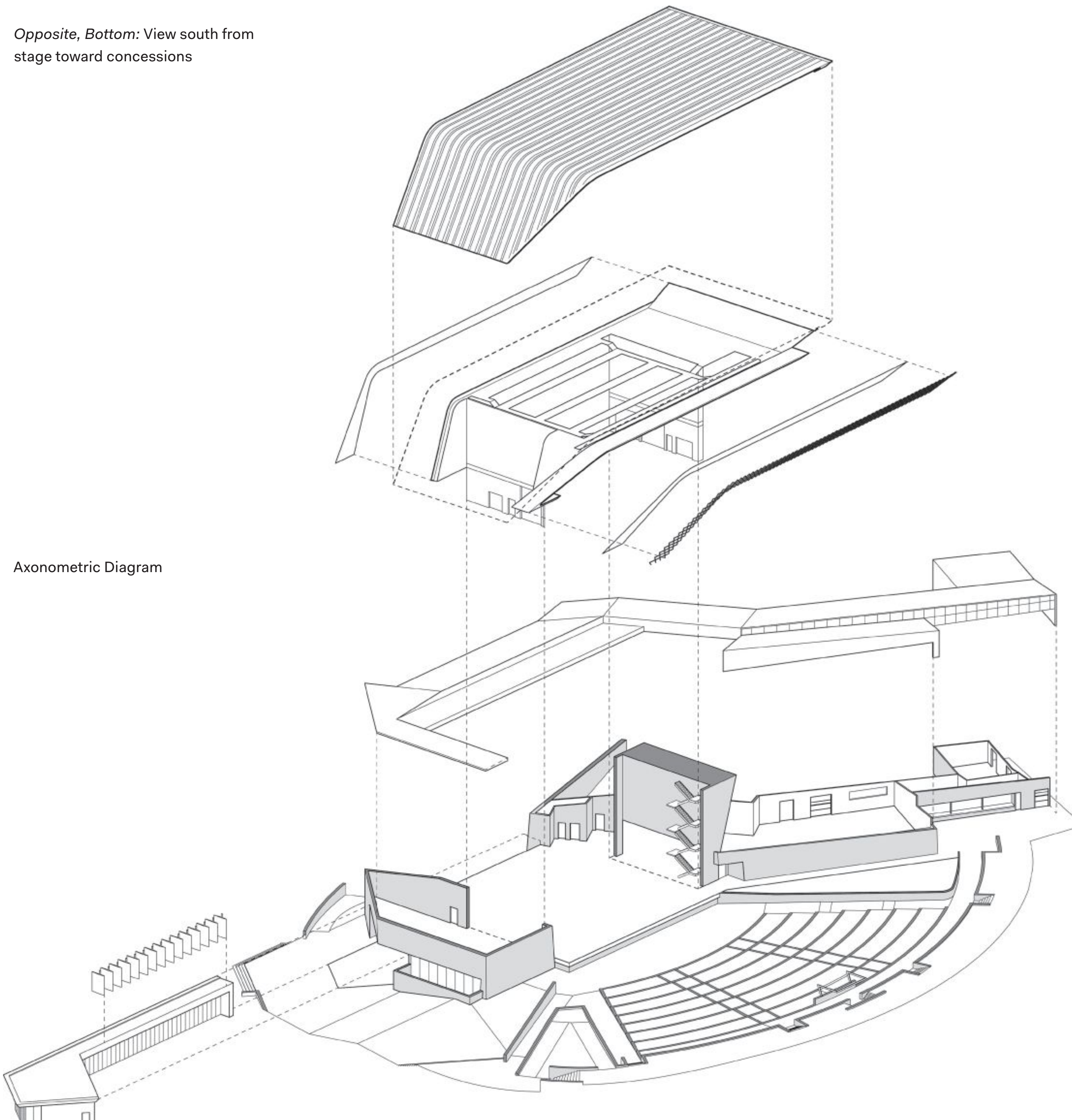
Previous Spread: Ascend Amphitheater anchors 11-acre Riverfront Park along Cumberland River

This Page: View west toward stage along limestone plinth



Opposite, Top: View north from riverside pedestrian and bicycle path

Opposite, Bottom: View south from stage toward concessions



Axonometric Diagram

Above: Riverfront Room and patio

Opposite: View east toward rear of amphitheater from Riverfront Park

Project Credits

Project: Riverfront Park & Ascend Amphitheater
Client: Metro Nashville Davidson County
Design Architect: Hodgetts + Fung, Los Angeles · Craig Hodgetts, FAIA, Hsinming Fung, AIA (principals-in-charge); Darin Vieira (associate senior designer)
Lead Consultant and Landscape Architect: Hawkins Partners, Nashville, Tenn. · Kim Hawkins (principal-in-charge); Brian Phelps (project designer); Nathan Oliver
Architect of Record and Interior Architect: Smith Gee Studio, Nashville, Tenn. · Hunter Gee, AIA (principal-in-charge); Andy Berry, AIA (project architect); Kara Babin Gee, ASSOC. AIA (interiors lead); Omar Bakeer, Kyle Keaffaber, Leah Robison, Reinalisa Santoyo
Lighting Consultant: Domingo Gonzalez Associates
Theater Planners: Schuler Shook
Acoustics: Jaffe Holden
Structural Engineer: EMC Structural Engineers
MEP Engineers: IC Thomasson Associates
Civil Engineer: Civil Site Design Group
Geotechnical Consultant: KS Ware & Associates
Construction Manager: Skanska
Environmental Graphics: TollesonMcCoy
Size: 40,000 square feet
Cost: $40 million


Ascend
AMPHITHEATER

Residential:
Casa BLM
Brasília, Brazil
Atria

TEXT BY KATIE GERFEN
PHOTOS BY HARUO MIKAMI

When the client for Casa BLM in Brasília, Brazil, first approached local firm Atria about designing his residence, there was no talk of kitchen appliances or the number of bathrooms. Instead, principal Gustavo Costa recalls,"He said, 'What I need is a library, but with a house around it.' " At the next meeting, the client came armed with books from his 6,000-volume collection. "He brought books on the Bauhaus, Gropius, Le Corbusier," Costa says. "He was looking for a house with 'roots in Modernism.' "

Surprisingly, given Brasília's roots as a model Modernist capital, classic Modernism is a stylistic departure for the city's South Lake neighborhood, where the client had inherited a 2,500-square-meter plot (part of a larger parcel divided among three brothers). Most houses here date back to the 1970s, and are of a Frank Lloyd Wright–inspired style, Costa says. But for Casa BLM a different approach was critical.

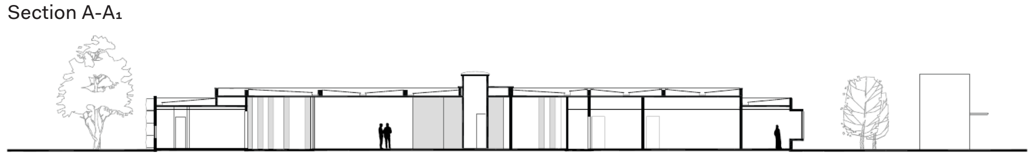
"We normally use natural materials in our work—ones that will get old in a good way," Costa says. To that end, his team clad the all-important library in Cor-Ten steel panels, which lend a quilted texture to the rectilinear volume at the front of the site. The panels are 60 percent perforated to admit daylight while filtering glare that could fade the books.

The house is organized with public spaces toward the street. An L-shaped path leads visitors around the side of the library to a courtyard behind. Instead of being greeted by a traditional front door, visitors can walk directly into the living room via a sliding wall of glass. An open kitchen and dining area round out the public space, where the client regularly entertains. The rear of the house has three bedrooms with en suite baths and an entertainment room for the family, all organized around a second, more private courtyard.

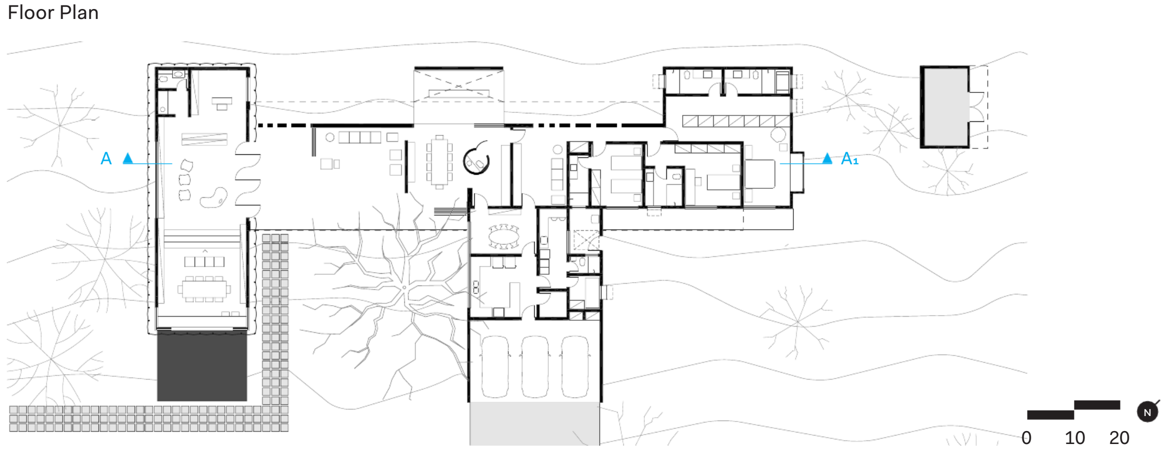
With the exception of the library volume, the house is built from pink-toned bricks, custom-designed and manufactured to measure 35 centimeters long by 6 centimeters high and deep. Unusually, the clay was not baked, but pressed in a hydraulic machine and dried. Each brick had a waterproof coating applied to account for the resultingly higher-than-standard porosity of the material. Masons arranged the bricks in a loose running-bond pattern to give the walls texture, complementing the waxed board-formed finish of the concrete-slab roof.

Atria doubled as general contractor on the house, allowing the team to carefully monitor the execution of all finishes and details. "It's a turnkey way of working," Costa says. The client's openmindedness was equally valuable as the firm experimented with materials and processes. "In Brazil, sometimes we have this type of client," the architect says, "but it is not always easy to find them."

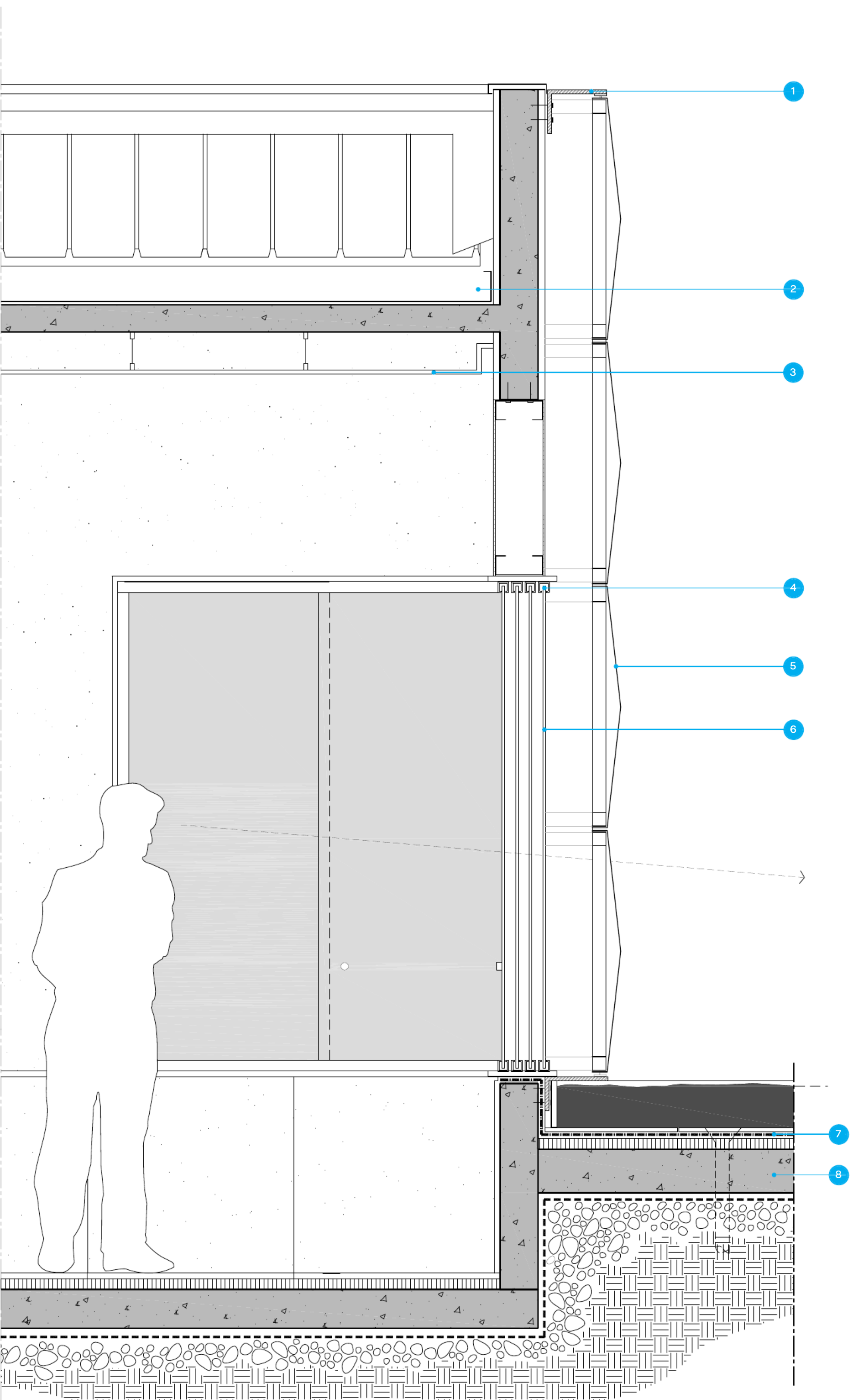
Section A-A_1



Floor Plan



Previous spread: The library is clad in perforated Cor-Ten steel panels that can be opened like shutters.



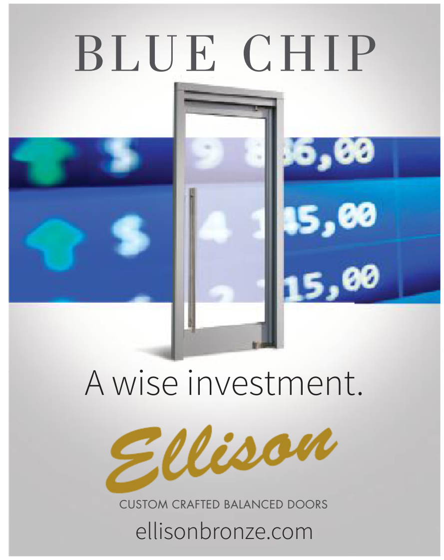
1. Steel structure
2. Galvanized metal gutter
3. Drywall
4. Aluminum frame
5. Perforated Cor-Ten steel panel
6. Tempered glass panels
7. Black porcelain, gloss finish
8. Reinforced concrete

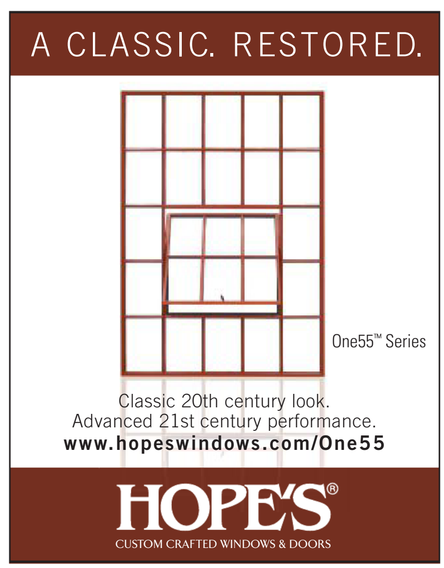
There is no traditional front door at Casa BLM. Instead, visitors enter through the living room, whose sliding glass wall is regularly left open. A continuous concrete slab caps the structure, providing a stong horizontal datum line.

Above: Inside the library, custom shelves hold the client's 6,000-volume collection, which includes many rare and first edition books. The space also contains a few select pieces from an extensive Modernist furniture collection. The floors in this room, and throughout the house, are Brazilian travertine.

Opposite: The bedrooms and other private spaces are located at the rear of the house. The architect sited the building to preserve the existing trees, which are protected in Brasília. A small brick outbuilding (at right) serves double duty as a dog house and a water cistern.

Project Credits
Project: Casa BLM, Brasília, Brazil
Client: Withheld
Architect: Atria, Brasília, Brazil · Gustavo Costa (principal)
Structural Engineer: Roberto Chendes
Contractor: Atria
Size: 6,781 square feet
Cost: Withheld





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Editorial: No Shame, No Gain

For lovers of architecture and cultural history, the World Monuments Watch list of endangered landmarks comes like a punch to the gut. Released biennially by the World Monuments Fund, the watch list provides recurring proof of a sad reality: Even the most revered places can fall on hard times, for reasons as varied as benign neglect, overuse, and outright greed.

More than 900 sites have been listed over the years. In 1996, the year of the watch list's debut, it fingered the Taj Mahal. The Egyptian Valley of the Kings came up in 2000 (and again in 2002), Frank Lloyd Wright's Ennis Brown House in 2004 and 2006, and the entire city of Venice in 2014.

The World Monuments Fund isn't just some scold, however—it offers help with planning, research, finances, and other resources. But its most powerful tool may very well be shame. The nonprofit knows that inclusion on the watch list can result in negative publicity for misbehaving businesses, governments, and individuals, and that the exposure may spur them to change course and take right action.

And what to do when the offending party not only proves indifferent to bad PR, but actively seeks it? This year, the fund has been forced to get extra-creative.

Among the 50 places on the recently announced 2016 watch list is something called the "Unnamed Monument"; intriguingly, its entry on the fund's website gives no other I.D., no geographic location, no photographs or drawings. The only information that the fund offers is the following brief statement:

> *The 2016 Watch includes the Unnamed Monument in recognition of the deliberate and calculated damage to thousands of cultural heritage sites in many areas of political and social instability. There are simply too many sites at risk to be included individually on the Watch, and no immediate hope for resolution. The Unnamed Monument seeks to shift the focus to local populations who are losing their cultural heritage and history, and away from our own outrage, which plays to the propaganda of those who are perpetrating this damage.*

You don't have to be a newshound to know the who, what, and where to which the Unnamed Monument refers. The fund's decision to name no names is understandable, even admirable, because appearing on the World Monuments Watch list is exactly the kind of reaction that terrorists aim for when they commit a crime. Psychologically and politically, their motivation is simple: Like schoolyard bullies, they do bad things for the attention; they want to horrify enemies and recruit followers. In the minds of these sociopaths, it makes no difference whether they're machine-gunning the audience at a heavy metal concert, beheading a journalist, or dynamiting an ancient shrine.

It may seem counterintuitive—and it's certainly frustrating to stifle our righteous indignation—but one of our most effective forms of retribution is to pointedly ignore the misdeed. Therein lies the subtle wisdom of the Unnamed Monument. It refuses to dignify barbarism with a response, or at least not the kind of response that the extremists want, which is their names in lights.

@NedCramer

STEPHEN VOSS