ARCHITECT

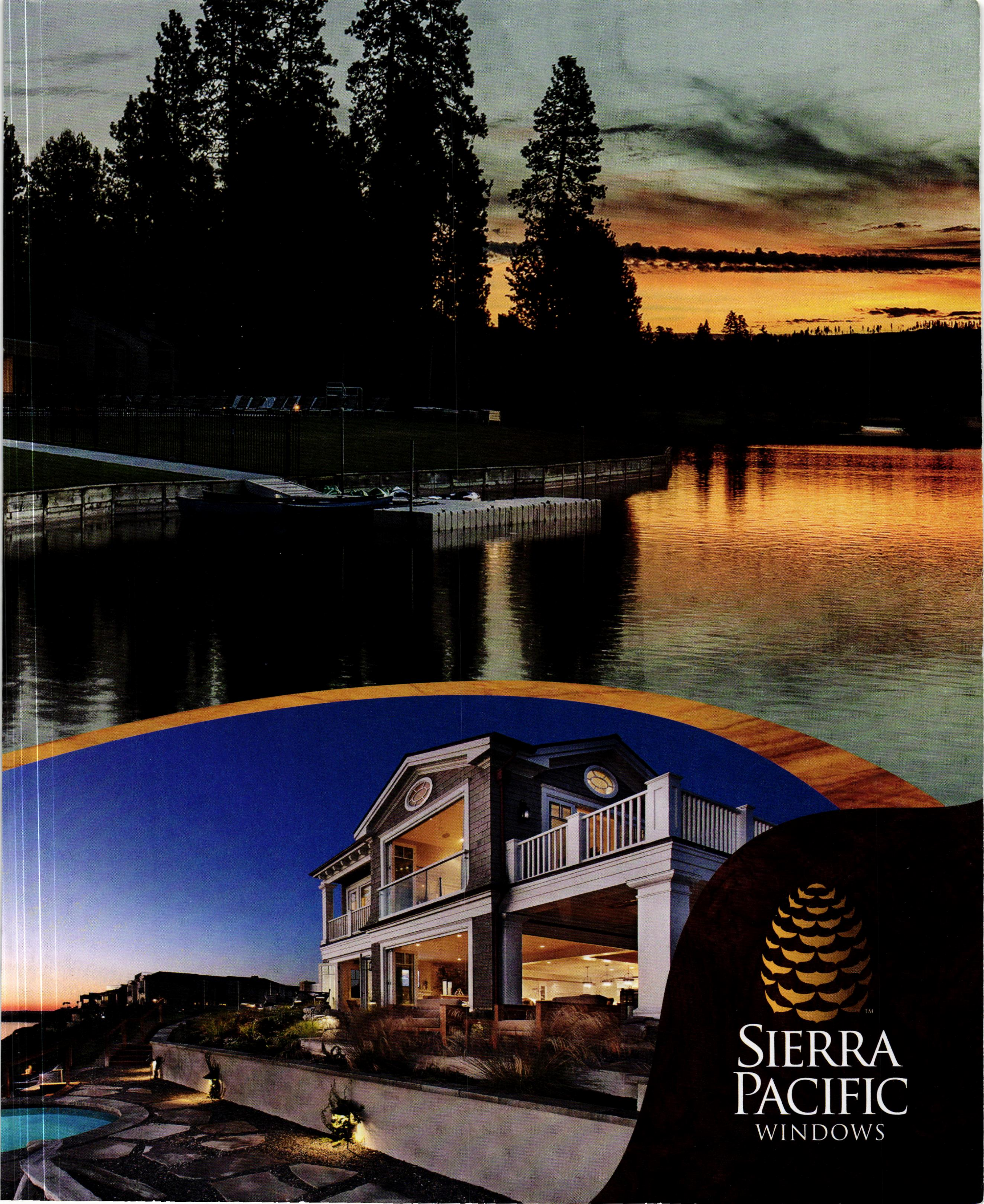
Agency—Agency
Piercy&Company
David M. Schwarz

Karrie Jacobs on MoMA's Growth
Assessing Canadian Architecture
Gabrielle Bullock Uses Her Voice
Recession-Proofing, Part 2

architectmagazine.com
The Journal of The American Institute of Architects

The Residential Architect Design Awards

Skinny, smart, simple housing for today


SIERRA
PACIFIC
WINDOWS

Residence, Burr Ridge, IL Architect: Michael Buss Architects, Ltd. Installing contractor: Complete Flashings Builder: McNaughton Brothers
Photographer: Scott Bell Construction Material : Snap-Clad .032 aluminum Color: Charcoal

Stunning Finish

"When the owners decided they wanted a metal roof, we were all-in. We were looking at renderings on the computer and when we put the metal roof on the design, all of a sudden this quaint house became stunning."

-Michael Buss, AIA, Michael Buss Architects, Ltd.

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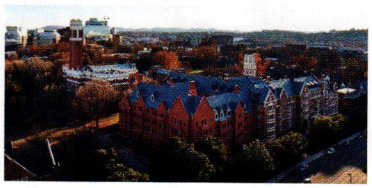
Volume 107, number 12. December 2019.
On the cover: XS House in Philadelphia by ISA; photo by Sam Oberter



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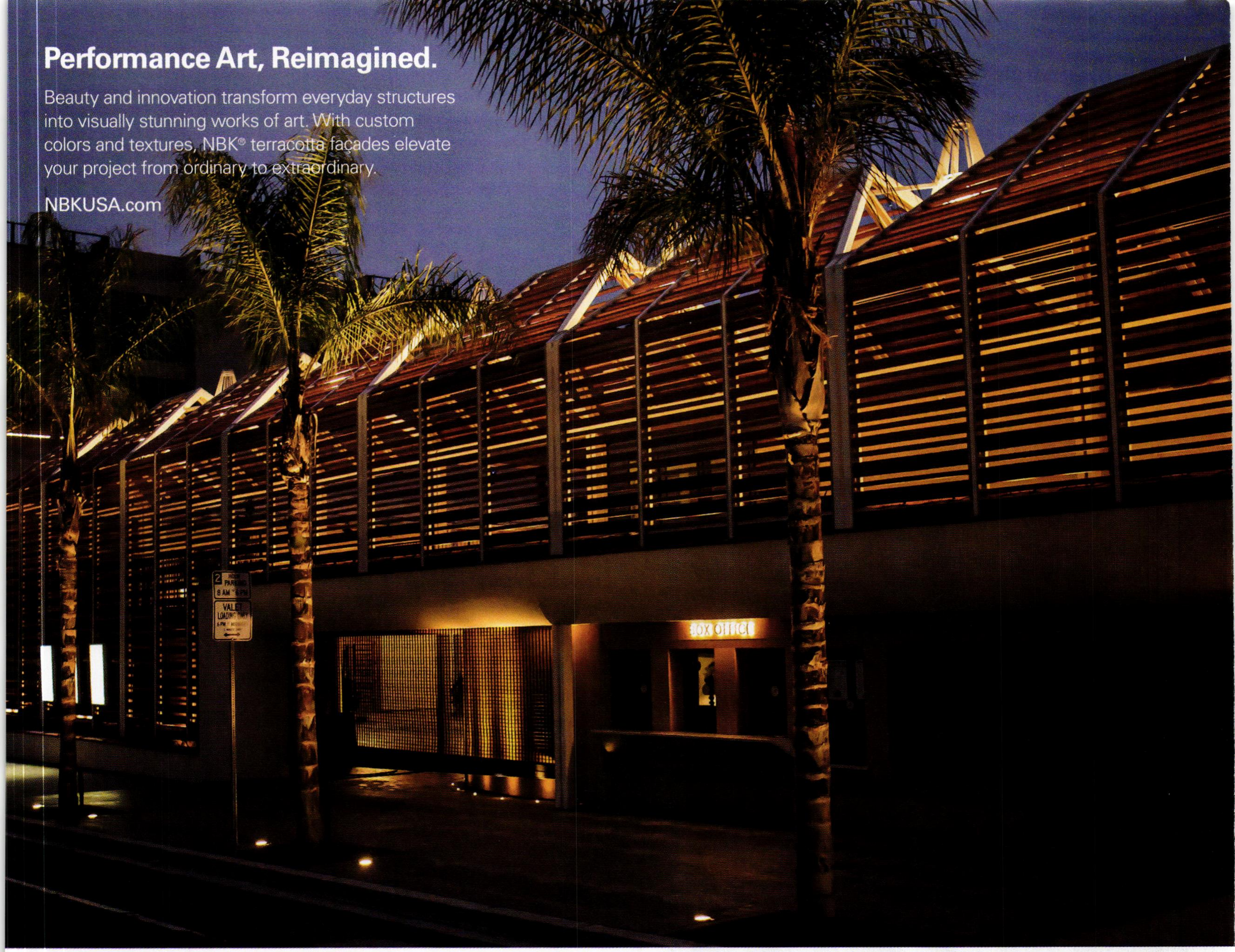

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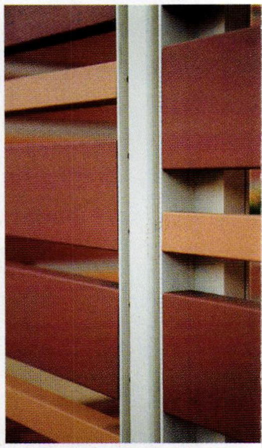

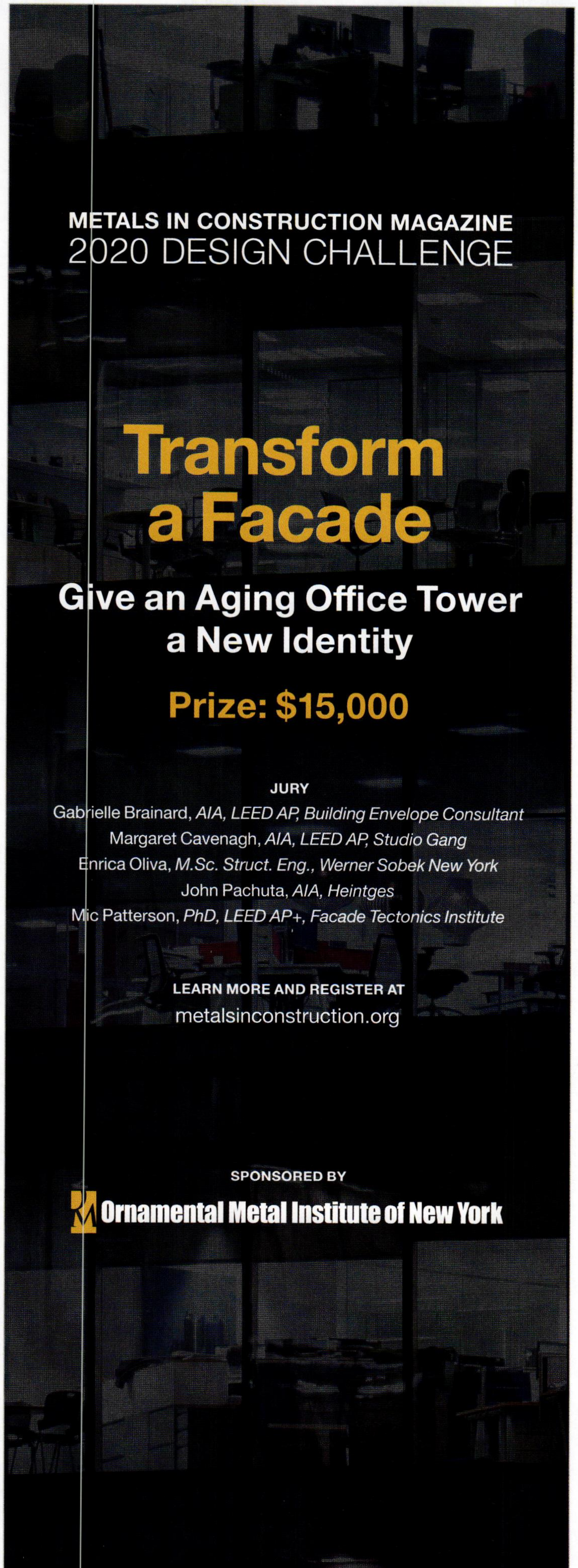

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The Journal of The American Institute of Architects

Editor-in-Chief
Ned Cramer, ASSOC. AIA
ncramer@hanleywood.com
@NedCramer

Managing Editor
Greig O'Brien
gobrien@hanleywood.com

Art Director
Robb Ogle
rogle@hanleywood.com

Design
Editor
Katie Gerfen
kgerfen@hanleywood.com

Features
Senior Editor
Eric Wills
ewills@hanleywood.com

Intern
Madeleine D'Angelo
mdangelo@hanleywood.com

Technology and Practice
Editor
Wanda Lau
wlau@hanleywood.com
@wandawlau

Senior Associate Editor
Katharine Keane
kkeane@hanleywood.com

Multimedia
Videographer/Video Editor
Rob Grauert Jr.
rgrauert@hanleywood.com

Contributing Editors
Aaron Betsky
Blaine Brownell, AIA
Daniel Davis
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Design Group
Executive Vice President, Build/Design Group
Ron Spink
rspink@hanleywood.com
202.736.3431

Senior Vice President, Sales, Remodeling/Distribution/Design
Dan Colunio
dcolunio@hanleywood.com
617.304.7297

Advertising
West
Director, Design Market Solutions
Suren Sagadevan
ssagadevan@hanleywood.com
310.863.1153

Account Coordinator
Danielle Washington
dwashington@hanleywood.com
202.380.3719

Emerging Accounts
Sarah Mueller
smueller@hanleywood.com
202.736.3619

Marketing
Vice President, Marketing
Matthew Carollo

Group Director, Audience Marketing & Circulation
Chris Lustan

East
Director, Design Market Solutions
Michael Gilbert
mgilbert@hanleywood.com
773.824.2435

Account Coordinator
Heidi Pieroni
hpieroni@hanleywood.com
773.824.2457

Production
Senior Director, Print Production
Margaret Coulter

Ad Production Coordinator
Bernadette Couture

Inside Sales
Ad Traffic Manager
Annie Clark

Lighting/U.K. & Europe
Cliff Smith
csmith@hanleywood.com
864.642.9598

Canada
D. John Magner
jmagner@yorkmedia.net
416.598.0101, ext. 220

China, Hong Kong, Taiwan
Judy Wang
judywang2000@vip.126.com
86.13810325171

Hanley Wood University/Education
Jim Bagan
jbagan@hanleywood.com
773.824.2428

List Rentals
The Information Refinery
Brian Clotworthy
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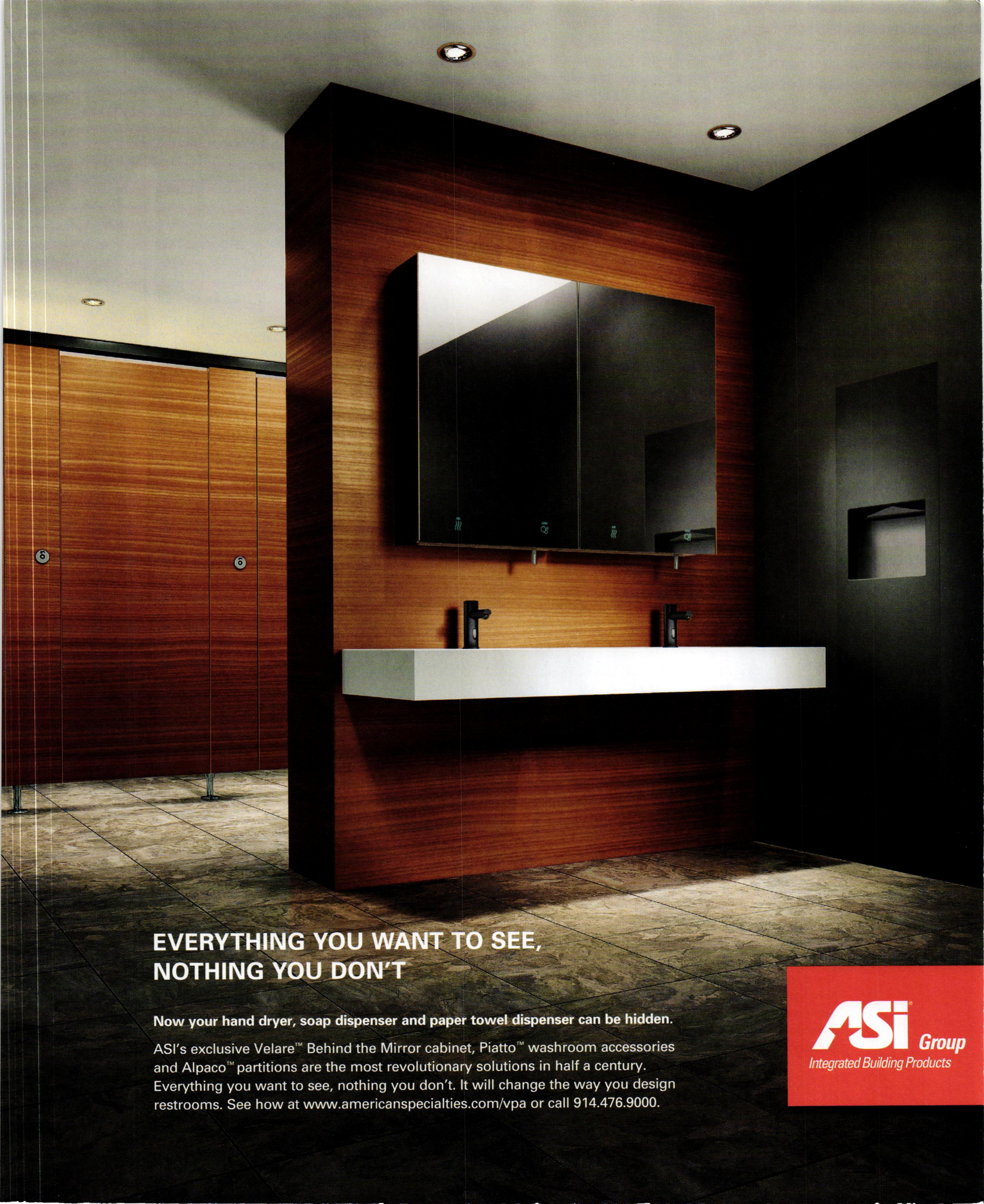
An Unfortunate Castle

Shuri Castle, a UNESCO World Heritage site on the Japanese island of Okinawa, has had a rough existence. It served as the residence and religious hub of the Second Shō Dynasty, which ruled the southern Ryukyu Kingdom from the mid 15th century until its annexation by the Meiji government in 1879. Fire consumed the massive walled complex in 1453, 1660, and 1709, and each time it was rebuilt soon after. But after the castle suffered massive damage from shelling by the U.S. battleship Mississippi during World War II, reconstruction didn't occur until the 1990s—only for another conflagration to claim six of the main buildings on Oct. 31.

> To see images of Shuri Castle before the Oct. 31 fire, visit bit.ly/ShuriCastle.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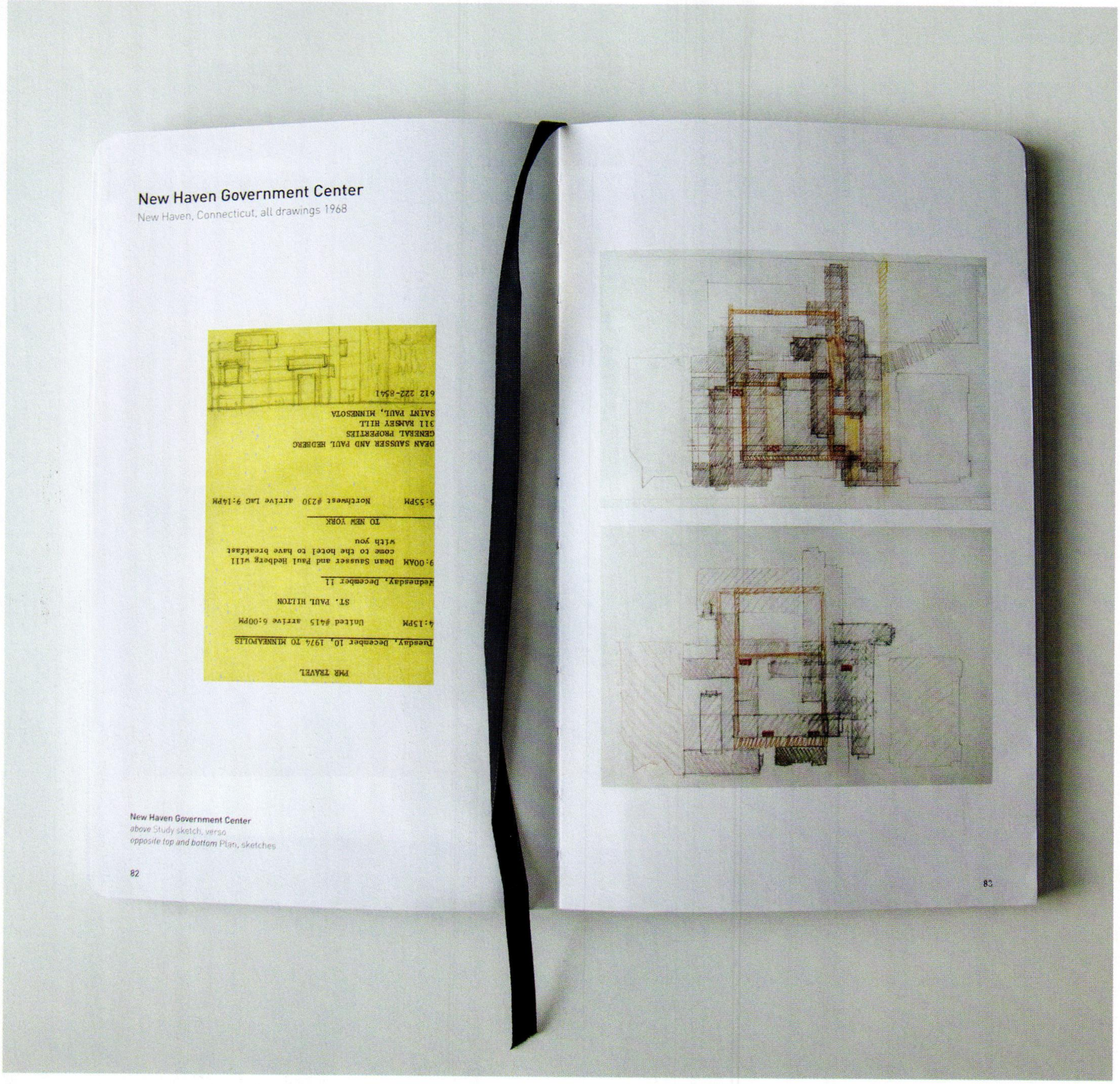
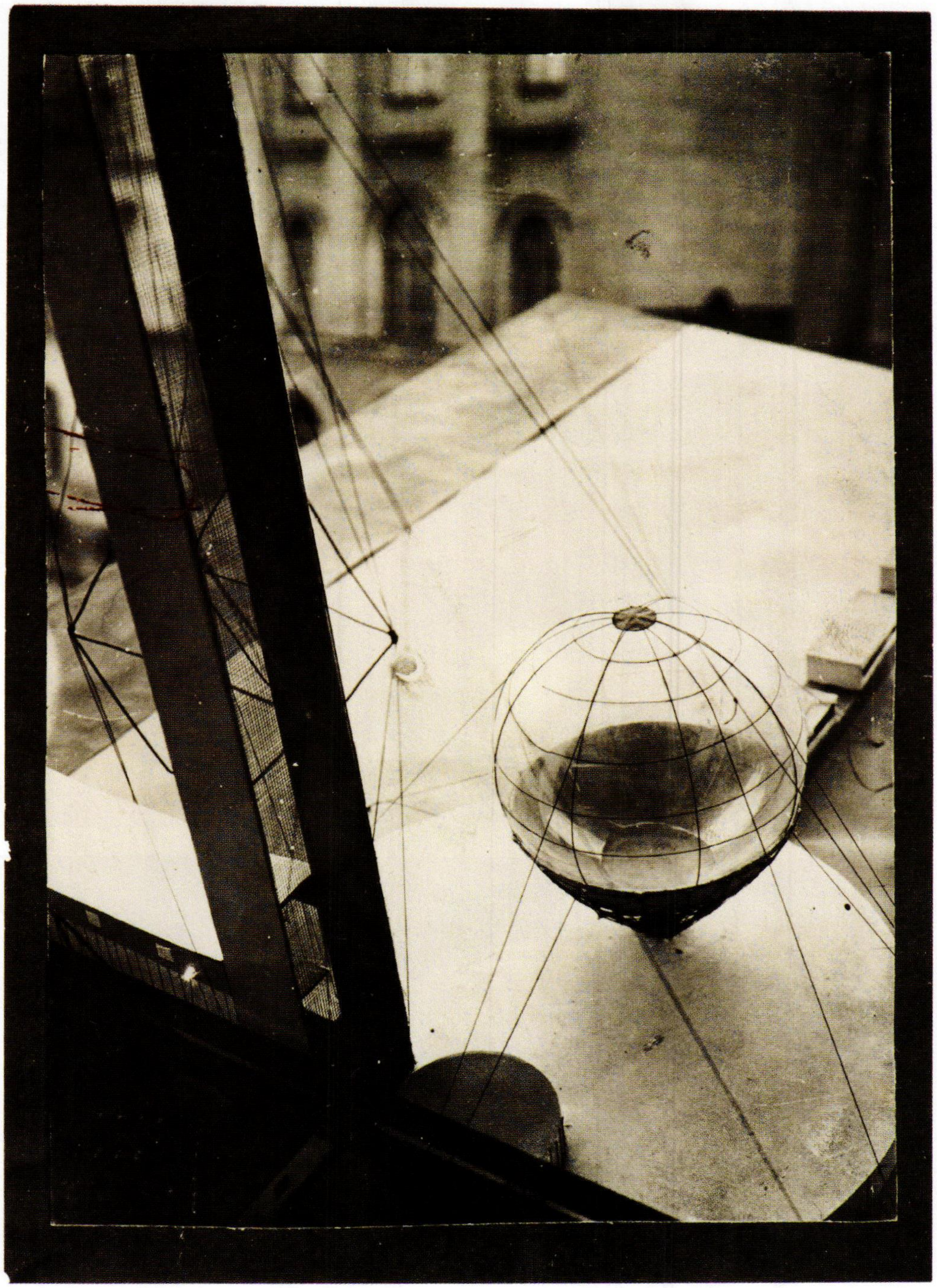


A Fresh Take on Paul Rudolph

Get to know one of 20th-century architecture's most idiosyncratic practitioners, Paul Rudolph, through a man who knew him well: John Morris Dixon, FAIA, a contributor to ARCHITECT and the editor-in-chief of *Progressive Architecture* from 1972 to 1996. Dixon's *Paul Rudolph: Inspiration and Process in Architecture* ($24.95) includes a new essay by the author, a 1986 interview with Rudolph, and dozens of sketches and other matter from the archives of the Library of Congress. Not surprisingly, given that it was published by Moleskine Books, the 144-page volume looks just like one of the iconic sketchbooks—rounded corners, ribbon place marker, and all.

> *To learn more about* Paul Rudolph: Inspiration and Process in Architecture, *visit bit.ly/DixonOnRudolph.*



COURTESY CANADIAN CENTRE FOR ARCHITECTURE

From Russia With Love

It's difficult to imagine two more diametrically opposed nations than the United States and the Soviet Union. While the U.S. typically vilified the Soviets, the USSR had more of a love-hate relationship with the U.S., as evident in Soviet architecture and other forms of cultural expression. "Generations of Russian politicians, intellectuals, and engineers envisioned modeling their country after the United States, hoping to cast it as a new America," says historian Jean-Louis Cohen. His exploration of the topic, *Building a new New World: Amerikanizm in Russian Architecture*, is on view through April 5, 2020, at the Canadian Centre for Architecture in Montreal.

> *The exhibition includes this 1927 photo of a model for a Lenin Institute and Library in Moscow (above) and 32 other rare objects. Learn more at bit.ly/USAUSSR.*

Best Practices: How to Find Work During a Recession

TEXT BY ALICE LIAO

Job hunting in a recession can be daunting, particularly for recent graduates with a limited portfolio or pool of professional contacts. Here, career advisers and practitioners offer advice on how best to prepare and improve your chances of landing a job.

Look Professional

When opportunities are scarce and competition is fierce, emerging designers who can articulate their skills and strengths to potential employers have a leg up on their competition, says Jacki Schaefer, career and alumni specialist at the Rice University School of Architecture, in Houston. Being detail-oriented and hardworking is not enough, she says. "There's a lot of soul-searching you have to do."

For inspiration in developing a portfolio and personal elevator pitch, Schaefer tells students to survey their classmates. "Compare portfolios and ask them for their opinion on what you do that's different," she says. "Your classmates are watching you when you present, so they're paying attention." Also ask professors and alumni for feedback. "One opinion is great, but 10 is fantastic," she says. "Get a consensus."

When actively applying for positions, keep your résumé and portfolio up to date and ready to go. Research the job and company, and write a tailored cover letter. The more you know about an organization, its projects, and its culture, "the better you're able to show in your cover letter why you are a fit," says Lou Ecken Kidd, director of career and professional development at the Taubman College of Architecture and Urban Planning at the University of Michigan.

Work for Yourself

In 2009, when Ann Arbor, Mich.–based Synedoche Design Studio founders Lisa Sauve, AIA, and Adam Smith, ASSOC. AIA, graduated from Lawrence Technological University, in Michigan, no one was hiring and summer internships "were even less likely," Sauve says. Rather than scramble for jobs, the duo began working on their first project, a small graphic design office that they found on Craigslist while in school. The project, which caused them to miss their own graduation ceremony, won an award and helped win them their next client.

For those who go out on their own, Sauve advises befriending local small businesses for leads on potential projects. "We feel like we have more in common with other small business owners in the community," she says. "We're all trying to grow and succeed together." Let your school's career office and local AIA components know that you're available to take on short-term work, such as taking measurements or drawing floor plans.

Be Flexible

Because recessions affect industries and cities differently, recent grads should be open to relocating for a job and consider alternative opportunities. Schaefer regularly tells her students to think creatively about opportunities possible with an architectural degree: "Good design is needed everywhere."

Construction management, real estate development, and forensic architecture are all related fields that benefit from the skills and training an architecture graduate offers. The experience and knowledge gained from this work can be advantageous when the market improves and architecture firms resume hiring, says Joshua Zinder, AIA, principal of his eponymous Princeton, N.J.–based firm. Even working as a real estate agent can provide insight on what homeowners want, which is useful for residential design.

> "In a recession, you have to be the one who's the most eager and willing to go out there and pursue the job."
>
> —Joshua Zinder, AIA, principal, Joshua Zinder Architecture + Design

If a designer has exhausted all potential opportunities, do anything, because "someone who's continuously employed is someone who's employable and worth talking to," Zinder says. Sauve, for example, photographed weddings on the weekends while Smith shot video for his alma mater. "In a recession," Zinder says, "you have to be the one who's the most eager and willing to go out there and pursue the job."

> *For more tips on securing a job during an economic downturn, visit bit.ly/ARRecessionHiring.*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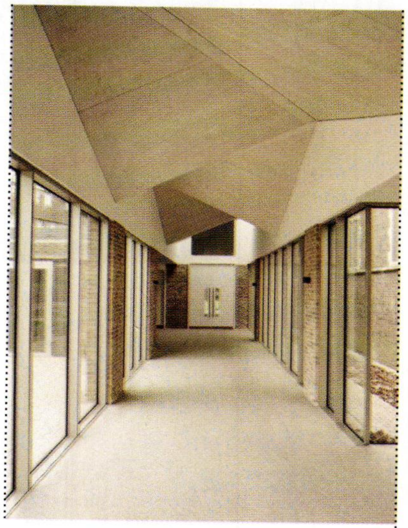
FIRE-RATED SHEATHING

Detail: Faceted Roof at Drayton Green Church

TEXT BY TIMOTHY A. SCHULER

Deftly inserted into a residential area by local design firm Piercy&Company, the International Presbyterian Church on Drayton Green, in London's West Ealing borough, features a pleated roofline complemented with faceted timber ceiling planes inside.

Hundreds of physical models helped explore the roof's scale and relationship to a historic 1913 chapel, around which the church wraps. The firm specified CLT for its structural performance and its ability to be left exposed as an interior finish. The 6-inch-thick ceiling panels are supported by a series of angled wide-flange beams that span a light-filled corridor, the main meeting space, and at the valleys of the roof folds.

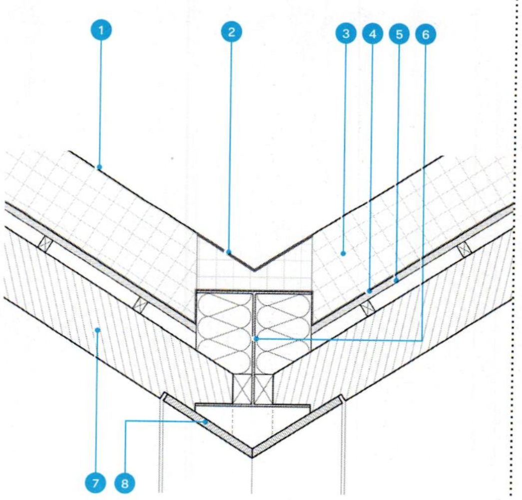


The prefabricated timber panels are notched to nest against the beam's web and bottom flange and secured with steel bolts. At panel joints, where the steel beam flange would have been exposed, ¾-inch-thick spruce boards the length of the CLT panels close the gap, hiding the steel structure. The spruce boards are also recessed into exposed surface of the CLT panels, creating a flush finish. Where the timber panels meet to form the roof's ridgeline, they are joined with a half-lap joint and screwed together.

Prior to installation, the CLT panels, prefabricated and installed by London-based supplier KLH UK, were treated with a tinted fire retardant. Piercy&Company director Pete Jennings says the design team had hoped that the finish would "have enough of a milkiness to ... pare back the yellowness of the timber. But when [the panels were] in situ, it still had too much of an industrial feel to it." To lighten the wood, the designers specified an additional whitewash coating, which, though successful, "was not an ideal way to do it," Jennings says. During the spray application, the church interior resembled a foggy London morning.

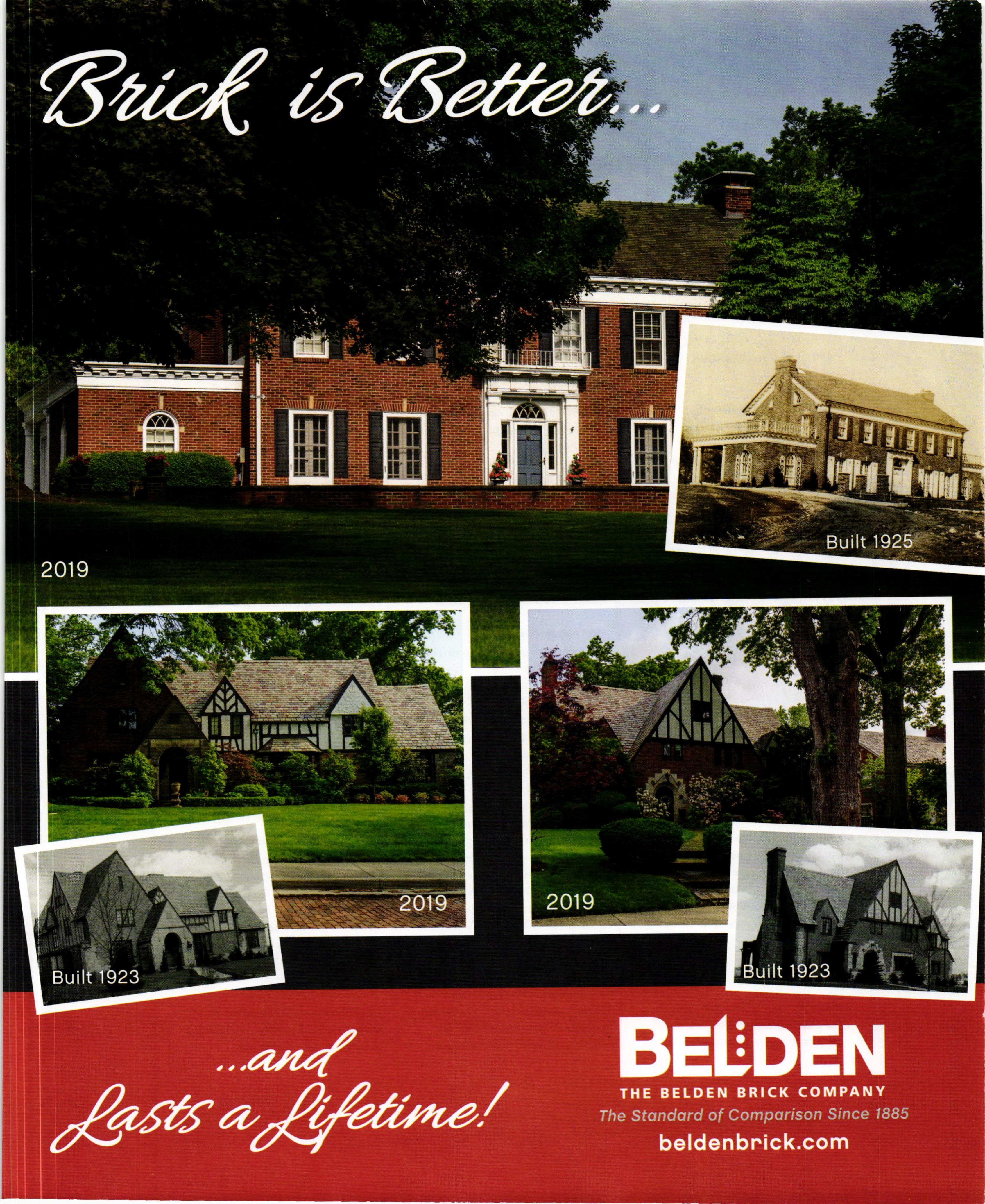
The church was completed in November 2018, though the firm continues to work with the congregation, Jennings says. "We were conscious that we were delivering the best possible [project] that felt like a home, but that could be furnished and embellished as [the clients] grew into the space."

JACK HOBHOUSE



1. Standing-seam single-ply rubber roof membrane
2. Metal valley flashing
3. Rigid insulation, 2" to 8" thick
4. Sika-Trocal vapor control membrane
5. Plywood deck and blocking (where steel beam depth exceeds CLT panel thickness)
6. UB (universal beam) 254mm × 146mm × 37mm (in lobby)
7. 160mm CLT ceiling panel with fire-retardant and whitewash applied
8. ¾" spruce Tilly board

> *To read more about Piercy&Company's design of the Drayton Green church, visit bit.ly/ARDrayton.*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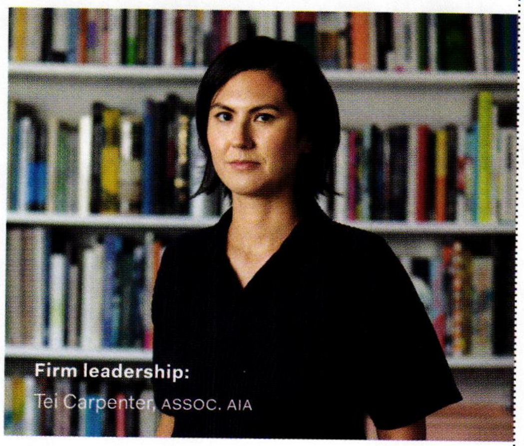
Next Progressives: Agency—Agency

EDITED BY KATHARINE KEANE

Location:
New York City and Toronto

Year founded:
2014



Firm leadership:
Tei Carpenter, ASSOC. AIA

Education:
B.A., Brown University; M.Arch., Princeton University

Experience:
Toshiko Mori Architect, Shigeru Ban Architects, and a short spell at Steven Holl Architects; adjunct assistant professor at the Columbia University Graduate School of Architecture, Planning and Preservation

Firm size:
Two to four

Mission:
We design thoughtful, experiential projects that reframe everyday encounters with the built environment, and create new value propositions for design through productive engagement with the public.

Origin of firm name:
The dual meaning of agency is combined and connected with the line to make Agency—Agency. I think it allows for a double reading of the practice as an ideological idea and as a more expansive idea of "office" that operates at multiple scales and levels of engagement.

First commission:
The renovation of a hair salon in NoHo, in downtown New York.

Favorite project:
New Public Hydrant is a series of small-scale infrastructural prototypes that reimagines public interaction with local water infrastructure in New York City. To raise awareness of the high quality of the city's drinking water, we developed three "hydrant hacks": a multi-species drinking fountain, an immersive sprinkler, and microclimate/bottle-fill station. Developing these with input from city agencies, and seeing reactions to the designs from people on the street, was interesting. We're now working to develop these beyond the prototype phase for more permanent applications.

Second favorite project:
We worked with curator Irene Sunwoo to design "Model Projections," an exhibition focused on architectural model making and its relationship to architectural production. The immersive installation and display system used off-the-shelf materials to evoke an architectural work in progress. By embracing the artifice of architectural models, the design oscillated between multiple scales, intertwining the materials and methods of model making and architectural construction.

Design tools of choice:
Olfa knife, camera, and WhatsApp

Design aggravation:
Big unselfconscious gestures for their own sake

The best advice you've ever received:
"It's a long game" and "keep it light."

Special item in your studio space:
A giant fiddle fig tree that almost reaches the ceiling and is surrounded by tons of plants and cactuses

Favorite place to get inspired:
The subway: I like the background noise, chaos, and unexpected encounters to reset my thoughts.

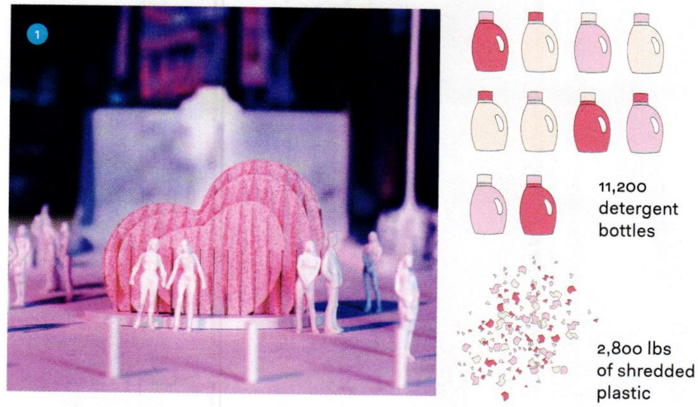
Architects should be discussing:
The Green New Deal and what an energy transition and decarbonization imply, and what they look like.

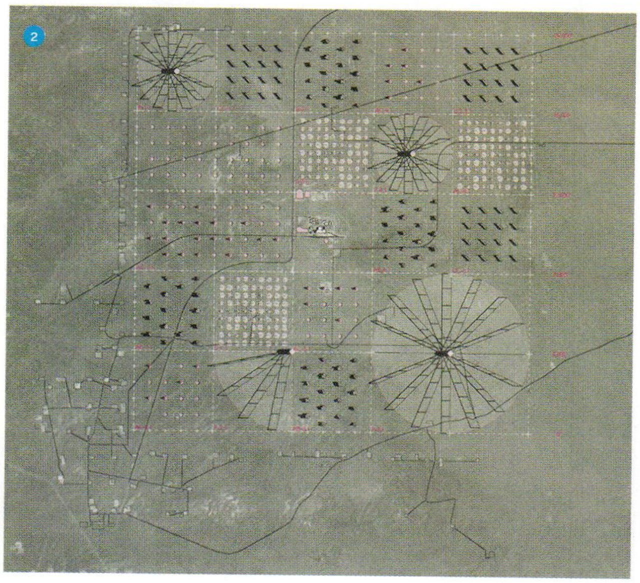
When I'm not designing, I'm:
Outside walking, surfing, swimming, or exploring with my newborn

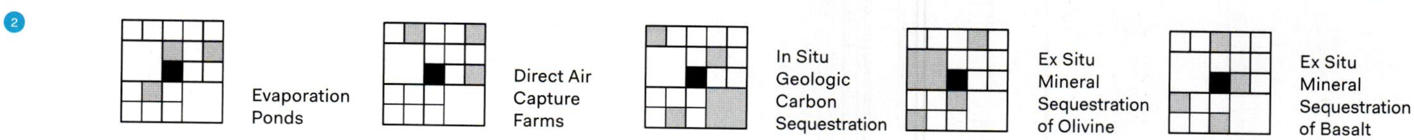
FRANCES F. DENNY

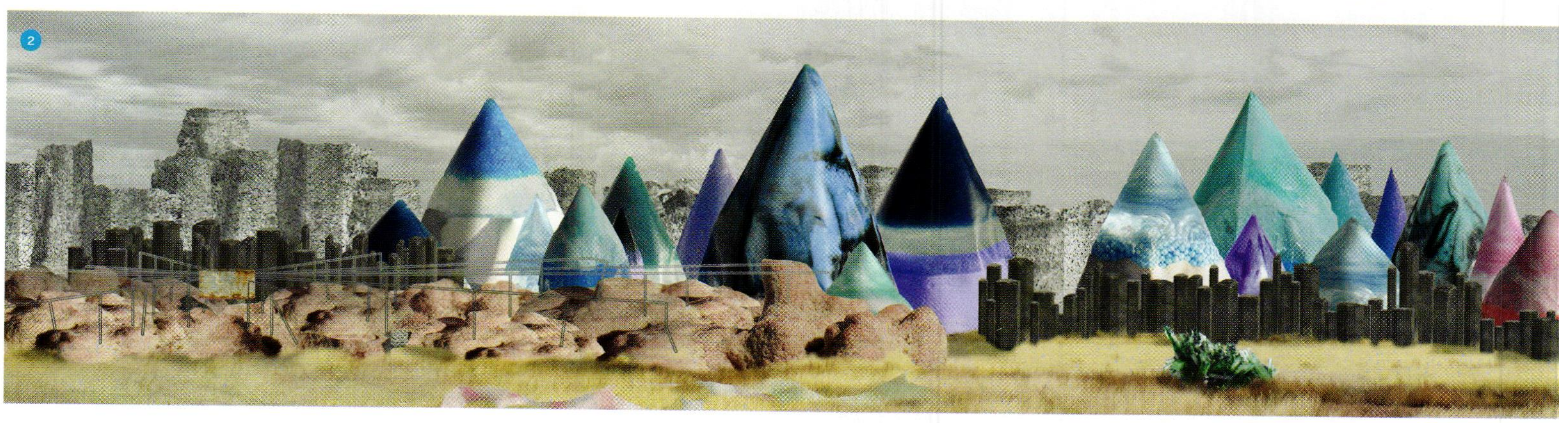
> *To learn more about Agency—Agency, visit bit.ly/ARAgencyAgency.*

Next Progressives: Agency—Agency









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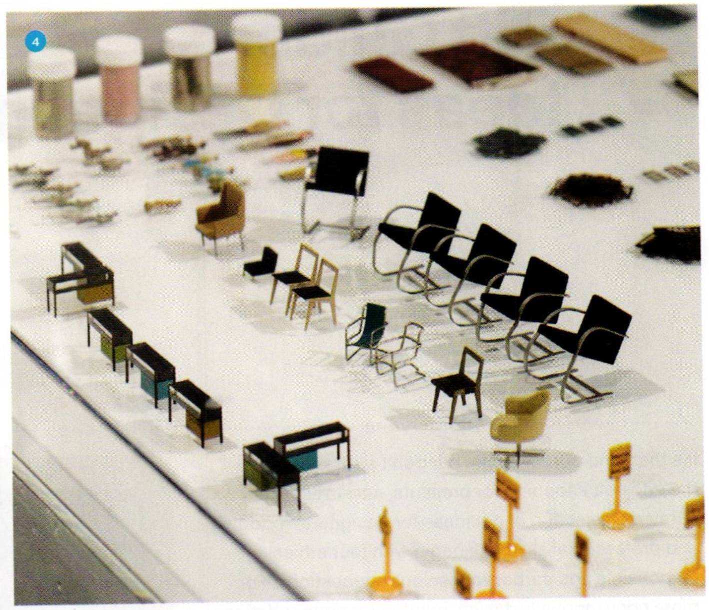
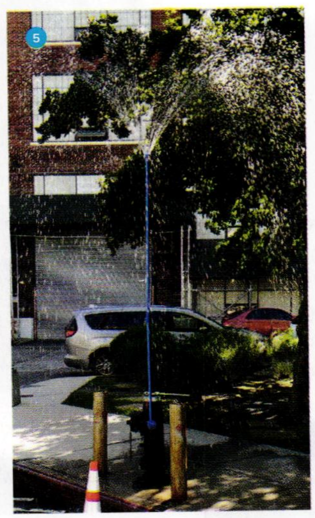
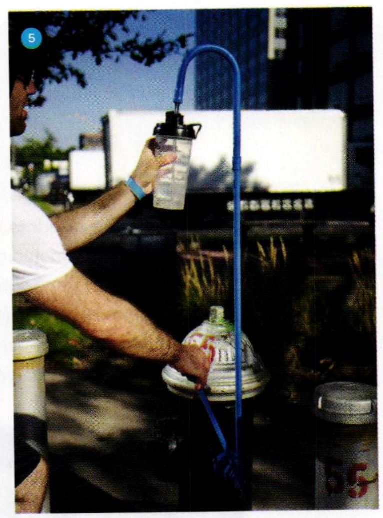
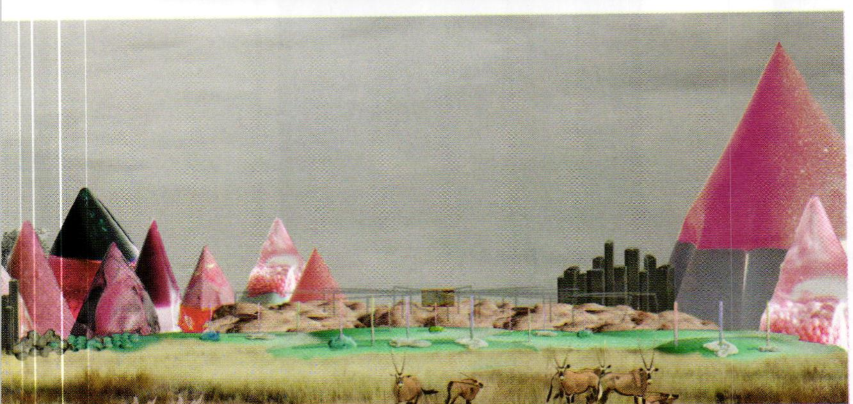








1. A finalist in the 2020 Times Square Valentine Heart Design Competition, "Heart Rising" calls for 100% post-consumer recycled plastic panels configured like a 3D heart emerging from the ground. By repurposing 11,200 plastic detergent bottles for the panels, Agency—Agency aims to raise awareness about climate change. 2. The first-place winner of the 2017 Nuclear: Landmarker for a Waste Isolation Site ideas competition, Testbed envisions installing multiple carbon sequestration technologies to capture the gaseous byproduct of nuclear decomposition and to deter human interaction. Over time, these processes would create new geological forms that would become markers for the site. 3. The new 20,000-square-foot Houston headquarters for the nonprofit Big Brothers Big Sisters features a three-story atrium, open and private offices, a children's playroom, an event space, and a balcony with views of downtown and the Buffalo Bayou. 4. Agency—Agency used drywall fragments and exposed metal studs for display cases of the 2018 "Model Projections" exhibition—which highlighted architectural model making of the mid-20th century—at the Arthur Ross Architecture Gallery at Columbia University GSAPP. 5. Conceived with Brooklyn, N.Y.–based designer Chris Woebken, these hydrant hacks offer New Yorkers alternative methods for interfacing with conventional fire hydrants in an effort to highlight the city's water quality.

Gift Guide:
Ideas for Designers of All Ages

TEXT BY NED CRAMER

It's that time of year again, but don't stress: To take the edge off shopping for presents, ARCHITECT has curated a selection of gift ideas for designers—budding and professional alike. We begin with four ethically responsible and carbon-conscious suggestions. For more conventionally design-minded recommendations, just turn the page.

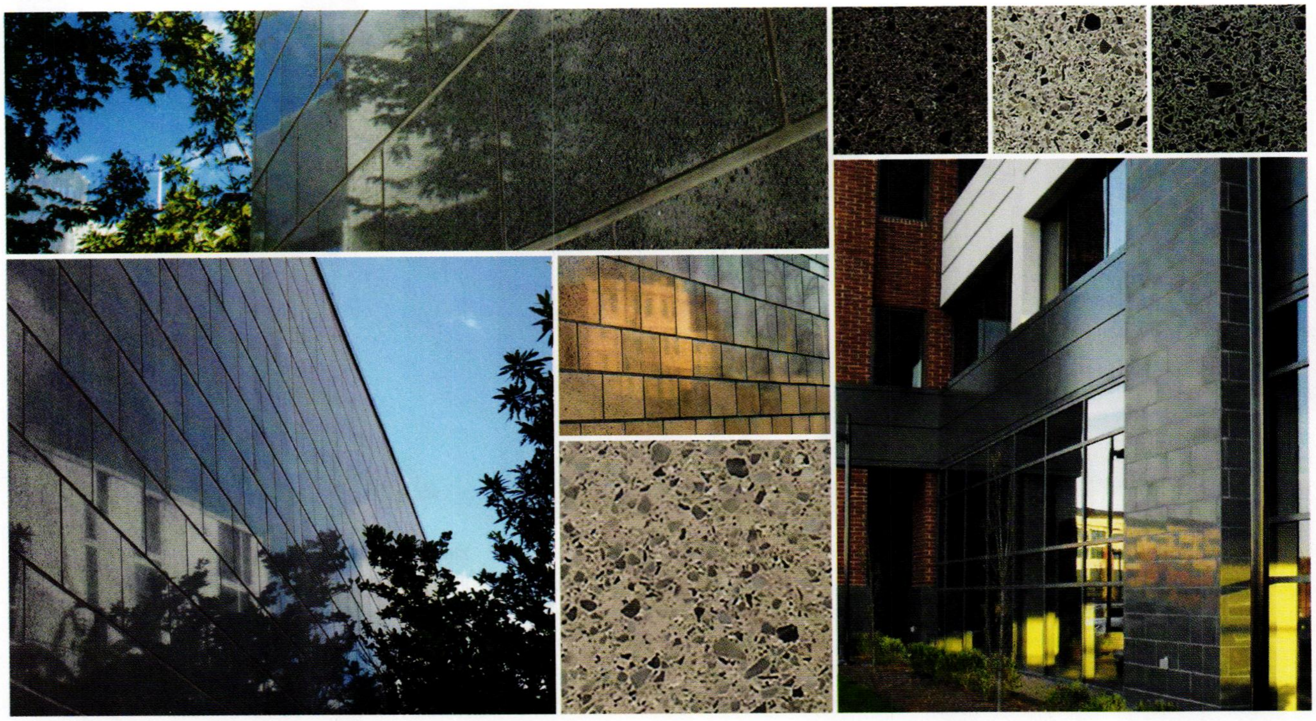
***Ukiyo-e* Woodblock Prints, from $300**
Consider antiques, including woodblock prints by Frank Lloyd Wright's favorite artist, Utagawa Hiroshige (1797–1858), because they don't add carbon to the atmosphere. *artsanddesignsjapan.com*

Hadrian Coins, $7 and up
Currency dating to the reign of the Roman architect–emperor Hadrian (117–138) is available from online numismatists for under $10. Finer bronze and silver casts start around $60. *vcoins.com*

Solar-Powered Lamp, $30
Artist Olafur Eliasson's Little Sun Diamond lamp provides five hours of bright electric light after as many hours exposure to the sun. Proceeds underwrite sales to people living off the grid. *littlesun.com*

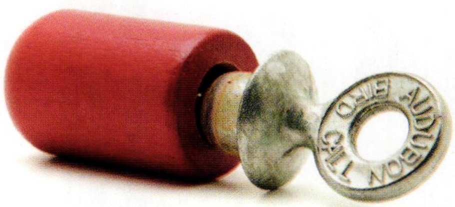
White Oak Tree, $13
According to entomologist Douglas Tallamy, "Restoring large stands of oaks to suburbia would go a long way toward shoring up the future of our nation's biodiversity." *shop.arborday.org*

> For even more gift ideas for current, future, or wannabe designers, visit bit.ly/ARgifts19.



Gift Guide:
Seven Slightly
Guiltier Pleasures

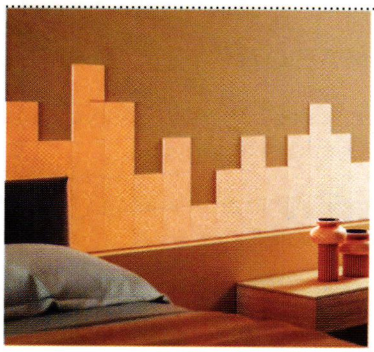
PoMo Revival Tins, $9 for one
Anyone enthusiastic about the recent revival of Postmodern design should love the collection of four tins created by Memphis Group co-founder George Sowden for Hay, the Danish home goods company. *us.hay.com*



Avian Translator, $8
Do you speak sparrow? Simply rotate the zinc handle in the Audubon Bird Call's birch wood case to communicate with your feathered friends. The design classic is handmade in the USA. *birdcall.com*

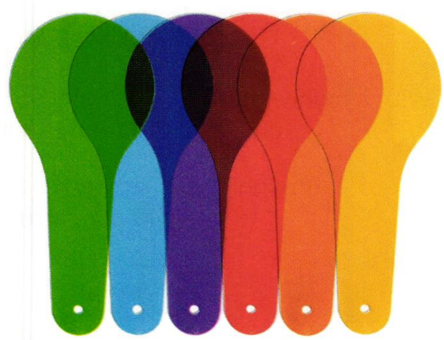
The Mona Lisa of Calendars, $51
Massimo Vignelli designed the peerless Stendig Calendar in 1966. Make sure your intended recipient has sufficient wall space: It measures 48" by 36". *us.stendigcalendars.com*

Hard Rock Speaker, $1,800
For audiophiles who have been very, very good, the MA770 Wireless Speaker, designed by David Adjaye, HON. FAIA, is molded from a proprietary concrete composite. *masterdynamic.com*



Light Mural, from $119.99
The color, intensity, and pattern of wall-mounted Nanoleaf Canvas LED squares can be controlled via a smartphone app, Siri, Alexa, Google Assistant, or the touch of your hand. *nanoleaf.me*

Ingenious Shopping Bag, $95 or $275
Designed by New York–based creative studio Various Projects, the Market Tote appears woven, but is cut from a single piece of leather. The tote comes in several colors and two sizes. *maharam.com*



Color Experiment, $9.99
Give young designers a new perspective on light with Primary Science Color Paddles, which can be overlapped to create different hues. Sold as kits of three six-color sets. *learningresources.com*


Unify

Opinion: Finding the Leader in the Mirror

TEXT BY GABRIELLE BULLOCK, FAIA

Big change can come from people who never expected to become change makers—from people who frequently second-guessed themselves, who look different from everyone else, and who never jumped the line. The tortoises, not the hares.

I had always been a rule-follower who stays the course—an idealist empowered by personal ambition and my mother's encouragement. When I decided to become an architect, I pursued design with little fear of failure. Looking back, I realize that harnessing my own naive bravery was the best thing I could have done.

My formal training in architecture began at the Rhode Island School of Design in 1979. I knew I had earned my seat there, but, deep down, I continuously felt "less than." I didn't anticipate that I'd be the only black woman in my classes, or that I'd have to find my tribe outside of architecture, among other students of color. Suppressing feelings of isolation, inadequacy, and invisibleness, I focused on working my ass off.

The architectural jargon was foreign and unintelligible, and I struggled to understand what the professors and critics were saying. I realize now that this was very much the egocentric, starchitect era of design education. This was their platform to shine, and they commanded it.

Recognizing that this was part of the game that would lead me to success, I worked even harder to learn their language. Once I grasped the concepts, I no longer felt inadequate. I even felt empowered to break the rules I had struggled to understand.

In 1984, I became the second black woman ever to graduate RISD's architecture department—and with A's no less. After 21 years in the profession, I was tapped to be managing director of my firm's Los Angeles office. I was flattered, scared, and surprised, but with encouragement from my tribe, I became the first woman and first African American to hold that role, firmwide.

As a woman with a direct communication style, I learned over time from peers that some colleagues and staff perceived me as "intimidating." Though I was the leader of my office, my requests, statements, and directives were met frequently with resistance. Self-reflection, coaching, and soul-searching occupied a good deal of my time; realizing what you can adapt while remaining true to yourself, and recognizing and addressing gender or racial bias are strategies I've had to develop throughout my design career.

While not dismissing the existence of unconscious biases, I chose to modify my professional style not only to keep my hard-earned seat at the table, but also to ensure my voice was heard, and, ultimately, to become the leader of the room. I mastered the rules to win the game.

In 2013, I was ready to make my next move at the firm. After completing several international projects and taking stock of my own experiences, I had cultural competency on my mind. I wanted the profession to be more equitable, diverse, and inclusive. I believed that we could change what we design by changing who designs it.

With the agency I had earned, I chose to develop a firmwide diversity and inclusion program, which I now lead. All my academic and professional experiences, advancements, and challenges have brought me to this point in my career.

Calls to diversify the complexion and cultural makeup of the design profession to better mirror the society we serve have become louder and more intense, with many more voices chiming in. But we have a long way to go. To women and underrepresented groups, I say harness your inner strength, find your tribe, and then use your voice. Being the only one in the room can be your platform to shine.

Gabrielle Bullock, FAIA, is a Los Angeles–based principal and the director of global diversity at Perkins and Will, where she oversees the firm's Diversity, Inclusion, and Engagement program.

COURTESY PERKINS AND WILL

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

ARCHITECT INTEL

Oldcastle BuildingEnvelope
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FACTORY-BUILT OR SITE-BUILT? AN ARCHITECT'S GUIDE TO FENESTRATION SOLUTIONS

Labor shortages have changed the construction narrative in surprising ways.

If you think the latest reports[1] on craft worker shortages is disheartening, just wait until you see what construction firms think of the training pipeline that's supposed to ride to the rescue. Nearly half of those firms rate the training pipeline poor, and most construction officials (73%) now believe the labor situation will only get worse.

Small wonder, then, why so many firms now rely on prefabrication to keep productivity up and projects on track. Take glazing subcontractors. There was a time not so long ago that pre-glazed unitized systems were reserved solely for high-rise projects. The idea that a three- or four-story mid-rise should be anything other than site-built was never entertained. So a factory-built curtain wall assembly for a three-story building? It doesn't pencil-out, right?

Don't tell Billy Strait that.

DRAMATIC SHIFT

Strait, a fenestration systems expert, has studied the industry closely since the late 1990s, most recently as regional vice president of Oldcastle BuildingEnvelope, North America's largest supplier of fenestration systems.

Strait has observed a dramatic shift in construction practice over the last few years. "There was a time when unitized glazing systems were considered too expensive," he says. "Today, the cost-benefit comparison is neutral. When you throw in reduced labor and scheduling certainty, the argument for prefab is compelling in a surprising number of applications."

BALLPARK STORY

As an example, the industry veteran cites a major league ballpark, Globe Life Field, now under construction in Arlington, Texas. "The project was originally spec'd for traditional stick-built," Strait says. "We suggested [that] factory-fabricated should be examined. They reconsidered their options, which proved fortunate. Poor weather delayed construction. Factory-built curtain walls allowed them to compress the schedule."

Strait makes it clear that factory construction, for all its quality-control advantages, isn't for every project. "There are pros and cons on both sides," he says. "Stick-built is often the best way for a variety of reasons."

So when does off-site fabrication make sense? Strait has five project qualifiers that can help guide decision-making:

1. Three or more stories.
2. 10,000 or more square feet of curtain wall. "More and more, 10,000 square feet is becoming the norm for architects. You have to look at a unitized solution," Strait says.
3. Chronic labor shortages.
4. Dense urban location with a tight schedule. "It's all about logistics. There isn't space for parts and pieces to be delivered on-site. It's easier to lift a pre-built assembly into place," he says.
5. Midwest or Northeast location. Winter messes up site-work construction, but a unitized solution can be installed at nearly any time.

The key to any project, of course, is an early assessment of prefab feasibility. "It's wise to consult your fenestration supplier early, just as soon as the schematics are ready," Strait says. "The trade-offs between one or the other system can then be accurately assessed."

There is no silver bullet in the construction labor wars. But unitized glazing can help you leapfrog less resourceful designers with a proven solution that can help remove owner doubt and concern.

[1] (2019, August 27). Eighty Percent of Contractors Report Difficulty Finding Qualified Craft Workers to Hire. Retrieved from: www.agc.org

To learn more about using prefabricated unitized systems, visit **www.obe.com**

Architectural Lighting: Recent Advances in LED Technology

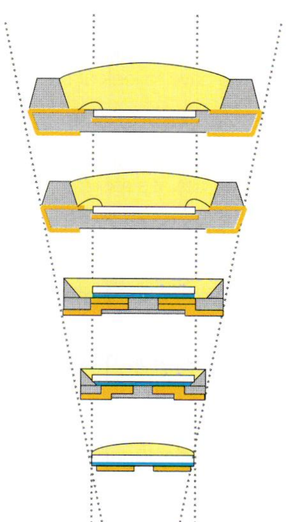
TEXT BY MURRYE BERNARD, AIA

LEDs have been used in electronics since the 1970s, but only recently have they entered—and transformed—the lighting and architectural design markets. In astonishingly short order, LEDs have been firmly established as energy-efficient replacements for incandescent and fluorescent lamps, as can be seen by the dearth of the latter products at industry trade shows.

Advances in solid-state lighting (SSL) technologies have made individual diodes smaller, brighter, more versatile, and more efficient. The U.S. Department of Energy projects that switching indoor and outdoor products from conventional light sources to LEDs will result in a 75% reduction in energy use—a savings of nearly $630 billion—from 2015 to 2035.

In the past, advancements in SSL by scientists and manufacturers often arose through trial and error, but research in this product category has become more methodical and purposeful. This article outlines recent achievements in the evolution of SSL technology.

LED Package Evolution



Plastic-leaded chip carrier (PLCC)

Quad-flat no-lead (QFN)

Chip-scale package (CSP)

SOURCE: LUMILEDS

Manufacturing Progress

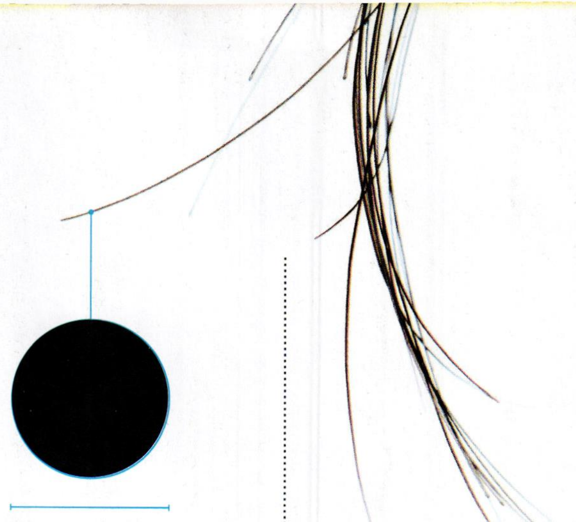
LED fixtures have come a long way, with improvements in performance, articulation in size, shape, form, and physical interfaces. The efficacy of LEDs—how efficiently the diodes themselves perform, measured in lumens per watt—has significantly increased while their cost has dropped. According to the 2017 U.S. Department of Energy report "LED Efficacy: What America Stands to Gain," the highest performing LED devices (at the time of the report's publication) could emit 160 to 170 lumens per watt. The DOE projected that the use of phosphor-converted LEDs (pc-LEDs) could increase efficacy to 255 lumens per watt. Because manufacturers are able to use fewer LEDs to achieve the same output, they can achieve more compact designs, increase visual comfort, and lower fixtures costs.

However, room for improvement in the efficiency of the overall fixture remains. Fixtures are becoming more compact due to improvements to the diode assembly itself. Chip-scale package (CSP) LEDs eliminate the need for a separate package, which is the casing that encapsulates an LED chip and phosphor. Furthermore, replacing ceramics—widely used in packages for their thermal management properties—with enhanced polymer materials can make the price point more competitive without detriment to quality and performance.

Quantum dot technology has the potential to produce even more effective and affordable systems. "White illumination in LED fixtures is primarily based on phosphor conversion," says Marc Dyble, a Detroit-based product marketing manager for German lighting manufacturer Osram, "and despite advancements over the last decade, the efficacy gap has remained stable. Developments in the technology behind quantum dots—tiny semiconductor particles that can emit light and can be as small as 10 atoms in diameter (about 10,000 times smaller than the diameter of a single hair)—will significantly reduce the production cost of LED lighting systems."

Smart LEDs, which combine the LED driver and control interface into a single package, can do more than emit or detect light. So-called intelligent red, green, and blue controls in the form of Smart RGBi can also eliminate the need for additional components. These LED fixtures can be adjusted in multiple ways, from the beam angle to the direction and illumination of an LED source, without the need for complex optics.

Architectural Lighting: Recent Advances in LED Technology



Single hair width
10,000nm

(not to scale)
The color emitted by a quantum dot is dependent on its size ~1–10nm

Quantum dots under a microscope

Advancements in manufacturing translate into better product applications and ultimately improve the user experience. Tasks such as navigating through a hospital to find a patient room, Dyble says, "can be made easier with customizable messaging projected onto wall or floor surfaces from luminaires simply based on your location. Further developments in the color-over-angle performance of LED sources reduce yellow and blue color striations, resulting in a uniform color appearance from the lighting fixtures illuminating the walls of the hospital hallway."

Humans at the Forefront

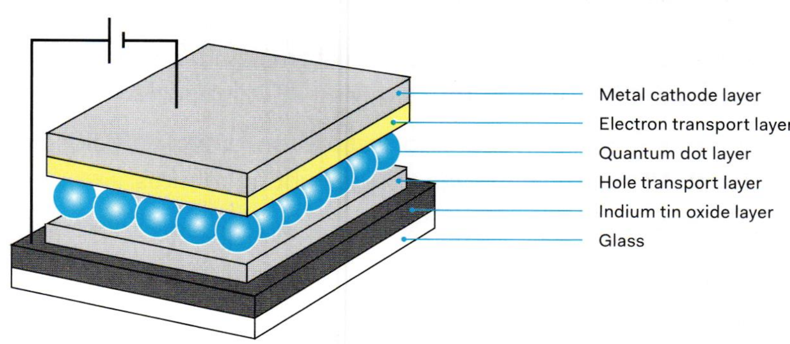
Beyond efficacy and efficiency, the industry is embracing a more holistic approach to lighting. "LED suppliers are seeing the benefit to manufacturers of joining together multiple systems like color tuning, dim to warm, and circadian rhythm," says Michael Giardina, a Los Angeles–based product manager at Acclaim Lighting.

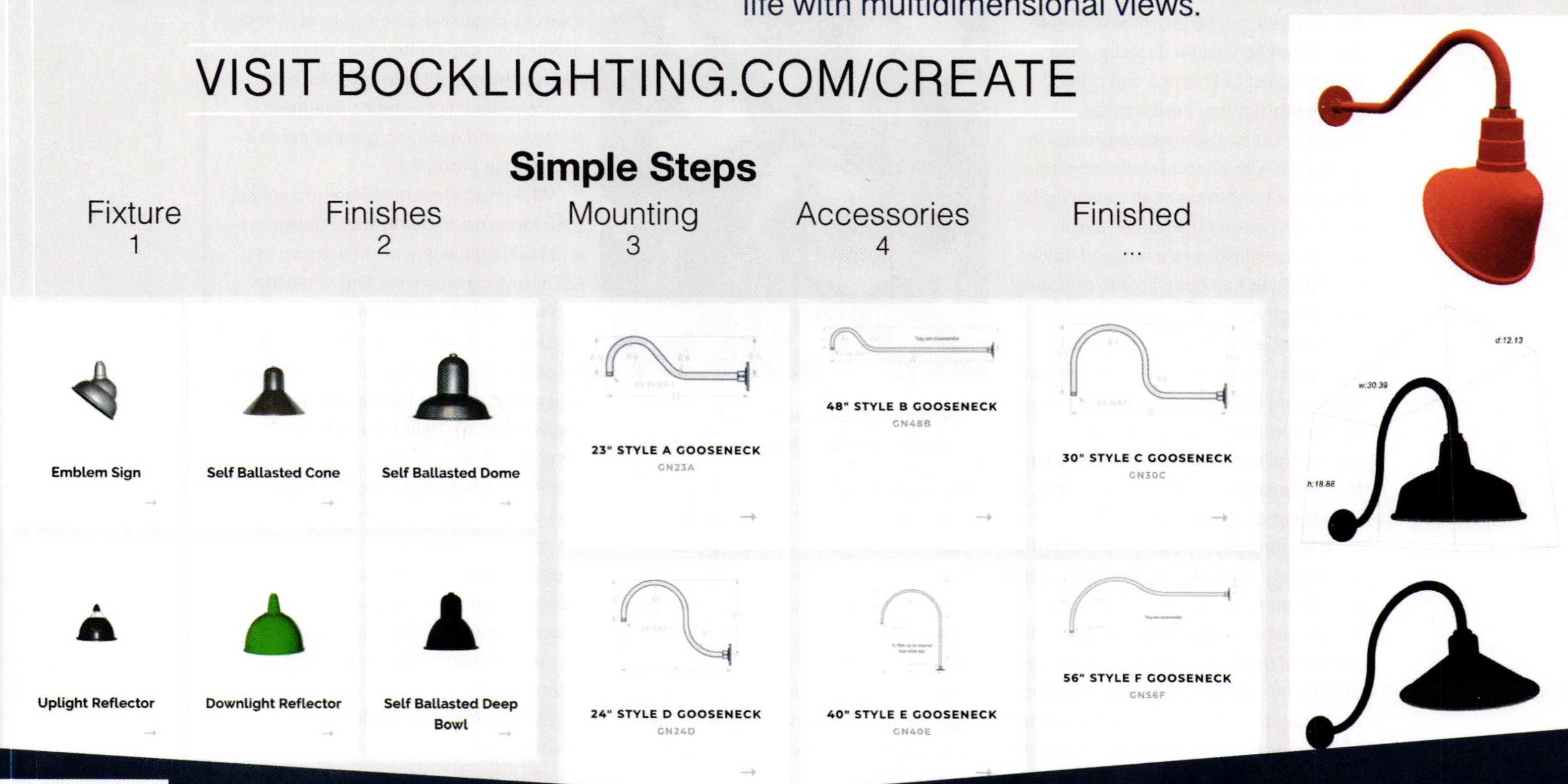
These innovations have helped spark interest in human-centric lighting (HCL), commonly called circadian lighting, which aims to support human well-being and productivity through dynamic lighting sources. Advancements in LED technology have fostered the creation of tunable white light systems, which mimic daylight by adjusting correlated color temperature and brightness levels throughout the day. "We have moved past the point of static lighting—such as the fluorescent lights in an office space or incandescent lights in a home—to tailoring the light spectra to the time of day, essentially mimicking daylight indoors," Dyble says. "Improvements to the quality of light—or color fidelity—of LED sources have also been a major focus using novel phosphors, all the while maintaining high efficacy."

"The research and technology behind tunable white systems are now reasonably mature, though more advanced control systems and higher output options are coming to market all the time," Giardina says. "The value in tunable white systems now lies in the education and adoption of the technology by a broader swath of the general public."

Quantum dot technology may also enhance HCL because of the ability to precisely control and program the tiny particles. The output is rich, saturated colors that mimic real sunlight. Studies show such dynamic lighting techniques can improve circadian rhythm.

Quantum Dot LED Structure





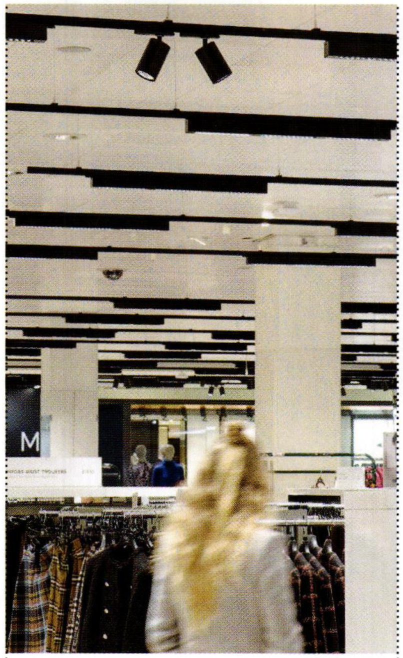
Emblem Sign
Self Ballasted Cone
Self Ballasted Dome
23" STYLE A GOOSENECK
GN23A
48" STYLE B GOOSENECK
GN48B
30" STYLE C GOOSENECK
GN30C
Uplight Reflector
Downlight Reflector
Self Ballasted Deep Bowl
24" STYLE D GOOSENECK
GN24D
40" STYLE E GOOSENECK
GN40E
56" STYLE F GOOSENECK
GN56F
d:12.13
w:30.39
h:18.88

Architectural Lighting: Recent Advances in LED Technology

Before and After Life

Quality assurance and environmental impact are two additional areas that have seen improvements. The process of evaluating and certifying LED performance has benefited from advancements in technology, helping to assuage end-user questions about the reliability, performance, and environmental impact of individual diodes. This year, the National Institute of Standards and Technology, now a part of the U.S. Department of Commerce, began offering a faster, more accurate calibration service for assessing the brightness of LED lamps and other solid-state lighting products for manufacturers. Lamps were previously calibrated with photometers, tools that measures brightness at all wavelengths while considering the human eye's natural sensitivities to a range of colors. The NIST lab had been able to measure lamp brightness with reasonably low uncertainties—previously between 0.5% and 1.0%. Thanks to its revamps in equipment and processes—upgrading to two automated equipment tables, one for the light sources and the other for the detectors—NIST has reduced uncertainties to 0.2% or less.

A March 2019 article "Environmental and Energy Improvements of LED Lamps over Time: A Comparative Life Cycle Assessment," published in *Leukos: The Journal of the Illuminating Engineering Society* by researchers at the University of Portland, in Oregon, notes that newer LED lamps have a smaller environmental impact than past SSL technologies—and even more so when compared to conventional lighting technologies. Newer LED lamps are manufactured with less metals and produce less hazardous waste, all without compromising their efficacy. "Innovation in LEDs has continued to shape a new frontier in lighting, one that is moving faster than ever," says co-author Heather Dillon, an associate professor of mechanical engineering at the university. "New applications for consumers, like LEDs that connect to smartphones, are my favorite innovation. The challenge with the new and innovative products is the complexity of the devices, making end of life a concern for consumers. This is an opportunity for the LED developers to take a leadership role in how consumer electronics of the future are designed for recycle and reuse."



Signify's 3D-printed track light at Marks & Spencer, in Manchester, England

Shredded material from Signify's 3D-printed luminaires, which are recyclable

Emerging LED Markets and Services

The SSL industry is beginning to leverage the increasing accessibility to 3D printing. Lighting designers and architects can now conceive luminaire assemblies with custom form factors specific to a project, and even have them manufactured on-site, minimizing lead times. Additive manufacturing has also enabled the integration of heat sinks—critical for absorbing and dispersing excess heat away from the LED—directly in the design of the fixture envelope rather than appending them as an auxiliary component. These production capabilities can ultimately reduce the overall size and cost of a fixture while increasing its aesthetic potential and enabling greater access to bespoke products.

While manufacturers have increased their focus on customization, designers and building owners are still drawn to LEDs' energy efficiency. But reliability and technological obsolescence continue to be concerns, particularly for end users. As a result, Dillon notes, several lighting manufacturers have begun offering "lighting as a service" contracts that guarantee specific lighting levels or features, and then take care of the confusion around the replacement process of lighting. "Researchers have been urging the designers and manufacturers to think about disassembly for repair and reuse for several years," Dillon says. This development "creates an opportunity for LEDs to maintain leadership in environmental stewardship."

COURTESY SIGNIFY

Residential: David M. Schwarz Architects and Hastings Architecture

TEXT BY CHARLES LINN, FAIA

Without squinting, it is difficult to tell that E. Bronson Ingram Residential College is much newer than the buildings it sits next to on Vanderbilt University's Nashville, Tenn., campus: Kirkland Hall (1907) and Alumni Hall (1925). And that is very much the point. The university, a major donor, and the architects shared the deep desire that the new college be as timeless as if it had always been there.

Completed last year and designed by Washington, D.C.–based David M. Schwarz Architects (DMSA) with local architect of record Hastings Architecture, the E. Bronson Ingram building exemplifies the academic utopian ideal of the residential college—where students live, dine, socialize, and study together under the tutelage of resident faculty for most of their college careers. This home to 340 students immerses them in a community far stronger than those found in conventional dorms.

DMSA was first hired by Vanderbilt in 2003 to do a residential master plan that would be phased in over 20 years, then rehired a decade later to design this building and to build out the original master plan with three additional residential colleges. Another is under construction now.

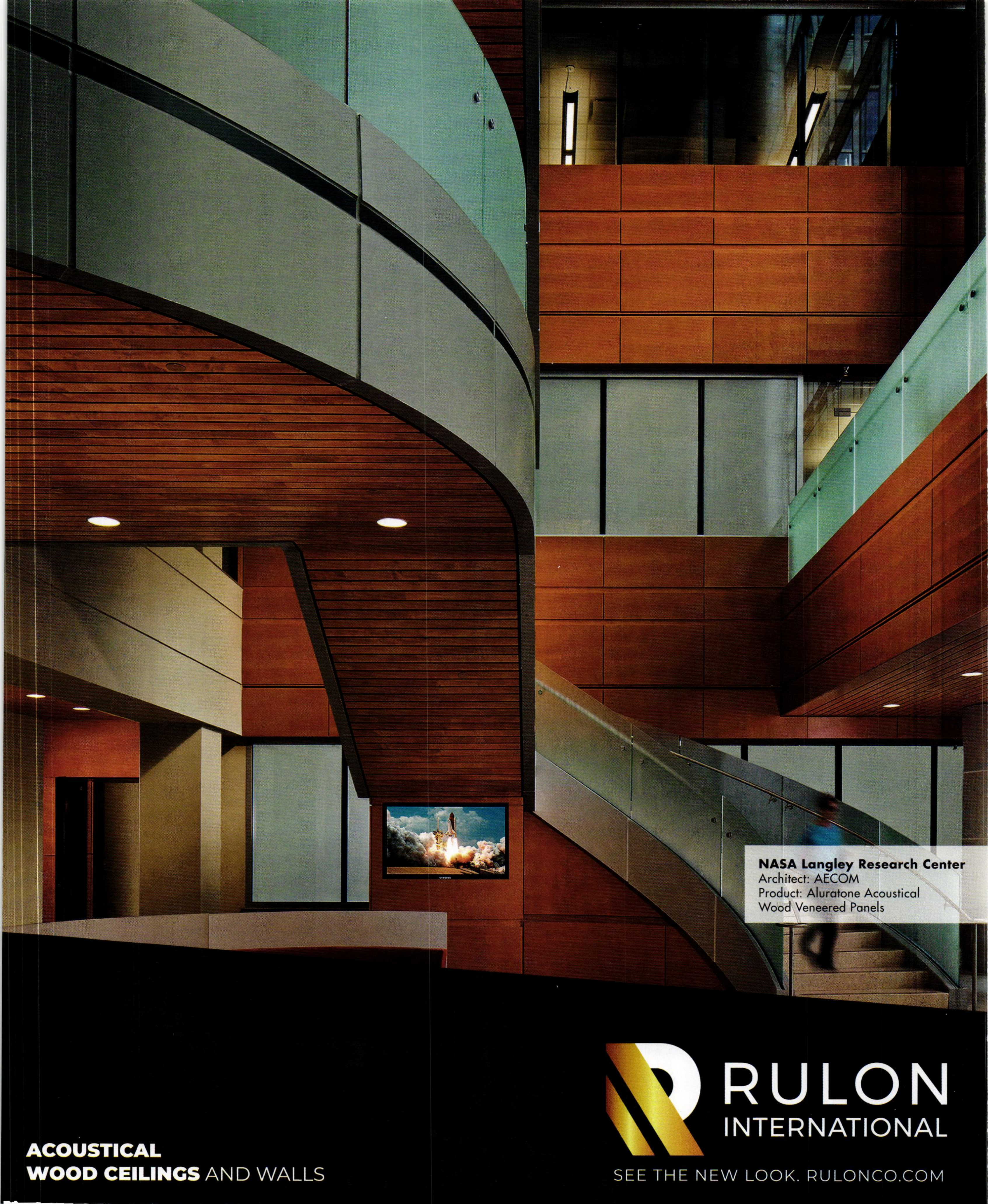
"They asked, 'How do we attract better students and faculty?'" says DMSA president Gregory Hoss, AIA, who worked on the master plan and was principal-in-charge of the E. Bronson Ingram project. "They realized their

South façade, showing brick detailing, slate-mimicking ceramic roof tiles, and chimneys that conceal plumbing and mechanical systems.

STEVE HALL/HALL + MERRICK PHOTOGRAPHERS

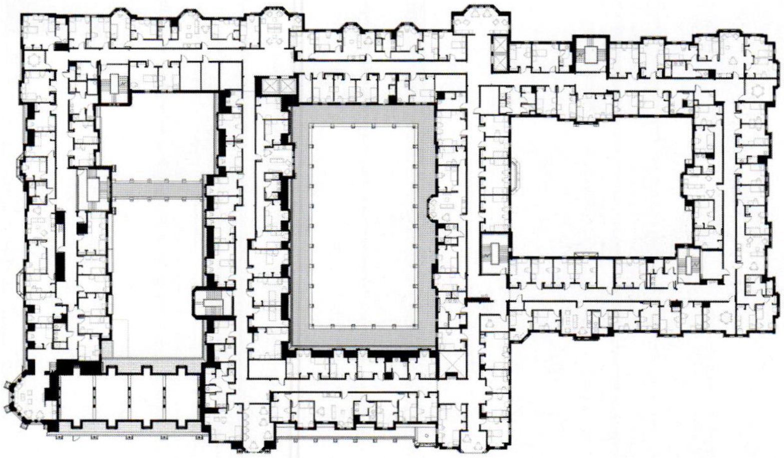
Project Credits
Project: E. Bronson Ingram Residential College, Nashville, Tenn.
Client: Vanderbilt University
Design Architect: David M. Schwarz Architects
Architect of Record: Hastings Architecture
General Contractor: R.C. Mathews
Civil Engineer: Barge Cauthen & Associates
MEP Engineer: Smith Seckman Reid
Structural Engineer: EMC Structural Engineers
Food Service Designer: Ricca Design Studios
Lighting Designer: John Coventry
Masonry Subcontractor: Kelly Construction
Stone Carving: Joseph Shaw & Son
Size: 205,000 square feet
Construction Cost: $99 million

> *For more photos of this project, visit bit.ly/EBronsonIngramResidentialCollege.*

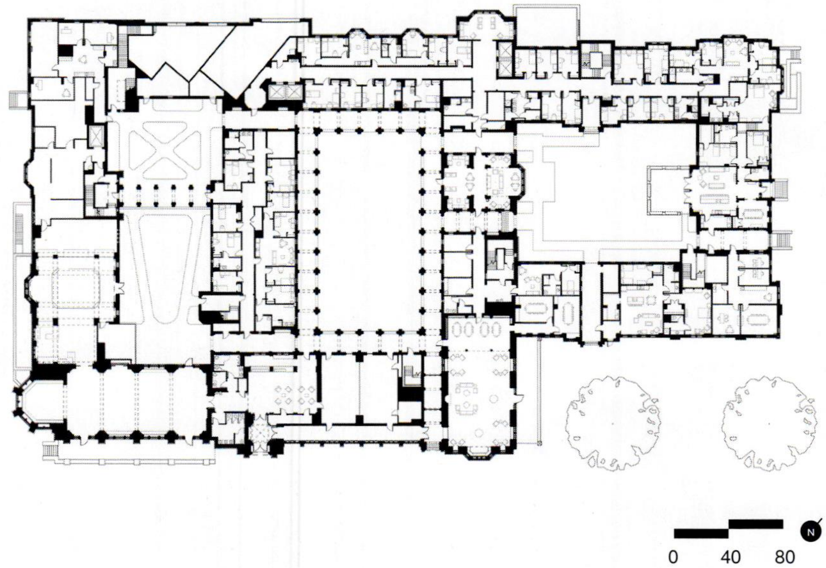


Residential:
David M. Schwarz Architects and Hastings Architecture

Typical Residential-Floor Plan



First-Floor Plan



housing stock was not only deficient, but some was subpar." Vanderbilt decided that to put itself on a level playing field with other prestigious schools it would adopt the residential college model for all of its future student housing.

Designing the E. Bronson Ingram Residential College in an architectural style that was popular roughly a century ago required microscopic attention to such things as selection of the steel windows, the mix of slate-colored ceramic roof tiles, and custom lighting fixtures. Even the most mundane details can betray a modern building that is masquerading as old. Thus, vertical brick expansion joints were hidden behind downspouts; molded brick was used instead of extruded to make wall surfaces ever so slightly irregular; and chimneys create a convincing profile along the skyline, but also conceal plumbing and ventilation systems (only one supports a fireplace flue).

The building's façade is composed in two aesthetics to "break down the scale," says DMSA project manager Ramsay Fairburn, AIA. "It is a massive building. We didn't want it to have great heaviness relative to the smaller scale of the buildings next door." The main elevation of the building is burnt-umber-colored brick, with split-faced trim in local Crab Orchard stone, along with cut Indiana limestone for window surrounds and belt coursing. The rest of the façade is a deep-red brick, and appears to be from an older, more austere era, with comparatively simple detailing in a dark pink sandstone imported from India.

The building's tower places an exclamation point on a corner of the building next to Alumni Lawn, the most important outdoor space at Vanderbilt. Inside, it contains a small dining alcove with windows on four sides, and two levels of bedrooms above. Because of egress issues, the top floor is unused and open to the outdoors.

Stylistically, the college's great room and dining hall echo similar

Residential:
David M. Schwarz Architects and Hastings Architecture

monumental spaces at other iconic residential colleges. They are trimmed in mahogany paneling and imported William Morris–print wall coverings. The great room is furnished with leather armchairs and lush carpets. The dining hall's ceilings appear as though they are supported by wood trusses, but those are nonstructural. Like the trusses, the long wooden tables and chairs are new but faithful to the period. These rooms are open to the public, but the rest of the building—including the four-person living suites, double rooms, and single rooms—is highly secured with keycard access.

To encourage the sense of community that comes from random meetings between fellow residents, elevator use is discouraged. Instead, students use stairways that open onto the three quads, which they naturally cross on their way to class or to visit friends. The main quad is surrounded on all four sides by a Gothic arcade, while another is bisected by a stylistically similar open passageway.

Today's students demand that schools be LEED rated. But while E. Bronson Ingram has a Gold certification, Hoss says his firm looks beyond ratings systems when considering sustainability: "We think buildings that are more timeless and less trendy tend to age better," he says. "If your client and the community fall in love with a building, and reuse it over many generations, it is the most sustainable thing you can do."

West courtyard, with view south to the tower

Vaulted Gothic arcade encircling central courtyard

STEVE HALL/HALL + MERRICK PHOTOGRAPHERS

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Model
SFX-S
4"& 6" Stainless Steel
Model
SXL
10"-16" Aluminum
FRESH AIR GRILLES
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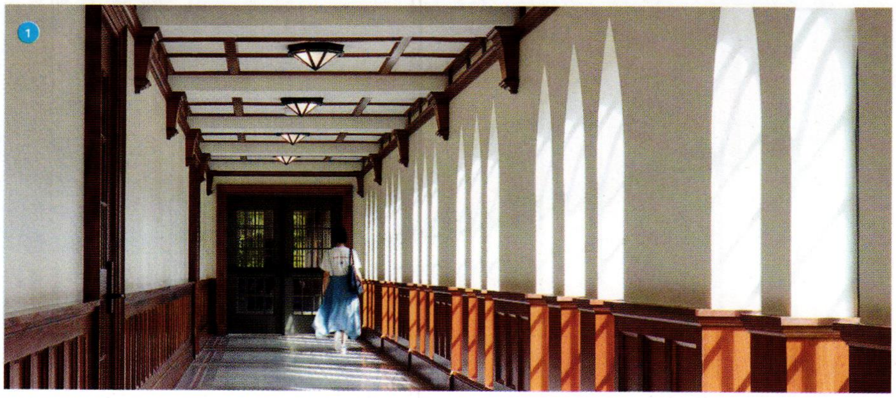
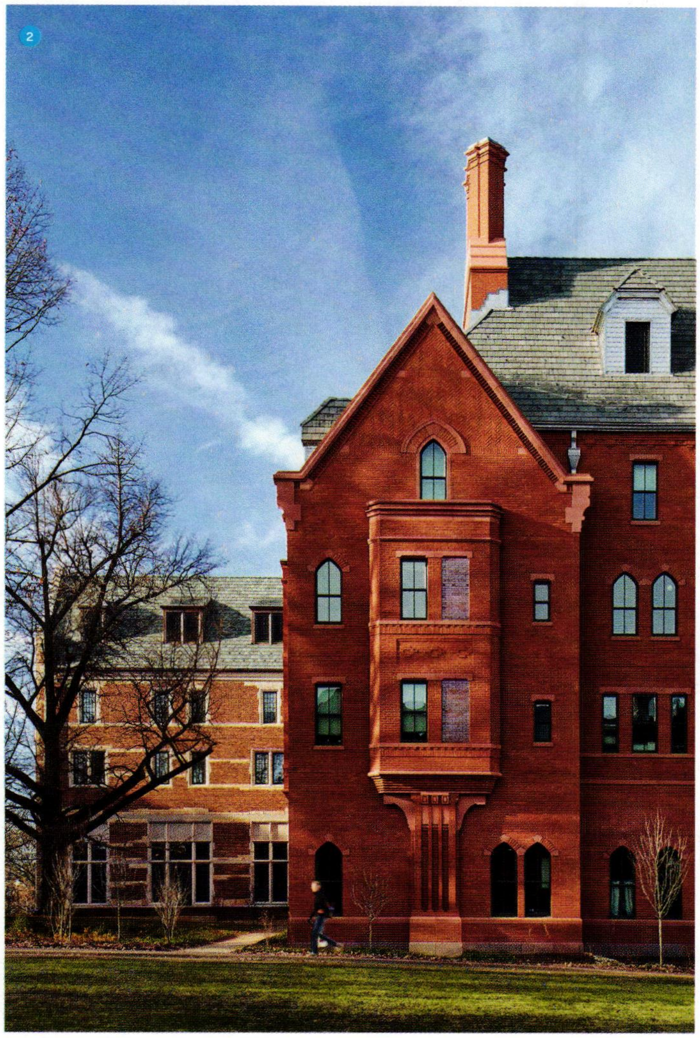
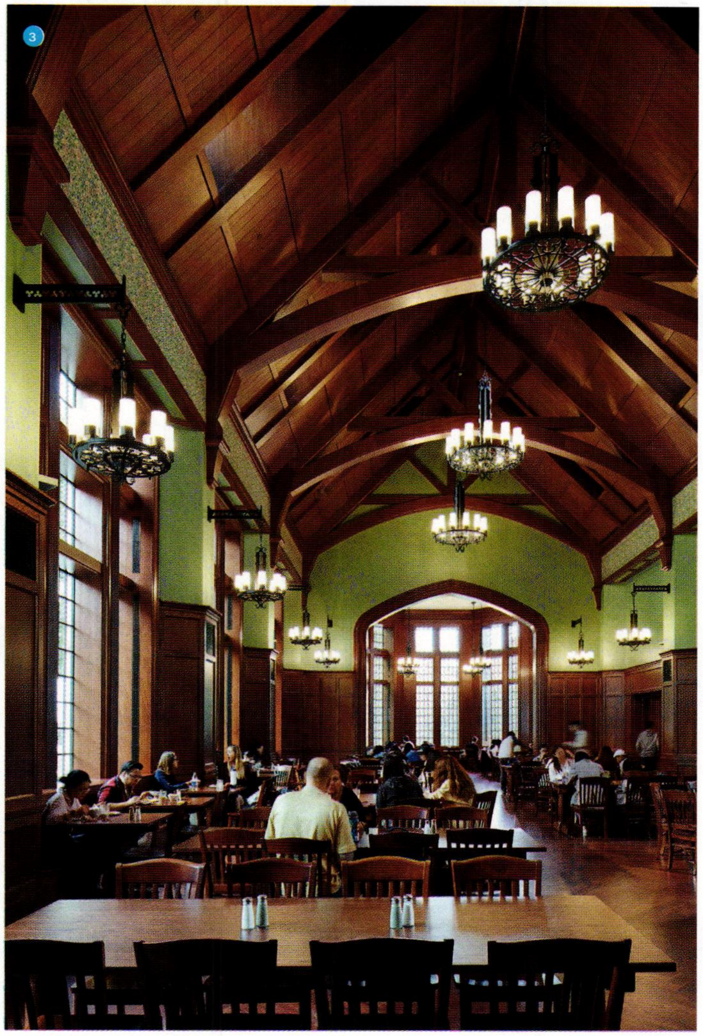
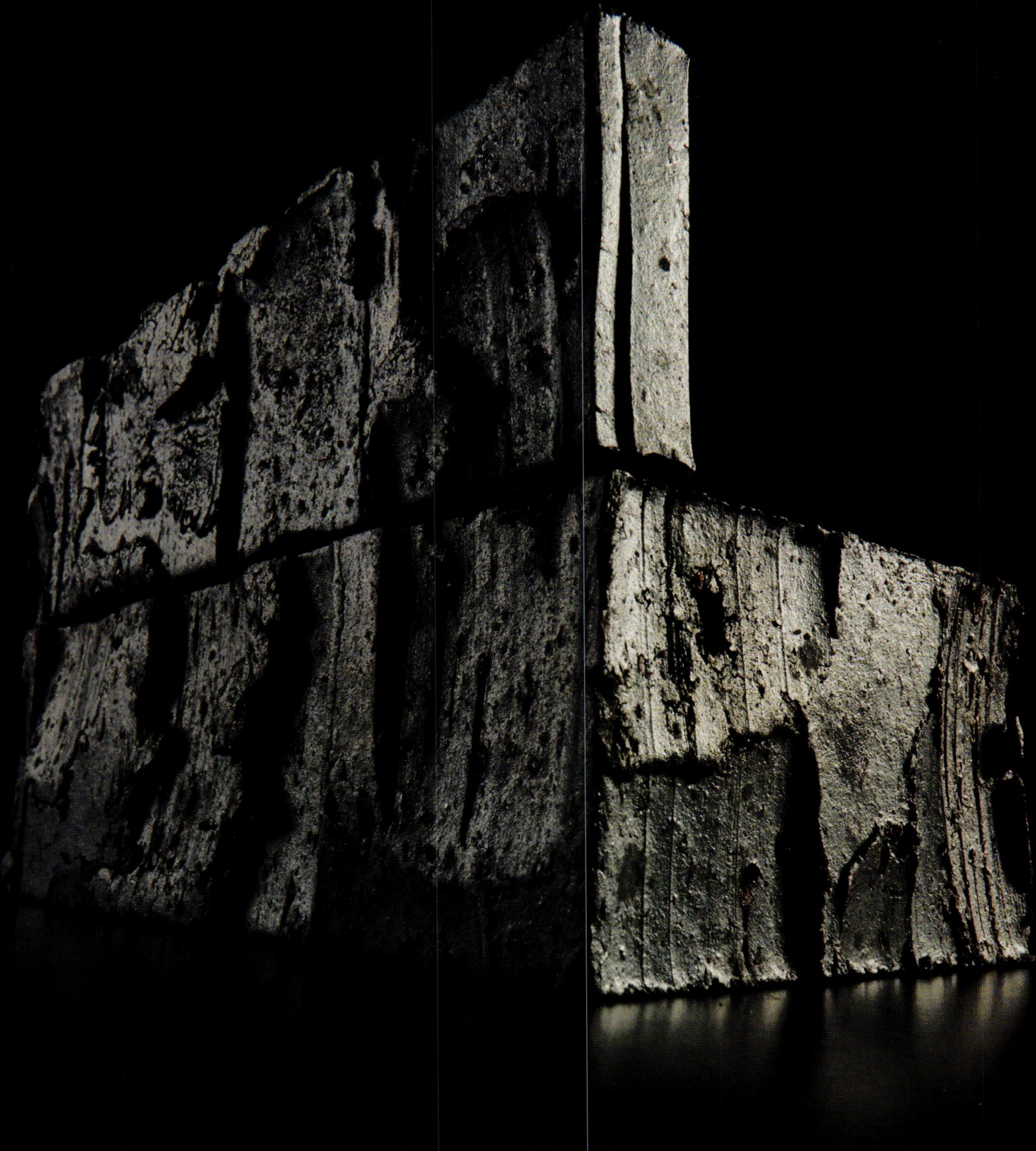






1. Window-lined hallways create bright circulation routes through the residential college. 2. The east elevation of the building is characterized by a deep-red brick with sandstone detailing; the contrasting skin of the western end of the building, with its lighter brick and limestone detailing, is visible beyond, at left. 3. The dining hall features nonstructural but stylistically appropriate trusses, and wood detailing on the ceiling, trim, and walls.

STEVE HALL/HALL + MERRICK PHOTOGRAPHERS



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To meet an ambitious 195 units/acre density target, Architect Togawa Smith Martin used an innovative double-podium design supporting five levels of wood-framed structure over two levels of concrete construction. PHOTO CREDIT: Kevin Korczyk | ARCHITECT: Togawa Smith Martin

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1. Develop an understanding of podium construction and design.
2. Discuss the advantages of podium construction and the unique design benefits of using timber as a primary building material.
3. Examine relevant building code provisions applicable to multi-story podium structures, including considerations for fire and life safety design.
4. Examine several case studies that feature podium configurations and the challenges, benefits, and best practices of using this construction typology.

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WHY PODIUMS

Throughout North America, specifying podium construction is an increasingly popular option for dense, urban areas, particularly when projects require infill scenarios. Limited space and rising costs of land and construction materials, such as concrete and steel, have prompted developers and architects to re-think building design. Rather than designing large, sprawling developments that take up an entire city block, building professionals are building higher and denser with materials that are more cost effective, lighter, and sustainable, such as wood. Podium construction allows for greater density and more rentable square footage than garden style apartments, and materials and labor tend to be more cost effective. Choosing to use wood enables the project to reap the potential benefits that inherently arise with a wood project: speed of construction, design flexibility, cost savings, and reduced environmental impact.[9]

DEFINING PODIUM CONSTRUCTION

Multi-story light-frame wood construction generally falls under construction Types III and V. Each building type is further subdivided into A and B, which have different fire-resistance rating requirements (with A being classified as more rigorous). Type IV construction, which utilizes heavy timber primary structural members, can also be used for mid-rise structures, but this type

BENEFITS AT A GLANCE

Potential benefits of podium construction that uses light-frame wood (light-frame) building systems:

- Reduced material and labor costs[2]
- Faster construction and installation[3]
- Lighter materials and lower foundation costs[4]
- Reduced environmental impact[5]
- Well suited to prefabricated construction[6]
- Boost density, building height and percentage of rentable square footage[7]
- Overall design flexibility that easily accommodates mixed-use programs and amenities such as multi-family residential, restaurants, commercial and/or retail, underground parking, lofts and mezzanines, parks and greenspace, pools and terraces.[8]

COOL FOR SCHOOL | University House Arena District, Eugene, OR
Podium construction can be an efficient and cost-effective way to meet the rapidly growing demand for student housing across the country. This 109,600 square-foot student housing project includes five stories of wood-frame construction over a concrete podium achieving an attractive yet affordable design. PHOTO CREDIT: Lincoln Barbour | ARCHITECT: Mahlum Architects

> **Podium construction—also known as pedestal or platform construction—typically includes multiple stories of light wood framing over a single- or multi-story podium of another construction style, which may include retail as well as above- or below-grade parking levels. Concrete podiums are the most common, though steel podiums also exist. Although not considered 'podiums' under the IBC, using a heavy timber system to separate parking from light wood-frame residential units above is also gaining popularity.**
>
> – WoodWorks | Wood Products Council

limits the use of concealed spaces and therefore requires more creativity to meet acoustic goals and conceal utilities.[10]

A provision in the *2018 IBC, Chapter 5 General Building Heights and Areas*, Section 510.2 "Horizontal Building Separation Allowance," recognizes that buildings with a podium structure are considered two distinct buildings "for the purpose of determining area limitations, continuity of fire walls, limitation of number of stories, and type of construction" where certain conditions are met. A core benefit of this provision is it allows for more stories in a building where wood construction is limited to four stories for Type V-A Residential occupancies and five stories for Type III residential occupancies. Podiums enable more stories to "fit" into the total allowable building height, which is particularly beneficial in urban areas that require increased density.[11] The total building height as measured from grade plane cannot exceed the height limit set forth in Section 503 for the construction type having the smaller allowable height. Since the podium is required to be of Type I-A construction, which is permitted to be unlimited in height, the allowable height of the Type III or Type V building will always control the overall building height.

Podium construction, also known as pedestal construction, is ideal for mid-rise, mixed-use structures. More commonly, the construction consists of two to five stories of light-frame wood construction over a concrete podium separated by a three-hour fire resistance-rated horizontal assembly. The upper slab of the concrete podium typically acts as both a fire separation and structural transfer slab for the framing above. This construction approach allows increased density with additional stories, maximizing the use of smaller urban lots while benefitting from the typically lower cost and faster installation of light-frame wood (light-frame) construction.[12]

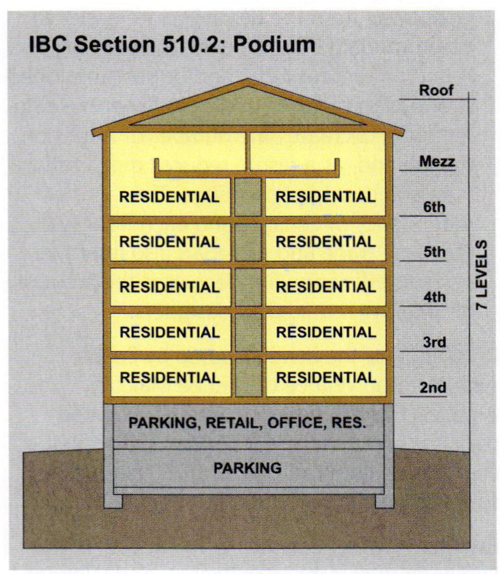
In mixed-use structures, the podium provides separation between different occupancy types; typically, the upper stories are residential or a mixed occupancy use while the first one or two levels range from parking garages to restaurants, retail, or other commercial uses. Typically, podiums are above parking levels (or other uses of a concrete podium such as commercial or retail space) and serve to separate a mixed-use building; therefore, these buildings require higher fire ratings and reduced sound transmission. It is also possible to have multiple story podiums, which will be discussed in detail in the next section.

Multiple Story Podiums

In versions of the IBC up to and including 2012, the lower portion of the construction (the podium) can be no more than one story above the grade plane. 2015 changes to IBC section 510.2 (and included in 2018) allowed multiple story podiums. This allows two stories of podium with five stories of wood framing above to meet the 85-foot maximum building height limitation while also meeting the 65-foot seismic force-resisting system (SFRS) height limit for light-frame wood stud-wood structural panel shear walls in high seismic areas (SDC D-F). For buildings designed in jurisdictions enforcing codes preceding the 2015 IBC, this requires approval of an Alternate Means and Methods Request (AAMR) by the Authority Having Jurisdiction (AHJ). However, knowing that the 2015 edition provides this allowance often eliminates the AHJ's concerns.[13]

IBC SECTION 510.4—TYPE IV PODIUM CONSTRUCTION BOOSTS VALUE AND COST SAVINGS

Although a typical podium structure is light-frame construction over a concrete or steel podium, in certain conditions, the podium itself can also be constructed of wood, which can further reduce overall construction costs and time, while creating a more sustainable and cost-effective building.[14] Type IV podium construction is covered in another special provision, IBC Section 510.4. While 510.4 is



Example of five-story light wood-frame construction with mezzanine over two-story (double) podium (Image courtesy Wood Products Council | Wood Works) used less frequently than the 510.2 horizontal building separation allowance provision, it offers a similar opportunity for stacking buildings and gaining an additional floor.

IBC Section 510.4 recognizes and allows the use of open Type IV construction podiums for buildings with parking below (S-2 occupancy) and any Group R occupancy above. This provision allows a one-story podium of Type I or Type IV construction, but only requires a two-hour fire separation that can be further reduced to a one-hour separation if the building has a sprinkler system per IBC Table 508.4. The overall building height is limited to what is permitted for the more restrictive construction type per IBC Table 503. Assuming a parking area of Type IV construction, the height limit would vary depending on the construction type classification of the upper structure.

Engineered wood products used to construct heavy timber podium buildings are an excellent structural and fire-resistant design option. These materials provide strength and durability combined with lighter weight and flexibility, which are both important in high seismic zones where building mass affects lateral design loads. The wood podium design also allows some projects to use light-framed shear walls on the first level, as well as smaller foundations than required for a concrete podium.[15]

Writing for *Building Design + Construction*, Karyn Beebe notes:

> An all-wood building enhances construction in many ways. Field modifications of a wood deck away from the beam line are easier to accommodate because it is not necessary to X-ray the slab for rebar and/or post-tensioned strand placement. In addition, fewer building materials decreases the number of trades on the job and, as a result, reduces mobilization time and construction delays. The redundancy of constructing each floor with the same trade and materials also improves framing efficiency and decreases the amount of detailing required by designers.[16]

In addition to the benefits noted by Beebe, Architect Dan Withee of Withee Malcolm Architects, which designed an 85-unit wood podium project in San Diego, "estimated that a concrete podium can cost $15,000 per parking space compared to $9,500 for a wood podium."

Bernhard Gafner Principal with Aspect Engineering corroborates Beebe's and Withee's claims, stating, "A mass timber project is approximately 25 percent faster to construct than a similar project in concrete. Noting the advantages for urban infill sites in particular, he says it also offers 90 percent less construction traffic (trucks delivering materials) and requires 75 percent fewer workers on the active deck, making for a much quieter job site."[18]

GLOSSARY

4-over-1—four stories of wood framing over a one-story above grade podium

5-over-1—five stories of wood framing over a podium (Type IIIA and IIIB)

5-over-2—five stories of wood framing over a two-story above grade podium

Balloon Framing—involves joists hanging off of a ledger attached to structural studs

Equilibrium Moisture Content (EMC)—"moisture content at which the wood is neither gaining nor losing moisture"; the history of a wood specimen, such as its long-term environment, also affects its EMC[1]

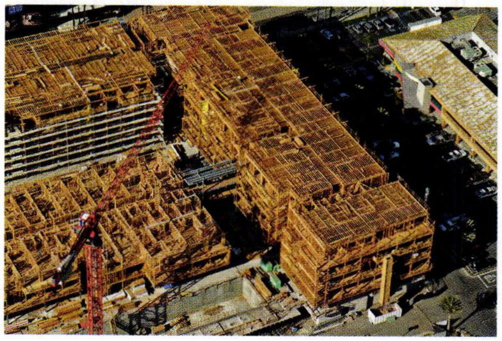
Mass Timber Products—typically characterized by large, solid wood members often manufactured off-site; includes sawn timbers, cross laminated timber, structural composite lumber, and structural glued laminated timber

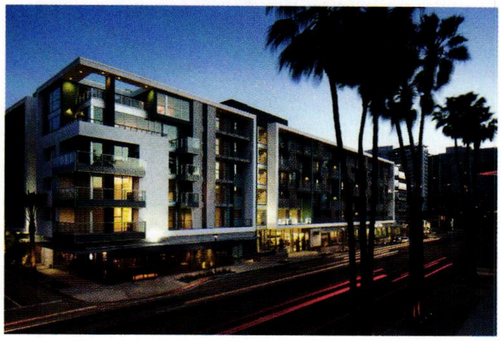
Mid-rise Structure—a general term commonly applied to buildings between measuring from the lowest ground elevation to the top of the uppermost occupied level; between four and ten stories or between 35 and 85 feet tall

Platform Framing—floor and roof framing on top of bearing walls; the most frequent framing style in conventional wood framing construction

Podium Construction—"also known as pedestal [...] —typically includes multiple stories of light framing over a single- or multi-story podium of another construction style, which may include retail as well as above- or below-grade parking levels"

Semi-balloon Framing—floor and/or roof framing; hangs off of bearing walls which are continuous past the horizontal framing to the underside of the floor or roof sheathing of the horizontal framing to the double top plates





SAVING WITH SAVY STYLE | Stella Residences
Stella is a great example of a project making the most of an urban infill site. Wood construction made this project more affordable while still offering amenities. To attract residents, the design team used the podium configuration to add resort-style features more typically found in luxury projects. The Stella complex includes a heated saltwater pool with hot tub and large sand beach, state-of-the-art fitness center, resident lounges and a catering kitchen, business center and conference room, private movie screening room, yoga studio and spa room, and rooftop deck. PHOTO CREDIT: Lawrence Anderson | ARCHITECT: DesignArc

URBAN INFILL: PODIUM CONSTRUCTION CAN HELP INCREASE DENSITY, AFFORDABILITY, AND ADD AMENITIES

In many projects, the fundamental value proposition of podium construction is that it is the sweet spot of value for development of certain properties, having higher densities (or total project area) than non-podium Type II, III, or V buildings. In addition, there is significantly less cost per unit/area than taller Type I buildings.

Because Section 510.2 of the 2018 IBC allows for additional stories, which enable increased density, podium construction is often ideal for urban infill projects.[19] Benefits of podium construction include sustainability, prefabrication, and less on-site labor and traffic, which is important in busy urban areas. In a presentation at the World Conference on Timber Engineering (WCTE), Kevin Cheung maintains, "The popularity of multi-storey wood frame condominium and rental apartment projects is spreading across America from coast to coast in major metropolitan areas to provide affordable housing to the growing population."[20]

Cheung cites shifting demographics and the need for "denser and taller housing [...] to create affordable, healthy, sustainable communities and neighbourhoods that are transit-oriented and pedestrian-friendly." To achieve this goal, as well as meeting increased demand for green ratings, Cheung notes that developers and other specifiers are using podium construction.[21]

Jason R. Shepard, AIA, a principal and director of multifamily housing at Atlanta-based Dwell Design Studio, maintains approximately 60 to 70 percent of Dwell Design's work is infill driven. He comments, "Most of our developers prefer to work with wood. A lot of our projects are five stories of light-frame construction over two levels of concrete podium. Most jurisdictions want retail services at ground level. Podium design supports that. [...] The wood wrap achieves more density, minimizes construction costs, and helps offset land costs."[22] Many of Dwell's projects exemplify Shepard's statements. For instance, Berwyn House Road in Atlanta, Georgia, is Type III light-frame construction over an elevated podium slab and parking structure, containing 7,500 sf of amenities, including a clubroom/fitness center and a pool courtyard.[23]

Writing for Multifamily Executive, Patrick Winters states, "The critical housing shortage in many of our most dynamic cities, coupled with the ascendancy of urban living, is driving a need for larger, denser, and more amenity-rich housing projects." Amenities include everything from gyms to pools, restaurants, retail spaces, offices, parking garages, and even hotels.[24]

Like Shepard, Winters cites the hybrid nature of concrete podium construction combined with light-frame as a sustainable and versatile design solution. The podium, in addition to building lobbies and parking, often contains ground-floor retail space. He notes that typical light-frame mid-rise buildings built over podiums can "achieve densities of 65 to 100 units per acre." According to Building Safe and Affordable Communities, research shows wood construction to have been $119.7/square foot in 2017.[25]

This article continues on http://go.hw.net/AR122019-6. Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.

QUIZ

1. Using engineered wood products to construct heavy timber podium buildings provides which of the following benefits:
   a. Strength and durability b. Lighter weight materials
   c. Flexibility d. All of the above

2. In podium construction, the light-frame wood construction over a concrete podium is separated by a______ fire resistance-rated horizontal assembly.
   a. One-hour b. 10-hour
   c. Three-hour d. Six-hour

3. According to the course, podium construction makes a positive impact on urban infill and densification strategies by:
   a. Contributing to environmentally responsible design
   b. Offering significant schedule and cost savings
   c. Allowing for flexible, innovative design within tight urban sites
   d. All of the above

4. The phrase, "___________," refers to two (or potentially) three stories of concrete construction with five stories of wood above grade podium.
   a. 5-over-2 b. Mixed-use construction
   c. 4-over-1 d. Multifamily housing

5. According to the IBC, the light-framed portions of multifamily podium structures may be ____________ construction, both of which have basic limitations with regard to height, number of stories, and square footage.
   a. Type III b. Type V
   c. None of the above d. Both A & B

6. According to the course, wood prefabrication has which of the following benefits:
   a. Process efficiency
   b. Controlled environment
   c. Reduced waste both on- and off-site
   d. All of the above

7. In a building with five stories of residential units, density can increase to _____ to _____ units per acre.
   a. 50; 80 b. 100; 120
   c. 200; 300 d. None of the above

8. In the MOTO case study, prefabricated wall panels and BCI flooring and ceiling joists that arrived on the job site as needed enabled the contractors to frame each floor in ______.
   a. One week b. Two weeks
   c. Three weeks d. Four weeks

9. The IBC treats podium-style buildings as ____ separate buildings, which boosts the number of potential stories that can be built.
   a. Six b. Three
   c. Two d. Four

10. Which of the following factors make wood podium construction ideal for urban infill projects?
   a. Use engineered wood products b. Provide for movement in the mechanical systems
   c. Include an expansion joint in the cladding d. All of the above

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RESIDENTIAL HEAT MANAGEMENT SOLUTIONS AND THE WELLNESS BENEFITS OF GAS FIREPLACES

Presented by:

HEAT & GLO

No one builds a better fire

With heat management systems, you can now put a television or artwork above your fireplace without the need for a mantel.

LEARNING OBJECTIVES

1. Define the concept of heat management and describe how modern fireplaces improve occupant experience, particularly thermal comfort.
2. Explore fireplace options and analyze various heat management systems used in modern fireplaces that can improve user safety and comfort.
3. Identify which heat management solutions are best for different applications and how to safely use gas fireplaces.
4. Understand key design and installation considerations for specifying fireplaces with heat management systems.

CONTINUING EDUCATION

AIA CREDIT: 1 LU/HSW
AIA COURSE NUMBER: AR122019-4

AIA Continuing Education Provider

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Today's attitude towards our built environment has never been more demanding. Where the ultimate goal used to be bringing to life an aesthetically superior structure, project goals of this era have evolved into more functional and forward-thinking designs. Performance expectations of a home or building now include energy efficiency, acoustic attenuation, universal design, resiliency, health conscious building materials, and the capacity to be "smart." Today's end-user of these properties, whether a buyer of a single-family home or a renter/tenant, have become more discerning as well.

And, comfort is king. The ultimate luxury? Spaces where this comfort can be fine-tuned depending on the function of the room, time of day, or occasion. Technological advancements in building materials and systems have changed how we design for these attitudes. However, the core of comfort remains beautifully basic in some aspects, like fire.

Fire: primal, universal, and non-replicable, it is undeniably unique among architectural "materials." This element has fascinated humankind since our earliest days, and the advent of the hearth has been domesticated to bring light, warmth, and comfort to living spaces around the world.

First, harnessing the flame was a priority. The next? Comfort control by strategically directing the heat generated from the appliance. This concept is called "heat management.

Today's modern fireplaces run the spectrum from classic wood-fueled types, to dazzling modern linear gas models, and everything in between in the form of fire art and custom-shaped masterpieces.

A plethora of research from both home buyers and professionals in the AEC industry confirms that the mass popularity and demand for a fireplace is stronger than ever.

CONSUMER DEMAND FOR FIREPLACE SYSTEMS

Frank Lloyd Wright famously said "The fireplace is the heart of the home." Modern consumers agree. Across every age, income, and regional demographic, homeowners listed a fireplace as a must-have home feature. Modern homeowners value quality time with family and friends more than material items, so when they consider whether to add a fireplace, the answer is often a resounding "yes." Harking back to the days of President Roosevelt's "Fireside Chats," fireplaces still evoke a strong sense of family togetherness.

Homeowners also consider value, health, and safety, too. They consider fireplaces to be a source of safe, clean warmth that not only creates a relaxing, welcoming environment, but also increases home value. According to Marshall & Swift Residential Cost Handbook, a gas fireplace adds between $3,000 and $6,000 to a home's appraised value. Modern safety features like venting, fan/blower technology, and heat distribution are among the top considerations that homeowners look for.[2]

Millennials, the demographic born between the early- to mid-1980s and early-1990s, are coming into their own in terms of purchasing power. Their buying patterns are set to shift the way businesses operate, and the hearth category is no different. Like other generations before them, Millennials value the warmth and ambiance a fireplace creates, as well as the added home value and architectural focal point.

GLOSSARY

BTU—British Thermal Unit, a measure of heat output, is the amount of energy required to heat one pound of liquid by one-degree Fahrenheit.

Convection Heating—The gradual, natural process of warm air rising as it increases in volume.

Conduction Heating—The transfer of heat from physical contact from an area of higher temperature to an area of lower temperature.

Direct Vent—A sealed combustion system that draws outside air for the fire and expels 100% of combustion exhaust and byproducts outside the home.

Heat Management—Systematic control of air temperature and the ability to choose when, where, and how heat is managed, preventing energy loss and maximizing heating strategies.

Passive Heat—A venting system that disperses heat naturally throughout the room using one front discharge, two side discharges, or an open top discharge while the fireplace is in operation.

Power Venting—A fan-powered accessory used in direct vent systems that supercharges the circulation of air and allows a fireplace to be installed anywhere in the home.

Radiation Heating—Infrared heat that travels in direct, invisible electromagnetic waves and absorbs into objects quickly, as in sunlight through a window.

Thermal Comfort—The individual condition of feeling neither too hot nor too cold; thermal comfort is influenced by air temperature, surface temperature, relative humidity, air motion, energy used, and materials used to keep or remove body heat

Zone Heating—The process of redirecting heat to rooms that are physically occupied instead of heating the whole house, whether it is occupied or not, using a mechanical heat management system.

More than other generations, Millennials are attracted by the desire to create a unique space with multiple design options. Plus, they are less attached to wood-burning fireplaces, and tend to prefer the ease, control, and safety features of modern gas fireplaces.[3]

Among homeowners who have not selected a fireplace, most if not all of the top reasons can be addressed with better information and communication from designers and builders. Complaints like cleaning, concerns about safety, maintenance, air leakage, and cost, and expectations of not using it during warm months all tend to sway homeowners away from purchasing a fireplace. However, as this course will demonstrate, modern fireplaces—especially gas—are not only safe, they also contribute to the overall health and wellness, design aesthetic, and comfort of a home.[4]

Role of the Hearth in Thermal Comfort

Fireplaces are synonymous with comfort. Comfort, in quite literal terms, is synonymous with hygge (pronounced "hoo-guh"), a Danish word with no true English translation except coziness and comfort. Hygge is all about creating an atmosphere that fosters well-being and contentment, and it can mean different things to different people: a warm cup of coffee, a soft blanket, a treasured book, or cozying up to a warm fire.[5] In the winter especially, hygge and fireplaces go hand in hand. The simplicity of sitting beside a fire while it's cold or dreary outside is thought to improve wellness and lift spirits. In the U.S., the top three most hygge cities are Seattle, Portland, Minneapolis, Denver (#5) and Hartford (#7) are well-known for the role that fireplaces have in their respective cities' hygge mindset.[6]

More than offering a cozy, inviting place to enjoy the company of family and friends, modern fireplaces also improve a home's thermal comfort, lighting and ambiance, and design aesthetic. Thermal comfort, when a person feels neither too hot nor too cold, is important for health, well-being, and productivity. It involves not just temperature control, but also humidity and air movement. Indoor air temperature preferences obviously vary from person to person, but a recommended range is between 69- and 73-degrees Fahrenheit. Radiant heat, when it feels warmer sitting beside a sun-drenched window versus when the blinds are drawn, also impacts air temperature. Indoor air temperature can be influenced by relative humidity, which is regulated by a home's HVAC system. Too much, and the room feels stuffy; too little, and occupants' throats and sinuses can dry out. Air movement, the last piece of thermal comfort, can be a major source of heat and energy loss in homes. It is also a primary component of modern venting technology with gas fireplaces.[7] Buildings and homes with energy efficient

Gas fireplaces offer the most convenience and design flexibility and come in a range of price points.

thermal comfort systems, such as fireplaces, will be more sustainable, have lower energy costs, and contribute to occupant's emotional and physical well-being.

FIREPLACES AS SUPPLEMENTAL WARMTH

The fireplace system consists of the appliance, its fuel source, venting systems, as well as accessories and optional design components. What works best for one home or consumer might not work for another; and homeowners, when faced with a plethora of choices in building or remodeling their home, don't know what questions to ask to find the best fit or what the functional elements of a fireplace are. Builders and designers, through offering more proactive and complete information about fireplace systems, can help homeowners select not just a fireplace in general, but upgrades that enhance the space and credibility of the builder.

Types of Fireplaces[8, 9]

Homeowners have the choice between masonry-built fireplaces, pre-fabricated fireplaces, or custom fireplaces. Masonry fireplaces can be found in many older homes and represent the traditional fireplace in terms of looks and fuel source: the sound of crackling logs, the sight of leaping flames, and the familiar smell of wood on the fire. Masonry fireplaces, with all their nostalgia, can be expensive to operate and their fuel source, wood, releases harmful chemicals into the air from the smoke. Pre-fabricated, factory-built fireplaces are often a more economical, energy efficient option than a masonry-built fireplace. However, some homeowners incorrectly believe that pre-fabricated fireplaces do not exude the authenticity of a masonry unit. Advances in technology and design have bridged the gap between the desire for the look and feel of a masonry wood-burning fireplace with the benefits of factory-built fireplaces.

Choosing the fuel type is the first step in selecting the right fireplace for the home, and often comes down to prioritizing convenience or sensory experience, depending on installation requirements. There are currently six types of fireplaces on the market: electric, wood, gel, ethanol, pellet, and gas. Each one has certain advantages and drawbacks in terms of heat management, design flexibility, safety, wellness, and technology.

Wood Fireplaces

The oldest and most traditional type of fireplace is the masonry wood-burning hearth. It requires a chimney for venting, so location is a key consideration, and it is also the most expensive option—to install and maintain. Factory-built non-masonry wood burning fireplaces are also available. Wood fireplaces are also expensive to burn and will contribute to significant heat loss without the right technology. It's estimated that ten pounds of wood produces up to 80,000 BTUs, and heat output is more difficult to adjust. Chimney systems for wood burning fireplaces can impact a home's thermal efficiency in a negative way.

Health and Safety Considerations

The risk of flames spreading from a woodburning fireplace to other combustibles within the home can be high without proper precautions. Safety begins with the chimney: annual cleaning, clearing debris from the top, and installing a chimney cap to keep animals and debris out. A dirty chimney also produces creosote, a preservative used on some wood that leaves a dangerous buildup in the chimney. TVs, artwork, and other combustibles must adhere to strict clearances related to distance from the fireplace, which can limit the décor and functionality of the room they're in. Smoke from wood fireplaces also releases toxic fumes into the air. The particles in wood smoke are equivalent to diesel, and breathing clean air is a top concern for any fireplace user.

Electric Fireplaces

When cost is a concern or when access to a gas line proves too complicated, electric fireplaces are good options. Electric fireplaces provide the simulated aesthetic of flames with a limited amount of radiant heat. The heater function on electric units is optional, providing a basic level of heat management. They will shut off if the power goes out and aren't as effective at distributing heat throughout the room, like wood or gas, and shouldn't be used as a primary or secondary heating source.

Health and Safety Considerations

Because there is no combustion, smoke, or actual flames, electric fireplaces tend to be very safe. Electric fireplaces are allowed in all national green-building programs.

Gel Fireplaces[10]

Gel fireplaces can be placed anywhere in a room, as long as it is well vented. Chimneys and gas hookups aren't needed, just single-use cans of the gel fuel. It burns clean and doesn't produce any smoke, but the flames don't last long—just a couple hours per can. At maximum capacity, a gel fireplace can produce up to 9,000 BTUs, compared to 30,000–80,000 BTUs or 25,000–60,000 BTUs for wood and gas, respectively. Therefore, it's a good solution for occasional fireplace usage when heat output isn't important.

The heater function on electric units is optional, providing a basic level of heat management.

Health and Safety Considerations

Gel burns cleanly, but the fuel cans need to be used safely: on a flat surface, away from wind and other weather elements (if used outside), and only used once, no refills.

Ethanol Fireplaces

Ethanol fireplaces can be used as standalone fireboxes or inserts, indoors or out. The flames produced by ethanol are real, but will not provide much more than radiant heat. Still, it's a renewable resource, flame output can be controlled, and they will only burn for at most six or seven hours before the fuel runs out. With both gel and ethanol fireplaces, an end-user will frequently need to purchase refill packs (often brand-specific) to keep the fireplace going. Because of this reason, these types may prove impractical for national or production builders to specify.

Health and Safety Considerations

Ethanol is denatured alcohol and as such, produces only water vapor when it burns. There are no fumes or emissions, making it safe to burn indoors, even without venting.

Pellet Fireplaces

Homeowners who want the sound of crackling, burning wood without the upkeep or safety hazards of wood fireplaces might enjoy pellet fireplaces. Pellets can be made of wood, corn, barley, or other biomass substances, and are burned in an existing factory-built fireplace or fireplace insert. Newer technology allows some pellet fireplaces to run off a thermostat, which allows the fire to burn within about one degree of the chosen temperature.

Health and Safety Considerations

Although wood and biomass pellets don't release toxic gases or fumes when burned, their overall product lifecycle is less environmentally friendly than gas or electric, when considering manufacturing, processing, and transport.

This article continues on http://go.hw.net/AR122019-4. Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.

QUIZ

1. A gas fireplace adds between ____ and _____ to a home's appraised value.
   A. $2,000–$5,000 B. $3,000–$6,000
   C. $3,000–$5,000 D. $3,500–$6,000

2. The optimal indoor thermal comfort range is between ________ degrees Fahrenheit.
   A. 69 and 73 B. 68 and 71
   C. 70 and 72 D. 71 and 73

3. Wood fireplaces can produce up to 80,000 BTUs compared to gas fireplaces, which range from 25,000 to ____ BTUs.
   A. 15,000 B. 20,000
   C. 40,000 D. 60,000

4. Direct vent fireplaces remove _____ of combustion exhaust and odors outside the home.
   A. 50% B. 100%
   C: 10% D. 85%

5. According to the course, which of the following characteristics are leading reasons why consumers purchase a modern fireplace?
   A. Flames B. Limited or zero heat output
   C. Lighting effects and decorative interiors D. All of the above

6. Using variable speed fireplace fans can increase the amount of ______ heat by distributing and promoting air circulation throughout the room.
   A. Convection B. Conduction
   C. Radiant D. Both A and B

7. Heat zone kits can redirect up to ____ percent of the fireplace's heat.
   A. 25 B. 40
   C. 50 D. 60

8. According to the course materials, when a gas fireplace is used for the first time after installation, the first step is to:
   A. Turn the fireplace up to high for three hours B. Clean the interior thoroughly
   C. Read the owner's manual D. Open all the windows and turn on the ceiling fans

9. Steady state efficiency is an unreliable indicator because:
   A. Natural heat loss is not considered B. Inconsistencies exist between the U.S. and Canada
   C. Not all gas appliances are measured by this standard D. Appliance sizes vary

10. _______ is the most important factor when determining the appropriate size of a fireplace for a certain space.
    A. Room size B. Fireplace dimensions
    C. Venting requirements D. Heat output

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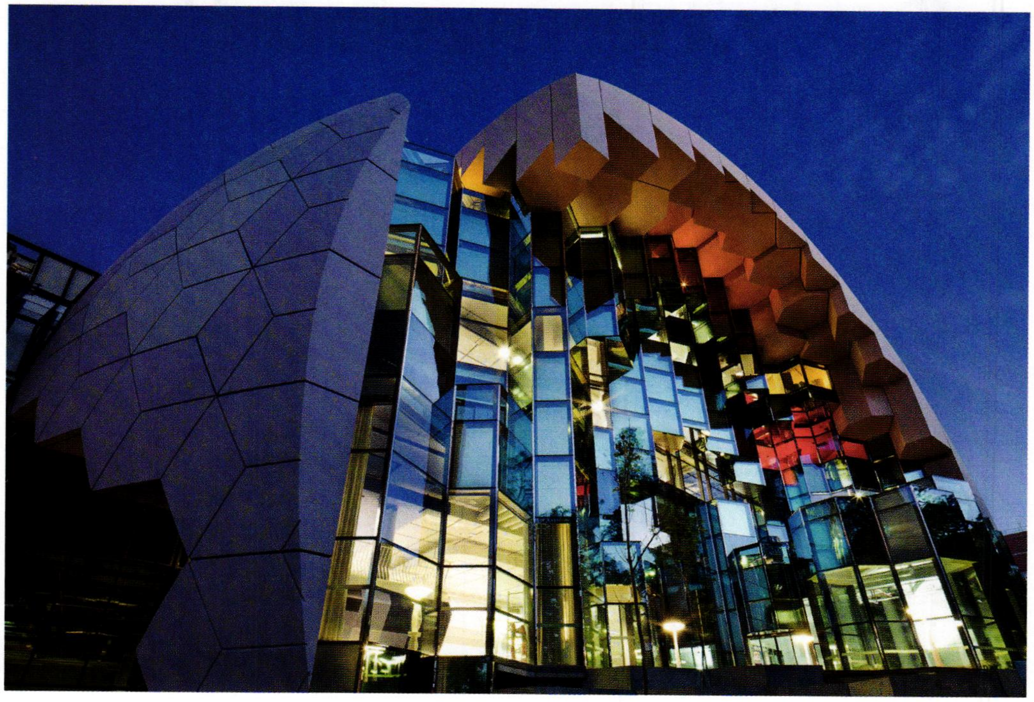
RIGID BOARD INSULATION

PROVIDING REAL SPACE VALUE IN COMMERCIAL REAL ESTATE

Presented by:

Kingspan.



LEARNING OBJECTIVES

1. Distinguish between several rigid insulation board technologies and their thermal performance.
2. Discuss how specifying high performing insulation can allow for a thinner total wall construction and increased internal square footage.
3. Learn how various wall constructions impact ROI in different real estate markets.
4. Examine the fire performance characteristics of different rigid insulation board technologies.

CONTINUING EDUCATION

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PREMIUM INSULATION = PREMIUM RENT

Insulation is an essential component of every building project whether commercial, residential, or industrial and whether new construction or a renovation. To meet today's requirements for energy efficiency and occupant comfort, architects need to design insulation into every part of a structure, from the foundation to the roof.

In the past, bulky foams and fiberglass or mineral fiber batts were the primary insulation options available. They could provide the energy efficiency performance needed but at the cost of thicker walls and roof assemblies. Recent advances in rigid insulation board technologies have changed this landscape significantly. Architects can now get the same R-value from thinner walls and roofs. That can mean greater design flexibility and, for commercial projects, more internal floor area within the same building footprint, which can increase leasable space and Return on Investment (ROI).

Insulation is no longer a "one technology fits all" proposition. Modern insulation board technologies offer a range of characteristics that can determine their fitness for use in different parts of a project. These include long-term durability, moisture resistance, and fire performance. By understanding these characteristics, architects can select the best type of insulation for each application.

HOW INSULATION WORKS

Thermal insulation is used to prevent heat loss/gain in buildings and thereby reduce energy usage. Before the different types of insulation and their applications are discussed, it is important to get a better understanding of how insulation works:

- Heat naturally flows from warmer areas to colder areas unless a barrier prevents the flow.
- In cold weather, heat leaks out of a building into the colder environment.
- In warm weather, heat from the environment moves into the cooler building.

Conduction

Conduction is the movement of heat within a material from one molecule to another; it can take place in solids, liquids, and gases.

Different materials have different thermal conductivity properties (k or lambda λ values). For example, tiled/stone floors feel cold whereas a wood floor feels warm. This is because tiles and stone have a high conductivity whereas wood has a lower conductivity.

Tiles allow heat to flow better, and thus, when feet touch the tile, it feels cold. Insulation materials with low thermal conductivity resist conduction.

The lower the thermal conductivity, the better the ability of the material to resist heat transfer through conduction, convection, and/or radiation. Using a low conductivity gas in insulation rather than just air further helps to reduce conduction

Convection

Convection is a circular flow of heat within liquids or gases, in which warm air expands and moves upward, balanced by the downward movement of cooler air; convection does not occur in solids or a vacuum.

As a liquid or gas heats up, its molecules become less dense. For example, warm air rises and transfers heat upwards. Insulation can resist convection by preventing the flow of air, such as with a closed cell material that impedes air movement. Materials can affect or manipulate convection in different ways.

With open products (fiber/wool), convection cells can be set up but the fibers act as baffles to retard the air and heat flow. Closed cell product convection cells can be set up but are limited to the size of the cell.

The smaller the cell, the less efficient it is and the more difficult for the convection cell to start. In addition, the more convection cells that heat has to pass through to get from the warm to the cold side of the material, the harder it is for heat to flow.

The precise edges of insulation boards minimize air gaps and air leakage when installed. This is also known as "convective bypass," which is the movement of heat-carrying air around insulation products.

Radiation

Radiation is the transfer of heat as energy across space from one body to another. It does not need gases, liquids, or solids to take place and can occur in a vacuum. The heat from the sun as felt on skin is a form of radiation. The rate of heat transfer as radiation depends on the difference in temperature between the radiating surface and the receiving surface, the distance between the surfaces, and the emissivity of the surfaces.

Emissivity is the ratio of the energy radiated from a material's surface to the radiation from a perfect black body and is affected by how emissive a surface is. A material with low emissivity, such as the "shiny" foil facing on an insulation board, reflects a large proportion of radiation (about 95%) and reduces the transfer of radiant heat in the proper configuration where the foil and an air space are on the warm side of the insulation. Radiation happens within insulation products as well; the fibers in fiber materials radiate heat as do the cell walls in foam materials.

Measuring Insulation Performance

Three inter-related measures are commonly used to evaluate how well insulation performs:

- Lambda value (k-value) measures the thermal conductivity of a material, which reflects its inherent ability to conduct, convect, and internally radiate heat. Insulation materials have low thermal conductivity.
- R-value measures the thermal resistance of a material at a given thickness. R-value is calculated by dividing the thickness of the material by its thermal conductivity. Materials with higher R-values are better at resisting heat loss or gain.
- U-value measures thermal transmittance of an entire building element, such as a wall or roof. It adds up the thermal resistance of all the layers in the element and corrects for air gaps and thermal bridges. U-value is expressed as an inverse of thermal resistance, so the lower the U-value, the better insulated the building is. Calculating U-values is a complex process, but leading insulation suppliers can provide technical assistance for these calculations.

The best way to compare the relative performance of different insulation materials is to look at their R-values per inch of thickness, which is essentially the reciprocal of thermal conductivity—the higher the better.

RIGID INSULATION BOARD TECHNOLOGIES

There are six rigid insulation board technologies that all have different properties and advantages.

Expanded Polystyrene (EPS)

Expanded Polystyrene (EPS) is a lightweight, rigid, closed cell insulation. EPS insulation is most commonly used in structural insulated panels (SIPs) and insulating concrete forms (ICFs), and it can also be used in floors, walls, ceilings, below grade foundations (high-density EPS), and roofing systems. It has the lowest average R-value per inch of thickness of all rigid foam insulation, at R-4. EPS is the least expensive and most vapor-permeable type of rigid foam insulation material discussed here.

EPS is manufactured in a two-stage process. Raw thermoplastic polymer beads are expanded by using steam; they are then dried, aged, and cured before being placed into a mold. In the

GLOSSARY

Conduction
The movement of heat within a material from one molecule to another; it can take place in solids, liquids and gases

Convection
A circular flow of heat within liquids or gases in which warm air expands and moves upward, balanced by the downward movement of cooler air; convection does not occur in solids or a vacuum

Radiation
The transfer of heat as energy across space from one body to another

R-Value
Measures the thermal resistance of a material at a given thickness; R-value is calculated by dividing the thickness of the material by its thermal conductivity; materials with higher R-values are better at resisting heat loss or gain

U-Value
Measures thermal transmittance of an entire building element, such as a wall or roof; U-value is expressed as an inverse of thermal resistance, so the lower the U-value, the better insulated the building is

Expanded Polystyrene (EPS) Insulation
A lightweight, rigid, closed cell insulation with the lowest average R-value per inch of thickness of all rigid foam insulation, at R-4

Extruded Polystyrene (XPS) Insulation
Insulation with a uniform, closed cell structure, which provides high resistance to water penetration damage and a good R-value of 5 per inch of thickness

Polyisocyanurate (Polyiso, PIR or ISO) Insulation
A rigid, closed cell thermoset insulation that has a high R-value of 6 per inch of thickness

Mineral Wool Insulation

A fibrous insulation made up of fine, intertwined fibers rather than cells that are produced as batts or boards; mineral wool has an R-value of 4 per inch of thickness

Phenolic Insulation
A rigid thermoset material with a high compressive strength and a closed cell structure that resists air, moisture, and water vapor penetration; phenolic insulation has the highest R-value per inch of thickness of all rigid foam insulation materials at 8 to 8.5.

mold, the beads are vacuumed and steamed again. Further expansion of the beads causes their surfaces to fuse together to create a solid block or beadboard.

Extruded Polystyrene (XPS)

Extruded polystyrene (XPS) has a uniform, closed cell structure which provides high resistance to water penetration damage and a good R-value of 5 per inch of thickness. Rigid extruded polystyrene insulation is lightweight, fiber free, and available with various levels of compressive strength ranging from 25 to 100 PSI. The high compressive strength of XPS insulation board makes it suitable for high-load applications, including under slab, below-grade foundation exteriors, inside basement walls, on exterior walls over wood sheathing, and on green roofs and plaza decks. It can also be used as continuous insulation for walls. XPS is also excellent for low-temperature freezer floors, cold storage facility floors, ice rinks, and parking decks requiring a minimum compressive strength of 40 psi.

XPS insulation is manufactured through an extrusion process that involves melting together the thermoplastic polymer and other ingredients. The liquid formed is then continuously extruded through a die and expands during the cooling process. This produces a closed cell rigid foam insulation.

Polyisocyanurate (polyiso, PIR or ISO)

Polyisocyanurate foam (PIR) is a rigid thermoset insulation that has a high R-value of 6 per inch of thickness. It is closed cell, so it resists air, moisture, and water vapor penetration. It is also lightweight, fiber free, and uses a low Global Warming Potential blowing agent. Though PIR has a lower R-value per inch than phenolic insulation, it offers another option for walls, attics, and roofing.

To produce PIR, a liquid polymer-forming mixture, including the blowing agent, is deposited onto the bottom layer of facing; it then expands to meet the top layer of facing. During this expansion, the polymer reaches a tacky/adhesive phase that bonds itself to the facing. It then goes through a heated conveyor with a fixed width gap to control board thickness. After production, the insulation is still releasing heat from the exothermic reaction that created the foam, and this heat cures and sets the polymer.

Mineral Wool

Mineral wool is a fibrous insulation made up of fibers rather than cells. These fine, intertwined fibers are produced as batts or boards. There are two types of mineral wool: glass wool insulation and stone wool insulation. Mineral wool, also known as mineral fiber, has an R-value of 4 per inch of thickness. The weight of stone wool insulation can be two to four times heavier than other common insulation boards. A significant benefit of mineral wool is its fire performance, which allows applications in roofing and walls despite its lower R-value per inch and greater weight. Mineral wool insulation is made from molten glass or stone that is spun into a fiber material.

Phenolic

Phenolic insulation is a rigid thermoset material with a high compressive strength and a closed cell structure that resists air, moisture, and water vapor penetration. Phenolic insulation has the highest R-value per inch of thickness of all rigid foam insulation materials discussed here at 8 to 8.5. It is lightweight, fiber-free, and uses a low Global Warming Potential (GWP) blowing agent.

Phenolic is thinner than most commonly used insulation products for any specific R-value. Due to its light weight and high R-value per inch of thickness, phenolic insulation is primarily used in walls, floors, soffits, and rainscreen and concrete sandwich wall systems (precast and tilt-up).

The closed cells in the core of phenolic insulation are enclosed in a solid polymer matrix. To produce phenolic insulation, a liquid polymer-forming mixture, including the blowing agent, is deposited onto the bottom layer of facing; it then expands to meet the top layer of facing. During this expansion, the polymer reaches a tacky/adhesive phase that bonds itself to the facing. It next goes through a heated conveyor with a fixed width gap to control board thickness. It is then kept at an elevated temperature to cure and set the polymer.

Thermoset closed cell phenolic thermal insulation is made from rigid cellular phenol resin and is available with foil, foil-glass, and glass facers. Phenolic insulation reinforced with foil facers on both sides can be used in brick with block wall assemblies, wood or steel stud framed walls, or as a rainscreen. Phenolic insulation board can be used in buildings of Type I through IV construction in accordance with IBC Section 2603.5 and Type V construction in accordance with IBC Section 2603.4.1.4.

Vacuum Insulation Panels (VIPs)

Vacuum insulation panels were first seen in commercial applications such as refrigerators, freezers, and cold shipping boxes. The outstanding thermal performance of VIPs can provide the thinnest possible solution for a number of temperature-controlled applications. VIPs have, more recently, been seen in building applications as more stringent regulations have come into place. In fact, the US Department of Housing and Urban Development began research to evaluate the market potential for the use of vacuum insulation panels in residential buildings. The research concluded that VIPs have become a 'feasible and important' means for designing energy efficient buildings.

With an R-value of 24 per inch of thickness, their insulating performance can be five times better than commonly available insulation materials. They are usually installed between fire resistant layers. Because of their extremely high R-value per inch, VIPs can make sense in roofing applications where a lack of construction depth or space is an issue, such as in commercial low slope roofing, balcony, and terrace applications. VIPs can also be a valuable option in historic renovations, where modifications to existing roofs may be severely restricted.

To produce VIPs, a dry powder is pressed into a slab; this step also helps to remove air from the slab. The slab is then placed inside a fleece coating which protects it from dust. The slab is heated to ensure it is as dry as possible, and then it is wrapped inside a metallized polymer film facing. A vacuum chamber removes the air from the insulation panel and the edges are sealed. This product requires careful installation to ensure the vacuum integrity. The panel surface should look wrinkled. If it is smooth, this is because air has entered the panel through a puncture so the performance will not be as good.

THE VALUE OF USABLE SPACE

A lower thermal conductivity can result in thinner insulation. Therefore, the width of external walls incorporating lower thermal conductivity rigid thermoset phenolic insulation solutions can be thinner than those using comparative solutions. This facilitates internal space gains without having to increase the overall designed footprint of a building.

The valuation and investment potential of commercial real estate depend directly on the amount of usable space within a building. Properties with greater interior floor area command a higher rental return in addition to a higher overall financial value and can provide a greater ROI.

Insulation can add width to external walls, which takes up internal floor space that could be used to generate additional rental income. Reducing the width of the walls of a building, without compromising the overall footprint designed, can release space and unlock a property's full investment potential.

ANALYSIS: FINANCIAL BENEFITS OF USING PREMIUM INSULATION

Currie & Brown, an asset management and construction consultancy, was commissioned to quantify the financial benefits of insulating external walls with various types of phenolic insulation and investigate this across non-residential projects in Boston, Chicago, and Washington, D.C.

In the Currie & Brown study, there were 70,416 database buildings, 11 case studies, and 4 types of external wall constructions examined to establish the financial benefits of using a premium performance insulation. All construction data costs accounted for variances in labor and material rates between cities.

For each of the case studies, the capital expenditure uplift and return on investment of using phenolic insulation products over a comparative insulation were investigated. The same method of calculation used in the database analysis was applied to each case study, correlating the analysis findings with real buildings and real cost information.

Before diving into the wall build-ups, it is helpful to review side-by-side comparisons of various insulations and the thicknesses needed to achieve a particular R-value.

This article continues on http://go.hw.net/AR122019-5. Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.

QUIZ

1. Which of the following is a benefit of thinner, rigid board insulation with a high R-value?
   a. More internal floor area within the same building footprint
   b. Increase of leasable space
   c. Higher return on investment
   d. All of the above

2. Which of the following is true of heat loss/gain in buildings?
   a. Heat naturally flows from colder areas to warmer areas, unless a barrier prevents the flow
   b. In cold weather, heat leaks out of a building into the colder environment
   c. In warm weather, heat from the environment moves into the cooler building
   d. Both B and C

3. _______ is a circular flow of heat within liquids or gases in which warm air expands and moves upward, balanced by the downward movement of cooler air.
   a. Conduction
   b. Convection
   c. Radiation
   d. All of the above

4. _______ is the transfer of heat as energy across space from one body to another.
   a. Conduction
   b. Convection
   c. Radiation
   d. All of the above

5. _______ measures the thermal resistance of a material at a given thickness and is calculated by dividing the thickness of the material by its thermal conductivity.
   a. Lambda value
   b. R-value
   c. U-value
   d. Radiation

6. Which insulation has the highest R-value per inch of thickness (8 to 8.5) of all rigid foam insulation materials discussed in the course?
   a. Extruded polystyrene
   b. Polyisocyanurate
   c. Mineral wood
   d. Phenolic

7. In which type of wall construction is insulation used in the frame as well as on the exterior?
   a. Blockwork cavity wall
   b. Brick clad stick frame wall
   c. Brick clad steel frame wall
   d. Both B and C

8. In the Chicago Office Tower case study, mineral wool insulation was compared to _________, which allowed for thinner walls and helped gain an additional floor area of 1,660.1 sq ft.
   a. Phenolic rainscreen board insulation
   b. Phenolic cavity wall insulation
   c. Phenolic framing board insulation
   d. None of the above

9. In the Boston Office Tower case study, using phenolic rainscreen board insulation resulted in an additional $92,518 in annual rental income, with a capitalized value of space at almost $2 million dollars and a _______% return on additional capital expenditure investment.
   a. 120
   b. 220
   c. 320
   d. 420

10. Most rigid insulation board technologies provide fire performance that meets the Class _____ requirements of ASTM E 84 for smoke and flame spread.
    a. A
    b. B
    c. C
    d. D

SPONSOR INFORMATION

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SPECIFYING SUSTAINABLE CONCRETE

Presented by:

BUILD WITH STRENGTH

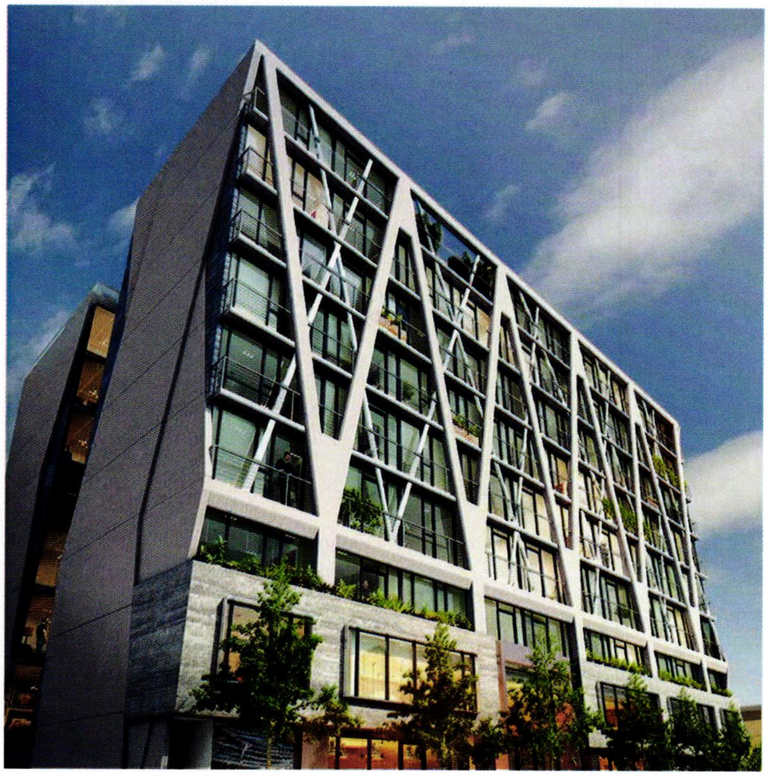

Figure 1: Rowan, San Francisco. One of San Francisco's newest and sleekest residential structures uses a giant, zigzagging concrete exoskeleton and stands out from other buildings. The exterior is for much more than show—it negates the need for interior columns, maximizing the interior space for residents. Concrete on the project used high volumes of fly ash to reduce environmental footprint.

LEARNING OBJECTIVES

1. Analyze the difference between performance-based specification and prescriptive specifications.
2. Evaluate how performance-based specifications can improve performance and lower environmental impact of concrete structures.
3. Learn how to implement performance-based specifications in projects.
4. Demonstrate the importance of balancing structural and architectural performance of concrete with green building strategies.

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AIA CREDIT: LU/ELECTIVE
AIA COURSE NUMBER: AR122019-2

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By: Lionel Lemay, Executive Vice President, Structures and Sustainability, NRMCA
Colin Lobo, Executive Vice President, Engineering, NRMCA
Karthik Obla, Vice President, Technical Services, NRMCA

INTRODUCTION

Sustainable concrete is difficult to define. There are many factors that can influence the way concrete is manufactured, designed, built, used and recycled that ultimately affect the environmental footprint of the structures built with concrete. Whether one is designing a building, pavement, bridge or dam, concrete is an important component used as foundation and superstructure, and these structures can have a significant impact on the environment throughout their lifecycle.

Design professionals can influence the performance and environmental impact of structures through effective design and project specifications regardless of the materials being used. However, concrete is unique in that it is so versatile both in terms of physical characteristics (size, shape, appearance, etc.) and mechanical properties (strength, stiffness, permeability, etc.) that design professionals can influence quantity of materials used and optimize performance, including environmental impacts, of concrete and concrete structures significantly through design decisions and project specifications. For example, using a higher-grade reinforcement and higher strength concrete for columns can reduce the section size and thereby the quantity of concrete and reinforcing steel. This results in more efficient and competitive designs, and the overall cost may be reduced.

A holistic approach is important. A focus on green construction should be appropriately balanced with maintaining (or not sacrificing) performance. Sacrificing performance may impact public safety (the intent of building codes) or require structures to be repaired or re-constructed at higher frequencies. This defeats the general purpose of sustainable development in the longer term.

PRESCRIPTIVE VERSUS PERFORMANCE SPECIFICATIONS

Specifications for concrete in construction documents establish project requirements where the contractor and material suppliers must comply. Project specifications that adhere to industry standard specifications, such as *ACI 301 Specification for Structural Concrete*, generally applicable for buildings, are supportive of performance-based criteria and sustainable concrete construction and can be adopted by reference in a project specification. However, many project specifications incorporate additional, unnecessary prescriptive requirements that contradict ACI 301 and detract from performance and environmental benefits.

A prescriptive specification imposes constraints on concrete mixture proportions or means and methods of construction. Examples of prescriptive criteria include limits on the composition of the concrete mixture such as minimum cement content, limits on the quantity and characteristics of supplementary cementitious materials (SCM), maximum water-cementitious materials (w/cm) ratio, grading of aggregates, etc.

A performance specification outlines the characteristics of the fresh and hardened concrete, depending on the application and aspects of the construction process that are necessary. These requirements should not restrict innovations by the concrete producer or the concrete contractor. Performance specifications should clearly specify the test methods and the acceptance criteria that will be used to verify and enforce the performance criteria. Performance specifications should provide the necessary flexibility to the contractor and producer to provide concrete mixtures that meet the performance criteria.

The general concept of how a performance-based specification works is as follows:

- There is a qualification and certification system that establishes the standards for concrete production facilities and the people involved.
- The design professional would define the performance requirements of the concrete for the different components of the structure.
- Producers and contractors would partner to ensure that the right mixture is designed, delivered and installed to meet the performance criteria.
- A submittal would document that the mixture will meet the specification requirements and include pre-qualification test results.
- While the concrete is being placed, a series of field acceptance tests would be conducted to determine if the concrete meets the performance criteria.
- There would be a clear set of instructions outlining what happens when concrete does not conform to the performance criteria.

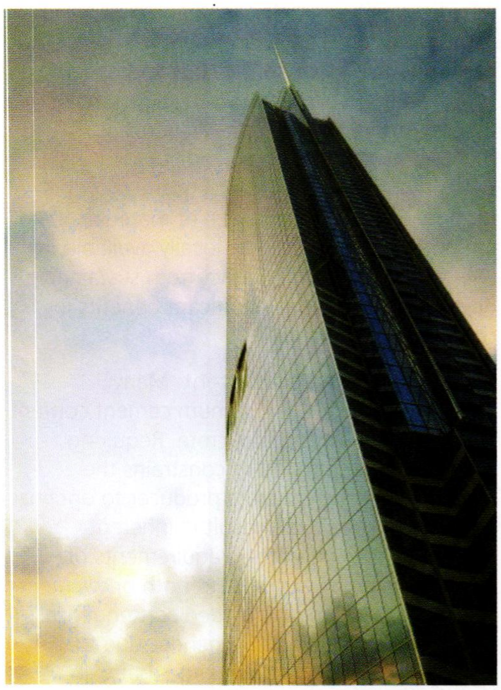


Figure 2: Standing at 1,100 feet tall, the Wilshire Grand Center in Los Angeles is the tallest building west of the Mississippi. The building uses a mixed concrete and steel structural system consisting of composite concrete and steel floors that span from an internal concrete core to perimeter concrete-filled steel box columns. Concrete for the 18-foot thick mat foundation was kept cool by circulating chilled water through 90,000 feet of polypropylene hoses that were eventually filled with grout.

The best example of a performance criterion is strength. By specifying compressive strength, a concrete producer can design a mixture to meet the strength criteria through experience and testing. The mixture proportions are not specified, just the target strength leaving the product formulation entirely in the hands of the manufacturer. It permits the producer to develop a mixture that not only meets the strength requirement but also does it economically, where cement content can be minimized or supplementary cementitious materials (SCMs) such as fly ash, slag cement or other innovative technologies can be used to reduce cost, improve performance like workability and durability and reduce environmental impact.

On the other hand, the best example of a prescriptive criterion is minimum cement content. This takes away the ability of the concrete producer to optimize concrete formulation. What is often seen in a project specification is a compressive strength requirement in addition to a minimum cement content, and very often a contradictory maximum water-cement ratio. Generally, the minimum cement content requirement is much higher than would be required to meet the specified compressive strength. This results in concrete that is more expensive (cement is the most expensive ingredient in concrete). The concrete may crack from high shrinkage or thermal effects, and the cement increases the carbon footprint of the concrete (since cement has a relatively high carbon footprint).

INFLUENCE OF PRESCRIPTIVE SPECIFICATIONS: SUSTAINABILITY, PERFORMANCE AND COST

Common prescriptive requirements found in concrete specifications and their effects on performance, including sustainability and cost, are summarized in Table 1. Most of these requirements do not support sustainability goals and often increase the cost of concrete.

The intended concrete performance can be attained without specifying prescriptive requirements. The following is a detailed discussion of how prescriptive criteria listed in Table 1 can influence performance and sustainability of concrete.

GLOSSARY

1. Portland cement—Most common type of cement in general use around the world as a basic ingredient of concrete, mortar, stucco, and non-specialty grout

1. Portland cement—Most common type of cement in general use around the world as a basic ingredient of concrete, mortar, stucco, and non-specialty grout

2. Supplementary cementitious materials (SCMs)—fly ash, slag cement, and silica fume used to increase strength, durability and workability

3. Fly ash—one component of coal ash which is used as an SCM in concrete

4. Silica fume—Waste byproduct of processing quartz into silicon or ferro-silicon metals in an electric arc furnace, used as an SCM in concrete

5. Prescriptive specification—contains detailed descriptions of what specific materials must be used as well as the installation instructions

6. Low alkali cement—portland cements with a total content of alkalies not above 0.6 percent, used in concrete made with certain types of aggregates that contain a form of silica that reacts with alkalies to cause an expansion that can disrupt a concrete

7. Slag cement—hydraulic cement formed when granulated blast furnace slag (GGBFS) is ground to suitable fineness and is used to replace a portion of portland cement

8. Global Warming Potential (GWP)—developed to allow comparisons of the global warming impacts of different gases

9. ASTM—American Society for Testing and Materials, an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services

10. LEED—Leadership in Energy and Environmental Design, most widely used green building rating system in the world

Table 1. Impact of Prescriptive Specification on Sustainability, Performance and Cost			
Specification Provision	Impact		
	Sustainability	Performance	Cost
1. Restrictions on type and source of cement	↓	↕	↑
2. Not permitting cements conforming to ASTM C1157 and ASTM C595	↓	↔	↔
3. Restriction on cement alkali content	↓	↔	↑
4. Restriction on type and source of aggregates	↓	↔	↑
5. Restrictions on characteristics of aggregates	↓	↔	↑
6. Minimum content for cementitious materials	↓	↕	↑
7. Restriction on quantity of SCM	↓	↓	↑
8. Restriction on type and characteristics of SCM	↓	↓	↑
9. Restriction on type or brands of admixtures	↔	↓	↑
10. Same class of concrete for all members in a structure	↓	↔	↑
11. Requiring higher strength than required for design	↓	↔	↑
12. Invoking maximum w/cm when not applicable or one that is not compatible with the design/specified strength.	↓	↔	↑
13. Requiring a high air content or requiring air content for concrete not exposed to freezing and thawing	↓	↓	↑
14. Restricting the use of a test records for submittals	↓	↓	↑
15. Restriction on changing proportions when needed to accommodate material variations and ambient conditions	↓	↓	↑
16. Requirement to use potable water	↓	↕	↑
17. Not permitting recycled aggregates and materials	↓	↕	↕
18. Not requiring accredited testing labs	↓	↔	↑
19. Specific limitations on slump	↓	↓	↕

1. Cement Type and source: Specifications often restrict Type (e.g. ASTM Type II) of cement or restrict use to certain sources. Unless there is a building code requirement or specific reason for durability or other property, these restrictions should be avoided. These restrictions may force the use of materials unfamiliar to the producer, require a greater over-design, cause incompatibility with other materials and/or require material to be transported a longer distance. Use of innovative products may be prevented. These restrictions do not support environmental goals and most often increase the cost of concrete.

2. Cement specification: Specifications often restrict the use of cements to ASTM C150. Blended cements conforming to ASTM C595 and performance cements conforming to ASTM C1157 are optimized for performance by cement manufacturers and often have a lower carbon footprint. These include portland-limestone cements (Type IL) and those blended with pozzolans (Type IP) and slag (Type IS). Permitting the use of blended cements supports sustainability. Cost implications are neutral. Concrete producers still have the flexibility of using additional SCMs to develop mixtures to meet the needs of a project.

3. Low alkali cement: Specifications often require the use of a low alkali cement to minimize the occurrence of deleterious expansive cracking due to alkali silica reactions. Manufacturing low alkali cements increases the use of natural resources and energy and can increase waste generation during cement manufacture. It should be noted that a recent revision to ASTM C150 has removed the option to order a low alkali cement. It is recognized that the total alkali content in concrete from the cement is more significant. Mitigation of alkali silica reactions can be accomplished using SCMs and admixtures. Requiring the use of low alkali cement will increase cost and not support environmental goals. It should be noted that alkali silica reactivity is only a concern when concrete is exposed to moisture; therefore, most concrete in buildings is not affected.

4. Type and source of aggregate: Specifications may restrict the aggregate type and require the use of a specific source—crushed vs. gravel, mineralogy, specific supplier or source, etc. This could force the use of materials that the producer may not be familiar with and prevent mixtures from being optimized for performance. The cost of aggregate might increase due to transportation. These requirements will not support sustainable development and can adversely impact performance. There may be situations where imported aggregates may be necessary. Examples include higher modulus or for architectural concrete.

5. Characteristics of aggregates: Specifications often place restrictions on the characteristics of aggregates, such as grading, specific gravity, particle shape and size. In some areas, local aggregate supplies may not comply with all requirements of referenced specifications, such as ASTM C33, but have a good history of use. This allowance is recognized in the building codes. However, when the requirements prevent the use of local materials or require use of materials that are not commonly used or locally available, it will increase cost and detract from sustainable development without significant benefits in concrete performance.

6. Limits on Cement content: Many specifications impose minimum cement content for different classes of concrete. Requiring minimum cement content constrains the innovation of the concrete producer to optimize concrete mixtures, can result in inherent incompatibility with other requirements of the specifications, such as strength or w/cm. These can result in unintended consequences, such as increased volume changes due to temperature or drying shrinkage that will result in cracking or reduced durability. It is a fallacy to assume that higher cement content results in improved durability. Minimum cement content requirements can impact cost and the environment with questionable benefits to quality, performance and durability.

On the other hand, attempts to force green construction should not set limits on maximum cement content. This could compromise constructability or performance of concrete in the structure resulting in reduced service life.

7. Quantity of SCM: Some specifications place limits on the quantity of SCMs. Often, the use of more than one type of SCM is prohibited. This prevents optimizing concrete mixtures for performance and durability. The only building code restriction is for exterior concrete subject to application of deicing chemicals. Maximum limits on the quantity of SCM increases cost and does not support sustainable development. Increasingly, projects seeking green certification impose prescriptive requirements on concrete mixtures such as minimum replacement for cement or minimum recycled content. These requirements can often impact the performance of fresh and hardened concrete properties, such as setting characteristics, ability to place and finish and rate of development of in-place properties. In the long run, this may impact the quality of construction or the service life of the structure. The implication to initial cost may be reduced, but it could cost more in the long term. Alternatives to limiting quantities of SCM to lower environmental impact are discussed later.

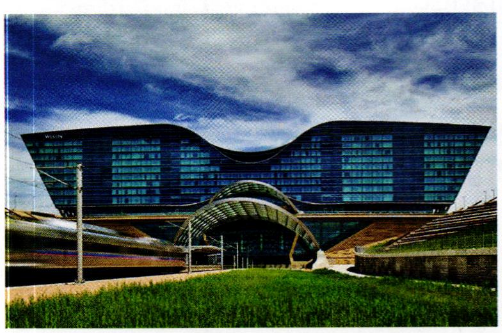


Figure 3: Denver International Hotel & Transit Center in Denver used complex mix designs including high strength, self-consolidating and lightweight concrete for the transit and hotel canopy abutments, the hotel ballroom's transfer beams and slab and the structure's sloping roof deck. Many of the walls and columns within the structure are "architecturally exposed," requiring a clean and attractive finish. Beyond being able to fulfill the project's design challenges, builders chose concrete for its fire resistance and strength.

This article continues on http://go.hw.net/AR122019-2. Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.

QUIZ

1. Prescriptive specifications impose constraints on concrete mixture proportions or means and methods of construction. These include:
   a. Minimum concrete content
   b. Limits on the composition of the concrete mixture
   c. Limits on the quantity and characteristics of supplementary cementitious materials
   d. All of the Above

2. According to the course, the best example of a performance criterion is ______, which allows the producer to design a mixture that can meet the criteria through experience and testing.
   a. Strength b. Water
   c. Height d. Air content

3. Specifications often require the use of a _____ alkali cement to minimize the occurrence of deleterious expansive cracking due to alkali silica reactions.
   a. High b. Low
   c. Medium d. Ultra-high

4. According to the course, some situations may require imported aggregates such as:
   a. Higher modulus b. Architectural concrete
   c. Both A & B d. None of the above

5. Air content requirements vary by aggregate size because the volume of paste changes. It is permitted to reduce air content when the specified strength exceeds _____ psi.
   a. 1000 b. 2000
   c. 5000 d. 2500

6. The quality of water being used to produce concrete and the provisions permitting the use of non-potable water with proper testing and evaluation is addressed in which regulation?
   a. ASTM C1602 b. ASTM 1508
   c. ICC 9876 d. ASTM C1800

7. According to the course, for a concrete mixture to be sustainable, it must meet performance requirements of the key stakeholders and meet the following criteria:
   a. Minimize energy and CO2 footprint b. Minimize potable water use and waste
   c. Increase use of recycled content d. All of the Above

8. A ________ is the investigation and evaluation of the environmental impacts of a product, process or service.
   a. Life Cycle Assessment (LCA) b. Environmental Product Disclosure
   c. ICC Report d. Responsible Sourcing

9. Under the LEED Product Disclosure and Optimization Credits, which of the following reports are verified and disclosed:
   a. Environmental Product Declarations b. Health Product Declarations
   c. Corporate Sustainability Reports d. All of the Above

10. Based on research conducted at MIT, greenhouse gas emissions due to operational energy of the building are responsible for ___________ of life cycle emissions.
    a. 20–25% b. 30–35%
    c. 60–70% d. 95–96%

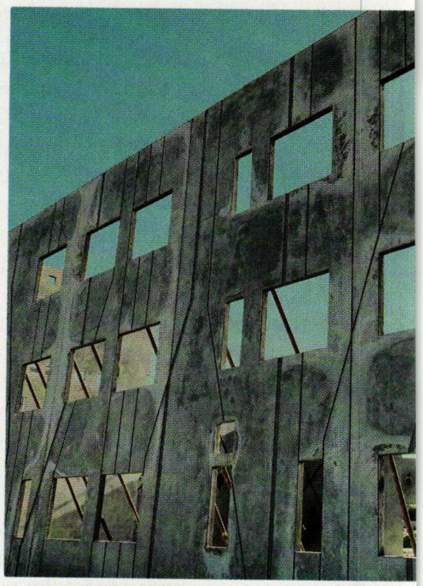
SPONSOR INFORMATION

BUILD WITH STRENGTH

Build with Strength, a coalition of the National Ready Mixed Concrete Association, educates the building and design communities and policymakers on the benefits of ready mixed concrete, and encourages its use as the building material of choice. No other material can replicate concrete's advantages in terms of strength, durability, safety and ease of use.

When nothing becomes something.

Net zero energy schools are taking off thanks to concrete.



NeoCity Academy in Kissimmee will be the first zero energy school building in Florida.

Modern and expansive. The 3 story, 45,000 square foot STEM school will provide 500 students seats.

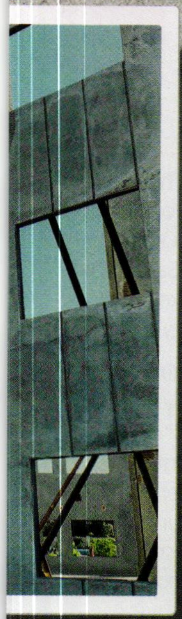
Quick and easy. The building was constructed in just 9 months using concrete tilt-wall as its primary building material.

Zero environmental footprint. Net zero energy buildings are able to generate just as much energy as they use, which is a huge win for our communities and our planet.

Unprecedented energy savings. Due to its high thermal mass, the building is expected to hit a target EUI of 16 kBtu/ft2 and save over $115,000 a year in energy costs.

What's the deal with precast concrete?

It's versatile, cost effective, quick and easy when it comes to construction and extremely energy efficient. Precast decreases sound attenuation and lowers maintenance costs while increasing a building's strength, sustainability and resiliency.




NEOCITY ACADEMY

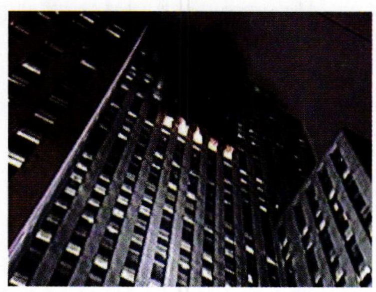
Presented by:

FIRE SAFETY IN HIGH-RISE STRUCTURES

INTRODUCTION

In 2005, a 32-storey building in Madrid was destroyed by a fire. The event was deemed "Madrid's most important fire in its history" by Mayor Alberto Ruiz Gallardon. Temperatures of the fire reached nearly 1,500°F.[1] One year earlier, on December 6, 2004, an electrical fire occurred at the LaSalle Bank Building in downtown Chicago. Here, temperatures reached in excess of 2,000°F, and the fire became the largest high-rise fire in the history of Illinois.

This photo shows the results of "leapfrog" fire propagation.



Although the fire burned for six hours, because the building was designed with fire rated construction, the fire was contained to two floors.[2]

As opposed to the building in Madrid, which ultimately was razed because of the fire, the "design of the [LaSalle] building contributed to smooth fire-fighting operations," and although the fire burned for six hours, it was ultimately contained to the 29th and 30th floors.

When fire has the opportunity to travel vertically along a structure's exterior, jumping from one floor to the next as it did in Madrid, the results can be devastating. It is necessary for stakeholders to consider the significance of perimeter fire containment, particularly as it relates to curtain wall assemblies, and understand testing requirements, procedures, and options before designing exterior curtain walls.

One of the most complex, yet least understood areas where fire can propagate is at the exterior of a building. Most often there is a non-rated curtain wall bypassing a rated floor assembly. Often, it can be difficult to determine what the code and testing requirements are for this situation.

LEARNING OBJECTIVES

1. Evaluate the significance of fire containment and the elements of life safety in fire hazards necessary to consider when specifying for the built environment.
2. Explore various standards and code requirements relating to perimeter fire containment that safeguard the public occupants of a building.
3. Examine how UL and Intertek tested and listed systems along with design best practices for fire containment ensure a safer environment for occupants.
4. Compare and contrast engineering judgements related to perimeter fire containment and fire barrier systems which contribute to the safety of occupants.

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One of the objectives of this course is to give a better understanding of how to provide life safety at that juncture. It is also important to recognize why fire containment is vital, as well as the three elements that the community uses to address life safety. Different building materials that are used in curtain wall construction and their fire performance will also be examined. The course will further cover the building code sections that set the minimum requirements for fire safety in the exterior area of the building. The critical design principles that are required for the above points to "work" will also be examined. Specifically, UL and Intertek testing systems will be analyzed as well as spandrel heights and how critical they are for successful containment. Finally, special conditions and the role of engineering judgments and why they are necessary will be discussed.

THE IMPORTANCE OF FIRE CONTAINMENT

The International Firestop Council, a trade association of firestopping manufacturers, defines fire containment, as a means "To confine a fire to the zone of origin, for a specified time, thereby preventing fire spread and leaving more time for evacuation of the building occupants. Specifically engineered containment systems are used as enclosures in instances where specific identifiable hazards within a building need to be independently isolated from the remainder of the building. Fire-resistive enclosures used for containment are subjected to fire exposure conditions specified in various related test standards."[3]

Fire containment is always important, but it becomes a complex issue in high-rise buildings where a non-rated glass curtainwall system passes a rated floor assembly.

When discussing fire containment, it is also necessary to acknowledge that the building owner has made a significant investment in a structure, which can in turn support commerce with nearby structures as well as with the surrounding neighborhood. Fire containment is important, too, in regard to the contents within a building; there might be certain assets or items that have value or cannot be replaced. However, that which is truly irreplaceable is human life. It must be asked, what is the value of one human life if design and installation of safety features in buildings are not given adequate attention?

Testing Origins

In the late 1990s, some of the earliest fire testing on exterior curtain walls was conducted by the Loss Prevention Council in the United Kingdom. Very early on, it was thought that if there was a void at the exterior of the floor slab and the interface with the exterior curtain wall, any fire-resistant material could fill the void. It was then discovered that this was not true.

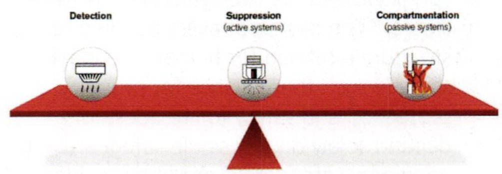
In a high rise structure, the exterior wall is typically constructed out of aluminum and glass both of which are sensitive to heat and temperature. In a scenario where mineral wool insulation is stuffed into the safing slot and a fire event takes place, in as little as ten minutes it is possible for fire to break out of the glass. Having nothing to support it, the safing will then fall out of the void, enabling fire to spread vertically through the void.

Around the same time period as the testing by the Loss Prevention Council, the U.S. was also beginning to conduct tests. One manufacturer had started to develop these fire containment systems as early as the 1960s and began to work with Underwriters Laboratory (UL) to develop a test standard that later became ASTM E2307. The manufacturer's fire containment system is one of the first tested and listed in the fire resistance directory.

The Three Elements of Life Safety

In terms of keeping occupants safe, the building community has a three-prong approach it typically uses for fire safety that is also known as the Three Elements of Life Safety:

Balancing the Three Elements of Life Safety



There are three elements that the building community uses to address life safety and required by code: Detection, Suppression (active systems), and Compartmentation (passive systems).

1. The first element is "**Detection**." Bukowski, Budnick, and Schemel define detection as "intended to provide sufficient early

GLOSSARY

Active Systems/Suppression— indicates there is an activation mechanism that must function for the system to work; most common type is sprinklers

Detection—"intended to provide sufficient early warning of a fire to permit occupant notification and escape, fire service notification, and in some cases activation of other fire protection features (e.g., special extinguishing systems, smoke management systems); both system activation (active) and notification (alarm) must occur to achieve early warning"

Dynamic—used by Intertek and UL to indicate the joint has been evaluated for movement

F Rating—the measurement of the joint and what the building code requires to continue the rating of the floor assembly; a UL rating

Fire Containment—"to confine a fire to the zone of origin, for a specified time, thereby preventing fire spread and leaving more time for evacuation of the building occupants"

Integrity Rating—the criteria for the Integrity Rating complies with the requirements for the F Rating of ANSI/ASTM E 2307 but also limits temperature rise to 325° above the starting temperature on the interior surface of the curtain wall; systems providing Integrity Rating are considered to fully contain both internal and external fire spread

International Firestop Council (IFC)—a nonprofit association comprised of key stakeholders including manufacturers, distributors, installers, and inspectors, concerns itself with "broad-based education, information, resources, affiliation, and procedures regarding firestop system selection, performance, installation and inspection to the construction and code-enforcement communities"; excellent resource when evaluating passive fire protection materials and systems and provides guidelines for writing perimeter fire containment engineering judgments

L Rating—the leakage rating, which is also not required by code; however, UL considers it to be a life safety element and is included in their listed assemblies; the L Rating measures air leakage per cubic feet per lineal foot through the perimeter joint at ambient and/or at 400 degrees F air temperature at an air pressure differential of 0.30 in. of water

Leapfrog Effect—another method of fire propagation; as a fire begins on the floor of origin, it can break the vision glass, go outside the building, and then is drawn back into the building because of the heated conditions on the floor above, re-entering the window opening on the floor above.

Passive Containment—Passive fire containment systems utilize fire-resistance-rated assemblies to contain the fire to the room of origin to allow occupants escape time. Passive systems do not have an activation mechanism; therefore, if properly designed and installed, they are guaranteed to work warning of a fire to permit occupant notification and escape, fire service notification, and in some cases activation of other fire protection features (e.g., special extinguishing systems, smoke management systems). Both system activation (detection) and notification (alarm) must occur to achieve early warning."[4] In short, having a detection system in place will alert occupants as to whether there is a danger, enabling them to either seek refuge or evacuate the structure.

2. The second is known as "**Active Systems**" or "**Suppression**." The most common type of active system is sprinklers. "Active" indicates that it has a turn on/off mechanism. It must be able to turn on for it to work. The NFPA 5000 Building Construction and Safety Code discusses the dangers of relying on only one method of safety. In regard to sprinklers and fire extinguishers, the NFPA states, "The design of every building or structure intended for human occupancy shall be such that reliance for property protection and safety to life does not depend solely on any single safeguard. An additional safeguard(s) shall be provided for property protection and life safety in case any single safeguard is ineffective due to inappropriate human actions, building failure, or system failure."[5] NFPA data further "indicates that the commonly stated reliability of automatic sprinkler systems in the range of 96% (fails once in every 25 fires) is overstating the reliability of sprinkler systems unless there are assurances that the preventative maintenance on the system is substantially better than that on the average." Overall, there is an abundance of research that suggests that total reliance on automatic sprinkler systems is not enough to prevent fire propagation. A multitude of failures are possible that can render sprinklers ineffective, which necessitates the use of all three elements of life safety.
3. The third element is known as "**Passive Containment**." "Passive," meaning that it does not have a turn on/off mechanism. If it is properly designed and installed, it is always guaranteed to work. It does not rely on something to trigger it into action. Bukowski, Budnick, and Schemel state, "Construction compartmentation is generally designed to limit the extent of fire spread as well as to maintain the building's structural integrity as well as tenability along escape routes for some specified period of time. In order to accomplish this, the construction features must be fire 'rated' (based on standard tests) and the integrity of the features maintained."[7]

Historically, it has not been prudent to have only one of the elements above in place. A balanced approach, where all Three Elements of Life Safety are employed, is best. In the event that one system becomes ineffective, this redundancy elevates the level of fire safety in the building.

BUILDING CODES RELATED TO PERIMETER FIRE CONTAINMENT

Building codes are descriptive about how to deal with life safety at the perimeter of a building. Some of the code language, however, can be confusing, making it necessary to thoroughly examine meaning and exceptions.

Section 705.8.5

Section 705.8.5, "Vertical Separation of Openings," in the 2018 IBC states:

> Openings in exterior walls in adjacent stories shall be separated vertically to protect against fire spread on the exterior of the buildings where the openings are within 5 feet (1524 mm) of each other horizontally and the opening in the lower story is not a protected opening with a fire protection rating of not less than ¾ hour. Such openings shall be separated vertically not less than 3 feet (914 mm) by spandrel girders, exterior walls or other similar assemblies that have a fire-resistance rating of not less than 1 hour, rated for exposure to fire from both sides, or by flame barriers that extend horizontally not less than 30 inches (762 mm) beyond the exterior wall. Flame barriers shall have a fire-resistance rating of not less than 1 hour. The unexposed surface temperature limitations specified in ASTM E119 or UL 263 shall not apply to the flame barriers unless otherwise required by the provisions of this code.

Exceptions:

1. This section shall not apply to buildings that are three stories or less above grade plane.
2. This section shall not apply to buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2.
3. Open parking garages.[8]

Interpretation

The code maintains that every 3 feet, there must be a 1-hour rated spandrel between window openings. However, there are three exceptions to this. If any of the three conditions are met, then this section of the code does not have to be followed.

The first exception only applies to buildings of three stories or less above grade. In reality, most buildings are three stories or greater, which means the exception does not apply. The second exception indicates that section 705.8.5 need not apply to buildings that are equipped throughout with automatic sprinkler systems. The third exception is that section 705.8.5 does not apply to open parking garages. Often times this section of the code is interpreted as a "safing only in the perimeter joint" approach and that installing a perimeter fire containment system which includes protecting a portion of the exterior wall assembly is not required. This is not the case since a perimeter fire containment system is still required per Section 715.4- Exterior curtain wall/floor intersection.

Section 715.4

Section 715.4, "Exterior curtain wall/floor intersection" in the 2018 IBC states:

> Where fire-resistance-rated floor/ceiling assemblies are required, voids created at the interior curtain wall assemblies and such floor assemblies shall be sealed with an approved system to prevent the interior spread of fire. Such systems shall be securely installed and tested in accordance with ASTM E2307 to provide an F Rating for a time period not less than the fire-resistance rating of the floor assembly. Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 705.8.5.
>
> Exception:
> Voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies where the vision glass extends to the finished floor level shall be permitted to be sealed with an approved material to prevent the interior spread of fire. Such material shall be securely installed and capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (0.254

mm) of water column (2.5 Pa) for the time period not less than the fire-resistance rating of the floor assembly.[9]

Interpretation

If there is a void created between a non-rated exterior wall and a floor assembly, then the rating of the floor slab has to be extended out to the exterior wall. This can be done by designing and installing a perimeter fire containment system in the joint that has been tested to ASTM E2307 and has demonstrated its ability to stay in place for the same hourly rating as the floor assembly.

One exception is that if there is vision glass that extends down to the top level of the floor slab, then it is permissible to choose a material that has been tested to E119 to fill that void. While this language is in the code, some manufacturers have tested systems to E2307 that have vision glass down to the floor. The recommendation is to find a tested and listed system that references the E2307 standard to install at the perimeter joint. IBC 2018 does not offer exceptions to not using this. In other words, it is compulsory. A perimeter fire containment system must be placed in the joint in order to allow more time for the occupants to escape the building and to keep fire from spreading up to adjacent floors.

It is important to highlight that a perimeter fire containment assembly is a systemized approach. Therefore, simply installing an "approved" material per ASTM E119 is not ideal since the test method does not adequately measure fire exposure on both sides of the assembly like ASTM E2307.

The E119 fire test that is performed on a fire rated wall is quite different than the testing done on a perimeter fire containment system. They are tested according to two entirely different standards. To obtain a fire rated wall, a wall is constructed and pushed up to a 10'x10' wall furnace. This wall is then tested to ASTM E119, similar to other partition, floor-ceiling systems that are rated for 1–2 hours. The furnace distributes uniform fire and temperature across the surface of the wall specimen.

This article continues on http://go.hw.net/AR122019-3.
Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.

QUIZ

1. According to the course, The Three Elements of Life Safety include which of the following?
   a. Detection
   b. Active systems
   c. Passive containment
   d. All of the above

2. Which section of the 2018 IBC code discusses Vertical Separation of Openings in detail?
   a. 705.8.5
   b. 715.4
   c. 715.5
   d. None of the above

3. Aluminum melts at which temperature?
   a. 1,050°F
   b. 1,220 °F
   c. 1,510°F
   d. 2,000°F

4. In ASTM E119, mineral wool was exposed to well above what temperature and still remained intact?
   a. 1,050°F
   b. 1,220 °F
   c. 1,510°F
   d. 2,000°F

5. Which of the following is the Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus?
   a. ASTM E119
   b. ASTM E2307
   c. ASTM E2874
   d. ASTM E118

6. Which test measures for "leapfrog" fire spread via the exterior of a building?
   a. ASTM E119
   b. ASTM E2307
   c. ASTM E2874
   d. ASTM E118

7. According to the course, which of the following qualifies as a special condition, which exists due to designers' desires to develop unique façades and building details?
   a. Short spandrel height
   b. Wide spandrels
   c. Geometry of spandrels
   d. All of the above

8. Within the UL and Intertek fire resistance directories, there are over ______ perimeter fire containment systems.
   a. 100
   b. 200
   c. 300
   d. 400

9. Per the IFC, which of the following is a guideline that pertains to making an engineering judgment in regard to a firestop system?
   a. Should be used in lieu of tested systems
   b. Should not be used in lieu of tested systems when available
   c. Can be transferred to other jobs and project locations
   d. All of the above

10. Which of the following is not considered to be a perimeter fire containment system design criteria?
   a. Mechanical attachment
   b. Horizontal Mullion Protection
   c. Compression-fitting the safing insulation
   d. Installing a smoke barrier

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How Identity Shapes Space

Following a unique path made all the difference for this designer.

Emily Pierson-Brown, ASSOC. AIA, appreciates her varied personal, educational, and professional experiences not just for what they led her to, but for how they informed her perspective. Now working as a designer and planner in Perkins Eastman's Pittsburgh office, Pierson-Brown was recently promoted to associate and is days away from becoming a licensed architect. A champion of equity and inclusion—both in the workplace and in the design process—she gives credit to her wife and her mother, two women who influence her unique point of view.

As told to Kathleen M. O'Donnell

I am the child of a single parent, and specifically, a single mother. I grew up in a household where there were never any boundaries around what I could do. My mother created a safe and comfortable space for me, and it never occurred to me until my adult life that my situation was unique, and that it had shaped my identity.

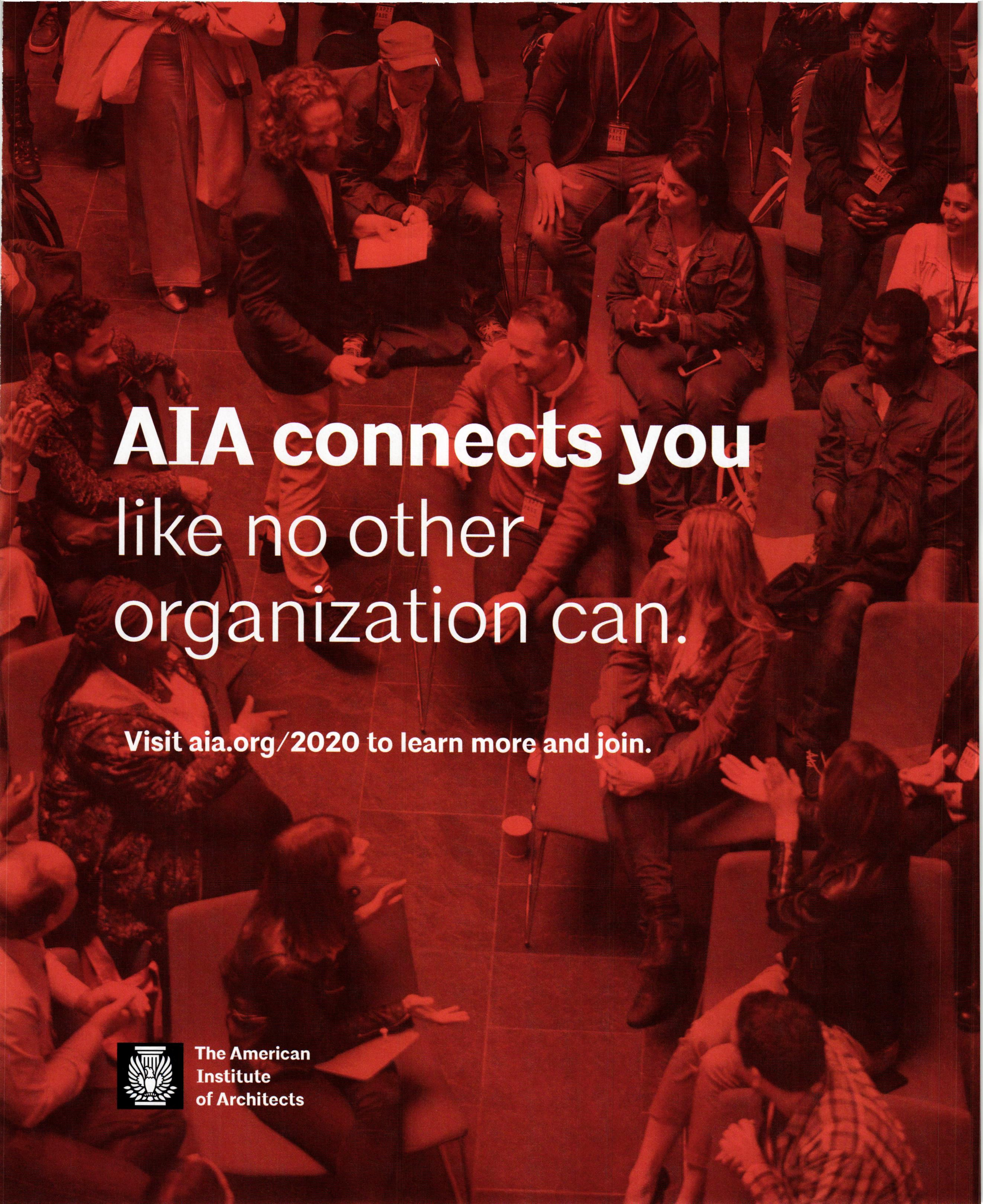
My wife is a law professor and she introduced me to the work of Kimberlé Crenshaw, who developed the concept of intersectionality. Crenshaw defines intersectionality as the framework or prism for understanding how multiple forms of inequality or disadvantage get compounded.

Crenshaw also sees identity as based on relationships. So, I can define my identity however I feel like it, but if other people don't perceive me in that way, it doesn't matter. How others relate to me and the way they perceive me is important to them and how they understand their own identities.

Because of the wonderful childhood I had, thanks to my mother's support, it really wasn't until I got to college that, ironically, I started to feel reined in by other people's imposition of identity on me. I did not have any female studio critics in my undergrad architecture classes and I couldn't figure out where the humanity in architecture was. I pursued a nonprofessional degree in architecture and studied art history.

My professional path has had many twists and turns since then. My first love was books, and I left architecture for a number of years to work at Borders. Next, I worked at a few design-build firms before pursuing a master's degree in architecture. Because I had these other experiences, I was able to bring my whole self to the program—as a gay woman, as a person who enjoys interacting with humans on different levels, and as someone who had prior knowledge of construction. I started to shift my focus more towards social justice and bringing people together in the built environment.

We relate best to people in physical space. If we miss out on being in the same room, then we lose something important about our humanity. In terms of understanding our work through an intersectional lens, we have to make sure that all of the stakeholders are at the table. AIA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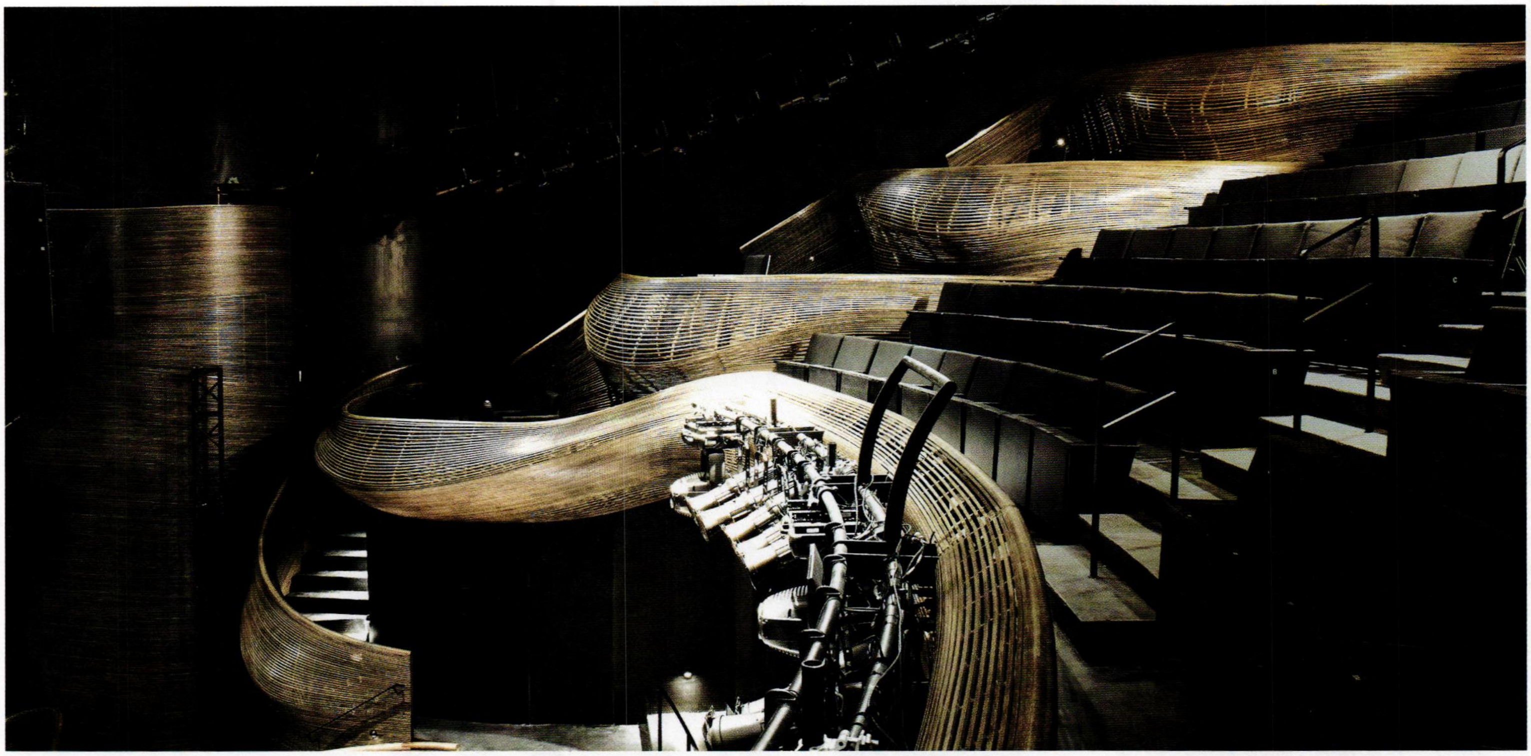


CREDIT: GREG MOONEY

At Atlanta's Tony Award-winning Alliance Theatre, a collaboration between architect, artist, and fabricator brought these handcrafted steam-bent solid oak pieces to life.

Creating New Paradigms

These two 2019 TAP Innovation Award winners exemplify new standards in design and architectural education.

By Dominic Mercier

Performative Millwork: the Alliance Theatre

For the renovation of Atlanta's Tony Award-winning Alliance Theatre—the first significant update since its founding in 1968—the design team found inspiration for a grand gesture in the work of artist Matthias Pliessnig, whose lattice-work benches made from reclaimed wood are a testament to form and physics. Working hand-in-hand, the trio of architect, artist, and fabricator upended the traditional linear project delivery process to highlight the artistry of handcrafted steam-bent solid oak pieces.

To develop a database of material behaviors, the curvatures it could achieve, and different acoustic strategies, the team leveraged a series of 1:1 mock-ups.

Achievement of the end design, a synthesis of acoustic and aesthetic ideals, required a new workflow that married handcrafted techniques with augmented reality. For the more than 100,000 linear feet of millwork slat centerlines, Trahan Architects developed new scripting techniques to provide layouts to fabricator CW Keller. The layouts all merged the artist's requirements—minimum spacing, profile shape, and more—with insights from the acoustician. The new process that emerged allowed CW Keller to bring laser scanning and projection to the site and assist with the installation of the complex assemblies.

Delivered at $350 per square foot, the theater's guardrails and balconies prove that complex, hand-driven artistry can be completed without the need for wasteful CNC templates. As economical as it is beautiful, the millwork also challenges historic notions of racial segregation by removing the buffer between balcony and orchestra seating and encourages a venue for community building and creative exchange.

Overhaul the Curriculum, Not Just a Course

After recognizing that much of the work created by students in the University of Tennessee's architecture program did not reflect many of the concepts learned in other materials and technology courses, the faculty suggested a major overhaul of the school's B.Arch. program. The school has long had a signature integration studio, pairing a design course with appropriate faculty teams leading every course, for fourth-year students. The redesign of the program's curriculum hinged on broadening that integration and introducing it much earlier than the program's fourth year.

The faculty eliminated all of the existing stand-alone courses in structures, technology, and materials, and introduced a new framework of nine half-semester courses, offering two credit hours each, that better align with the agendas of the program's second- and third-year studios. All of the new courses include blended content focused on topics such as climate, materials, and building systems, and reiterate concepts and principles throughout. As discussions around the curriculum progressed, the faculty took the opportunity to work in the school's digital offerings including digital manipulation, modeling, and fabrication to extrapolate design strategies.

After two years of planning and discussion, the curriculum was adopted with a final faculty vote in 2015. Since the start of the second-year class in fall 2016, the school has cycled through nine courses and has strengthened the existing fourth-year integration studio. By weaving together the trajectories of blended and reiterative content, the University of Tennessee has created a new paradigm for developing a sensibility in which design and technology are inseparable. AIA

AIA Feature

CREDIT: KEITH NEGLEY

Four Decades of Green Design

Over the last 50 years, a once-nascent conversation about sustainability has evolved into a full-scale priority for the profession.

By Katherine Flynn

Passive design—or design that takes advantage of the climate to maintain a comfortable temperature range—has been used to heat and cool living spaces throughout human history, but the practice saw a strong groundswell among architects in the United States in the 1970s.

The 1973 oil embargo, sweeping policy overhauls like the Clean Water Act, and the creation of the Environmental Protection Agency all contributed to the conviction of a small group of passionate and environmentally conscious architects that they needed to design differently. These architects saw it as an essential task to revive practices that could heat and cool buildings without relying on the energy-intensive mechanical systems introduced in the decades prior. In the process, much of the sustainability discourse present in the architectural profession today began to take shape.

With climate change conversations becoming increasingly urgent, sustainability has shifted from a nascent movement to a major focus. We talked to four architects—two who started their careers working on passive residential projects in the 1970s, and two leading sustainability initiatives at larger firms today—about how they use passive design techniques, how a drive for designing low-energy buildings informs their practice, and what sustainability means to them.

David Wright, Owner, David Wright, Architect, Grass Valley, Calif.

David Wright is a pioneer in the field of passive solar design, a practice he still continues today. He is also the author of The Passive Solar Primer: Sustainable Architecture *(Schiffer Publishing, 2008).*

I graduated from CalPoly [California State Polytechnic University] in 1964, and there was not a lot of concern for energy conservation in the early '60s. I joined the Peace Corps and was assigned to Tunisia, and one of the projects I worked on was a 60-unit affordable housing design for police, schoolteachers, and nurses—people who couldn't necessarily afford "good" housing. I had learned several things about some of the traditional architecture in North Africa, which used natural conditioning features—orienting the buildings properly to let in sunlight in the wintertime, and allowing breezes off the Mediterranean to cool them in the summertime. Lo and behold, the buildings worked to naturally heat and cool themselves.

I finished my stint there and was reassigned to Guinea, in tropical West Africa. My job was to design and build an agricultural junior college, 300 kilometers up in the jungle. There, I was designing for a whole different climate. I looked at traditional ways of keeping the rainfall out, making sure the breeze could blow through, and generally adapting the buildings to the climate zone.

When I came back to the U.S. and became licensed, I moved to New Mexico because I was enamored with the idea of using natural materials like adobe. I analyzed the performance characteristics of traditional adobes in conjunction with more modern materials, and with—by then—a very strong understanding of physics and the laws of nature, started developing what became known as passive solar techniques.

It was fascinating to evolve new ways of space-conditioning buildings, and when the 1973 oil crisis occurred, we went from what I call the "lunatic fringe"—people out there in New Mexico trying to figure stuff out—to what I call "lunatic center." All of the magazines, all of the newspapers, and all of the people writing books showed up to check out what was going on.

From then on, everything we did was an evolution. I got away from adobe and into super-insulated and earth-integrated buildings, especially in Oklahoma and Minnesota—but with heavy insulation and thermal mass, using all of the principals of passive solar. At the time, my staff and I all thought, "We're going to revolutionize architecture here because we're going to create buildings that are functionally formed in response to the climate, and that will become a methodology for architects all over the world to start developing their own microclimate regional-style buildings."

It's still totally fascinating to me as an [older] architect. I'm amazed at how the code [has] changed and how, today, the things that I and a couple of other guys [were talking about] in the 1970s are actually in the code now, especially in California—you have to pay attention to passive solar effects on a building, even with big buildings like the Federal Building in San Francisco.

I think, personally, passive solar–designed buildings are both very energy efficient and generally healthier architecture, buildings that are actually more comfortable because they're responding to their local climate.

Dennis R. Holloway, Owner, Dennis R. Holloway, Architect, Rio Rancho, N.M.

Dennis R. Holloway, an architect and professor of architecture, directed development of the University

AIA Feature

CONTINUED

of Minnesota Ouroboros Solar House in 1973, a pioneering alternative energy project.

In the late '60s and '70s, all of us were environmentalists. We knew about the problems with industrialization and the use of fossil fuels. When that first oil embargo became a reality, I thought, "This country needs to be independent [from fossil fuels]. And while we're at it, why don't we start thinking about alternative sources of energy?"

In 1973, [things were] really starting to look critical. There wasn't enough gasoline, and you had to wait in line. I was teaching at the University of Minnesota, and that really made me think, "Let's do something in the classroom." Because education has to be the beginning of this change.

I was teaching a large class of freshmen, about 150 students, about environmental design, and a big part of that was the energy focus of the country. So in 1973, I started a three-year project where we were going to design a house. These were freshman students who had never designed before. It was going to be off the grid. It was a really exciting time. Using the energy of freshman students who don't have a preconception about what architecture is made for really great potential. The whole class came up with a startling design proposal for a house that was off the grid, supported by active and passive solar systems, thermal mass storage, and more.

Between term breaks, I raised some money from the local electric company and leveraged the natural gas company to also match that grant—so we had $20,000 to start with. And then I used that to leverage building materials. And so, in the next trimester, we were actually constructing a house with 150 students who had not had construction experience before. We organized the work like a community. We were just going out there, and we knew what we were doing was correct. We knew that this would mean something. It was new students, all this energy, and a new problem—a new paradigm.

I've designed about 80 solar houses. My favorite was designed in 1979 in Boulder, Colo.; it's a fantastic solar house and is independent of fossil fuels. The National Solar Institute gives you about six or seven rules of thumb [for passive solar design], and I've used those now in almost every kind of building, from institutional to residential. You can, with high thermal mass and glazing facing south, make architecture that doesn't need fossil fuel for heating and cooling.

We used to talk about the user's desires back in the '70s—"user" was a new word. It was different from the client; the user was more generic. What do people need as humans? That seems to have been forgotten in the last 20 years.

Helena Zambrano, AIA, Sustainability Director, Overland Partners, San Antonio

Zambrano established the sustainability vision for Overland Partners and manages the sustainability group there. She is a member of AIA's Committee on the Environment (COTE).

I studied in Mexico at the University of Monterrey. It's a small campus at the base of the mountains, elevated from the rest of the city. When I started, classrooms didn't have air conditioning, but the buildings were arranged to catch the breezes from the mountains. They were very comfortable buildings, just by using passive strategies.

As the campus grew, the new buildings were blocking the buildings in the core. At that point, they introduced air conditioning. But that raised my awareness of the design of the built environment.

After graduation, I decided to focus my education on sustainable design with a master's in environmental building design from the University of Pennsylvania. I learned building performance simulation, energy modeling, daylight modeling, and computational fluid dynamics.

Daylighting is one of my favorite parts of architecture because it's really important for environmental design. It's one of the cheapest strategies that have the biggest impact on health and happiness. It's also beautiful. It's something that you can design—it's different than energy efficiency in that sense.

In the daylighting design process, as well as in environmental design, I like to start by looking at the available resources on-site. How can the architecture leverage those environmental resources? Environmental loads should be addressed through architectural elements and passive strategies, rather than relying on mechanical systems.

After figuring out the right strategies and conceptual design through climate and site analyses, I use metrics to optimize design. For daylighting, daylight availability is a metric that allows me to test the overall annual performance. However, daylighting design is dynamic in nature, and point-in-time illuminance is a metric that helps me understand the seasonal performance of different design elements. Both daylight autonomy and point-in-time illuminance map the available direct and indirect light falling on an analysis grid from a light source, in this case, the sun.

Finally, post-occupancy evaluations (POE) are critical to evaluate our design assumptions, optimize operational issues and learn about occupant satisfaction of the space. POEs allow us to document lessons learned and apply those lessons in our next building.

Arathi Gowda, AIA, Associate Director, Skidmore, Owings & Merrill, Chicago

Gowda is an associate director at Skidmore, Owings & Merrill and a member of AIA's Committee on the Environment (COTE).

During my career, sustainability went from a "nice to have" to an imperative. We have reached a limit to our resources, and while that presents challenges, it motivates a necessary revolution which will let us fundamentally reposition our entire economy.

Environmentalists and many of my mentors were fighting the good fight in the '70s and '80s, when it just seemed like a world of plenty. I'm thankful for the early leadership from many, many people in the environmentalist movement who said, "Hey, we need to plan for the future."

I graduated from Carnegie Mellon in 2002, and even at that time there was a dialogue around sustainability. There was a cohort of professors who studied in Germany and taught a return to passive design techniques that architects historically practiced, but lost with the advent of technical solutions like air conditioning. To design more passively, we need to understand things like sun, wind, and light.

As a young architect, one of the first people I worked with in Chicago was Howard Alan. He was an early leader in passive design, and he was talking about renewable [energy] when people were slamming the door in his face. There was a moment in the late '70s when oil and gas prices spiked, where people were listening. He paved the way for what we are seeing today.

I'm a leader of our performance team at SOM, and we use a lot of analytical simulation, paired with our MEP [mechanical, electrical, and plumbing] team. My team is half engineers and half architects, and I think that's really important for the group because with the complex buildings we work on, often a technical solution builds on top of a design technique.

I started my career almost 17 years ago [at SOM], a firm that has always been a champion of sustainable design thinking. What was once a passive discussion is now an active one; our collective priorities and goals have changed.

Our clients want sustainability. Without question, it must be present in our work. The sustainable revolution is very exciting, despite the eco-anxiety that I and others focused on sustainability feel. We must stay focused, use what we know, and champion the solutions we've developed. Luckily for us, there is a groundswell of support. AIA

AIAFuture


CREDIT: TOM GRIFFITH

LMN leveraged its in-house fabrication capabilities to show how stage lighting, house lighting, acoustics, AV, and fire protection could combine at the Voxman music building at the University of Iowa.

Is a Fab Lab In Your Firm's Future?

In-house fabrication is allowing firms to work smarter, cheaper, and faster.

By Katy Tomasulo

For Seattle's LMN Architects, and many firms like it, in-house fabrication had humble beginnings: in principal Scott Crawford, ASSOC. AIA's garage, where he and two other team members set up a CNC machine and tested how such tools could benefit the firm's approach to design. A few years later, both team expertise and management buy-in grew, and the architecture firm now supports a full-fledged fabrication studio in the basement of its downtown office building, an operation that has become central to the firm's design process.

Though some architects shy away from in-house fabrication—which may include using CNC machines, woodworking equipment, 3D printers, and other tools to create models, prototypes, and full-scale mock-ups—whether due to lack of knowledge, concerns about budgets, or fears of alienating contractors and fabricators, more and more are recognizing the possibilities that those capabilities can bring in the form of clearer communication and collaborative visualization.

"Having people in the office make things helps them understand how those things go together," says LMN partner Sam Miller, FAIA. "Testing things at a larger scale changes the dialogue with fabricators and contractors. It's no longer looking at a design idea; it's looking at a fabricated object. That changes the dynamic of the conversation in a great way."

Open Communications

Just as a picture is worth a thousand words, having a physical mock-up can bring clarity to a designer's vision for all parties, from contractors to project owners, as well as help ensure that vision properly comes to life.

"You're having conversations about something real," Miller says, noting that the two-way discussion provides real-time feedback on possible constraints and preferences, which they can then use to adapt the design to make it faster, cheaper, and easier to install. "It's a dialogue between the people building and the people designing to optimize for all conditions."

Fabrication helps everyone on the team understand the core design challenge and have a voice in its resolution, says Parke MacDowell, AIA, fabrication manager and associate at Payette in Boston. The firm's operations include a model shop situated directly on the floor of its 175-person studio, as well as a satellite space with larger equipment such as a CNC machine and welding and woodworking tools.

"Making clarifies ideas. Clear ideas expedite decisions. Decisions move projects forward," MacDowell notes.

He points to an owner/contractor/architect meeting where the team struggled to resolve the installation procedure for an unusual cove lighting detail. The Payette team left the meeting, headed to their shop, and returned the next day with a full-scale prototype that immediately resolved the impasse. "A physical object is something everyone can understand," he says.

The impact is powerful for details both small or large, simple or elaborate.

LMN leveraged its capabilities to address extreme complexities in the design of the University of Iowa Voxman School of Music building, using 3D parametric modeling to develop the main performance hall's suspended ceiling. The ceiling's 900 panels, in which no two are alike, integrate five separate functions—stage lighting, house lighting, acoustics, audiovisual, and fire protection. LMN was able to provide the 3D model for the fabricator to build from, providing a walk-through of the fabrication logic and showing how the material could best be used while maximizing available sheet sizes.

Along with ensuring an accurate interpretation of the design vision, the process can help build trust with the fabricator, Crawford says, "by having a conversation around those built pieces rather than just renderings."

Max Jarosz, formerly with Höweler + Yoon Architecture and now the manager of the Fabrication Lab and Model Shop at the University of Miami, agrees, noting that if firms have the same equipment as fabricators, they can use that expertise and language to show how certain tasks and design elements can be accomplished, particularly if the firm has a more advanced digital skill set.

Payette saw this firsthand when using in-house fabrication to mock up a pedestrian bridge for Northeastern University. The weathering-steel structure features vast overlapping plates that dissolve into a perforated pattern. The team's in-house experience welding the mock-up gave them a unique perspective of the limitations of the fabrication process behind the finished product. "We can provide added value by recognizing both the constraints and opportunities known best by the builder and the aspirations and client needs best understood by the architect," MacDowell says.

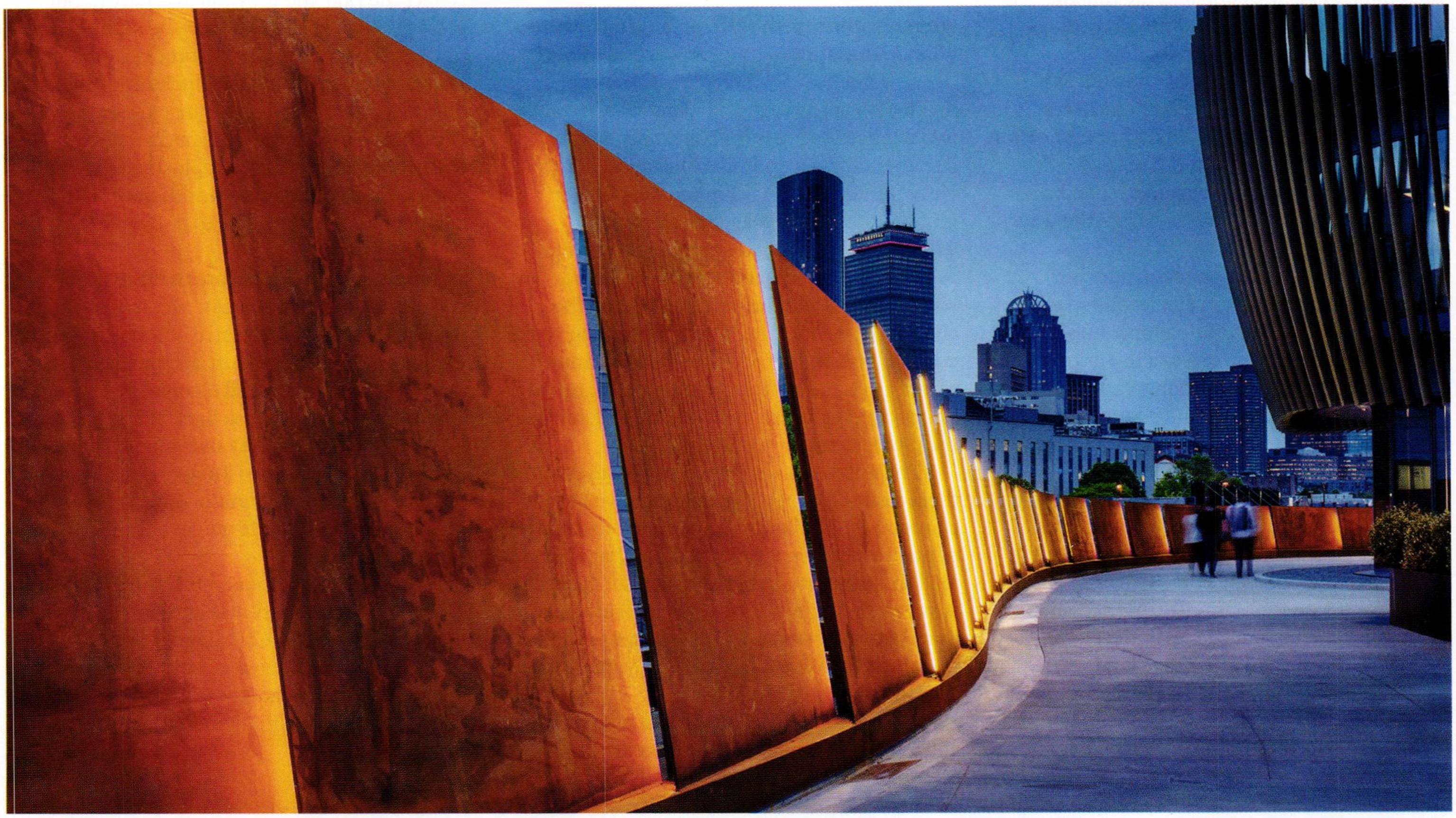
A hospital project in China challenged Payette to design patient rooms with ample gathering space for visitors and plenty of natural light while mitigating negative solar gain. The team designed the 2,500 patient rooms with "window boxes" that provide an alcove of seating along with solar shading. Payette fabricated a 12-foot-by-10-foot full-scale mock-up of the window box, and when the global design team assembled in Boston, they understood the concept immediately. "This is something that was really facilitated by having fabrication in-house," MacDowell says, noting that the $25,000 cost to fabricate such a large piece was well worth the clear communication and assurances the process reaped.

The architects note that in-house fabrication often contributes to a project's sustainability story by ensuring that designs are achievable, thereby reducing rework. Working through the manufacturing details also helps determine how best to maximize materials, such as sheet goods, to cut back on waste.

Maximizing Investment

Implementing a fabrication studio requires buy-in across the board, from leadership to

By using full-scale modeling when designing the pedestrian bridge for Northeastern University, Payette was able to interpret the design from the standpoint of the welders and fabricators.



CREDIT: WARREN JAGGER

AIAFuture
(CONTINUED)

associates, as well as an overall cultural shift that recognizes the value such efforts can bring to encourage use.

It's important to consider the long-term return on investment. While there are upfront costs (as well as fabrication expenses that may or may not be passed along to the client), those outlays must be weighed against potential savings brought by potentially shaving weeks off the design process, avoiding mistakes, eliminating rework, and getting customer buy-in.

Don't think about monetization, Miller notes; that's not the primary goal. "The goal is to change how we work, and this is a part of that."

To encourage adoption by associates, MacDowell recommends keeping things front and center. "Document it, share it, and put it in a place where people can see it," he says.

Often, the efforts start with a core group of people who recognize the potential and get excited about it, creating a grassroots movement that hopefully builds into cultural change.

"Look at it less as a production space and more as a place to go explore our designs," Crawford says. "You have to reconceptualize. It's not just something overlaid onto the process. ... The greatest benefit comes when design teams themselves are experiencing what happens in the shop and the making of these things; then they internalize things more readily."

Management also should consider the recruitment benefits. Many students have access to CNC machines and digital fabrication technologies in school, but not at most firms, Jarosz says. For new grads, it can be intimidating to not be able to design the way they're used to.

Keep in mind that you're introducing giant machines and often dangerous specialty equipment. Just like a fabricator, contractor, or manufacturer, make safety a top priority. Implement a training curriculum and institute protocols for who can run the equipment, how that equipment can be used, and how it is locked away when not in use.

LMN, for example, has a day-to-day shop manager plus a crew of about a dozen staff members who are trained on all equipment in addition to their design work. They serve as ambassadors on their projects, noting when something can be mocked up in the shop. They then have the authority to make it happen.

It's a fitting approach to a changing profession. "It's not about tools and equipment, it's about design culture," MacDowell notes. "The hands-on exploration of shapes, textures, and details is a critical part of our process." **AIA**

AIAPerspective

CREDIT: GREG POWERS

Well Done Is Better Than Well Said

Never separate the life you live from the words you speak.

As I look back at 2019 and ahead to 2020, two words come to mind: optimism and impatience. I am optimistic because, in my view, our profession is limited only by our imagination in the years ahead, and our willingness to accept and embrace our role as leaders. I am impatient because we no longer have the luxury of time to meet the challenges we face, including improving social equality, expanding economic opportunity, adapting to and mitigating climate change, and embracing equity, diversity, and inclusion in the profession.

The good news is that we are focused on these issues like never before, and we have a unique set of talents and a demonstrated passion for the built environment that will help lead to a more equitable, compassionate, and sustainable society. But we should remember that success in any one of these areas requires a sustained focus on all of them, because they are as interconnected as we are.

After all, the focus on environmental stewardship isn't just about reducing the environmental impact of the built world. It is ultimately about ensuring that everyone has access to structures that protect their health, safety, and welfare in a rapidly changing climate, regardless of their socioeconomic condition, race, gender, or the hemisphere in which they live.

Success requires that the people in the design studio who create those structures reflect the rich and growing diversity of our society. Success requires that the path—from undergraduate to seasoned professional—will mirror 21st-century values, including efficiency, diversity, inclusivity, and transparency. Ultimately, for architecture and architects to thrive in an ever more sophisticated, diverse, and challenging world, the creativity, perspective, talent, and leadership of everyone will be essential.

Together, we can ensure that the next generation of architects can accomplish what we can't even conceive of today. I want them to see our profession as being central to advancing positive social change. I want those who will follow us to look back and say that we did our best to live by the values that we espouse. I want them to know that we lived by the words of the late Senator Paul Wellstone: "Never separate the life you live from the words you speak."

I am optimistic about our future because I see how this profession is working to successfully meet the challenges of our time. Our successes and commitment today reinforce my faith that there is nothing we can't do, and there is no problem that we can't solve, together. **AIA**

William Bates, FAIA, 2019 AIA President

“Imagine if the Folk Art Museum had been left standing, forcing the museum’s big glass curtain wall do a detour around it. How genre-busting would that be?”

The Missed Opportunities of MoMA’s Expansion by Karrie Jacobs

When I visited the newly expanded Museum of Modern Art in New York for the first time, during its October press preview, I arrived with baggage. I've been angry at the museum ever since it tore down the American Folk Art Museum, designed by Tod Williams, FAIA, and Billie Tsien, AIA, to make extra room for the expansion. When I'd last given the matter serious thought, nearly six years ago, MoMA's director, Glenn D. Lowry, and the project's standard-bearer, Elizabeth Diller, were doing their best to persuade an incredulous cultural community that the much smaller, one-of-a-kind museum had to be demolished to make room for more art and to support an optimized circulation pattern within the addition. At the time, I found it unsettling that a museum I'd loved my whole life had morphed into a rapacious engine of development.

My first visit to the newly expanded MoMA did little to counter that feeling. At the press preview, the galleries largely empty of visitors, I concluded that it had become a better museum but a worse building. I welcomed the new curatorial approach but found the architecture—despite moments of high-ceilinged grandeur—amorphous and bland, both inside and out. Then I returned a few weeks later, when the galleries of the new museum, designed by Diller Scofidio + Renfro in collaboration with Gensler, were crammed with visitors. And I came to a somewhat different conclusion.

I remained enthused about how the various media and disciplines were newly intermingled, paintings sharing wall space with film; works from across a broad spectrum—including architecture and design—cohabitating in galleries organized by cultural themes. But now, in part by watching my fellow visitors make their way through the revamped museum, I came to appreciate aspects of the architecture as well: especially the unexpected visual connections and cutouts between floors, between the new wing and the old.

Later, as I walked the perimeter of the museum, west on W. 53rd Street, then east on W. 54th Street, I found myself thinking, *What is a work of architecture?* The museum's curators, in their full embrace of 21st-century intersectionality and ambiguous boundaries, had scrambled my sensibilities and left me with this slippery question—one that the architects had seemed unable to answer.

A History of Expansion

Like every New Yorker, I think of the MoMA I first visited as a child as the original. In reality, it was itself the product of several major expansions. The museum's first true home was the W. 53rd Street townhouse it borrowed from the Rockefellers in 1932, before it commissioned its own building, still the most emblematic one, designed by Philip L. Goodwin and Edward Durell Stone in vintage International Style and completed in 1939. It was expanded in the 1950s and again in the early 1960s, both times by Philip Johnson. Johnson, of course, was responsible for the sculpture garden which, together with the Goodwin/Stone façade, are the signifiers for MoMA as a place (not to be confused with MoMA the institution).

MoMA's new entrance on W. 53rd Street

The expansions that happened more recently, in my adult life, were a mixed bag. MoMA's westward march began in earnest with a César Pelli–designed addition—completed in 1984 and topped with a 52-story condo tower—that doubled the museum's size. It was widely panned for its central escalators that transformed the museum, critics said, into a shopping mall. Paul Goldberger, HON. AIA, writing for *The New York Times Magazine*, tread more lightly in his critique. He noted that the glass-clad addition "exudes a contented, self-satisfied air." It was a signal, long overdue, that modern art was the establishment, not the avant-garde.

At the time, I'd just arrived back in New York City after nearly a decade on the West Coast and I found the expanded museum thrilling. I was broadly interested in visual culture back then but was not so particular about architecture. The updated museum gave me more of what I wanted: eye candy.

By the time the next westward expansion, designed by Yoshio Taniguchi, HON. FAIA, opened in 2004, I was well attuned to the building itself. While I was appreciative of the added gallery space, particularly the new galleries stocked with contemporary art, I found the redesigned museum to be unpleasantly huge—252,000 additional square feet, the size of more than two Walmarts—and disconcertingly loud. The addition somehow transformed the museum into a subwoofer, amplifying visitor conversations into a deep, steady roar. (At one point in the Taniguchi era, I

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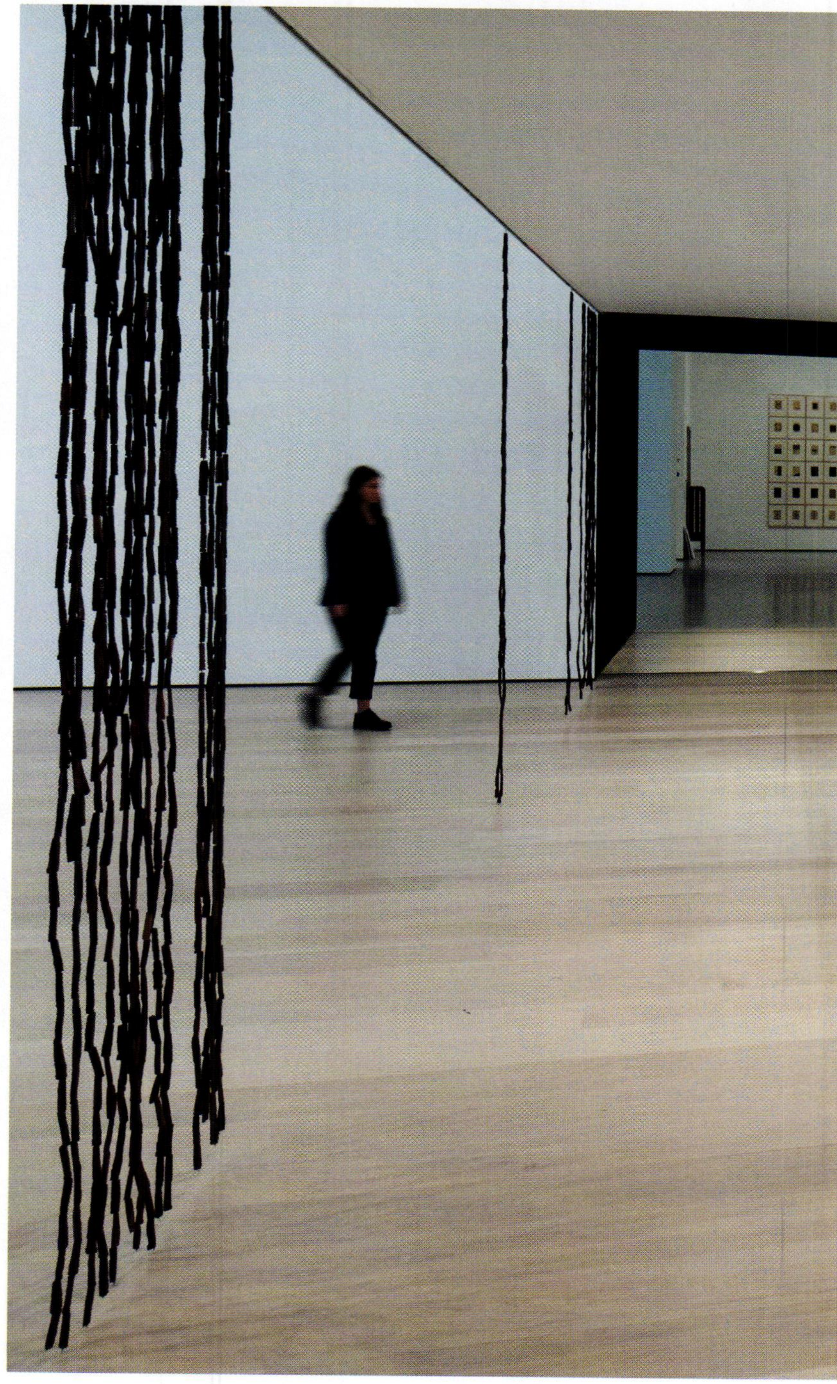


found myself having lunch with the museum's director and suggested to him that MoMA should hand out noise-canceling headphones to visitors.) As for the architecture, it felt like an homage to Modernism—the equivalent of a historic museum building a faux-historic addition. The museum had grown in size and, perhaps, in ambition, but not in vision.

The newest expansion takes MoMA most of the way west on its block of W. 53rd Street, into the lower reaches of a Jean Nouvel, HON. FAIA–designed condo tower. From its origins near Fifth Avenue, it has spread across nearly the entire block toward Sixth Avenue, where its further expansion is—presumably—blocked by a 40-story office tower. After the Folk Art Museum, which opened in 2001 on W. 53rd Street, went bust a decade later, MoMA purchased the small building—40,000 square feet with a 40 by 100 footprint—and faced a public outcry when it announced plans to demolish it. The museum hired DS+R to do a circulation study for what they'd begun referring to as a "campus." To no one's surprise, the firm determined that the Folk Art Museum couldn't possibly fit into the new scheme. Its floor plates didn't line up with MoMA's, its architectural style was more detailed and less stereotypically modern, and the building was, as Diller put it, "obdurate."

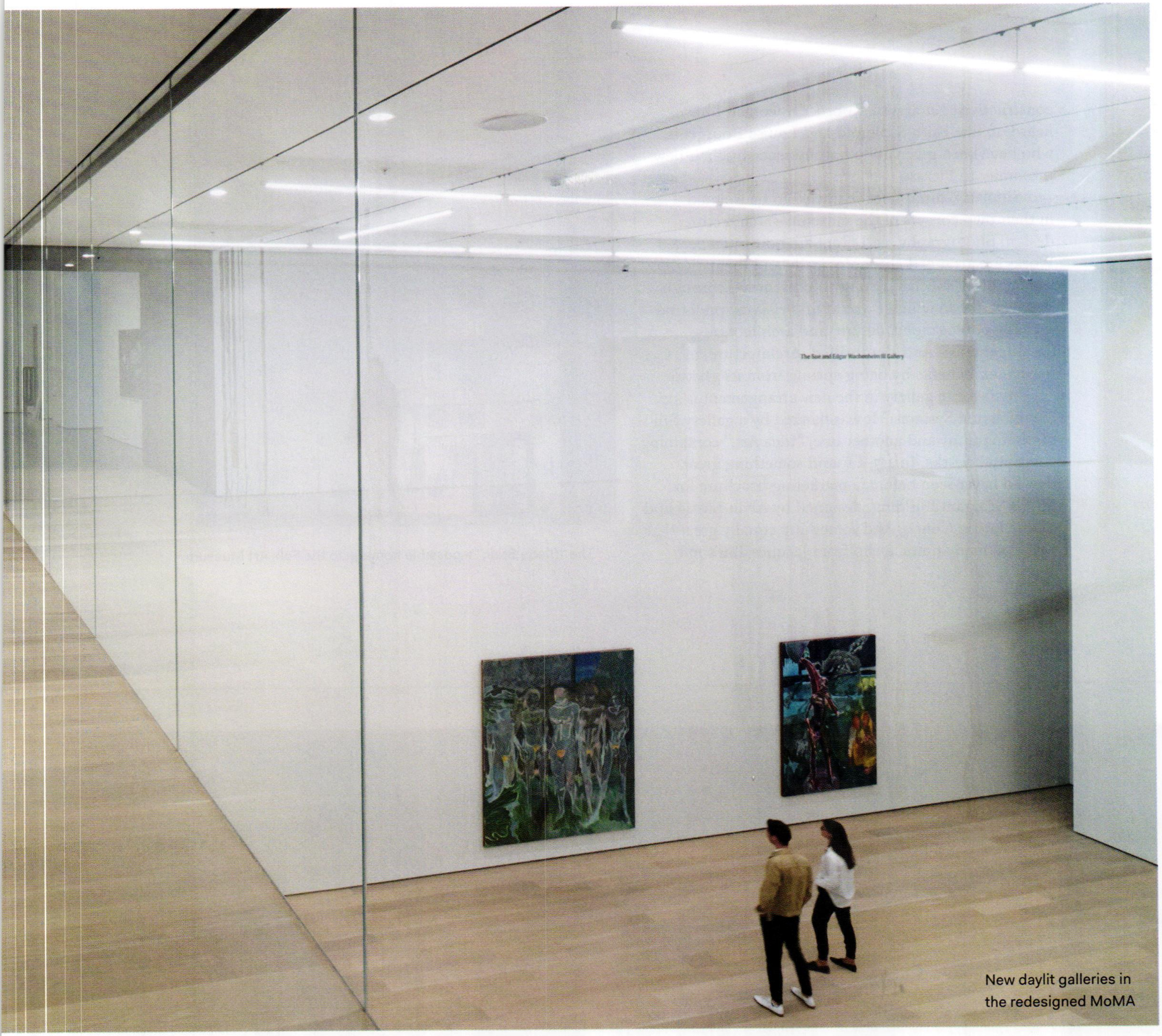
Sometime in 2013, while DS+R was studying MoMA, I interviewed Williams and Tsien and asked them about the Folk Art Museum. "I should tell you that this was also a labor of love for the people who were building it," Williams told me. He explained that he'd brought the construction workers on a field trip to the Cooper-Hewitt National Design Triennial to help immerse them in design culture. The message Williams wanted to send was, "This is not just any piece of work. We want you to give your best, because it's something you'll leave behind."

That's not how it turned out, of course. In early 2014, Diller spoke at a public forum and presented circulation diagrams for the expanded museum that she said demonstrated the impracticality of preserving the Folk Art Museum. I was unpersuaded. While it was clear that the floors couldn't be made to line up, I thought that MoMA should have kept the building and used it as a satellite for special exhibitions or projects, much like PS1. But the desire to have a flawless, loop-shaped circulation pattern overrode that possibility—that preserving such a significant work of architecture might make MoMA an even better museum.

Most of what I believe about modern art, the canon, is based on my repeated visits to this very museum. What MoMA has done with this renovation is extended—or exploded—that canon.

Exploding the Canon

When I first set foot in the newest MoMA, I had no idea where, exactly, I was supposed to go. I was



New daylit galleries in the redesigned MoMA

IWAN BAAN; COURTESY MOMA

unsure whether I could still use the pathways I'd established after the Taniguchi expansion. What I really wanted to do was find the addition, the three floors of galleries known as the David Geffen Wing. Fortunately, I was handed a map when I walked in the door, and I used it ... a lot.

The circulation path through the new galleries felt more wobbly than I would have expected given the bold, red line Diller showed in her 2014 presentation. Occasionally, unexpectedly, I'd hit a dead end. But I didn't mind. Most of what I believe about modern art, the canon, is based on my repeated visits to this very museum. What MoMA has done with this renovation is extended—or exploded—that canon. Yes, there are very familiar works on display: Hello Jackson Pollock! Hello Henri Rousseau! And Monet's Water Lilies have a strangely inert—think hotel conference room—dead-end gallery all their own. But much of what's on the walls is new to me. There are artists, many of them women, I'd never heard of, including Polish constructivist Katarzyna Kobro. Or women I have heard of, like Faith Ringgold and Louise Bourgeois, who have been given added prominence by their new proximity to Picasso.

Similarly, disciplines that used to be isolated in their own corners of the museum—architecture, design, photography, and film—are now interspersed. Works are arranged chronologically and thematically, instead of by specialty. So my old pathways through the museum, in which I would first visit my preferred realms—photography, design, and architecture—no longer exist. And I'm thrilled. Architecture, in particular, benefits by being sprung from its ghetto.

My favorite gallery in the new arrangement is 417, "Architecture Systems." It was flanked by a gallery full of photography and another one, "Idea Art," containing conceptual works. In 417, I found something great that I'd never seen before, a marketing brochure for Mies's Seagram Building, designed by Alvin Lustig and Elaine Lustig Cohen. And something equally great that I've seen many times, a clip from Jacques Tati's 1967

The "Blade Stair," a possible homage to the Folk Art Museum

IWAN BAAN; COURTESY MOMA

masterpiece, *Playtime*, best described as a parody of Modernism. Indeed, my favorite thing, architecturally speaking, about the revamped exhibition scheme are the screens that appear to be seamlessly embedded in the gallery walls, so that a film by Tati, or a 1945 dance film by Maya Deren and Talley Beatty, can occupy wall space as if it's simply another painting. (It's also a major plus that an acoustic consultant has helped dampen the building's irritating din.)

Still, the museum has become one of those buildings—like a major airport terminal—that you can't exactly see from the outside. Yes, it takes up nearly an entire block of midtown Manhattan, but as it's grown, it's become less distinct. Yes, the 1939 International Style building at 11 W. 53rd St.—an early experiment in maximizing the use of glass—remains an icon. But it's sandwiched by museum additions in black glass that more or less blend into the overall midtown aesthetic. The museum's new entry features a matte black façade with a 95,500-pound steel canopy, an elegant move that could just as easily be the entrance to a hotel or a corporate office. The portion of the Nouvel tower that houses new galleries meets the street with remarkably little fanfare. What drama exists stems from a view downward from the sidewalk into an expanded museum store, which gives off a seductive golden glow and might appear to passersby to be the focal point of the building. (The Nouvel tower, which should be fabulous, given its height and muscular diagonal ribbing, is wasted on a side street; you have to crane your neck to see it.)

A Missed Genre-Busting Move

If Taniguchi's addition was too deferential, too beholden to the timeworn conventions of Modernism, the DS+R design is weirdly postmodern in that it isn't a specific architectural object, but rather a process, a sequence of conduits and connections. Diller, on the firm's website, describes the project as "incorporating the Museum's existing building blocks into a comprehensible whole through careful and deliberate interventions into previous logics." She adds, "This work has required the curiosity of an archeologist and the skill of a surgeon." I think what she's saying is that almost everything that matters, architecturally speaking, is inside.

One aspect of the museum that the architects feature on their website is the "blade stair," a vertical passageway that "marks the threshold to the new expansion of the museum and acts as a palette cleanser." While this staircase actually sits within the envelope of the Taniguchi building, it appears to me to be a subliminal eulogy to the Folk Art Museum, which famously was designed so that its stairways doubled as galleries. I'd like to think that this minimalist staircase, situated so that it's visible from the street, at least at night, is a memorial one architect has left to the work of another.

Immediately west of that staircase, on the former footprint of the lost museum, is an interlocking stack of galleries intended for performance art and other works that don't fit easily into the flow. This includes the Marie-Josée and Henry Kravis Studio, an industrial-looking double-height space equipped with a sound booth, currently occupied by an endearing 1970s sound sculpture called Rainforest V. It's a nice gesture, but it prompts a question: If you're going to set aside a special set of galleries that, in a subtle way, honor the distinctive, eight-story building that was razed to improve the circulation pattern of this mammoth museum, why demolish the building at all? Imagine if the Folk Art Museum had been left standing, forcing MoMA's big glass curtain wall do a detour around it. How genre-busting would that be? Certainly that block of W. 53rd Street would benefit by being a little less homogeneous. And an interruption in the unbroken expanse of MoMA might have furthered the curators' penchant for "fluid, interconnected narratives" and advanced their current enthusiasm for illuminating contrasts. Before you even walked under its new canopy, MoMA could have imparted a lesson that the 21st century insists on teaching us: No matter how hard you try to erase it, the past never truly goes away.

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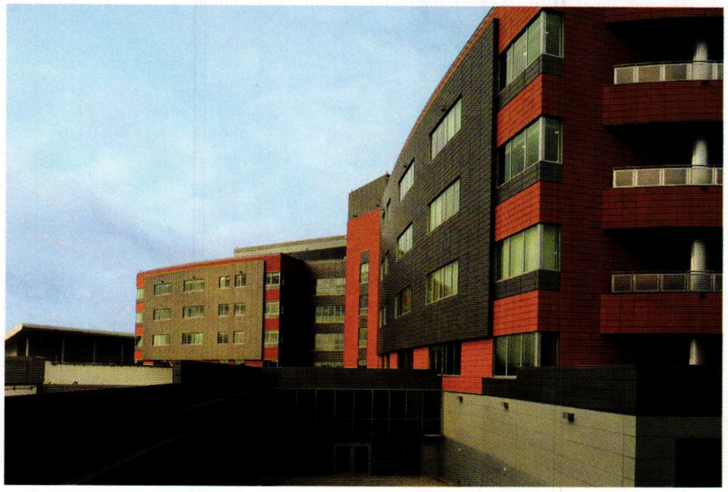

It's not a black-and-white world. That's why architects and specifiers should cheer the news that the world of continuous insulation (ci) is about to expand. For building projects that demand outstanding comfort, occupant safety, and sustainability, a new generation of mineral wool ci boards offer even more ways to express creativity without compromising envelope safety and performance.

No one is more delighted about the news than Owens Corning Commercial Building Systems specialist and registered architect Tiffany Coppock. She understands the difficulties architects often face in designing rainscreen or cavity wall systems that meet code, design intent, and owners' expectations.

Mineral wool ci is a pro favorite because of its outstanding hydrophobic and UV-resistance qualities, along with its legendary fire resistance. Case in point: the Museum of the Moving Image in Astoria, N.Y. Mineral wool was exposed to three seasons of rain, sleet, snow, wind, and sun before the cladding was installed. The mineral wool panels emerged virtually unscathed, a remarkable outcome. "It highlights the abilities of mineral wool ci versus other insulation types," Coppock says.

HIGH COMPRESSIVE STRENGTH

"High compressive mineral wool ci has the same hydrophobic and UV-resistance qualities," explains Coppock. "High compressive strength allows builders to install the cladding system completely separate from mineral wool ci. Lower compressive strength mineral wool ci requires the cladding attachment system to be installed first. Mineral wool insulation is then added later around the girts, clips, rails, or channels before cladding is secured. High compressive strength means mineral wool boards are installed prior to and independent of the cladding attachment system. The only ci thermal bridges are cladding attachment fasteners," explains Coppock.

Owens Corning has added three new high compressive strength continuous insulation products to its Thermafiber RainBarrier* Insulation portfolio. These new high compressive mineral wool ci boards are part of a product series called Thermafiber RainBarrier ci High Compressive and are designed to be used in continuous insulation applications where both the cladding and the cladding attachment are fastened outboard of the mineral wool insulation. Using ThermaCrimp* technology, these new products offer the highest compressive strength mineral wool ci and can be used behind any cladding type, including combustible and open-joint assemblies. Thermafiber RainBarrier ci High Compressive board products reduce thermal bridging, optimize R-value, and meet ASHRAE 90.1 requirements.

Coppock says architects and specifiers can scale their wall assembly solution with three grades of compressive strength mineral wool ci including lightweight, medium weight, and heavyweight cladding.

EASY INSTALLATION

"High compression doesn't mean high density and the cutting and notching issues that might imply," Coppock says. "RainBarrier fits between cladding attachment elements, such as masonry ties, and clip and rail systems. Pliability and flexibility lets installers form the boards around most attachment hardware without cutting or notching," she reports.

For architects and specifiers looking to explore new design possibilities, high compressive strength mineral wool ci may be just the answer they're looking for.

*The terms Thermafiber, RainBarrier, and ThermaCrimp are registered trademarks of Owens Corning.

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“Canadian architects have generally toed the Modernist line, but there was one occasion in the last half-century when Canada found itself in the architectural vanguard.”

A Brief History of Canadian Architecture by Witold Rybczynski, HON. FAIA

Canadian Modern Architecture: 1967 to the Present (Princeton Architectural Press, 2019) is a bulky little tome that is neither a directory nor a considered history but rather a survey of hundreds of buildings, large and small, public and private, important and obscure. The book is organized chronologically, thematically, and regionally, and includes essays by 17 different authors: academics, critics, and journalists. This large squad of scribblers is necessary because Canada is simply too large geographically, and too diverse culturally, to have a single coherent architectural story.

With so many authors, the coverage is necessarily uneven, and although the book claims to be comprehensive, its selections can be quirky: Ray Affleck's superb Alcan headquarters in Montreal, an early exercise in historic preservation that combined several Victorian mansions, a 1928 hotel, and new construction, merits only a postage-stamp-size photo; Moshe Safdie, FAIA's masterly National Gallery of Canada gets no more than a passing nod, and his Library Square in Vancouver is not mentioned at all, nor is Arthur Erickson's excellent Bank of Canada in Ottawa. At the same time, unbuilt projects intended for the Canadian North are covered in dutiful detail, and some private residences receive more attention than major civic landmarks. It makes for a somewhat perplexing bouillabaisse—like leafing through back issues of a magazine.

The title *Canadian Modern Architecture* raises the nagging question: Is there really such a thing as a distinctive Canadian architecture? Off the bat, the answer is no. As the book chronicles, over the last 50 years Canadian architecture has followed a well-trodden path: It starts with orthodox Modernism, which gives way in the 1970s and 1980s to Postmodernism and, following a brief flirtation with Deconstructivism, flits between the opposite poles of Expressionism and High-Tech until settling down with international Modernism, although this time with a lot more glass. Many of the prominent Canadian buildings that signposted this trajectory were the work of outsiders: Ludwig Mies van der Rohe (major commercial projects in downtown Montreal and Toronto), Philip Johnson (a CBC headquarters), Daniel Libeskind, FAIA (an addition to the Royal Ontario Museum), Antoine Predock, FAIA (Winnipeg's Canadian Museum of Human Rights), as well as Thom Mayne, FAIA, Santiago Calatrava, FAIA, Will Alsop, Norman Foster, HON. FAIA, Frank Gehry, FAIA, and of course Safdie (both Gehry and Safdie have Canadian citizenship but have long practiced in the U.S.). Not surprisingly, all this imported talent

Ray Affleck's Alcan headquarters in Montreal

The Philip Johnson–designed Canadian Broadcasting Centre in Toronto

accelerated the dissemination of international design trends, making Canada, like most countries, part of a global architectural culture.

An Absence of Classicism

One trend is conspicuously absent: Unlike its neighbor to the south and many European countries, Canada did not foster a traditionalist movement. There was no Henry Hope Reed or Léon Krier to lead the charge, no Modernist scourge like Prince Charles, and one looks in vain for Canadian equivalents to classicist practitioners such as Allan Greenberg, Quinlan Terry, or Maurice Culot. No major Canadian university has recently opted to build a Gothic Revival college (like Princeton and Yale), a Richardsonian law school (like Harvard), or a Byzantine-Romanesque public policy school (like Rice). No Canadian cities have erected a classical library (like Chicago) or a classical concert hall (like Nashville and Fort Worth). If you are a small Canadian college and you want a building that complements your Neoclassical campus, you head

TOP: JEAN GAGNON; BOTTOM: MICHAEL WILSON/CBC LICENSING

south and hire Robert A.M. Stern, FAIA, as Acadia University in Nova Scotia did. (His Georgian Revival Irving Environmental Science Centre is pointedly not included in *Canadian Modern Architecture*.)

The apparent Canadian disinterest in contemporary Classicism might suggest a greater public enthusiasm for Modernism, although judging from the current commercial housing market in the suburbs surrounding Canada's major cities, the public's taste in domestic architecture remains traditional, and the historic preservation movement has as much support in Canada as elsewhere. An aggressively Modernist addition proposed for Ottawa's venerable Château Laurier, a beloved 1912 French Renaissance Revival hotel, was recently quashed due to a public outcry. A more likely explanation is that the ruling classes that commission buildings have considered Modern architecture—rightly or wrongly—to be the correct style for a forward-looking modern society such as Canada.

Canadian architects have generally toed the Modernist line, preferring to leave radical experimentation to others, but there was one occasion in the last half-century when Canada found itself in the architectural vanguard. In the mid-1960s, three Canadian buildings captured the world's attention: Safdie's Habitat 67 in Montreal, Arthur Erickson's Simon Fraser University in Vancouver, and John Andrews's Scarborough College in Toronto. All three were striking examples of what came to be called megastructures. Theoretical megastructure proposals were all the rage, appearing in the work of the Metabolist group in Japan, Archigram in England, and Candilis-Josic-Woods in France, but with the exception of the latter's Free University of Berlin (designed with Manfred Schiedhelm), none of those proposals saw the light of day. The large Canadian projects, on the other hand, were executed with self-assured aplomb. If there was a distinctive Canadian architecture, this seemed to be it.

The Canadian embrace of the megastructure is difficult to explain. Scarborough College, with its long internal "street," can be seen as a reaction to long, cold winters, but Habitat looks more Mediterranean than northern, and the open-air public spaces of Simon Fraser take advantage of the temperate Pacific climate. Nor were Andrews, Erickson, and Safdie part of a new Canadian school; they all built with concrete, but Scarborough was resolutely Brutalist, the mountaintop Acropolis of Simon Fraser was a concrete version of post-and-beam timber architecture (and included a delicate high-tech space-frame canopy), and the geometrical arrangement and the smooth surfaces of Habitat's prefabricated boxes, which look like stucco, gave the impression of a vertical village. Eventually, the Canadian enthusiasm for megastructures waned—Habitat was too expensive, Scarborough proved too inflexible, and Simon Fraser lost some of its compelling human scale as it grew.

Safdie and Erickson remain Canada's best known architects, and Andrews, before returning to his native Australia, provided the Toronto skyline with

Arthur Erickson's Simon Fraser University in Vancouver, a 1960s megastructure from when Canada embraced the architectural vanguard

MARIA JANICKI

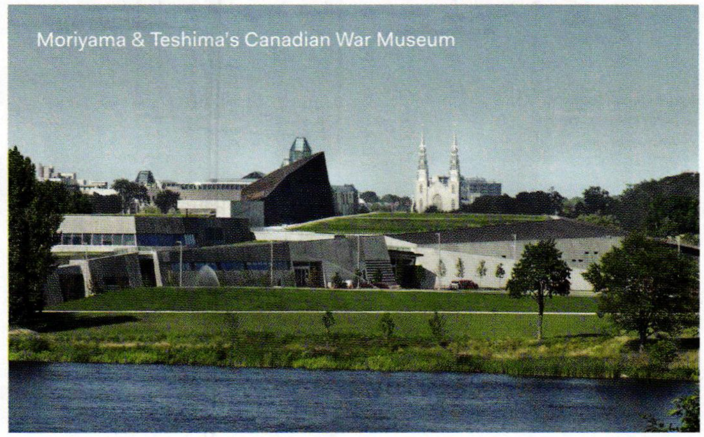
its chief landmark, the CN Tower. The 1960s was a scintillating decade for Canadian architecture for an additional reason: It produced a lesser-known jewel, the University of Toronto's Massey College. The architect was Ron Thom, and his building was an odd mixture: the plan was based on an Oxbridge quadrangle, while the architecture was a combination of Frank Lloyd Wright—think Midway Gardens—and early Dutch Modernism (see "A Tale of Two Colleges" in the July 2015 issue of ARCHITECT). At a time when *béton brut* was all the rage, Thom finished the college

A proposed addition to the Château Laurier, quashed after public outcry

COURTESY LARCO HOSPITALITY

in brick, gave it ornamental finials and decorative ironwork, and designed all the Arts and Crafts furnishings. It sounds like Postmodernism *avant la lettre*, but his highly original design was neither ironic nor humorous. Far outside the mainstream, Massey College had little impact—at home or abroad—although it remains a compelling example of a nuanced and crafted Modernist architecture of the sort that Tod Williams, FAIA, and Billie Tsien, AIA, would explore several decades later.

Public institutions have been major architectural patrons in Canada. The megastructure projects were commissioned by publicly funded universities and a federally funded world's fair—only the government had pockets deep enough to make the extra investment that megastructures required. When knowledgeable and supportive politicians and civil servants were involved—as it was in the case of Massey College in the form of a demanding donor, Vincent Massey, and an old-fashioned academic, the novelist Robertson Davies—exceptional buildings could follow. But absent informed leadership, a conservative bureaucracy might simply jump on


Moriyama & Teshima's Canadian War Museum

MORIYAMA & TESHIMA ARCHITECTS

the latest stylistic bandwagon, which is what seems to have happened in Canada after the 1960s, when public architecture, such as Moriyama & Teshima's Canadian War Museum and Patkau Architects' Grande Bibliothèque du Québec, were more likely to reflect global fashions than break new ground.

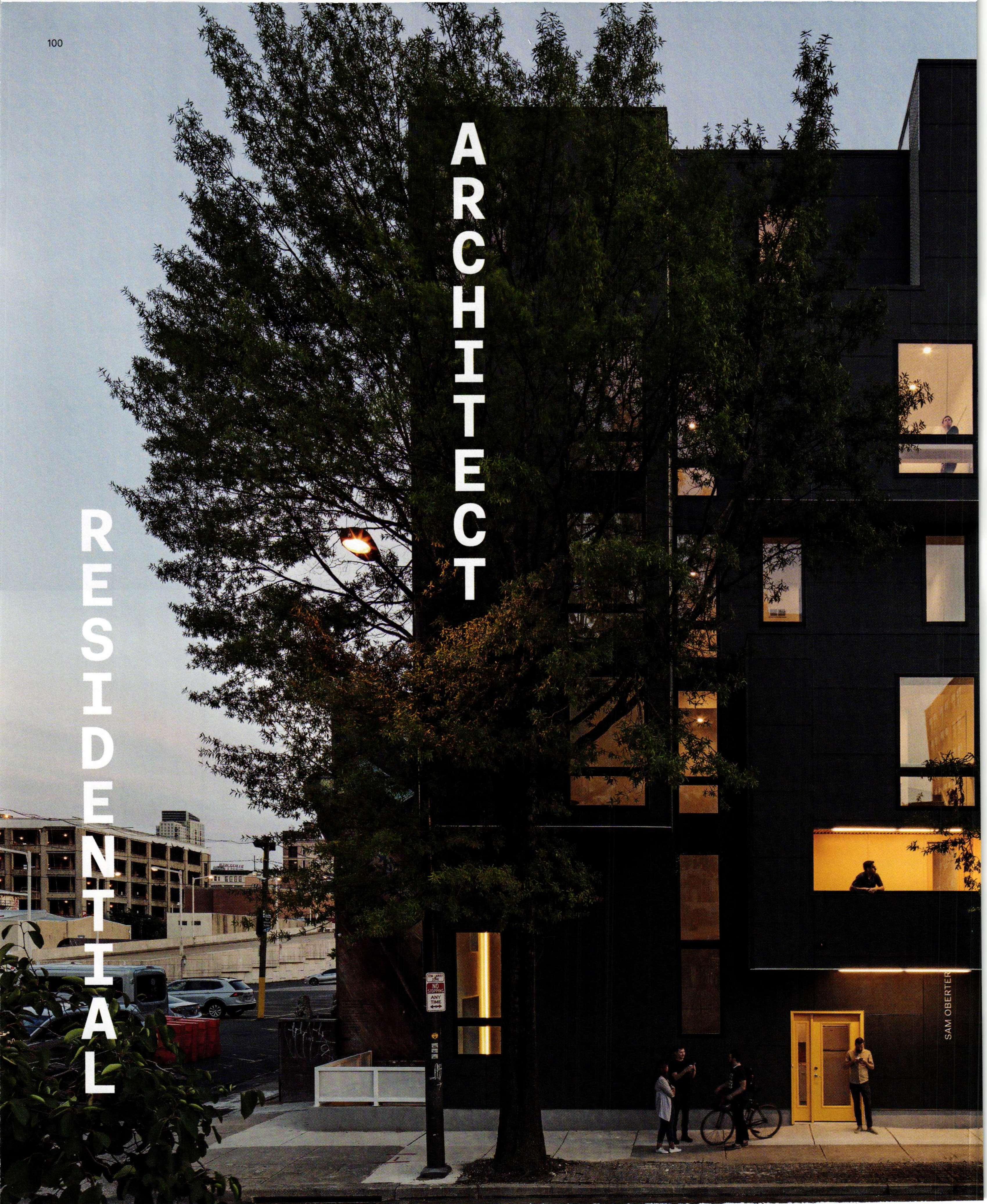
A Climate-Inspired Pragmatism

A major influence on Canadian architecture has been climate. Most of Canada has long, cold, snowy winters; buildings, whatever their style, have to support snow loads, resist freeze-thaw cycles, and have adequate insulation and glazing. A badly detailed building in a cold climate will not simply weather poorly and spring a few leaks, it can literally fall apart. (It's no coincidence that Alvar Aalto's early Finnish buildings were so much more sensibly detailed than the contemporaneous buildings of Le Corbusier and Mies van der Rohe.) Northern conservatism is pragmatic. Megastructures aside, Canadian architects have tended to steer clear of polemics and extreme theories, and have avoided showy architectural effects. Partly this a question of national character, but mainly it's just too cold.

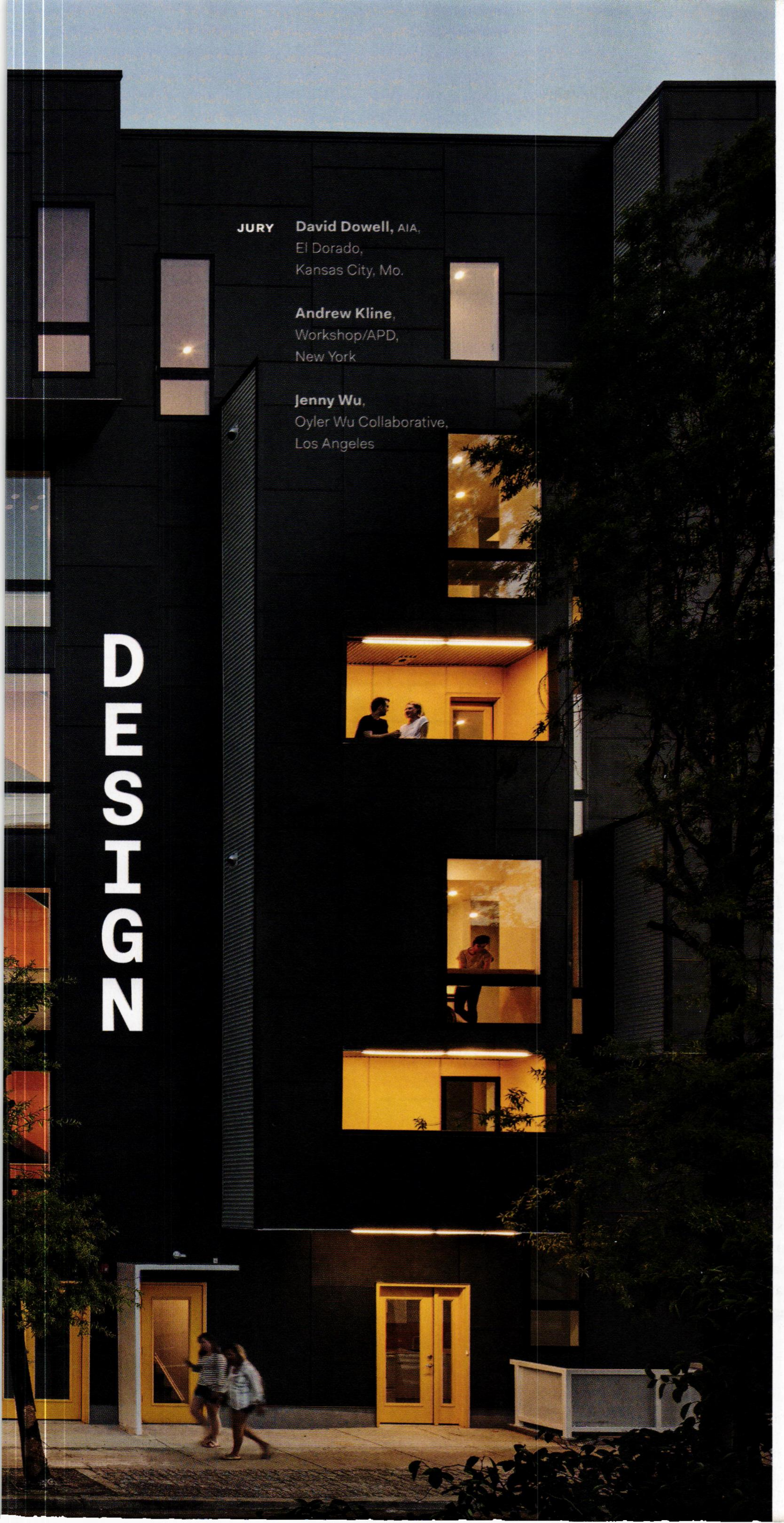
Canadian architecture has traveled abroad—the late Bing Thom's Arena Stage in Washington, D.C., KPMB's glassy Orchestra Hall in Minneapolis, Diamond Schmitt's Mariinsky II Theater in St. Petersburg, Russia. Yet the ranks of so-called starchitects—those architects with global practices whose names have become internationally recognized brands—are noticeable for the paucity of Canadians. Given the dubious quality of much of today's high-profile architecture, this may not be a bad thing.

One of the most successful Canadian consumer products of recent times is the Canada Goose parka; it's not revolutionary, it's well made—it's not cheap—it's kind of stylish though not aggressively so, and it keeps you warm. Good Canadian architecture is like that. If you want a flashy clickbait building, hire one of the usual suspects; if you want something well-put-together that does the job over the long haul, get a Canadian.

RESIDENTIAL ARCHITECT



SAM OBERTER



AWARDS

Residential architecture lives under a microscope. The nexus of global crises in affordability, accessibility, and sustainability, and a de facto test lab for the design world, housing is seen as having the potential to move the needle more readily than any other typology. So when selecting the latest winners of the Residential Architect Design Awards, this year's jury demanded an "it" factor. Whether "it" means functioning off the grid, gaming local zoning codes, building on unbuildable lots, or imparting dignity upon affordability, each of the 13 winners furthers the expectation that housing can be transformative when design leads the way.

EDITED BY KATIE GERFEN
PROJECT DESCRIPTIONS BY
EDWARD KEEGAN, AIA

XS HOUSE

PHILADELPHIA
ISA

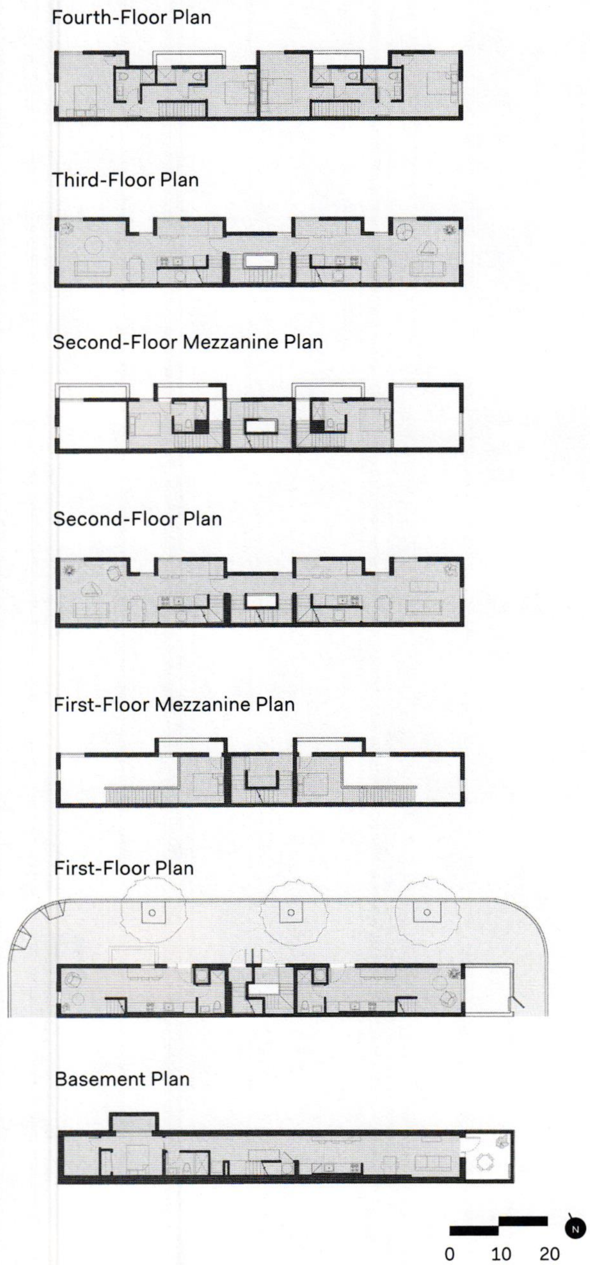
AWARD

MULTIFAMILY

In a phenomenon that played out in many American cities during the mid-20th century, the sunken Vine Street Expressway cut a 100-foot-wide swath of demolition through Philadelphia's Center City. This reckless car-oriented development impacted the Chinatown neighborhood and left many oddly shaped—and sized—sites that still sit as parking lots or similar underdeveloped uses. Local firm ISA designed XS House for one of these parcels, an 11-foot-by-93-foot lot that isn't much larger than a wide sidewalk setback.

The architects creatively fit a 5,000-square-foot, seven-unit building within this narrow footprint. While technically a three-story structure, the 63-foot-tall envelope reads as a six-story building—its six duplex units' upper levels count as mezzanines (the seventh unit is a single level in the basement). Zoning allowed façade projections up to 3 feet deep, a dimension that would typically be just a bay window in a standard apartment, but which expanded some of XS House's tiny units by as much as a third. The rhythmic development of these extensions—which accommodate exterior balconies as well—enliven the façade along the expressway. The architects also capitalized on the structures' designation as a three-story building, which requires just a single stair, saving considerable area within the small footprint for use as apartments.

Ironically, XS House's site was so small that it previously accommodated parking for just two cars. The development adds desirable residential density to Philadelphia's core while thoughtfully healing some of the spatial scars left by auto-centric midcentury urban planning. It demonstrates that good design can often overcome even the most challenging problem.



SAM OBERTER

"The kooky massing that's interesting and different, the idea of using a code variance to make the spaces livable—it's all super clever and well done."
—Andrew Kline

"The effort and the rigor of fabricating integrated lighting, suspension support, treads—and to make it all feel so effortless and light—is not inconsequential."
—David Dowell

SUSPENDED STAIR

NEW YORK
O'NEILL ROSE ARCHITECTS

AWARD
ARCHITECTURAL DESIGN DETAIL

Daylight is a precious resource in a narrow New York City townhouse, and Brooklyn-based O'Neill Rose Architects faced this challenge head-on when remodeling the lower two levels of one into a duplex garden apartment. The need for a stair to connect the two floors in the middle of the unit threatened to block light from one part of the apartment to the other.

The solution that the design team developed is an elegant communicating stair that uses cantilevered and suspended members to make it "float." Eight narrow steel rods descend from a structural beam embedded in the ceiling above the second floor, providing suspension and support for 17 knife-edged blackened-steel stair treads that emerge from the white plastered wall. These treads are anchored to a structural member concealed within the wall that is in turn bolted to the townhouse's existing masonry bearing wall to provide cantilever support. The second tread extends the full length of the staircase's run, providing a minimalist bench that greets visitors upon entry to the apartment.

The continuous stair rail is made from the same material as the stair's structural components and is attached to the suspension rods to provide necessary diagonal stability to the composition. The rail is the beefiest visible portion of the stair and, coupled with the twists and turns necessary to resolve the stair's geometry, reads as a rather traditional element within the interior of the vintage building.

Making an architecture that appears to be made of almost nothing requires a certain amount of hidden effort, which the architects admit when they refer to the stair's suspension as akin to a marionette puppet—a particularly elegant one, at that.

MICHAEL MORAN/OTTO

DAVID HARTWELL

BRANCH HOUSE

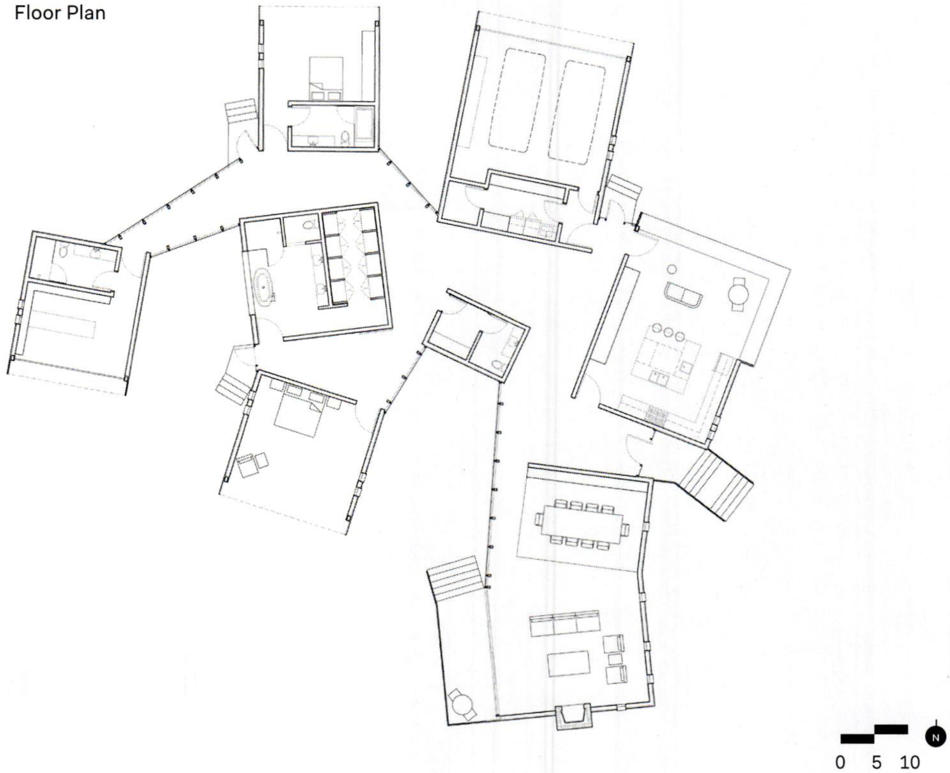
MONTECITO, CALIF.
TOLO ARCHITECTURE

AWARD
CUSTOM HOME MORE THAN
3000 SQUARE FEET

Designed by Los Angeles–based TOLO Architecture, the Branch House brings a village of abstract domestic forms to a typical suburban enclave in Montecito, Calif. The 4,400-square-foot single-family residence sits on a 1-acre site on a cul de sac. A series of eight rectangular volumes, each with a skylight, enclose a living room and dining room, a kitchen, a two-car garage, an office, two bedrooms, a master bath, and a powder room, respectively, and are deployed in a nonorthogonal layout across the site. The positioning of each balances the desire for occupant privacy as well as views of the surrounding landscape. Meandering glass-lined hallways connect the volumes and act as galleries for the client's art collection.

The interior palette is simple, even stark: concrete floors, gypsum board walls and ceilings, and exposed laminated-veneer lumber joists in the corridors and other areas. Colorfully glazed Heath clay tile punctuates specific areas: blue

Floor Plan



"It's so difficult in residential to convince a client to accept a massing that's a little unusual, and the sequencing of spaces and the light—it's really interesting how it all starts to engage the land."
—**Jenny Wu**

DAVID HARTWELL

for the kitchen, and blue, pink, and yellow for the bathrooms. The exterior is even simpler, with the roof and siding of the boldly geometric volumes sheathed in copper shingles that act as a rainscreen while protecting the wood-framed structure from fire like a protective armor.

The continuous concrete floor of the extensive single-story home sits on concrete piles that protect the root structure of the property's native coastal live oaks. The trees were carefully maintained during the restoration of the natural slope of the site, which had been altered to accommodate an earlier structure. The Branch House's simple forms, formal invention, and easy relationship to the landscape recall California forerunners like Joseph Eichler and Frank Gehry, FAIA, and are crafted with a precision that defies dating.

REDUCTION RESIDENCE

PITTSBURGH, PA.
BOHLIN CYWINSKI JACKSON

AWARD
RENOVATION

This 2,100-square-foot postwar brick residence in Pittsburgh was renovated by the local office of Bohlin Cywinski Jackson for a young design-savvy couple with three children. It was dubbed the Reduction Residence in recognition of the architect's surgical and minimalist design interventions—they retained the house's basic organization of an entry stair and living room across the front of the ground floor with dining and kitchen behind, and a master suite across the front of the second floor with two smaller bedrooms in back.

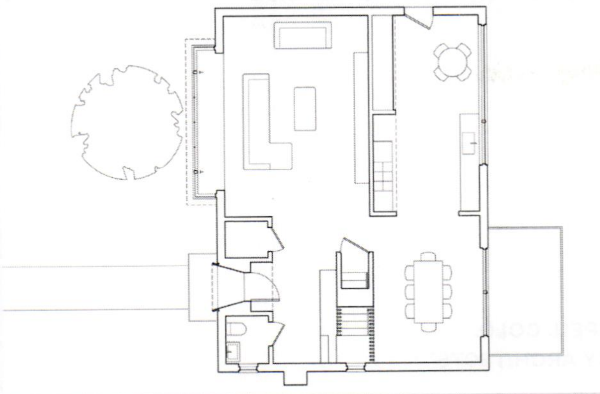
Cutting operable skylights along the roof ridge increased natural ventilation while bringing daylight into the center of the house through dramatic positioning above the master bedroom and the staircase. The light-stained pine stairs are bathed in natural light and surrounded by white-painted slat-screen walls that downstairs visually connect the foyer and dining room. Second-floor ceilings were raised to provide an enlarged sense of space and enhance ventilation, exposing the existing rafters, which were enhanced with natural finishes and punctuate the spaces. Existing door, window, and wall trim was removed, leaving sharp, plaster-framed openings that enhance shadows with their clear-cut edges. Continuous new pine floors tie the first-level spaces together while the second-level wood floors were salvaged and painted white to camouflage previous wear and tear while providing spatial continuity.

The "reductions" that give the home its name transform the layout into a light and bright series of interconnected spaces. The results are minimal in expression and organization, yet dramatically reframe the traditional house's modest aesthetic.

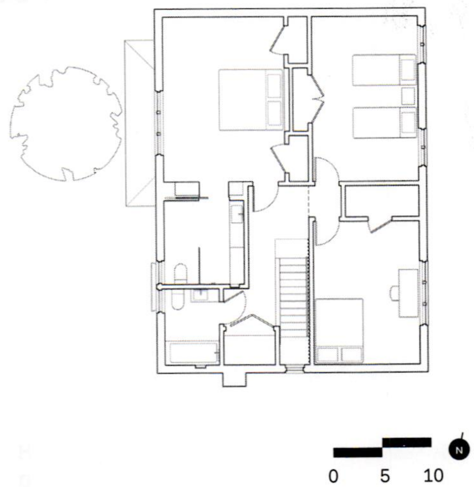
"There's a lot of mileage out of some very simple moves, and I really like that you can see so much of the original in the new work. I appreciate the nuance of it"
—David Dowell

COURTESY BOHLIN CYWINSKI JACKSON

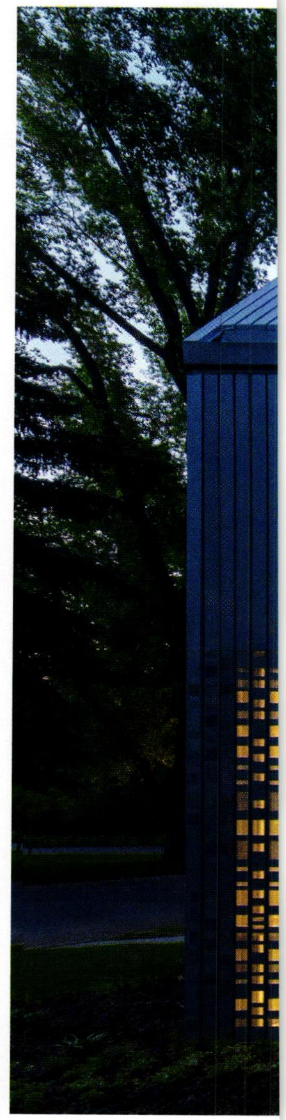
First-Floor Plan



Second-Floor Plan



COURTESY BOHLIN CYWINSKI JACKSON



VICTORIAN MUSIC BOX

ASPEN, COLO.
CCY ARCHITECTS

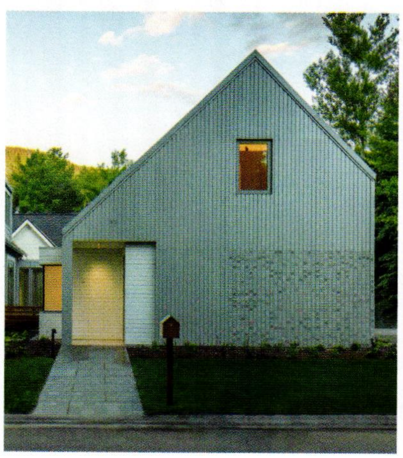
HONORABLE MENTION

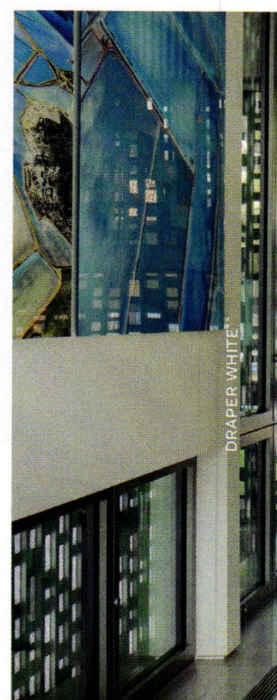
ARCHITECTURAL DESIGN DETAIL

Architects are often handed out-of-the box design challenges, but incorporating Chopin's "Nocturne in E-Flat Major, Op.9, No.2"—the client's favorite piece of music—into the façade of a free-standing guesthouse may be a first. Yet it was this conceit that drove the team at Basalt, Colo.–based CCY Architects to develop an elaborate, Chopin-inspired perforated scrim that wraps three faces of the structure, which sits next to an 1880s Victorian home in Aspen, Colo. Dubbed the Music Box, the new building houses the family's baby grand piano and is used for music recitals when not occupied by guests.

The scrim is made out of Galvalume siding: 4-inch-wide sheathing was perforated with a pattern inspired by the roll that drives a player piano. The architects broke down the Chopin piece into distinct notes and chords and assigned each a variable that corresponded to the hole size and number of holes in each group. The hole size indicates the pitch and the number of holes correlate to the duration of the note. Together, these holes form the perforation pattern that renders the music into graphic form.

The cladding is utilized as a rainscreen, and runs continuously over the façade, regardless of whether what's behind is solid wall or window. When the scrim fronts glazing, it provides solar shading for the interior during the day; at night, the light coming from inside the glazing renders the scrim pattern visible, generating an ethereal glow. Music Box seems to be what Johann Wolfgang von Goethe had in mind when he called architecture "frozen music": If only the 19th-century German philosopher could visit Aspen with a large enough player piano, the Music Box's metaphor could become reality.

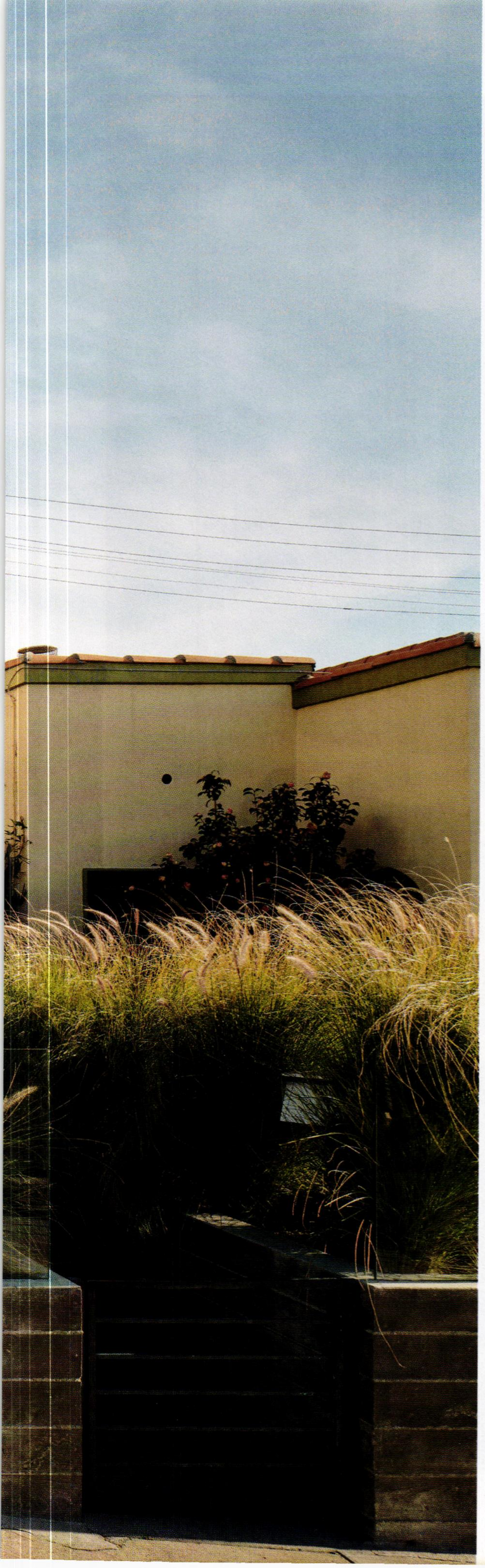




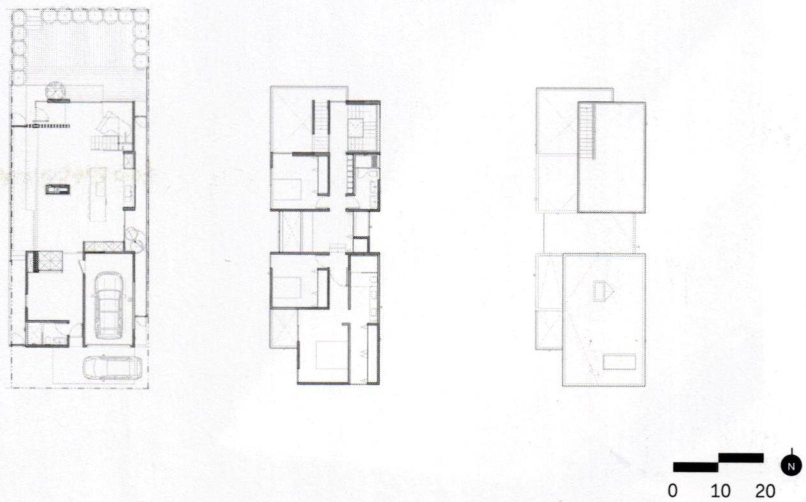
DRAPER WHITE

"I like the effect of the light and shadow. It's a simple detail but it is really effective."
—Jenny Wu

JOE FLETCHER



First-Floor Plan Second-Floor Plan Roof/Terrace Plan



WALK-STREET HOUSE

HERMOSA BEACH, CALIF.
RAS-A STUDIO

HONORABLE MENTION

CUSTOM HOME LESS THAN 3000 SQUARE FEET

Designed by Redondo Beach, Calif.–based RAS-A Studio, the two-story, 2,110-square-foot Walk-Street House draws its name from its location fronting a pedestrian-only street in Hermosa Beach. To limit the incursion of the automobile further, the designers incorporated a two-car "stacker" mechanical parking lift in the garage to the rear of the property, halving the footprint necessary to meet the community's requirement for a two-car garage.

The pedestrian street is effectively a shared front yard with neighbors, just two blocks from the Pacific Ocean. Floor-to-ceiling glazing marks much of the first floor; the glass is punctuated by western red cedar siding that's deployed both inside and out in several configurations: horizontal, vertical, and slatted. An open plan makes the most of the house's tight 30-foot-by-70-foot lot. Entry is separated from the primary living spaces by a white concrete-block feature wall using standard masonry units laid

"Proportionally, the massing—interior and exterior—is really beautiful, but also the materiality is really concise. It's beautifully warm for a modern house."
—Andrew Kline

on their side—turning their hollow cores into a perforated screen. A single space punctuated by a central fireplace accommodates living, kitchen, and dining areas, and a 27-foot-long glass door effectively expands these spaces into the 6½-foot-deep side yard. The second floor comprises three bedrooms, including a master suite that cantilevers over the drive at the rear of the house. The corridor incorporates a library as well as a small study that's open to the dining room below. A deck at the front includes an outdoor stair to the roof terrace.

Walk-Street House's free plan and small footprint, combined with large openings that enhance natural ventilation, provides quintessential Southern California living, while de-emphasizing the role of the car in a nod to a shared 21st-century future.

JOE FLETCHER


MICHAEL MORAN/OTTO

OCULI HOUSE

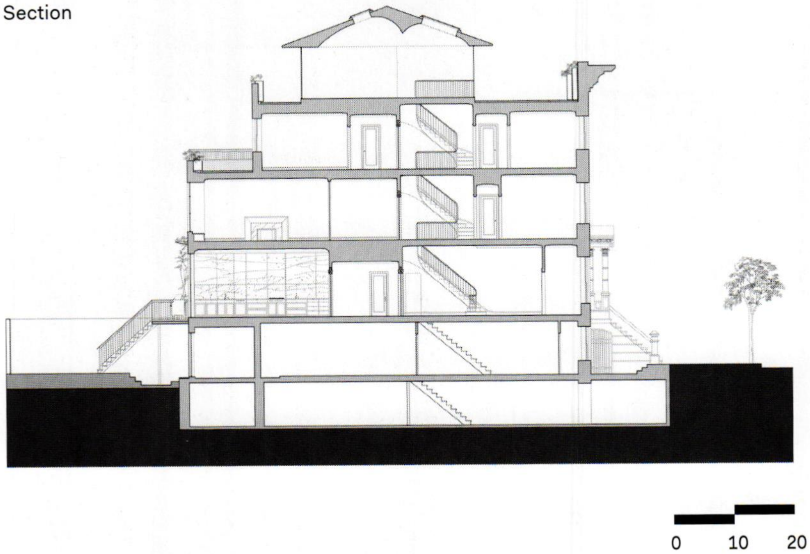
NEW YORK
O'NEILL ROSE ARCHITECTS

AWARD ARCHITECTURAL INTERIORS

Dubbed Oculi House for the most memorable of the interventions by Brooklyn, N.Y.–based O'Neill Rose Architects, this transformation of a 3,000-square-foot brownstone spreads abundant natural light through four floors within the narrow constraints of a common New York City housing type. The architects drew on Isamu Noguchi's forms for inspiration when developing two intersecting elliptical oculi for the ceiling of the fourth-floor lounge space. Positioned above the townhouse's central stair, the two skylights drive the renovation's daylighting strategy.

At the fourth-floor lounge area, floor-to-ceiling

Section



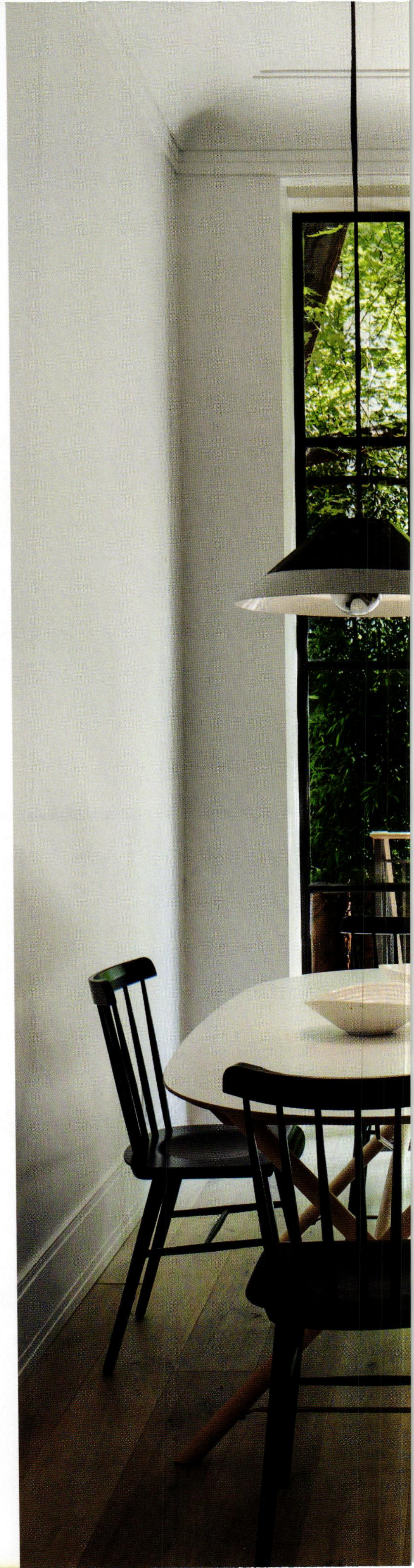
glazing is deployed at front and rear; it is supplemented on the lower floors by expansive windows facing the rear yard to increase the presence of natural light throughout the space.

Light-colored painted-plaster walls, light-stained custom wood floors, and thin, minimal balusters on the stairs walk the line between modern and traditional design, while enhancing the reflection and filtering of daylight. While light was critical to the project's success, the architects don't shy from dark colors: Narrow-mullioned black windows are reprised as room-dividing partitions and custom black kitchen cabinets and built-in bookcases also punctuate the spaces.

The architects note that the project's development used both digital tools and traditional handcrafting methods: The oculi were conceived using 3D computer modeling, but ultimately realized through hands-on collaboration with plasterers who employed age-old material techniques. A similar process incorporating 21st-century visualization with traditional craft was used to create an expressive stone wall in the kitchen that artfully exploits the material's natural variation.

Neither strictly modern nor traditional, Oculi House demonstrates the thoughtful intersection of many contrasts.

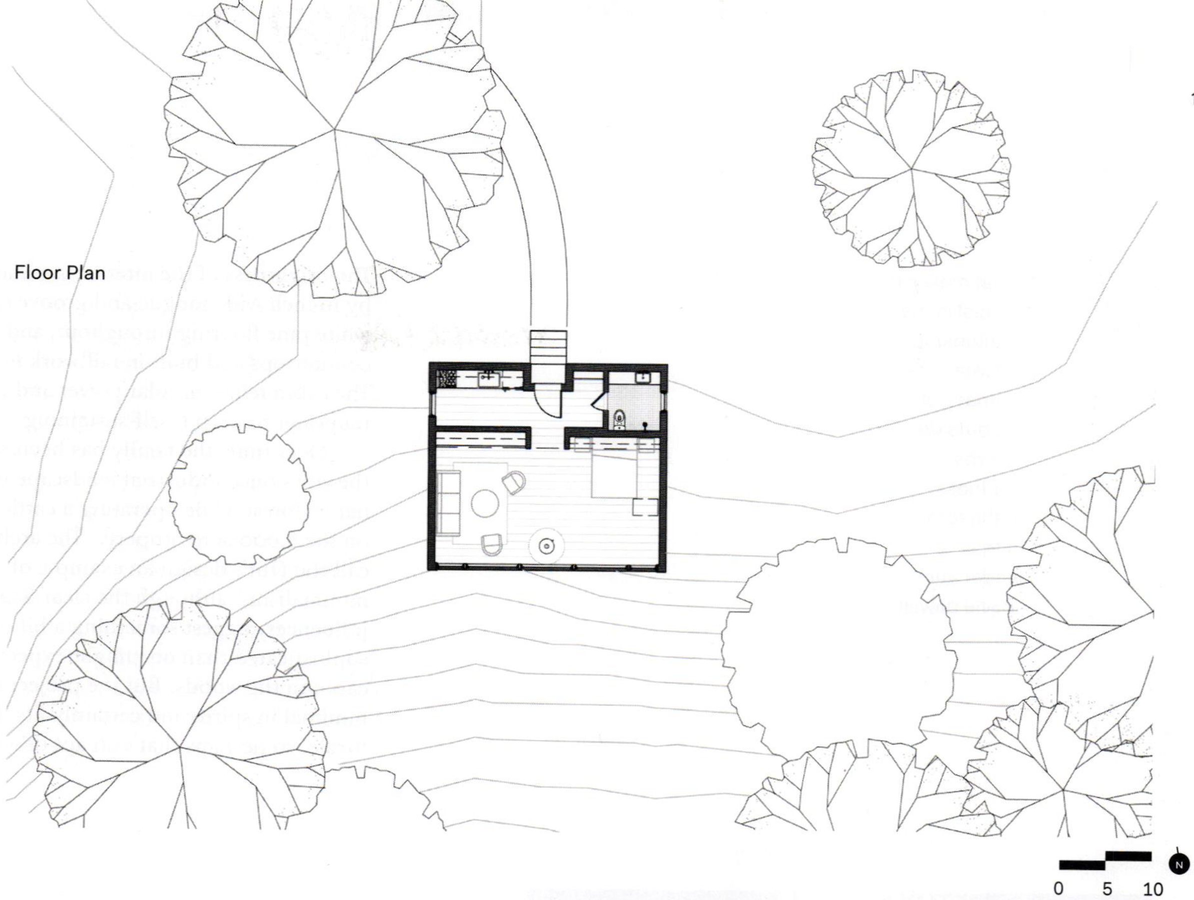
"It's trying to do something different in a fairly traditional building. The oculi give the project a little something extra—there are some very nice moments where the light starts to wrap corners."
—Jenny Wu



MICHAEL MORAN/OTTO

GREG DUTTON/MIDLAND ARCHITECTURE

Floor Plan



THE HUT

BELMONT COUNTY, OHIO
MIDLAND ARCHITECTURE

CITATION
CUSTOM HOME LESS THAN 3000 SQUARE FEET

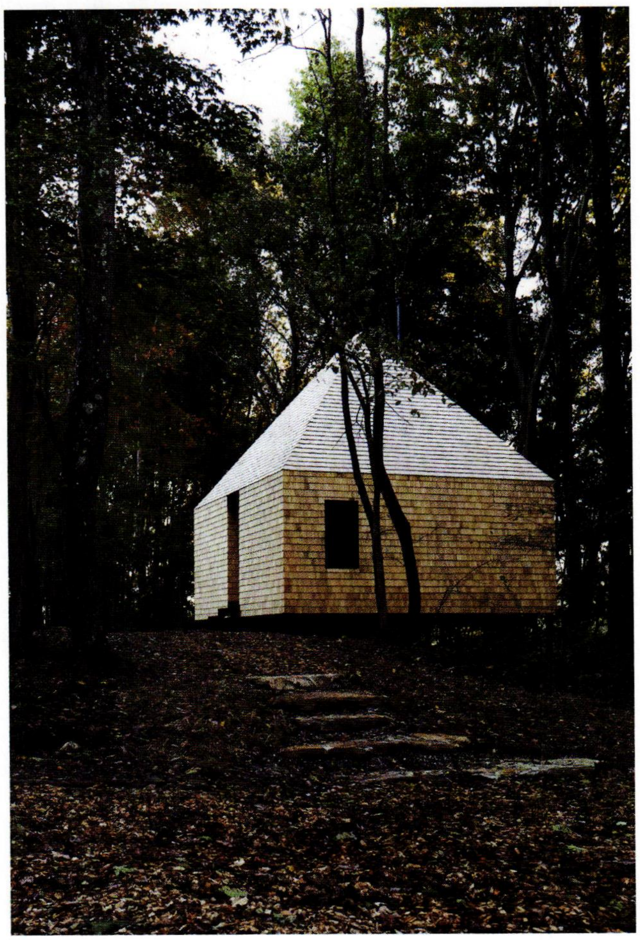
The Hut presents a very singular image of domesticity, with its almost-square plan topped by a hipped roof. Looking from many vantages like a treehouse, its exterior is entirely clad in cedar shingle and shakes, with a monochromatic interior of white-painted wood lap paneling. Designed in the Columbus, Ohio, office of Midland Architecture, the Hut's secluded site in eastern Ohio was formerly a strip mine. The clients—Midland partner Greg Dutton, along with his father and brother—built the structure with relatives and friends as a retreat on the Belmont County property that's been in the family for almost four decades.

Set above the ground on concrete piers, and on the edge of a steep slope, the 600-square-foot cabin operates entirely off the grid. The living room and bedroom are a single space centered on a wood burning stove located in front of a 25-foot-wide wall of floor-to-ceiling windows overlooking the surrounding forest and a lake.

"What makes it special is the relationship between the intimacy of the outside and the boldness of the form in that landscape."
—David Dowell

The brightness of the interior is enhanced by 10-inch-wide tongue-and-groove eastern white pine flooring throughout, and white oak countertops and built-in millwork in the kitchen. The cabin relies on solar power and collected rainwater to keep it self-sustaining.

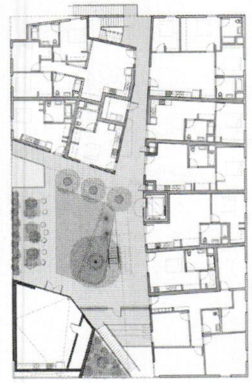
Over time, the family has been restoring the site's once-industrial landscape to its native forest while operating a cattle farm on the 2,000-acre property. The architects call the Hut's design an example of "country minimalism," although the clear Scandinavian influences suggest something a bit more sophisticated than one might expect from a cabin in the woods. But the project is clearly minimal in spirit, and certainly fits its rural locale, so perhaps that's an apt description.



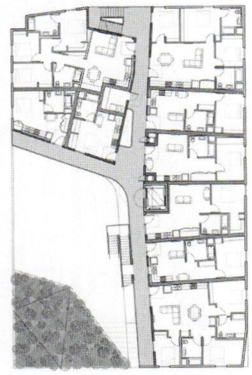
LEFT: GREG DUTTON/MIDLAND ARCHITECTURE; RIGHT: ALEXANDRA RIBAR

ALEXANDRA RIBAR

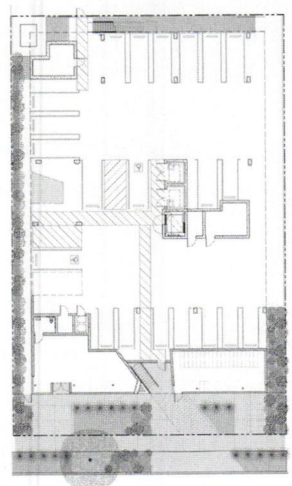
Plaza-Level Plan

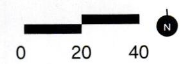


Typical Unit-Level Plan



Ground-Floor Plan





MLK1101 SUPPORTIVE HOUSING

LOS ANGELES
LORCAN O'HERLIHY ARCHITECTS

CITATION

AFFORDABLE HOUSING

Local firm Lorcan O'Herlihy Architects (LOHA) designed the bright four-story MLK1101 Supportive Housing for an infill site on Martin Luther King Jr. Boulevard in South Los Angeles. The 38,000-square-foot building provides 26 affordable apartments (from studios to three bedrooms) for the previously homeless. The L-shaped parti allows for abundant daylight and cross ventilation in every unit, reducing heating, cooling, and artificial lighting loads to attain LEED Gold certification. Exterior corridors, subtly different in plan on each floor, define the north and east edges of an elevated courtyard that provides a green gathering space for residents.

Two glazed, street-level retail spaces generate income to help subsidize the development, and a stair connects the sidewalk to the second-level courtyard, fostering social interaction with the broader Los Angeles community. A community room opens to the courtyard and provides residents with shared kitchen and dining areas to encourage both planned and impromptu gatherings. The courtyard features drought-tolerant plantings and edible gardens that allow residents to grow their own food.

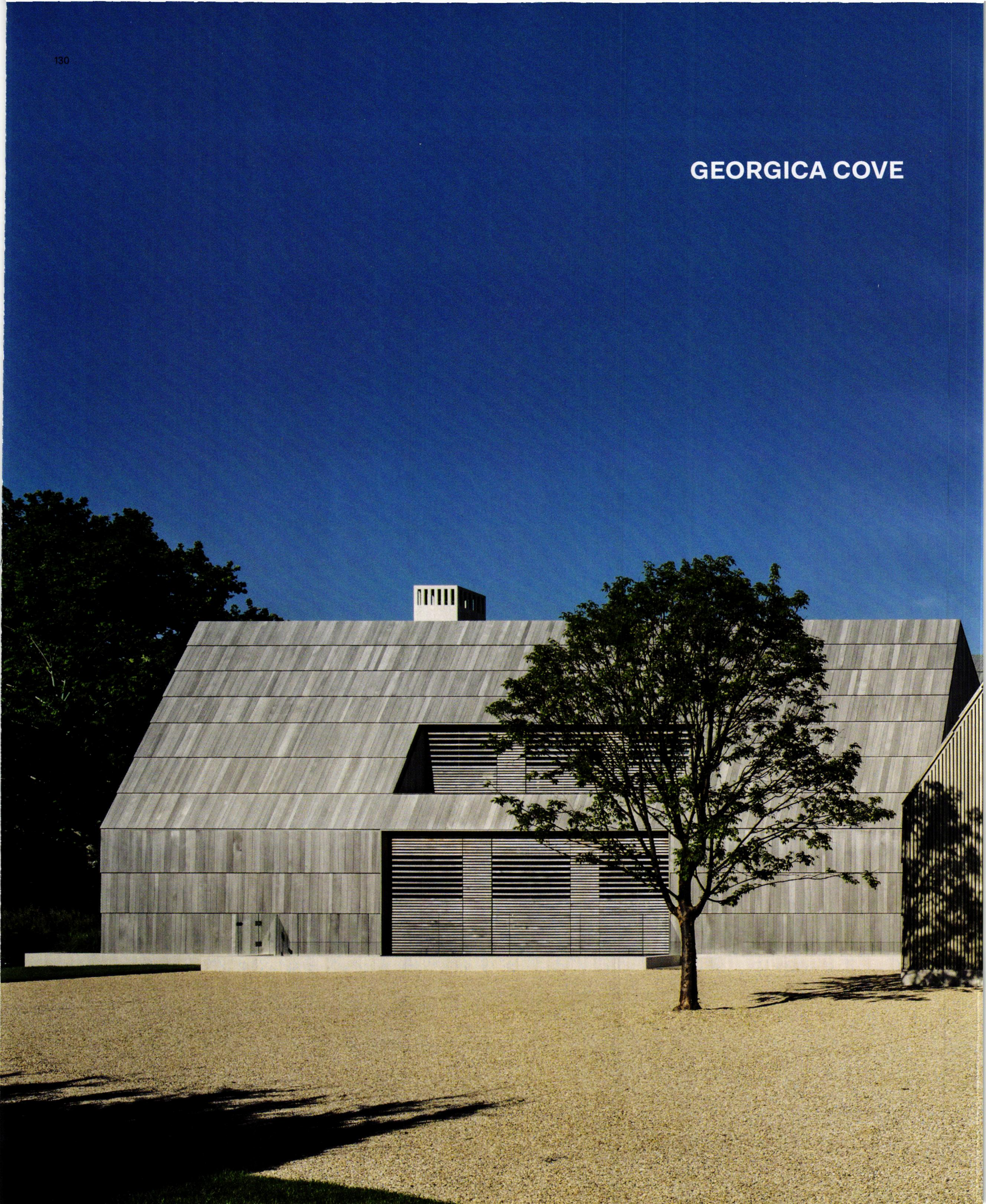
LOHA designed the simple façades as an inexpensive combination of white metal panels with vertical fins and painted cement board. Metal handrails and screens keep the exterior corridors light and airy, sharing architectural affinities with Southern California predecessors like Rudolph Schindler and Richard Neutra. MLK1101 demonstrates that good design can help affordable housing provide a good home.

IWAN BAAN

> *MLK1101 Supportive Housing appeared in the October 2019 issue of* ARCHITECT. *For more images, visit bit.ly/MLK1101.*

"I'm always amazed when any kind of true supportive housing work can rise to this level."
—**David Dowell**

GEORGICA COVE



EAST HAMPTON, N.Y.
BATES MASI + ARCHITECTS

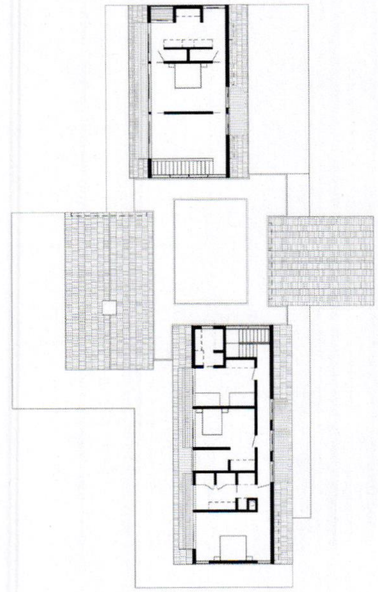
CITATION
CUSTOM HOME MORE THAN 3000 SQUARE FEET

Local firm Bates Masi + Architects turned to the precedent of farm structures when conceiving this 6,500-square-foot single-family residence facing East Hampton, N.Y.'s Georgica Cove. Organized as a compound of totemic steep-roofed gabled structures, the four-building complex on a 2.2-acre site opens toward a pond on the west side of the property, while presenting an opaque face to the road and entry driveway.

The iconic gable of the garage greets visitors who arrive via the driveway at the east end of the house; they enter the complex through a central courtyard. The gables of the other three structures run north–south, with a hybridized

COURTESY BATES MASI ARCHITECTS

Second-Floor Plan

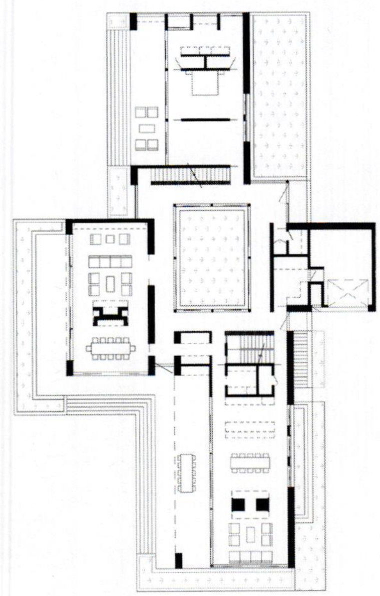


double gable defining the two larger structures. The central volume houses formal dining and living rooms within a double-height space, while the two-story south block has a family room, casual dining room, and kitchen on the first floor, with three bedroom suites above. The north wing has a master bedroom suite and office on the first floor with another bedroom suite above.

Separate mechanical systems allow the owners to control the energy use of the complex depending on occupancy. A white marble plinth keeps the buildings above the surrounding flood plain while sand-filled dry wells beneath accept stormwater runoff.

The clear interest in local vernacular traditions didn't hinder the architect's ingenuity, as they've recast simple farm structures with old materials presented in new ways: The lightly stained gray cedar exteriors unify the complex through minimal means. Gabled ends are clad in thin vertical cedar strips, while roofs and sidewalls receive board siding that blurs the distinction between surfaces—an intentional reference to traditional shakes and shingles, but rendered in oversized pieces that clarify the complex's contemporary vintage.

First-Floor Plan



"There's a lot of tongue-in-cheek play happening here—with the pitch of the gables, and the materiality, and the playfulness of scale. It feels very important when you look at that nuance."
—Andrew Kline

COURTESY BATES + MASI ARCHITECTS

S-M-L LOFT

NEW YORK
BREITNER CIACCIA—OFFICE OF ARCHITECTURE

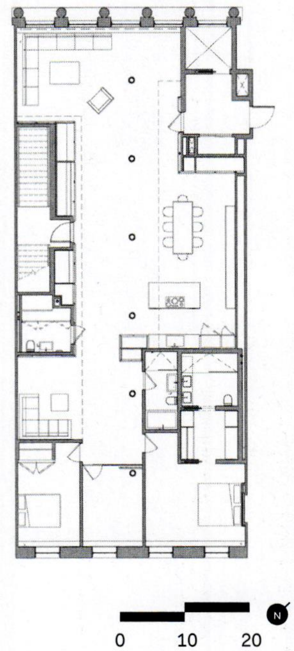
CITATION ARCHITECTURAL INTERIORS

A full-floor, 2,500-square-foot loft in Manhattan's SoHo is the canvas for an interior renovation by Brooklyn, N.Y.–based Breitner Ciaccia—Office of Architecture. The space is bisected by a row of existing (and quintessentially) 19th-century cast-iron columns supporting a timber beam. An elevator at the southeast corner and a straight-run egress stair along the north wall were the only other immovable features, and the design team used them, along with a new kitchen, to direct the design, developing an industrial-inspired metal panel system to camouflage each and organize the programmed space throughout.

Classifying these three paneled interventions by size—around the elevator (small), kitchen (medium), and egress stair (large)—gave the project its name: S-M-L Loft. The S element defines the entry and punctuates the living room at the front. The M intervention frames the bright white cabinetry of the kitchen, and neatly divides the apartment's open-plan gathering spaces from three bedrooms and den at the rear of the loft. The L element around the egress stair conceals multiple functions—bookshelves, a built-in desk, an audiovisual closet, and a powder room—within the interstitial space between the stair and the central kitchen and dining area.

The perforated sheet metal panels are set within elegant narrow frames, and by their sheer size dominate the interior aesthetic. They read as heavy and industrial on one hand, yet as delicate and almost soft in their leather-like dark patina and detailing on the other. The architects kept the rest of the finishes neutral: 15- to 18-inch-wide white oak plank flooring and white plaster walls and ceilings throughout; concealed lighting in recessed coves illuminates the ceilings. This is minimalism with a purpose—fulfilling functional needs with frankly contemporary means, reinvigorating a large open space with allusions to its industrial origins.

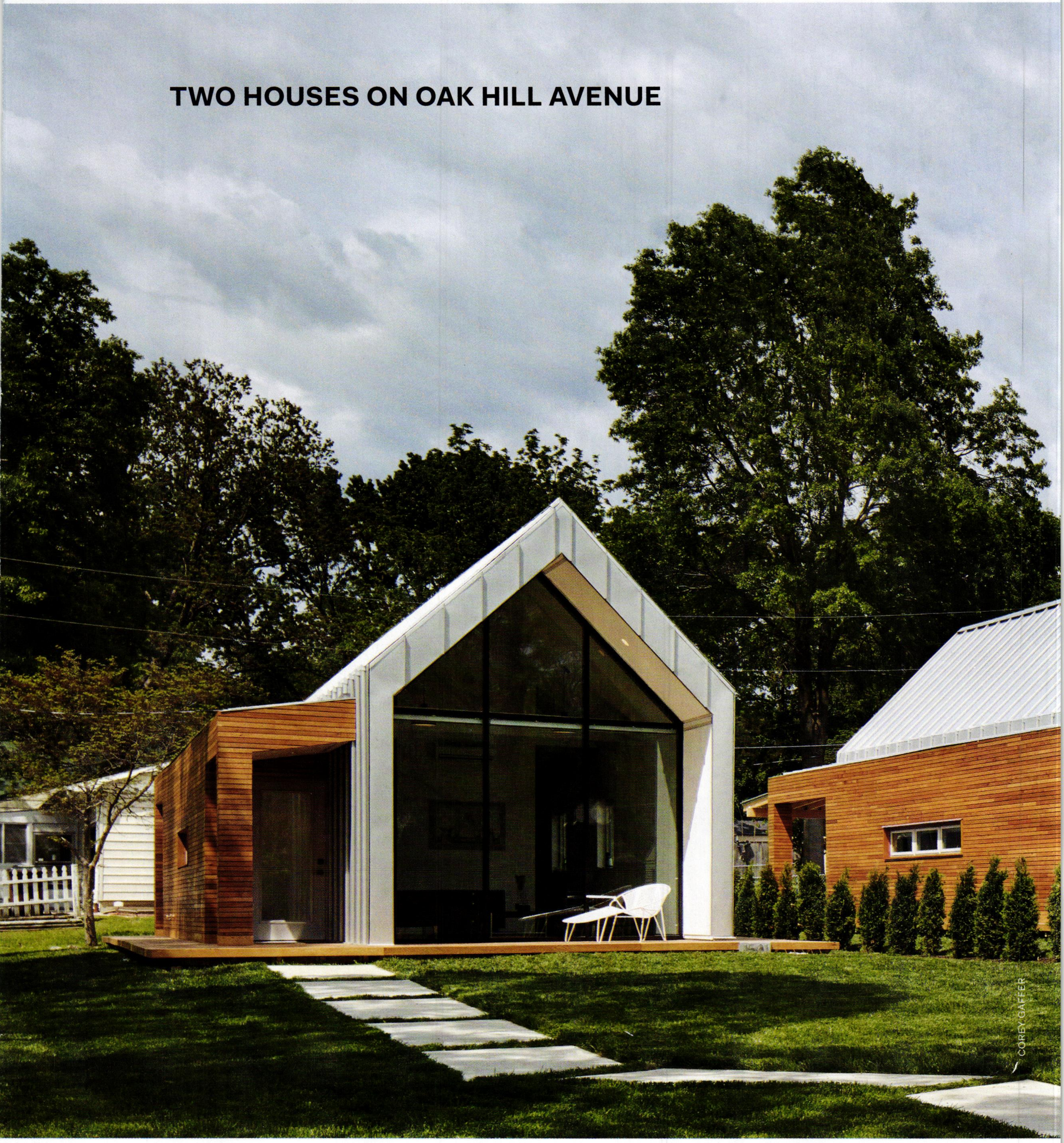
Floor Plan



AMY BARKOW

"It's really well done, and I thought bringing warm tones into an industrial feel was really beautiful."
—Andrew Kline

TWO HOUSES ON OAK HILL AVENUE



COREY GAFFER

HONORABLE MENTION

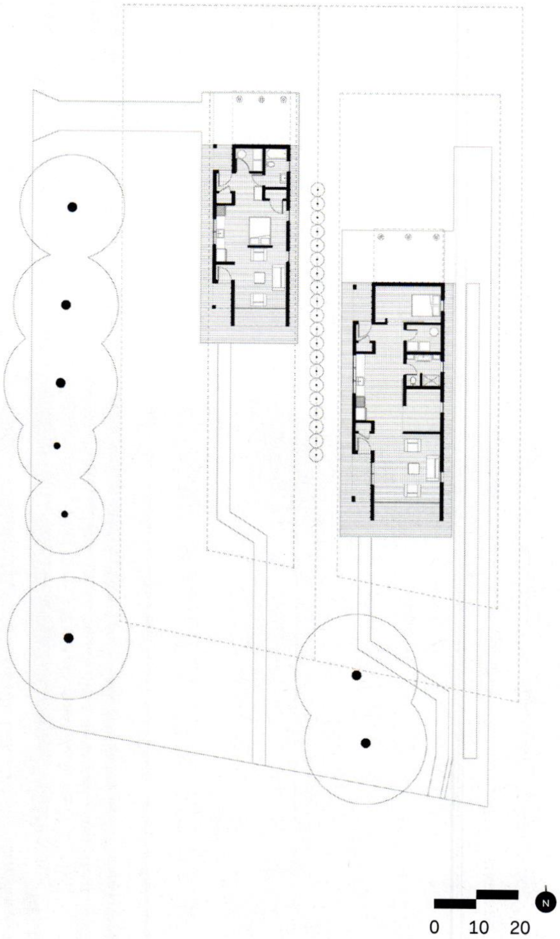
AFFORDABLE HOUSING

LAWRENCE, KAN.
STUDIO 804

Dan Rockhill's University of Kansas–based Studio 804 created these two small houses on a quiet residential street in Lawrence, Kan., in response to the area's changing demographics, which suggest a growing need for more small and affordable homes. The Two Houses on Oak Hill Avenue subdivide a corner lot once occupied by a large 1920s single-family residence that had been demolished prior to Studio 804's acquisition of the site.

Both homes are organized on a north–south axis and utilize a similarly extruded 12:12 gable

Floor Plan



form. A narrow shed-roofed extension along the west flank of both houses contains front and rear entries and a galley-style kitchen. The houses are offset from each other on the lot to maximize yard space on the side and to provide privacy. Standing-seam Galvalume siding and roofing define the main body of each house, with floor-to-ceiling glazing at the south end, facing the front yard and street. Horizontal wood siding differentiates the western extensions, and exterior decking on three sides promotes outdoor living. Modest covered parking is attached to the rear of each house.

The 650-square-foot studio house features an open plan, while the 1,000-square-foot house has a single enclosed bedroom with a semi-private area that can be used as an office or second bedroom. The interiors are marked by high ceilings punctuated by exposed wood cross ties, white painted gypsum board walls, and red oak flooring. Both homes achieved LEED Platinum, will be deeded independently, and will provide relatively low-priced options for buyers.

The gabled forms fit easily within the East Lawrence neighborhood, honoring the more modest bones of its older neighbors, while expressing its modernity through a minimalist approach to materials and detailing.

COREY GAFFER

"To see someone say: 'Our lots are too big and we should make two smaller homes so that they are affordable,' and to do it in a way that is expressed beautifully, is refreshing."
—**Andrew Kline**

SKYVALLEY HOUSE

LAKE ARROWHEAD, CALIF.
EDWARD OGOSTA ARCHITECTURE

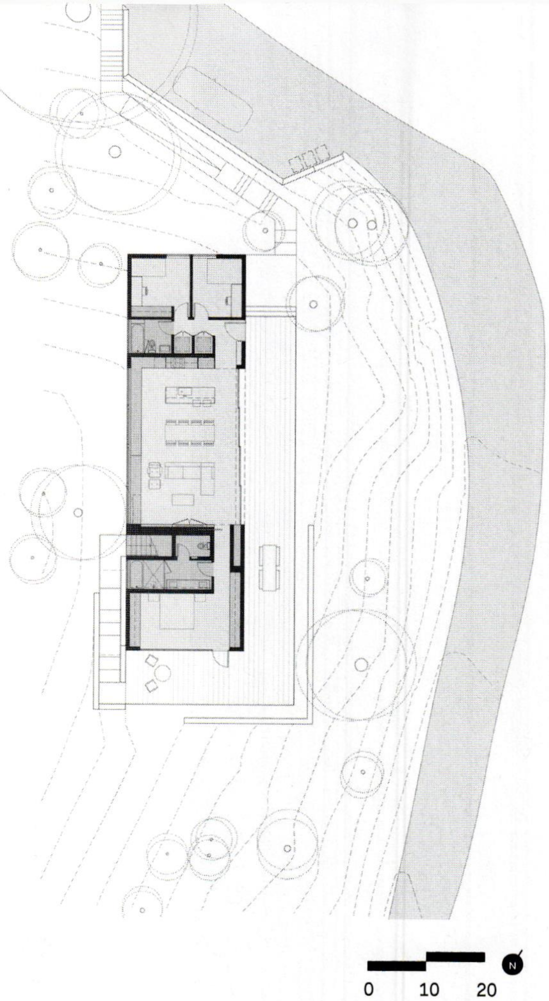
AWARD

ON THE BOARDS

Los Angeles–based Edward Ogosta Architecture faced a lot of challenges when conceiving the SkyValley House in Lake Arrowhead, Calif.: difficult sloping topography exacerbated by tight building setbacks, dense vegetation, and community regulations that prescribed "a nostalgic Alpine architecture with steeply pitched roofs, 'earth tones,' and decorative detailing."

The design that emerged for the 1,450-square-foot single-family residence is configured on one level, with the primary living spaces—kitchen, dining, and living—in the center, with entry, guest bedroom, and office to the north and master suite to the south. The site's slope drives the house's directionality,

Floor Plan



"I like the massing and the different elevations—and how it starts to change as you move around the building."
—**Jenny Wu**

with the west facing into a hillside—allowing for just clerestory windows on that side. A wide exterior deck to the east and south extends the living spaces and master bedroom over and above the descending landscape.

The house is a mix of the simple and complex: There's a straightforward rectangular floor plan and black corrugated-metal cladding on both exterior walls and roof, but the structure is topped by slopes that are momentarily hip, shed, and gable. The forms fulfill the "Alpine" stricture of the design guidelines while reading as asymmetrical and decidedly contemporary. The volume is split by a narrow slot of space that serves as a rooftop stargazing platform, and is accessed via an exterior stair tucked into the hill. Light interior finishes provide a stark contrast to the dark exterior: White plaster walls and ceilings and oiled white oak floors help distribute daylight throughout, while contributing to an aesthetic that the architects describe as a "California chalet for the 21st century."

PROJECT CREDITS

XS House
Page 102
Location: Philadelphia
Client: Callahan Ward
Architect: ISA, Philadelphia · Brian Phillips, AIA, Deb Katz, AIA (principals); Alexandra Gauzza, AIA, Jason Jackson (studio directors); Matt Underwood (senior designer)
Structural Engineer: Larsen & Landis Structural Engineers
MEP Engineer: J+M Engineering
General Contractor: Callahan Ward
Lighting: Lam Partners
Size: 5,000 square feet
Cost: $1.14 million

Materials and Sources
Exterior Wall Systems: Fiber cement panels; Corrugated metal

Suspended Stair
Page 104
Location: New York
Client: Sam Sullivan and David Moench
Architect: O'Neill Rose Architects, New York · Devin O'Neill
Mechanical Engineer: Nino D'Antonio
Structural Engineer: Ross Dalland
General Contractor: ABR Contracting
Lighting Designer: O'Neill Rose Architects
Size: 32 square feet (stair); 2,042 square feet (unit)
Cost: Withheld

Materials and Sources
Metal: Blackened-steel treads; Steel suspension rods

Branch House
Page 106
Location: Montecito, Calif.
Client: Withheld
Architect: TOLO Architecture, Los Angeles · Peter Tolkin, AIA (principal); Jeremy Schacht; Albert Escobar
Structural Engineer: Joseph Perazzelli Structural Engineering
Civil Engineer: Michael Viettone Civil Engineering
General Contractor: RHC Construction
Landscape Architect: Wade Graham Landscape Studio
Lighting Designer: Lighting Design Alliance
Energy Consultant: Monterey Energy Group
Arborist: Westree
Size: 4,400 square feet (house); 700 square feet (garage); 500 square feet (studio)
Cost: Withheld

Materials and Sources
Appliances: Sub-Zero (refrigerator, wine refrigerator); Gaggenau (double oven); Wolf (gas range, hood); Miele (dishwasher); Electrolux (washer, dryer)
Bathroom Fixtures: Dornbracht; Waterstone Faucets; Blu Bathworks; Icera; Chicago Faucets
Cabinets: Bartlett's Fine Cabinetry (custom)
Ceilings: LVL beams; plywood
Countertops: Stainless steel; Stone
Exterior Wall Systems: Martin Roofing and Sheet Metal (copper cladding)
Flooring: Finished concrete; Heath Ceramics (ceramic tile)
Furniture: Moroso; Knoll
Hardware: FSB; Simonswerk
HVAC: Radiant floor heating; Unico
Insulation: Owens Corning
Kitchen Fixtures: Dornbracht
Lighting Control Systems: Lutron Electronics Co. (RadioRA 2 System, Diva)
Lighting: LF Illumination; Hevi; Bega; Tivoli; Prudential Ltg; Litelab; Soraa
Metal: Central Machine & Welding (Steel structure; Custom steel windows)
Music System: Sonos; James Loudspeaker
Photovoltaics: Photovoltaic system
Plumbing/Water System: Solar hot-water heater
Roofing: Custom copper roofing; IB Roof Systems
Site/Landscape Products: Nesheim Landscape (installation)
Structural System: Wood frame on raised structural slab; Gordon Fiano (structural wood framing/beams)
Walls: Skim-coat plaster over drywall
Windows/Doors: Custom steel fixed windows; Vitrocsa; Shüco International; Architectural Millwork of Santa Barbara; Architectural Window Shades; Schweiss (garage door); Industrial Skylights

Reduction Residence
Page 110
Location: Pittsburgh
Client: Withheld
Architect: Bohlin Cywinski Jackson, Wilkes-Barre, Pa. · Kent Suhrbier, AIA (principal); Bill James (project manager)
Interior Designer: Bohlin Cywinski Jackson
General Contractor: Cummings Construction
Size: 2,100 square feet
Cost: Withheld

Materials and Sources
Bathroom Fixtures: Cocoon
Countertops: Silestone
Fabrics/Finishes: Porcelanosa (tile and solid surface)
Flooring: Dinesen (Pine flooring)
Lighting: WAC Lighting
Paints/Finishes: Portola (Limewash, Roman Clay paints)
Roofing: Copper
Windows/Doors: Kolbe (VistaLuxe)

Victorian Music Box

Page 114
Location: Aspen, Colo.
Client: Withheld
Architect: CCY Architects, Basalt, Colo. · John Cottle, FAIA (principal); John Schenck, AIA; Evan A. Barrett, AIA
Interior Designer: Cheryl Troxel
MEP Engineer: Architectural Engineering Consultants
Structural Engineer: KL&A Engineers & Builders
Civil Engineer: Roaring Fork Engineering
Construction Manager: Ryan McGovern & Jim Gohery
General Contractor: Koru Construction
Landscape Architect: Bluegreen
Lighting Designer: Scott Oldner Lighting Design; David Electic
Size: 6,800 square feet (split between two units)
Cost: Withheld

Materials and Sources
Acoustical System: Staggered wood frame; Topakustik (wood finishes); Maxxon (Acousti-Mat)
Appliances: Miele
Bathroom Fixtures: Dornbracht
Carpet: Hibernia Woolen Mills
Cabinets: Benchcraft (custom rift white oak); Bulthaup (kitchen)
Ceilings: Level 5–finish Venetian plaster
Concrete: Cast-in-place
Countertops: Miele
Exterior Wall Systems: Wood frame with batons; reverse standing-seam Galvalume
Flooring: Porcelanosa; Carlisle Wood Flooring; Concrete with acrylic paint
Glass: Low-E glass; Electrochromic glass; Vitro (Starphire ultra clear shower glass)
HVAC: Radiant in-floor; supplemental forced air
Insulation: Spray foam; 1½" Rigid, acoustic batt insulation
Lighting Control Systems: Xssentials; Savant
Lighting: Bega; Micro-K; Light & Green; Klus; No. 8 Lighting
Masonry/Stone: Colorado Buff; Colorado Rose
Metal: Galvalume; Plate steel
Roofing: Formed aluminum
Site/Landscape: Stone pavers
Structural System: Slab on grade with spread footings; steel-and-wood frame
Walls: Level 5–finish Venetian plaster
Windows/Doors: Loewen; Tru Architectural

Walk-Street House

Page 116
Location: Hermosa Beach, Calif.
Client: Mardi and Anton Watts
Architect: RAS-A Studio, Redondo Beach, Calif. · Robert Sweet (lead principal); Paul Miller, AIA (project architect)
Structural Engineer: McCullum Engineering
General Contractor: RAS-A Build
Landscape Designer: Jones Landscapes
Size: 2,110 square feet
Cost: Withheld

Materials and Sources
Appliances: Miele
Bathroom Fixtures: Hansgrohe; Axor; Duravit
Cabinets: Custom (white oak, 13-ply with laminate fronts)
Ceilings: Western red cedar
Concrete: Polished slab on grade
Countertops: Neolith (porcelain slab in kitchen); Corian (master bath)
Kitchen Fixtures: Kohler
Lighting: Halo; Artemide
Masonry/Stone: Ann Sacks (porcelain tile); Cle Tile (encaustic tile)
Paints/Finishes: Sherwin Williams (Cashmere interior paint)
Photovoltaics/Other Renewables: Solar hot water collector
Wallcoverings: Western red cedar (interior and exterior siding)
Windows/Doors: Fleetwood Windows & Doors

Oculi House

Page 120
Location: New York
Client: Withheld
Architect: O'Neill Rose Architects, New York · Devin O'Neill (partner)
Interior Designer: Keryn Kaplan
Mechanical Engineer: Nino D'Antonio
Structural Engineer: Ross Dalland
General Contractor: ABR Molding General Contractors
Size: 3,000 square feet
Cost: Confidential

Materials and Sources
Appliances: Miele (cooktop, dishwasher); Sub-Zero (refrigerator)
Cabinets: Custom
Ceilings: Plaster
Countertops: Custom
Flooring: Wood
Lighting: Custom
Paints/Finishes: Farrow & Ball
Roofing: Kemper System
Windows/Doors: Bliss Nor-Am

The Hut

Page 124
Location: Belmont County, Ohio
Client: Dutton Family
Architect: Midland Architecture, Columbus, Ohio · Greg Dutton, ASSOC. AIA, Matt Diersen, AIA (principals-in-charge); Matthew Manzo, AIA (project architect)
Interior Designer: Greg and Liz Dutton
Structural Engineer: Conway Engineering
Construction Manager: Greg and Chris Dutton
General Contractor: Withrow Contracting
Landscape Architect: Matt Lokay
Custom Millwork: Ryan Smith
Custom Cabinetry: Mullet Cabinet
Size: 600 square feet
Cost: Withheld

Materials and Sources
Appliances: Summit Appliance
Bathroom Fixtures: Kohler
Cabinets: Mullet Cabinet (custom)
Ceilings: Keim Lumber (Ponderosa pine tongue-and-groove)
Countertops: Ryan Smith (custom white oak)
Exterior Wall Systems: Keim Lumber (White cedar shingle)
Flooring: Stonewood Products (Wide-plank eastern white pine)
Kitchen Fixtures: Kohler
Lighting: School House
Metal: Ohio Valley Metal Roofing
Paints/Finishes: Sherwin-Williams
Photovoltaics/Other Renewables: Scherrer Engineering (photovoltaic system)
Roofing: Keim Lumber (White cedar shingle)
Wallcoverings: Keim Lumber (Ponderosa pine tongue-and-groove)
Windows/Doors: Andersen

MLK1101 Supportive Housing

Page 128
Location: Los Angeles
Client: Clifford Beers Housing
Architect: Lorcan O'Herlihy Architects, Los Angeles · Lorcan O'Herlihy, FAIA (principal); Santiago Tolosa, Nick Hopson, Ghazal Khezri, Chris Gassaway, Christopher Lim, Dana Lydon (project team)
General Contractor: GB Construction
Landscape Architect: LINK Landscape Architecture
Structural Engineer: John Labib & Associates
Civil/MEP Engineer: SY Lee & Associates
Size: 34,000 square feet (with 4,000-square-foot park space)
Cost: Withheld

Materials and Sources
Acoustical System: Pliteq (GenieMat PMI-05 Type R rebonded recycled rubber perimeter isolation strip)
Appliances: Maytag (MAT14PD washer in white; MDE/MDG25PD dryer in white)

Bathroom Fixtures: American Standard (2391.202 tub in white; 8336.230 toilet paper holder in polished chrome; 1662.214 shower kit in polished chrome; 2064.210 towel hook; 2064.018 towel bar; 0610.000 bathroom sink in white; 1660.613 shower head in chrome finish; T010500.002 tub volume control; 888.086 tub spout in starlight chrome); Bobrick (B-4288 toilet paper holder; Bobrick B-4221 seat cover dispenser; B-4112 soap dispenser; B-4262 paper towel dispenser); Kohler (K-99890 medicine cabinet; K-3519 water closet in white)
Carpet: Shaw Floors (XV442, Windy City)
Cabinets: solid wood plywood, white
Countertops: Formica (plastic laminate); Wilsonart (solid surface)
Exterior Wall Systems: Metal Sales (T16-E Wall Panel); James Hardie (High-density fiber cement board, painted white)
Flooring: Marmoleum (Walton linoleum flooring in Uni-Black); Cali Bamboo (Fossilized)
Kitchen Fixtures: Frigidaire (FFET1222Q, FFHT1831Q refrigerator/freezer; FGM0205KF microwave in stainless steel; FFGS3025PS oven/cooktop in stainless steel; FDB2410H dishwasher in stainless steel); Summit (WNM6307DFK oven/ cooktop, in white); Minka Aire (F833-WH ceiling fan, in white); Air King (ESZ303ADA range hood, in white); General Electric (GFC1020T food waste disposal); American Standard (4931.300 kitchen faucet, in chrome finish; 24DB.332211.290 kitchen sink, in stainless steel)
Lighting: DMF (DRD2 recessed LED downlight; DEL40 LED low-profile emergency lighting; DLS62 architectural LED edge-lit exit sign with battery backup); LA Lighting (LED strip light, 1-STR220 Series); GlobaLux (LED Premium High Bay); RAB Lighting (VXBRLED13NDG); AFX (Algiers LED Vanity ALV Series); Progress Lighting (52" ceiling fan with light kit)
Metal: Construction Specialties (RS-4300 storm-resistant fixed horizontal louver)
Paints/Finishes: Dunn Edwards (DEW338 "White Heat," in eggshell and semi-gloss)
Roofing: Carlisle (Sure-Weld TPO reinforced membrane)
Site and Landscape Products: Hydrotech (green roof)
Windows/Doors: VPI Quality Windows (Endurance Series, vinyl); Arcadia A450 Series, AFG451 Series storefront)

Georgica Cove

Page 130
Location: East Hampton, N.Y.
Client: Withheld
Architect: Bates Masi + Architects, East Hampton, N.Y. · Paul Masi, AIA (lead design partner); Daniel Widlowski, Jack Booton (project architects)
Interior Designer: Erica Millar Designs
Structural/Civil Engineer: Steven Maresca
General Contractor: John Hummel & Associates Custom Builders
Landscape Architect: J. Mendoza Gardens
Size: 6,500 square feet
Cost: Withheld

Materials and Sources

Appliances: Miele; Viking; Wolf; Thermador
Bathroom Fixtures: Toto; Kohler
Cabinets: Custom
Countertops: Stone
Flooring: Oak
Kitchen Fixtures: Custom
Paints/Finishes: Benjamin Moore
Windows/Doors: Arcadia

S-M-L Loft

Page 134
Location: New York
Client: Withheld
Architect: Breitner Ciaccia—Office of Architecture, Brooklyn, N.Y. · Bronwyn Breitner, AIA, Luigi Ciaccia, AIA (principals); Scott Mikawa (designer)
MEP Engineer: Jack Green Associates
General Contractor: SilverLining
Lighting Designer: BOLD
Audiovisual: Bright Home Theater
Size: 2,630 square feet
Cost: Withheld

Materials and Sources

Appliances: Gaggenau; Sub-Zero
Bathroom Fixtures: Dornbracht (plumbing fixtures); Duravit (toilets, sinks)
Cabinets: Bulthaup
Concrete: Get Real Surfaces
Countertops: Bulthaup
Flooring: I.J. Peiser's Sons
Hardware: Nanz
Kitchen Fixtures: Bulthaup
Lighting Control Systems: Lutron Electronics
Lighting: iGuzzini; Ecosense; Sistemalux; Interlux; Element
Metal: Caliper Studio

Two Houses on Oak Hill Avenue

Page 136
Location: Lawrence, Kan.
Client: Studio 804
Designer: Studio 804, University of Kansas, Lawrence, Kan. · Dan Rockhill (distinguished professor); Christina Base, Sam Bradley, Gen Daley, Alex Delekta, Blake Firkins, Jacob Hansen, Jared Heinzerling, Grace Kennedy, Joe Libeer, TJ Niemann, Alan Palerma, Emilie Printemps, Daniel Ritchie, Dana Ritter, Bianca Webb (students)
Structural Engineer: Norton & Schmidt Consulting Engineers
General Contractor: Studio 804
Size: 650 square feet (house 1); 1,000 square feet (house 2)
Cost: $169,000 (house 1, sale price); $229,000 (house 2, sale price)

Materials and Sources

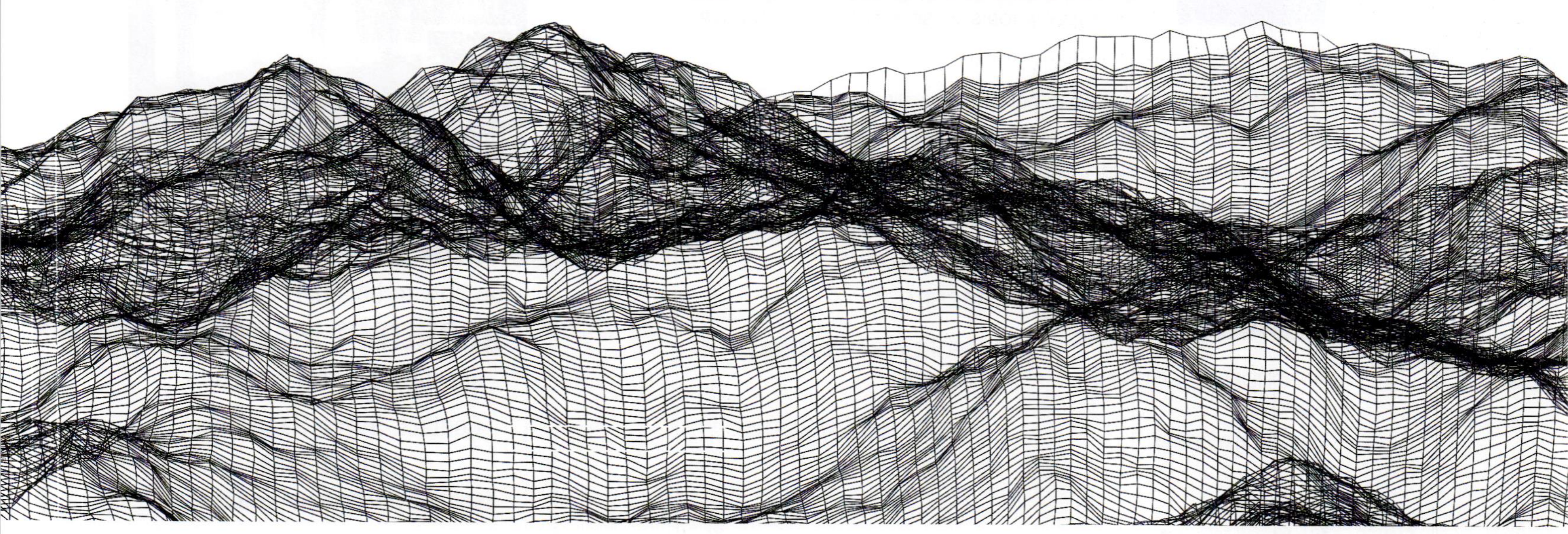
Adhesives/Coatings/Sealants: Prosoco
Appliances: Blomberg
Bathroom Fixtures: Duravit; Kohler
Cabinets: IKEA
Concrete: MCM
Countertops: Richlite
Exterior Wall Systems: Bridger Steel
Flooring: Master Craft
Furniture: Troscan Design
Glass: Tubelite
Gypsum: USG
HVAC: Samsung
Insulation: Hunter Panel
Kitchen Fixtures: Elkay
Lighting Control Systems/Lighting: Contech Engineered Solutions
Masonry/Stone: Daltile
Metal: Exltube
Paints/Finishes: Steel It; Benjamin Moore; Schluter
Plumbing/Water System: Kohler; Bradford White
Roofing: WR Grace, Bridger Steel
Site/Landscape: Robi Decking
Structural System: Stego Industries
Wallcoverings: Vaproshield; Richelieu; Lynden
Walls: 475 High Performance Building Supply; Spore
Windows/Doors: Pella; Tubelite; Viracon; SureSill

SkyValley House

Page 140
Location: Lake Arrowhead, Calif.
Client: David Holley and Abby Kessler
Architect: Edward Ogosta Architecture, Los Angeles · Ed Ogosta, AIA (principal); Luis Garcia (designer)
General Contractor: Joseph McCormick
Size: 1,450 square feet
Cost: Withheld

Materials and Sources

Countertops: Caesarstone
Exterior Wall Systems/Roofing: Metal Sales
Structural System: Concrete foundations; Wood framing
Windows/Doors: Fleetwood Windows & Doors



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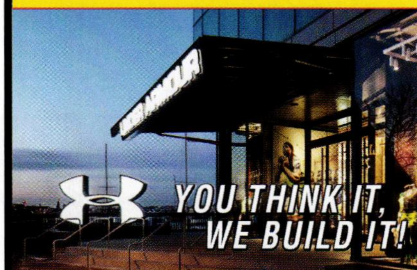

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Editorial:
All I Want for Christmas

I remember feeling incredibly fortunate in the 1990s. The Soviet empire had fallen, the U.S. economy was enjoying an unprecedented run of growth, AIDS was in check, computers and the internet promised a technological utopia, and Frank Gehry, FAIA, was leading architecture into a new era of apparently limitless formal possibilities. Of course, there were still terrors—in Bosnia, for instance, and Rwanda—but they could be categorized as post-communist and -colonial aftershocks rather than emerging dangers. At long last, the world had been made safe for democracy.

Whether the '90s were ever truly a moment of possibility, or I was just being naive in my privilege, today the options are unquestionably narrower. No wonder Greta Thunberg is so upset. Unchecked development since World War II—aptly named the Great Acceleration—has left her generation holding a malodorous bag of social inequity, political instability, and extreme weather.

The three issues are inextricable, and they won't just go away. Deteriorating conditions in parts of Africa, Southeast Asia, the Middle East, and Latin America have already compelled millions to migrate in search of security—and hundreds of millions more will be displaced by flooding and desertification in coming decades if we fail to act on climate change. Even the rich West won't be immune. As anthropologist Bruno Latour observes in *Down to Earth: Politics in the New Climatic Regime* (Polity, 2018): "To the migrants from *outside* who have to cross borders and leave their countries behind at the price of immense tragedies, we must from now on add the migrants *from inside* who, while remaining in place, are experiencing the drama of seeing themselves *left behind by their own countries*."

Why didn't humanity heed John Ruskin's warning, in *The Stones of Venice*, about unfettered commerce? The week I wrote this, 6 feet of water swept over the Piazza San Marco and wildfires licked at the base of the Getty Center in Los Angeles. Lines on a map mean nothing to nature, as it reacts violently to humanity's abuse. With governments across the globe immobilized by corruption, even citizenship in rich countries offers no guarantee of protection. Any resident of New Orleans or Flint, Mich., can tell you that.

It feels at times like we are backsliding, when we could be implementing an organized realignment. So I felt palpable relief when AIA overwhelmingly adopted the Resolution for Urgent and Sustained Climate Action this summer, and I felt it again last month when AIA president William Bates, FAIA, and CEO Robert Ivy, FAIA, released a statement opposing the U.S. withdrawal from the Paris Climate Agreement, describing the move, with suitably diplomatic reserve, as "shortsighted." The leadership is important.

Architects have significant power to mitigate climate change, and the path forward is straight and simple: Join the AIA 2030 Commitment and take responsibility for your buildings' carbon emissions. Bewilderingly, only 252 signatories reported data for 2018, out of some 20,000 firms in the U.S. The profession can and must do better. Please forgive me for hectoring—and for doing so during the holidays. It's just that we live in a most delicate time, and only through united, sustained action can the profession meaningfully help to make the world safe.

STEPHEN VOSS