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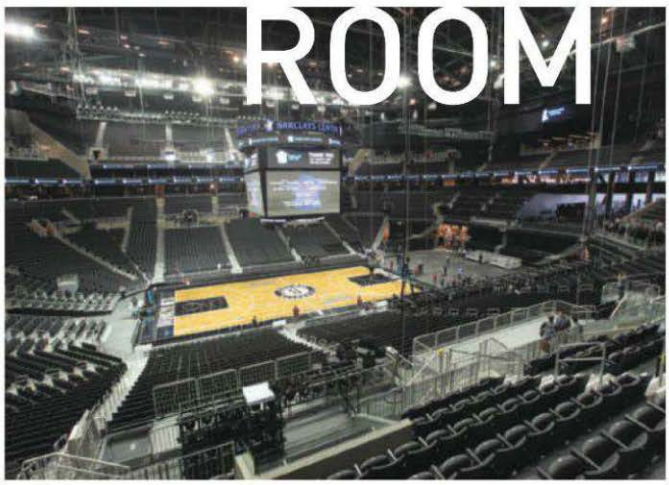

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ON THE COVER: SOUTHEAST CORNER OF BROOME STREET & BROADWAY, MANHATTAN, 10:25 P.M. ON OCTOBER 29, 2012. PHOTO BY VALENTINA VANNI.

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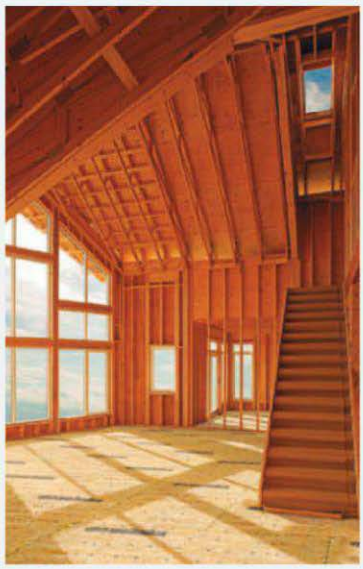

The Makings of a Great Subfloor

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CIRCLE 40

The Naked City

The storm and its aftermath.

AS JOURNALISTS, we at ARCHITECTURAL RECORD are by nature outside observers—writers and editors who consider the content of the magazine as objectively as possible. But a month ago, all of us who work here in New York City were caught up in the enormous and disturbing story of Hurricane Sandy. Awaiting the storm on a Monday, with offices and schools shut, and the transit system—the lifeblood of the city—closed, we each hunkered down at home, staying connected through the Internet, posting on our website, and working on the issue of the magazine you're now reading. When Sandy hit, many of us watched the same terrifying television footage everyone saw around the globe: rising waters, cars floating in the streets like bath toys, surging rivers rushing into the tunnels that link the island of Manhattan to the rest of the world—a great city brought to its knees by nature.

The aftermath left us shaken, as the death toll rose (more than 85 lives lost in New York, New Jersey, and Connecticut) and the damage was assessed (upwards of $50 billion). We returned to RECORD's Midtown Manhattan office, some of us traveling hours by car or bus for what is ordinarily a short commute—and some of us leaving at night for a home without light or heat. But we are fortunate. Tens of thousands were still without power weeks later, and thousands more were left homeless.

We knew we had to change the cover of ARCHITECTURAL RECORD this month to reflect a catastrophe with implications far beyond our city and region. Everyone on earth faces the tempestuous potential of climate change to radically alter the way we build and live.

As the days passed, people exchanged stories: The apartment "super" in Tribeca who had gone to his building's underground garage to check on tenants' cars, only to be trapped by the water and drowned. The woman who left her Staten Island home not long before the surge swept in, taking her husband and daughter to their deaths. An artist in Red Hook, Brooklyn, whose work was saved because he lived on the second floor, while his neighbors downstairs lost everything they had created. There were innumerable stories of kindness, too—of sharing food and offering beds to those who had to evacuate their homes.

In some ways Sandy was an equal-opportunity storm, devastating the financial capital of Lower Manhattan as well as working-class communities in Queens. But in other ways, the economic gulfs that divide New Yorkers were thrown into starker relief. The Goldman Sachs building, designed by Pei Cobb Freed and opened in 2009, remained aglow with light along the Hudson River, with its own generator and pumps. (Meanwhile, the architects who work at Pei Cobb Freed, not far away on Pine Street, found their offices flooded.) The Rockaways—a sandy strip of land along the ocean in Queens that is home to a number of public-housing projects—remained without electrical power long after it was restored to Manhattan. Two weeks after the storm, residents there stood in long lines for provisions; volunteers with orange buckets and jugs of bleach arrived to help clean up the mountains of debris; church groups set up tents to dispense food. Nearby, in another modest—and still dark—seaside neighborhood, a spray-painted sign that read "Broad Channel: The Forgotten Town" was propped up against a battered boat improbably beached on the road. With its swamped cars and junked refrigerators, this part of the city, more than most of New York, looked like post-Katrina New Orleans.

In the midst of the crisis, of course, came the presidential election, following an especially bitter campaign, in which Romney and Obama disagreed about the role of the federal government in responding to natural disasters, but seemed to agree that global climate change didn't belong on this year's political agenda. It may not be an electable topic, but most scientists say that without an alteration in human behavior, storms are likely to become ever more extreme.

Opinions differ about how to protect a coastal city like New York. The state's governor, Andrew Cuomo, likes the kind of gargantuan storm barriers that loom over the mouth of the Thames outside London, while Mayor Michael Bloomberg doesn't think they would work in New York's vast harbor. Clearly, every reasonable means of dealing with rising waters needs to be considered, including the "soft" infrastructure of wetlands and ecologically modified shorelines. Let's hope that our leaders begin to feel a sense of urgency about creating new policies—and that they can find the political will to make crucial investments. Sandy was just the latest wake-up call. ■

Cathleen McGuigan

Cathleen McGuigan, Editor in Chief

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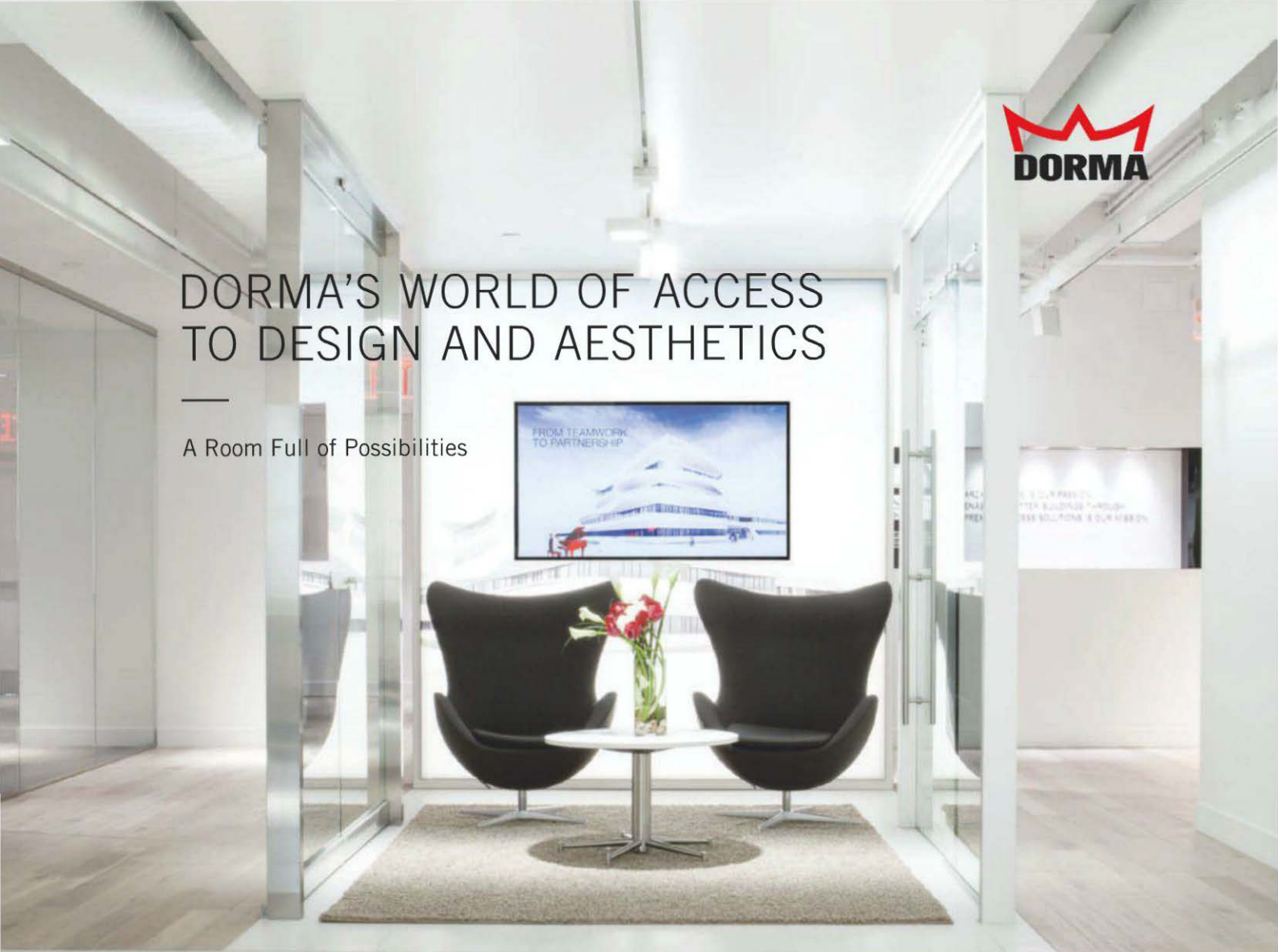

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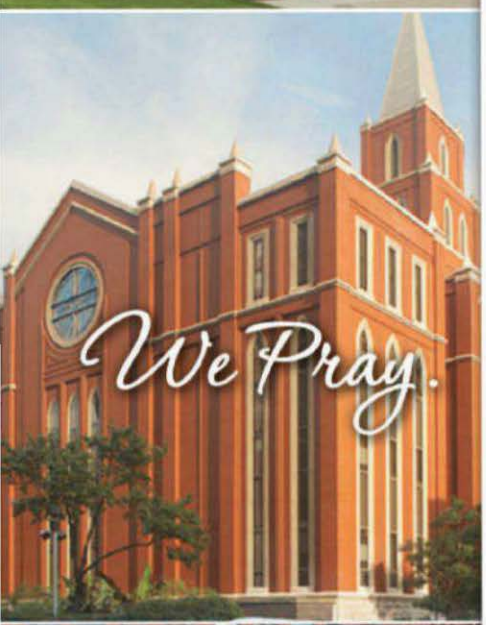

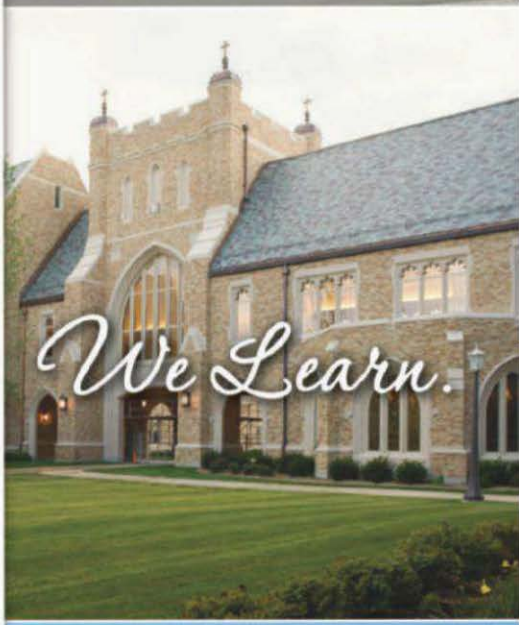

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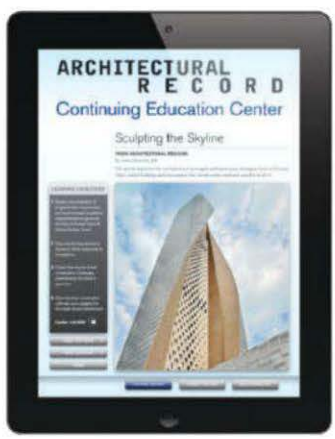

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Harnessing all benefits from sustainable construction

Gail Brager, Annika Feige, Prem Jain, Patrick McAllister, Chrisna du Plessis, Vishnu Swaminathan, Holger Wallbaum

4th International Holcim Forum for Sustainable Construction

Although sustainable development incurs costs, it also offers considerable economic potential. "Economy of Sustainable Construction" is the focus of the 4th International Holcim Forum, hosted by the Indian Institute of Technology (IIT Bombay) in Mumbai, India, from April 11 to April 13, 2013.

Chair: **Mohsen Mostafavi**. Co-Chair: **Battula Chakravarthy**. Keynotes: **Alejandro Aravena, Lucas Bretschger, Sir David Chipperfield, Ian Morris, Brinda Somaya**. Panelists: **Marc Angélil, Nirmal Kishnani, Ashok Lall, Werner Sobek**.
Program details and registration at **www.holcimforum.org**

Holcimforum
for sustainable construction

CIRCLE 39

DAILY UPDATES
archrecord.com/news
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perspective

@HawthorneLAT All the talk of lines and snafus at the polls makes me think our electoral architecture is about as sturdy as our infrastructure.

—*Christopher Hawthorne, architecture critic for the* Los Angeles Times, *in a November 6 tweet*

A hot-dog stand at the corner of Fifth Avenue and 19th Street was a beacon in blacked-out Lower Manhattan.

PHOTOGRAPHY: © IWAN BAAN

It Happened Here: Hurricane Sandy's Impact

BY FRED A. BERNSTEIN

WHEN HURRICANE Katrina hit New Orleans in 2005, New Yorkers watched in horror as residents climbed onto rooftops, stranded, or fled to shelters that provided precious little shelter. For all kinds of reasons—ranging from geography to confidence in government—New Yorkers believed that "it could never happen here."

But for a few days this fall, it very nearly did. In Manhattan, the moat itself became the enemy, as a storm surge swept over the island. Suddenly, Canal Street threatened to revert to a canal, and Chelsea was, by all accounts, Chel Sea. (The High Line park, 30 feet above the ground, was, for a time, the high and dry line.) Throughout Lower Manhattan, many residents found that, even when the waters receded, and even after the power came back on, there was so much damage—mostly to basement mechanical equipment—that buildings would be uninhabitable for months. Among those affected were celebrity residents of Richard Meier's three West Village towers.

But well-heeled Manhattanites were, for the most part, merely inconvenienced. The real tragedies occurred elsewhere: in the Rockaways, where an entire neighborhood was lost; on the Jersey Shore, where towns were permanently disfigured; and on Staten Island, where bodies were

Damaged homes on Rockaway Beach in Queens, New York, after Hurricane Sandy came and went.

still being pulled out of flooded basements days after the storm. More than 100 people died as a direct result of Sandy, and many others suffered; the fate of hospital and nursing home-patients provided particularly ghastly news.

It was a tale of two cities, some parts barely touched, others gravely injured. Volunteers began reaching the hard-hit areas, providing food and other necessities, often with surprisingly little government assistance. Among the second responders were architects; members of the Staten Island chapter of the American Institute of Architects worked with the Department of Buildings to inspect houses, providing, in many cases, the green stickers that allowed their owners to return. (But, without a "good samaritan" law to protect them from liability, architects were unable to conduct inspections on their own.)

But many New Yorkers had no homes to return to. The number of displaced was in the tens of thousands. City "projects," often in low-lying neighborhoods, with antiquated systems, were especially hard hit. Schools were pressed into service as emergency shelters, but eventually the students had to return, and the city confronted a long-term housing crisis.

Meanwhile, power outages paralyzed large swaths of the city, including the New York Stock Exchange and most of the financial district. (Lower Manhattan became SoPo, a new nickname for "south of power.") Those whose workplaces were undamaged generally couldn't reach them, with the subway system flooded. The cost was estimated in the billions of dollars, but it's hard to guess the long-term effects on Manhattan's economy; surely some companies will decide to move operations to higher ground.

In Manhattan, the moat itself became the enemy, as a storm surge swept over the island. Canal Street threatened to revert to a canal.

Soon the questions began, about why the city hadn't made better preparations for the storm that everybody knew was coming. Keeping the tunnels that connect Manhattan to New Jersey and Long Island dry would have been relatively easy, engineers asserted. (Inflatable plugs, developed for the Department of Homeland Security, could offer a low-cost alternative to conventional floodgates.) And how could the utility company Con Edison have left crucial equipment—including a transformer on 14th Street that exploded during the storm—exposed?

Much was made of a 2009 symposium, sponsored by the American Society of Civil Engineers, at which a five-mile steel barrier in the Atlantic Ocean, stretching from Sandy Hook, New Jersey, to the Rockaway Peninsula, was discussed. Mayor Michael Bloomberg and others have dismissed the idea as impractical—it would cost tens of billions—and also unfair, since water has to go somewhere. A barrier would protect Manhattan—making it the ultimate gated community—while worsening conditions elsewhere. And much was made of the Museum of Modern Art's *Rising Currents: Projects for New York's Waterfront,* a 2010

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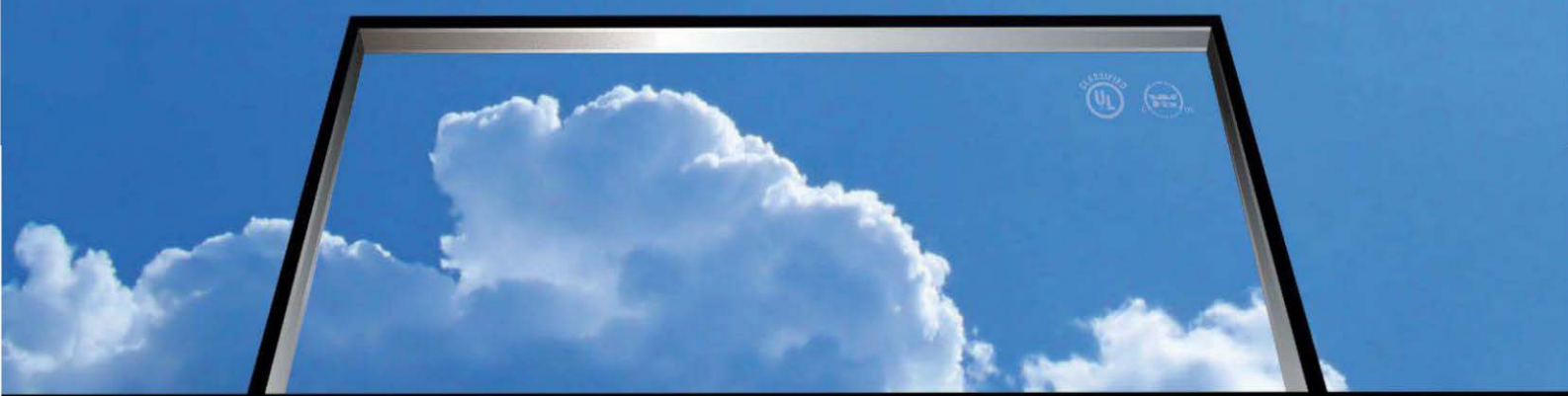

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exhibition of "soft infrastructure" solutions. Proposals included suspending housing over the harbor, changing the shape of the New Jersey shoreline, and installing permeable paving in Lower Manhattan.

But one Manhattan architect, Alex Gorlin, referred to such solutions as the "crunchy granola" approach to civil engineering, mocking the idea that "oyster beds and a few lovely marshes at the Battery will hold back 14½-foot surges." New York, he says, needs to get serious about rising waters—as serious as London is with its movable flood barrier (completed in 1982 and used more than 100 times)—or risk long-term decline.

There was lots of talk of how the Netherlands protects territory that is, in many cases, below sea level. "I'm glad I hired a Dutchman," says Leslie Koch, the president of the Trust for Governors Island, where a new park by Adriaan Geuze of the Rotterdam firm West 8 is taking shape. Parts of Governors Island had already been raised as much as 16 feet at Geuze's behest; Koch reported they were "bone dry" soon after the storm. But there's no way to raise Manhattan 16 feet. That's why the approach advocated by Guy Nordenson, the engineer who helped organize *Rising Currents*—an approach he describes as "living with water" or "controlled flooding"—makes sense. But "as far as I know, no one at any level of government is thinking that way," says Nordenson.

As in New Orleans, telling people not to return to their homes is political suicide. Of course, the government is doing more than allowing people to return to vulnerable sites; it is encouraging them to do so, by dispensing funds through FEMA. Matthew Kahn, a professor of economics at UCLA, says that FEMA grants provide incentives to repeat the mistakes of the past. Calling for a "tough love" approach to storm recovery, he says, "It's simply an economic argument. If you're spending other people's money, you're less likely to move to higher ground or come up with more resilient buildings." He added that coastal residents "are more likely to adopt the best architectural practices from around the world if they have more skin in the game."

Kahn isn't the only one who thinks buildings have to change; in the view of many architects, placing essential equipment in basements makes little sense. The whole point of *Rising Currents,* says Nordenson, was "to shift the emphasis. If we accept that water is going to come, how do we manage it?" Standards developed by FEMA for flood zones, and incorporated into city building codes, require sealed mechanical spaces and many other concessions to rising waters, but so far enforcement has been spotty.

Of course, market forces will shape the city of the future. Will the developers of the planned shopping mall at the World Trade Center–Westfield Group and the Port Authority of New York and New Jersey—rethink their plans to build much of the 365,000-square-foot complex below ground? (Planning for future deluges, including possible evacuations before every big storm, would be, at the very least, disruptive to the retail experience.)

In some parts of the city, ground-floor spaces may be less desirable than they were two months ago. Pei Cobb Freed, the venerable architecture firm, has long occupied the base of a skyscraper, which it designed, near the East River. But after the superstorm flooded the street-level space, the firm had to decide whether to relocate, permanently, to a higher floor. "We love the space we've been in," says principal Ian Bader, sounding wistful for the pre-Sandy Manhattan. "But reason has to prevail." ■

The flooded Hugh L. Carey Tunnel, formerly known as the Brooklyn Battery Tunnel, looked like a canal on October 30 (left). A flooded street in Queens on October 29 (below).

PHOTOGRAPHY (FROM TOP): © METROPOLITAN TRANSPORTATION AUTHORITY/PATRICK CASHIN; WANG CHENGYUN

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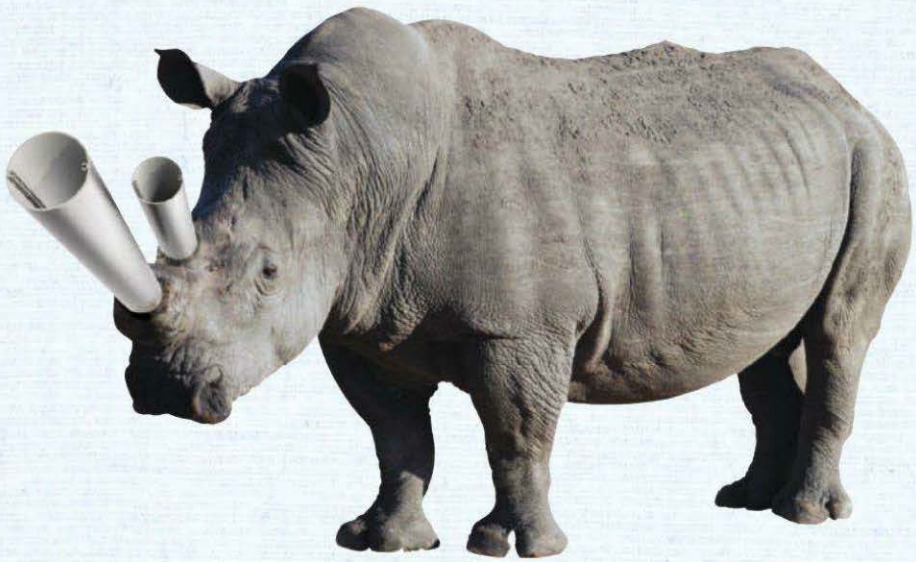

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CIRCLE 69

RECORD Honors One in a Million

BY LAURA MIRVISS

WHEN IT comes to continuing education, few architects get a free pass. From recently licensed practitioners to Pritzker Prize–winning architects, most need to fulfill state licensing requirements by completing a minimum number of education credits. Bernard Tschumi, Deborah Berke, and Frank Gehry each filed credits through ARCHITECTURAL RECORD's continuing-education portal this year. (It's really them. We checked.)

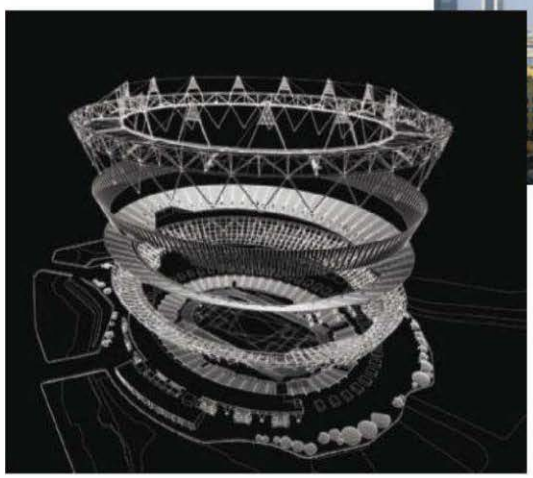
Furiously trying to complete the requirements before the end of the year has become a proud tradition since the American Institute of Architects started the program in the mid-1990s. RECORD receives an avalanche of Web traffic each December, when the number of completed tests doubles.

And sometimes, riding the late wave has its advantages. Tim Kwiatkowski, a vice president at Illinois-based FGM Architects, recently won $5,000 in RECORD's Millionth Test-Taker Sweepstakes. He took eight tests in mid-October, mostly on his iPad in the evenings after work, and landed the 1 million slot after reading an article on slip resistance for floors. "I e-mailed my boss after I heard I won, and said, 'See, procrastination does pay off,'" says Kwiatkowski, who runs the firm's 30-person office in O'Fallon, Illinois, outside St. Louis. "I'm a nuts-and-bolts person—I love writing specs and reading about all the different properties of materials."

RECORD's program started in 1997, around the time when states began requiring continuing education for licensure. But the architecture profession was a relatively late adopter: In 1995, when the AIA introduced the requirements to its membership, continuing-education requirements for lawyers, doctors, and accountants had been on the books for decades. "There was pushback, and a lot of the membership didn't like it, but after the states started requiring it, it became a fact of life," says Deane Evans, a professor at New Jersey Institute of Technology and a McGraw-Hill consultant who helped start the AIA program. "The AIA thought it would enhance the image of architects—their national reputation—if they showed they were keeping up with their skills and knowledge base."

ARCHITECTURAL RECORD, published by McGraw-Hill Construction, is the largest single provider of continuing-education credits, offering 300 courses, which are taken by 30,000 architects and designers annually. The popularity of various topics has waxed and waned, though sustainability has topped the list for several years, along with building-envelope design, residential design, and products and materials. Since 2008, the most widely read CEU articles have covered topics ranging from urban forests and water efficiency to the Burj Khalifa, the world's tallest building.

Graham Hogan, a senior associate at Antoine Predock Architect in Albuquerque, says he gravitates toward articles about sustainable design, and often reads them on airplanes during his frequent work trips. "It's just so convenient. If you're really busy, it's hard to work those things into your schedule," says Hogan, who snagged the 1,000,001 spot in the sweepstakes, winning an Eero Saarinen Womb chair from Knoll. He fulfills approximately 80 percent of his continuing-education requirements through RECORD. "I think it's a good thing, personally. It's a bit of a hassle sometimes, but I certainly support continuing education—and if I can get a great chair out of it, all the better." ■



Recent RECORD CEUs have included articles on the renovation of the United Nations Secretariat tower (above), the Burj Khalifa (right), and the Olympic Stadium in London (below). Tim Kwiatkowski (bottom right) won RECORD's Millionth Test-Taker Sweepstakes.

PHOTOGRAPHY (CLOCKWISE FROM TOP LEFT): © U.N. CAPITAL MASTER PLAN/JOHN WOODRUFF AND PETER BROWN; NICK MERRICK/HEDRICH BLESSING; COURTESY TIM KWIATKOWSKI; POPULOUS

Hudson Yards to Break Ground

BY C.J. HUGHES

AFTER YEARS of debate and delays, Hudson Yards—an ambitious plan to create a new mixed-use neighborhood from scratch over railroad tracks on Manhattan's West Side—is finally breaking ground. Excavations for the first office tower on the site, designed by Kohn Pedersen Fox Associates (KPF), which also created the master plan, will begin by the first week of December, according to a source at the Related Companies, its co-developer with Oxford Properties Group.

While much of Manhattan's waterfront suffered serious flood damage from Hurricane Sandy, the site, which sprawls along the Hudson River between 10th and 12th Avenues and West 30th and West 33rd Streets, was spared. The Long Island Rail Road (LIRR) stores its trains there, and its pumps worked when the water surged. Most of the development will be built atop a massive platform that will cover the tracks and allow trains to run even during construction. This should protect buildings from future storms, which have suddenly become a major worry. "Hudson Yards will have the benefit of learning from the mistakes of others" and incorporate the latest dewatering technologies, says Mitchell Moss, an urban-planning professor at New York University.

The first tower, a 46-story, 1.7 million-square-foot building, with the luxury-apparel company Coach as anchor tenant, will be at the far southeastern corner of the 26-acre Hudson Yards site. Construction of the $1 billion glass tower, which slopes westward before tapering to a point, is to be completed by 2015. Studios Architecture has designed the interiors for Coach; an entrance of the building will overhang a portion of the High Line park. The entire development will include 14 acres of public open space and parks.

In addition to the Coach tower, KPF is designing a 1,300-foot high-rise. Connecting the two will be a five-story retail podium by Elkus Manfredi Architects, facing a landscaped plaza by Nelson Byrd Woltz. Also planned for the first phase: a 950-foot mixed-use tower with a hotel, condos, and shops, by SOM. And Diller Scofidio + Renfro, along with the Rockwell Group, is designing a "culture shed," a five-story movable structure abutting an 825-foot apartment tower that the team has also designed. The shed can roll out, like a trundle bed, to create a 55,000-square-foot performance and exhibition space.

A half-dozen structures, not yet designed, are planned for a second phase on the western side of the site. The total project, whose cost is $15 billion, isn't expected to be completed for a decade. "This has to be the most exciting thing I've ever worked on," says Bill Pedersen, 74, the lead design architect and a KPF founder.

The official start of the project caps a controversial history. In 2002, New York Mayor Michael Bloomberg proposed building a sports stadium at the Hudson Yards site; the city's megadensity rezoning of the former industrial area occurred three years later. In 2008 the Metropolitan Transportation Authority, which controls the site, chose the Related Companies' plan over four competing proposals. The city has also extended a subway line to serve the new neighborhood; it's set to open in 2014. ■

Kohn Pedersen Fox's master plan for the Hudson Yards development sprawls along the Hudson River between 10th and 12th Avenues and West 30th and West 33rd Streets.

IMAGE: COURTESY VISUALHOUSE/KPF

noted

Zaha Hadid's Broad Museum Opens in Michigan

Designed by Zaha Hadid Architects, the $28 million Eli and Edythe Broad Art Museum opened at Michigan State University on November 11. The 46,000-square-foot museum, with a pleated stainless-steel-and-glass facade, will show rotating temporary exhibitions.

Perot Museum Opens December 1 in Dallas

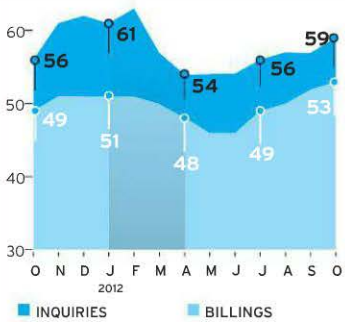
The Perot Museum of Nature and Science, designed by Thom Mayne, opens in Dallas a month ahead of schedule on December 1. The 180,000-square-foot cube-shaped building is clad in 656 textured precast-concrete panels and features a zigzag escalator contained in a glass-enclosed tube.

Design World Loses Three Luminaries This Fall

Three prominent architects died in late October: Gae Aulenti, 84, a preeminent Italian designer; John Johansen, 96, an experimental Modernist and the last surviving member of the "Harvard Five"; and Lebbeus Woods, 72, a visionary draftsman and educator.

MoMA PS1 Young Architects Program Finalists Announced

MoMA PS1 named the five firms that will compete to design a temporary installation in PS1's Queens, New York, courtyard this summer: CODA (Ithaca, New York); Leong Leong Architects (New York City); Moorhead & Moorhead (New York City); TempAgency (Charlottesville, Virginia, and Brooklyn); and French 2D (Boston and Syracuse, New York).



ABI Up for Third Month in a Row

The October Architectural Billings Index (ABI) score was 52.8, up from 51.6 in September, reflecting that firms are growing at their strongest pace since December 2010. "With three straight monthly gains," says AIA chief economist Kermit Baker, "it's beginning to look like demand for design services has turned the corner."

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CIRCLE 12

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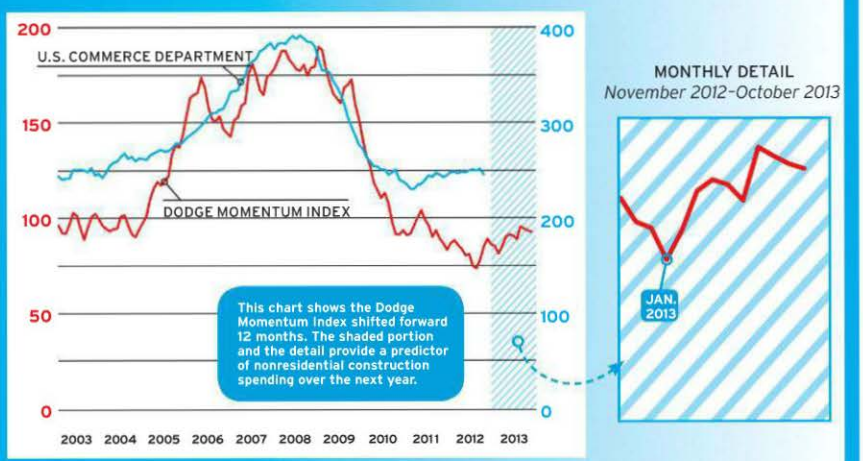
Data from McGraw-Hill Dodge Analytics

INDEX CONTINUES TO SLUMP

In October, the Dodge Momentum Index declined for the third month in a row, slipping another 0.6% to 93.3 (100 is the index baseline and is derived from the total value of projects in the Dodge database in 2000). After bottoming out in mid-2011, the index had shown improvement, peaking at 96.0 in July 2012. The recent weakening can be attributed, in part, to uncertainty preceding the presidential election and to fears about the "fiscal cliff" – the spending cuts and tax increases scheduled for January, unless Congress takes action.



The Dodge Momentum Index is a 12-month leading indicator of construction spending. The information is derived from first-issued planning reports in the largest database of construction projects in the U.S., McGraw-Hill Construction's Dodge Reports. The data have been shown to lead the U.S. Commerce Department's nonresidential spending by a full year.

Top 2012 Arena and Stadium Projects

Ranked by construction-starts value through September 2012

$1B*
PROJECT: *New Santa Clara Stadium*
ARCHITECT: ***HNTB Architecture***
LOCATION: *Santa Clara, CA*

$250M
PROJECT: *Baylor University Stadium*
ARCHITECT: ***Populous***
LOCATION: *Waco, TX*

$100M
PROJECT: *Sioux Falls Events Center*
ARCHITECTS: ***Sink Combs Dethlefs*** *Koch Hazard Architects*
LOCATION: *Sioux Falls, SD*

$84M
PROJECT: *Chicago Cubs Spring-Training Facility*
ARCHITECTS: ***Populous*** *DWL Architects*
LOCATION: *Mesa, AZ*

$80M
PROJECT: *University of Alaska Seawolf Sports Arena*
ARCHITECTS: ***McCool Carlson Green***
LOCATION: *Anchorage, AK*

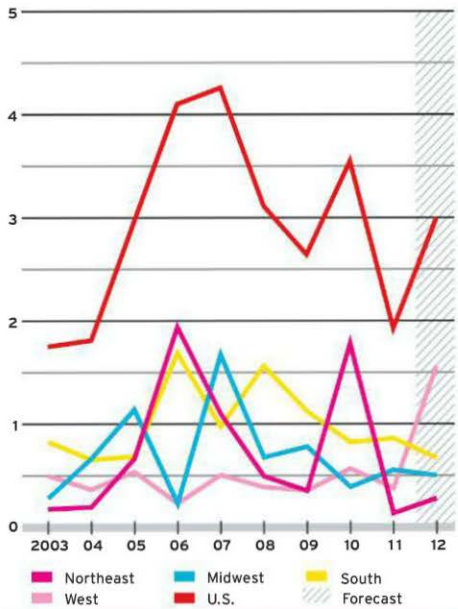
* The new Santa Clara Stadium (page 113), which will serve as the home for the NFL's 49ers when complete in 2014, accounts for the June spike in the index for stadiums and arenas and for San Jose's rank as the No. 1 metro-area market for sports construction.

ARENAS AND STADIUMS

A small number of large projects drive historical trends in the sports-construction market.

Arena and Stadium Starts by Region

Including U.S. total and 2012 forecast figures, by billions of dollars



Top Metro-Area Markets

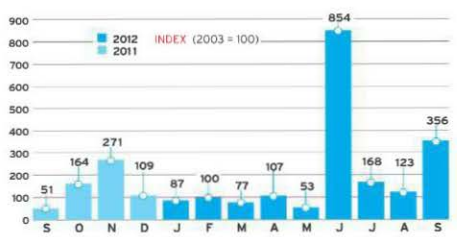
Total starts for arenas and stadiums 1/2011–9/2012

		$ millions
1	San Jose-Santa Clara, CA	1,009
2	Waco, TX	250
3	Phoenix-Mesa, AZ	102
4	Sioux Falls, SD	100
5	Anchorage, AK	80

THE DODGE INDEX FOR ARENA AND STADIUM CONSTRUCTION

9/2011–9/2012

The index is based on data for building starts in the U.S. The average dollar value of projects in 2003 serves as the index baseline.



McGraw-Hill Dodge Analytics tracks projects from predesign through construction to capture hard construction costs, square footage, and other key statistical information.

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CIRCLE 67

Learning the Hard Way

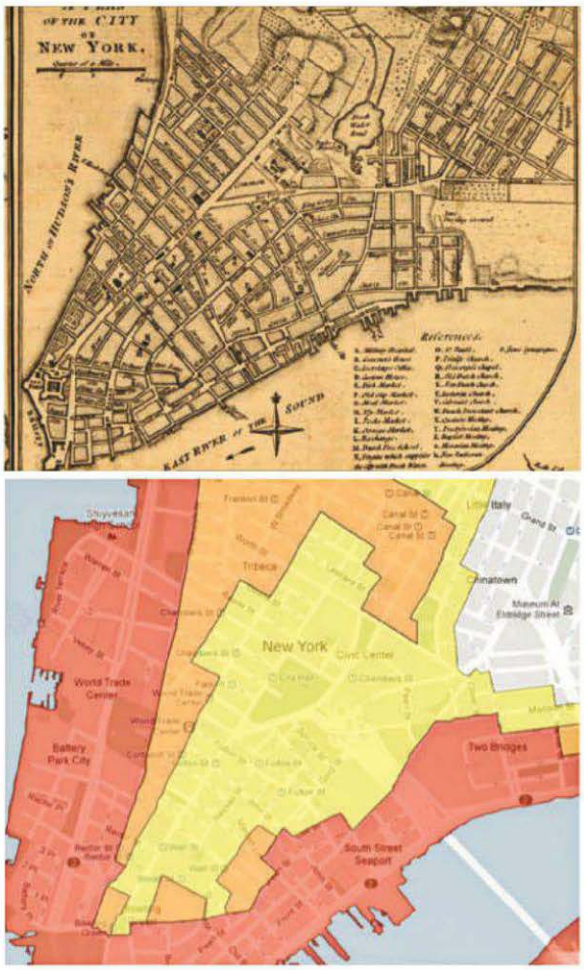
What are some of the lessons that Sandy teaches us about the way we build?

BY MICHAEL SORKIN

ALMOST TWO weeks after Sandy struck, my wife and I got our heat and hot water back; electric power had returned a few days earlier. Our apartment in Lower Manhattan relies on the Con Edison steam system, not a boiler; the utility's slow repair process was the source of the lag between the restoration of power and the return of heat. In both cases, though, we had relied on a centralized technology, rather than a distributed one, which raises fundamental questions about how we conceptualize and deploy necessary infrastructure. As we rebuild, we must be alert to the susceptibility of massive systems to massive failure.

Sandy's misery—and risk—were unevenly distributed. Of course, the greatest damage occurred in the lowest-lying areas of the city, where homes were flooded and swept away. Up on the 16th floor of our apartment building, we were inconvenienced; but having to travel uptown to shower and use the Internet was hardly comparable to the real tragedies suffered by so many. And, because we live in a zone of privilege, the police were everywhere. The situation was very different in the city's public-housing projects—where more than 400 buildings were affected and where, two weeks after the storm, over 15,000 apartments remained without heat, hot water, or power.

It is clear to rational observers that the seas are rising, that the frequency and energy of storms are increasing, and that we're desperately unready. In many ways, New York was less prepared for Sandy than New Orleans was for Katrina. Although its system was inadequate and failed spectacularly, the pumps and levees of New Orleans were a longstanding acknowledgment of the topographic and hydrological facts of a situation known to be parlous. While New York has marshaled far greater financial, material, and leadership resources, and shown instances of remarkable resilience (the badly flooded subways came back amazingly fast), it has done almost nothing to plan for the re-contoured reality of climate change.



If you remove the areas most at risk of flooding (pink in map, above), you get the original outline of Manhattan (map, top).

We are only slowly recognizing that it's a problem we've brought on ourselves by the way we've built. A map of Lower Manhattan reveals that the area of greatest danger is precisely the territory created by fill (beginning in the days of 17th-century New Amsterdam), further evidence of the substantially anthropogenic causes of the flood.

The problem can be addressed only by actions that offer both behavioral and physical solutions. Tunnels must be protected, barriers built, wetlands restored and constructed, attenuating shoals inscribed, pavement made porous, and equipment such as generators and fuel supplies elevated or otherwise secured. The economics are clear: Our failure to protect our lowlands will cost, just for Sandy, perhaps $50 billion, and the cost curve for repair has surely crossed the one for protection. At NYU Langone Medical Center on the East River—which had to close when its generators failed and its belowground MRI machines were destroyed—the damage may be up to $1 billion. We are now forced to think, as New Orleans did, about environmental triage, about the necessary dialectic of protection and abandonment, a problem that far exceeds actuarial calculation.

This nexus locates the social dilemmas of environmental transformation. In New York, we must ask whether working-class shore communities—such as the Rockaways in Queens and Midland Beach on Staten Island—have become our Lower Ninth Wards. How will we balance the claims of culture and community against the severity of the risk and the lifestyle economics of relatively low-density settlement on a fragile shore? It seems certain that we will protect, rather than abandon, the global assets of Lower Manhattan. But an examination of the 600 miles of New York's coastline will surely demand serious, even radical, thinking about a broad range of protective tactics, from massive Dutch-style defenses to softer forms of naturalization to strategic withdrawal. These decisions will play out along lines that will not simply be technical but will focus the values that underlie the very idea of community, the meaning of mutuality.

Perhaps the most symbolically fraught damage caused by Sandy was the flooding of the 9/11 Memorial, the preeminent marker of the form of risk that has dominated our thinking for the past decade. It's often remarked that generals always prepare to fight the last war. It's time to recognize that we can no longer focus such disproportionate resources on yesterday's risks. Let us hope that the poisonous anti-government and anti-environmental politics of today do not prevent us from using our peace dividend to solve this urgent threat. ■

Michael Sorkin runs Michael Sorkin Studio and the urban-design program at CUNY.

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perspective **house of the month**

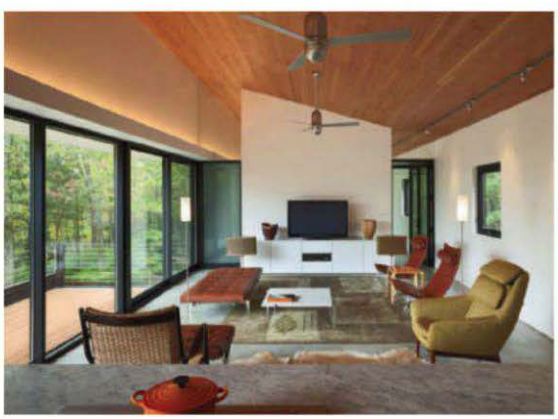
HUSBAND AND WIFE CHAN-LI LIN AND DENISE FERRIS DESIGN A MODERN HOUSE WITH A DRAMATIC STRUCTURE IN WACCABUC, NEW YORK. **BY LAURA RASKIN**

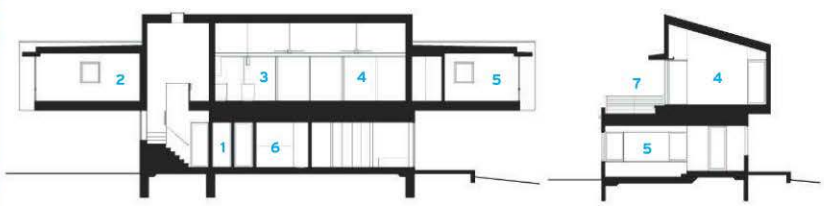
HANGING OUT
Large window walls maximize views and daylight for the main living spaces on the second floor (above). Clad in black-stained cedar, the upper story cantilevers 20 feet from each end (right). Polished concrete floors contain a radiant-heating system in the south-facing living room (below).

BASED IN New York City, Chan-li Lin has worked for Rafael Viñoly Architects for 22 years, focusing on large projects. About three years ago he and his wife, Denise Ferris, an architect and project manager, decided to design on a smaller scale—a weekend house.

A teardown on a small hill 50 miles north of the city in Waccabuc, New York, hit the mark. When Lin saw the view into the woods from the roof of the existing house, he decided that living spaces should be at that level, where abundant trees would provide privacy. The couple razed the old structure but saved the foundation for the new 2,170-square-foot house. The second floor, a rectangular volume, cantilevers dramatically 20 feet from each end of the house. These cantilevers, supported by two steel trusses integrated within a two-by-six wood frame, extend from a pedestal-like base to shelter a carport at the east and a porch at the west. "I was keen on developing something whose characteristics were determined by a structure," says Lin.

Enclosed by cedar walls that are stained black, with shiplap joints, the second floor contains the kitchen, living spaces, and a bedroom. Two more bedrooms are located on the ground floor, the front of which is red cedar stained with a natural finish. While the couple originally intended to sell the house, they've been getting too much pleasure from it to let it go. "We were either going to enjoy doing it or kill each other," jokes Lin about working on the house with Ferris, "but we truly enjoyed it. Our strengths are compatible." ■





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TRANSVERSE SECTION

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3 KITCHEN
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5 BEDROOM
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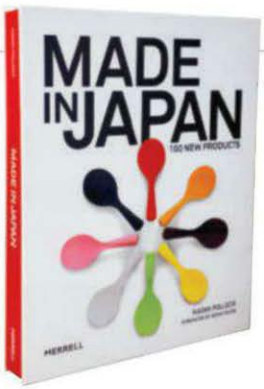
The Japanese Culture of Making Things



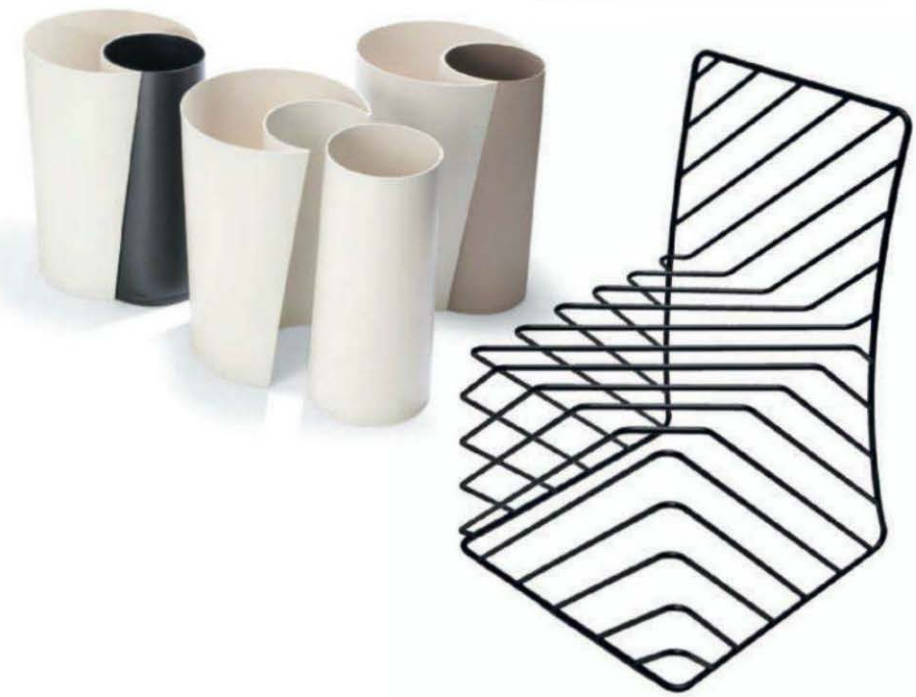
Made in Japan: 100 New Products,
by Naomi Pollock. Foreword by Reiko Sudo. London and New York: Merrell Publishers, 2012, 240 pages, $49.95.

Reviewed by Rita Catinella Orrell

THE LATEST book from architect and journalist Naomi Pollock highlights 100 objects—from kitchen gadgets to furnishings—that illustrate why products that are "made in Japan" continue to be revered in the international design community. Renowned designers featured in the book include Naoto Fukasawa, Toyo Ito, and Nendo, a multidisciplinary firm founded by Oki Sato that has become a headliner at design shows like Milan's annual Salone del Mobile.

In her short introduction, Pollock, who is RECORD's Japan-based correspondent, describes the Japanese culture of *monozukuri,* or "making things," which originated with traditional crafts like woodworking but has extended to the mass-produced and machine-made. She writes that this national ethic "drives the maker to refine, study with the eye and the hand, and refine again, no matter how infinitesimal the change. This cycle of repeated evaluation and revision yields the high-quality products that enjoy a great and enduring appreciation in Japan today." While created for modern Japanese consumers and their needs, these items also lend themselves to other urban settings where people need to carry bags home from the store (the Ai Walk by Takano), require a step stool handsome enough to leave on display (the Lucano by Chiaki Murata), or want a space-saving recycling bin (the Guh bin by Gaku Otomo).

Each of the 100 featured items—many of which will be new to consumers outside of Japan—gets a two-page spread including a short essay on its origin and development. The pieces range in scope from dumbbells that double as sculpture to Fukasawa's best-selling CD player for Muji that "fits effortlessly into people's lives," writes Pollock. As the designs cover an 11-year period, from 2001 to 2012, some readers might find the description of them as "new" a bit subjective, given today's rapid-fire pace of social media. But as they represent the timeless quality that is the ethos of Japanese products, these pieces illustrate that good design comes without an expiration date. ■



FUNCTIONAL FORMS Clockwise from right: CD player by Naoto Fukasawa for Muji; Standing Rice Scoop by Marna; Thin Black Lines Chair by Oki Sato/Nendo; Guh recycling bin by Gaku Otomo/Stagio for Iwatani Materials; Tatamiza legless chair by Kenya Hara/Hara Design Institute for Hida Sangyo.

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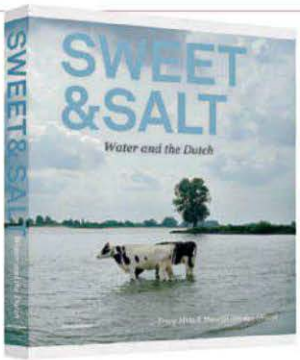
Lessons From the Dutch

Sweet & Salt: Water and the Dutch,
by Tracy Metz and Maartje van den Heuvel. Rotterdam: NAi Publishers (distributed in the U.S. by D.A.P.), 2012, 296 pages, $45.

Reviewed by James S. Russell



WATER WORLD A scheme for a UNESCO-IHE competition envisions an artificial delta connecting Rotterdam and the sea (right). Neutelings Riedijk Architects designed a housing block on the water in Huizen (below). Polders, which are reclaimed from the sea, are one of the most characteristic features of the Dutch landscape (bottom).

AS CLEANUP from Hurricane Sandy segues to rebuilding, *Sweet & Salt* could have been ripped from newspaper headlines. The not-so-underlying theme is of the Dutch as canaries in the global-warming coal mine. Much of Holland's most productive land is below sea level, so the Dutch are acutely aware of subtle changes in the rivers, seas, and weather that get lost in all the background noise masking the climate-change debate in America. After all, Holland has built its culture, social arrangements, and urban planning around controlling water for hundreds of years.

You will not find any hand-wringing in this volume. *Sweet & Salt* is a profoundly humanistic consideration of the culture of water, with, along the way, many ideas by designers about how to deal with water's myriad challenges. Architects, planners, and landscape designers will never think of a riverbank, levee, or seashore the same way again.

You can open *Sweet & Salt* to a photo of torrential water ripping through the streets of a medieval town or a golden-hued painting of a peaceful ice-covered pond just after the chilly sun has set. Is this a history, a guidebook, a cautionary tale of climate change, a dike designer's handbook, or an art book? In the hands of Tracy Metz, a longtime RECORD contributor, and art historian Maartje van den Heuvel, it is all of the above. *Sweet & Salt* is an intensely visual consideration of the history, culture, and engineering of water that engages our senses and our emotions—not just our intellect—with its ravishing (and beautifully printed) photography, cartography, and art. We're awed and enraptured by water—when we're not fighting it off.

Even for that enormously competent nation, the challenges brought by climate change are daunting. Droughts dry up rivers even in such a characteristically damp country. Floods threaten the world's most elaborately contrived system of levees, canals, locks, and barriers. Sea-level rise may be barely detectable, but salt water infiltrating fresh groundwater is already becoming a major problem for Dutch farmers.

The book wraps a plethora of ideas, politics, history, and art around five big themes: Conflict, Concord, Profit, Pleasure, and Myth. If these categories are a bit unwieldy, they also make the book an enormous pleasure. You get lost among luscious and provocative paintings and photos. Put away the hair shirt, please, and enjoy. ■

James S. Russell is the architecture critic for Bloomberg News and the author of The Agile City: Building Well-being and Wealth in an Era of Climate Change.

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Pen Type-A

Ideal for architects and designers, this stainless-steel pen and ruler sleeve had its production crowd-funded through Kickstarter. Currently manufactured in a machine shop in Vermont, the 5" Pen Type-A uses replaceable Hi-Tec-C ink cartridges, available in various widths and colors.
$150 cwandt.com

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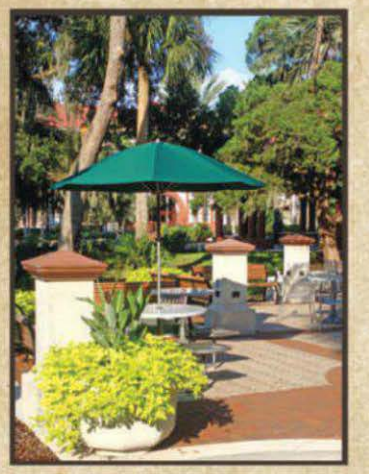

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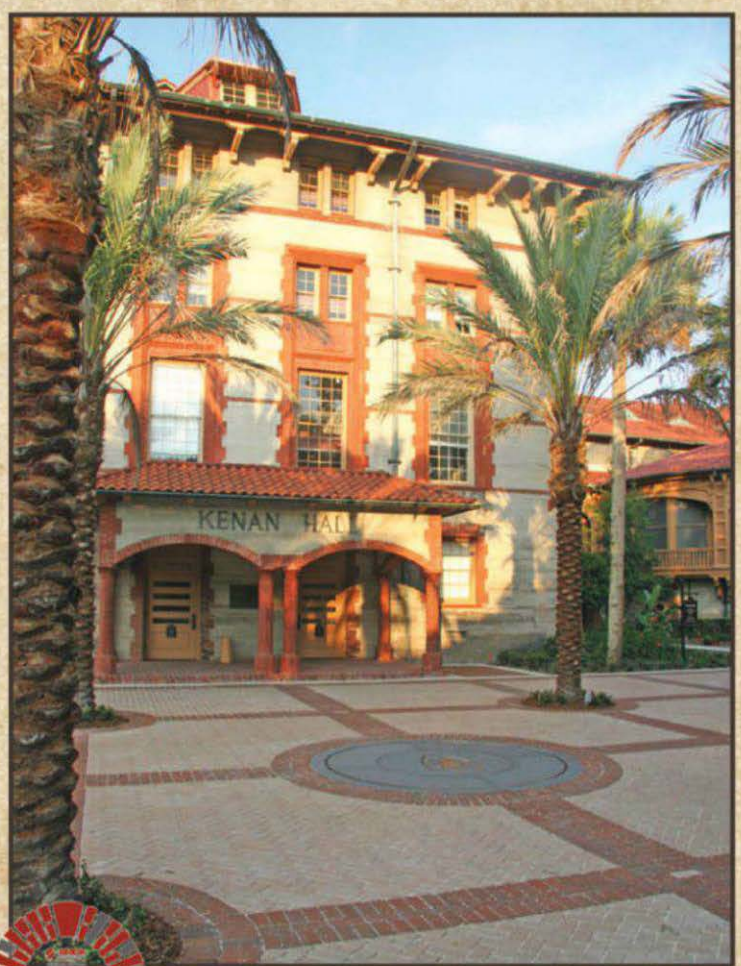

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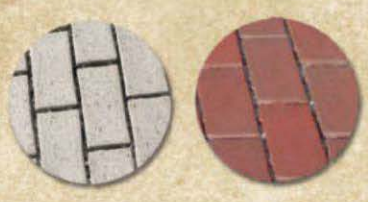

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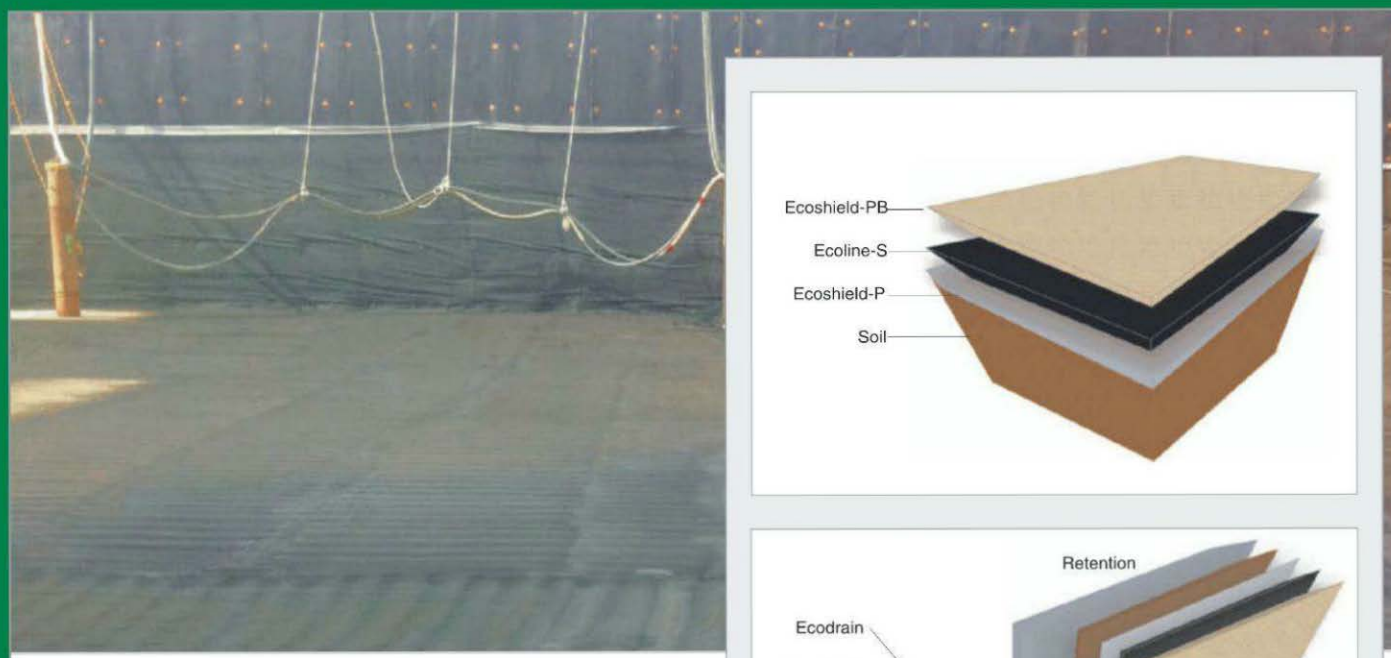

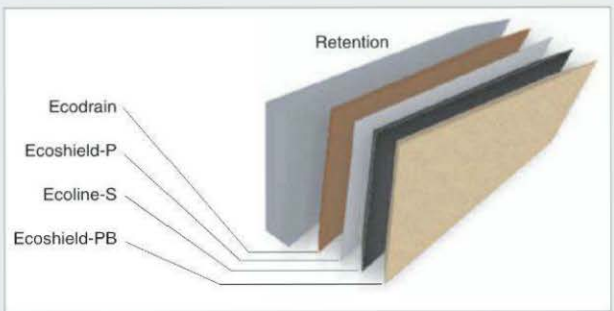

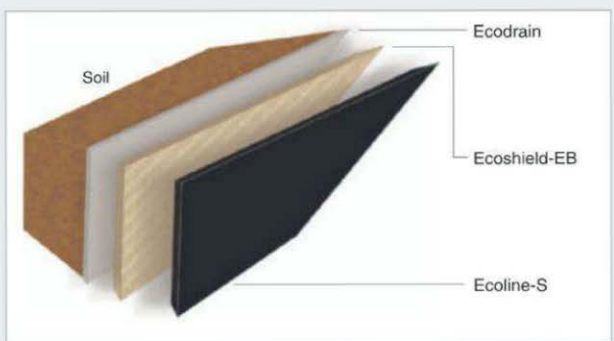

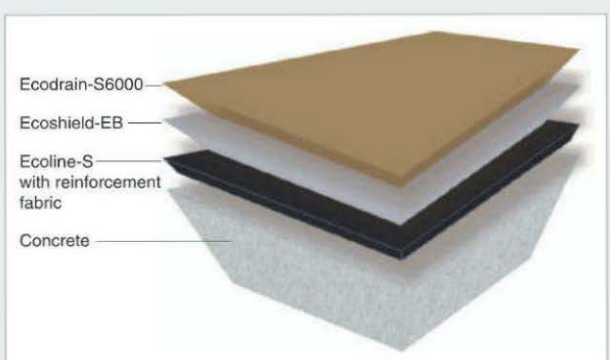

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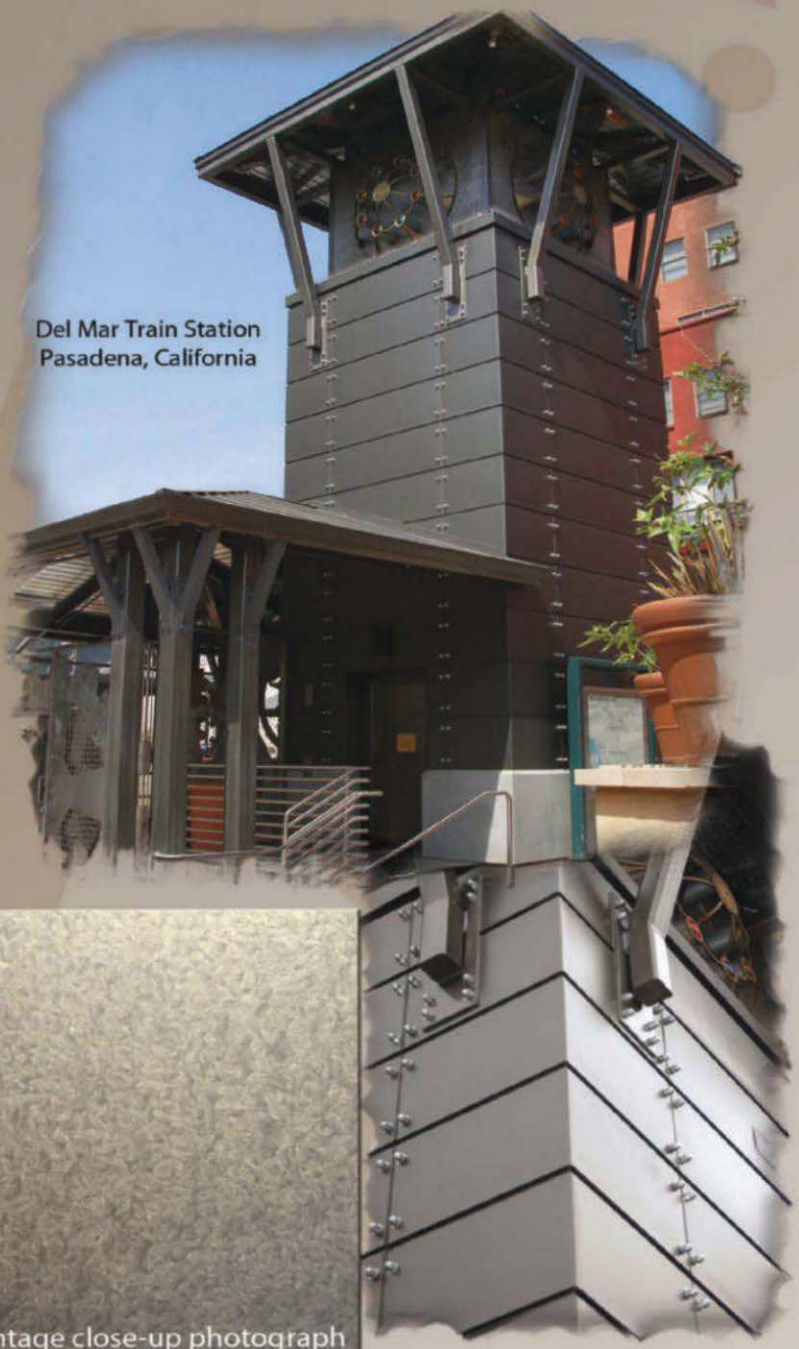

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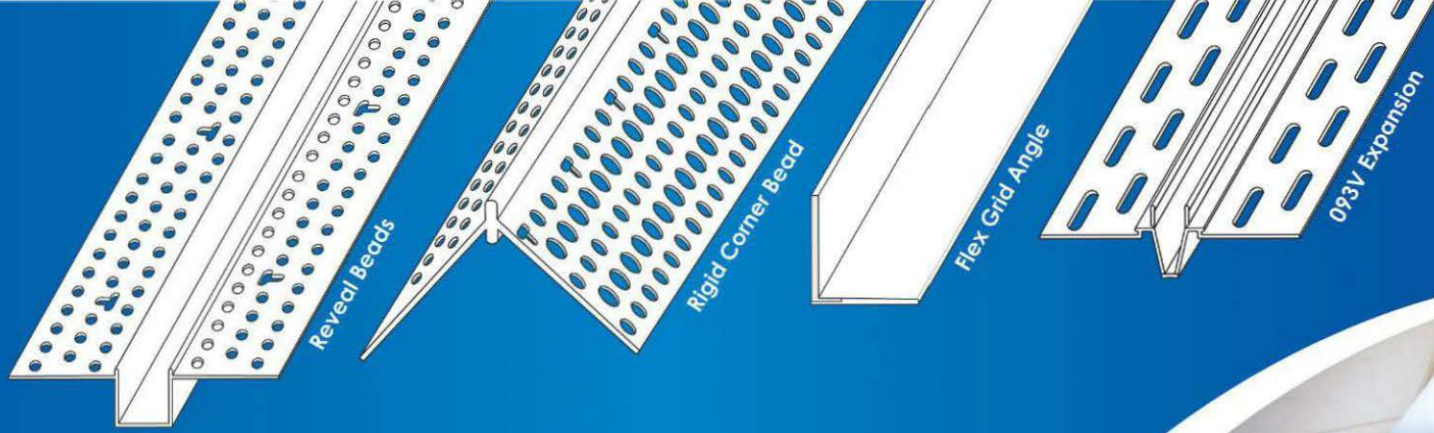

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DESIGN VANGUARD 2012

BY NECESSITY, young architects do whatever is needed to keep themselves going and pay the bills—teach, serve as general contractors on small projects, fabricate lighting fixtures and furniture, and chase after jobs no matter how far away. It's a tough way of working. But the ad hoc nature of such emerging practices keeps them nimble, which is especially valuable in an age of challenging economics and limited resources. Some of this year's Design Vanguard firms aren't waiting for clients to approach them, but are initiating projects and serving in multiple capacities—as designer, developer, contractor, consultant. Others have set up satellite offices in distant places, even if their firms are small. Blurring roles, disciplines, and national boundaries is all part of the young architect's kit of survival strategies these days. *Clifford A. Pearson*

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Urbanprem Minamiaoyama, Tokyo, by Yuko Nagayama & Associates
PHOTOGRAPHY: © DAICI ANO

Yuko Nagayama & Associates Tokyo

A rising young architect manages her own successful practice—and family—breaking ground in design and as a professional woman.

FOUNDED 2002
DESIGN STAFF 4
PRINCIPAL Yuko Nagayama
EDUCATION Showa Women's University, B.A., 1998
WORK HISTORY Jun Aoki & Associates, 1998-2002
KEY COMPLETED PROJECTS
Kiyaryokan, Ehime prefecture, Japan, 2012; Sisii, Kobe, Japan, 2012; Anteprima ION, Singapore, 2009; Urbanprem Minamiaoyama, Tokyo, 2008; Azumaya Tea House, Chiba prefecture, Japan, 2007; A Hill on a House, Tokyo, 2006; Afloat-f, Tokyo, 2002
KEY CURRENT PROJECTS
Zenpukuji House, Tokyo, 2013
YUKONAGAYAMA.CO.JP

Afloat-f

The project that launched Nagayama's career, Afloat-f is a two-story hair and nail salon located in Tokyo's Omotesando neighborhood. Illuminated from below by halogen lamps, aluminum satellite dishes reflect ambient light on the hairstyling floor. While spotlights shine down on the cutting stations, daylight enters through a courtyard. Floor-to-ceiling mirrored walls visually enlarge the 4,844-square-foot space.

The first thing you notice about architect Yuko Nagayama is her youth. She looks far too young to have built a five-story commercial building in Tokyo's upscale Minamiaoyama area, a stunning boutique for Louis Vuitton in the heart of Kyoto, and shops for the handbag brand Anteprima all over Asia. No wonder. The 37-year-old architect launched her practice when she was only 26.

At that time, she had just left the office of Jun Aoki, a principal who encourages employees to exit after four years to infuse his firm with a steady supply of fresh blood. During her tenure, Nagayama acquired essential practical experience by working on houses and the Aomori Museum of Art. To assist his young protégée as she went out on her own, Aoki sent her off with a commission for a salon in Tokyo's trendy Omotesando district.

That first project, the two-story salon called Afloat-f, was completed in 2002. It features 22 eight-foot-wide satellite dishes doubling as suspended reflectors, illuminated by uplights centered below each one, above the hairstyling area. With that stunning debut the architect won a string of commissions. Three years later Nagayama finally had time to catch her breath and take her licensing exam.

Today she runs her four-person firm from two apartments in adjacent residential buildings on the western edge of Tokyo. One gives her space to bring her baby without disturbing her staff; the other centers on a small meeting room where a vintage wooden drawing desk serves as the conference table.

Balancing motherhood and work, Nagayama is engaged in an impressive lineup of projects that includes residences, cake shops, and a museum on Teshima, an island in the Seto Inland Sea put on the architecture map by Ryue Nishizawa's Teshima Art Museum. For a few young architects, designing on the island is an honor granted by Mitsuko Fukutake and the Fukutake Foundation, the group that turned nearby Naoshima into an art mecca. While Nishizawa's shallow concrete dome focuses on birth, Nagayama's museum addresses death.

To house the museum, devoted to works by the graphic artist Tadanori Yokoo, Nagayama is resurrecting a trio of 100-year-old residential structures. As part of her scheme, she is incorporating Yokoo's landscape installation symbolizing the afterlife and including a mini–River Styx that will run under the building. After the project's 2013 completion, a tatami-floored room inside will be available for funerals that were traditionally held at home. "Combining museums with other functions is a recent trend for the Fukutake Foundation," she explains.

Though the museum/funeral hall may be a first, it isn't Nagayama's only unusual undertaking. She designed a surreal lounge for the *Hotaruna*, a cruise ship created by the anime artist Leiji Matsumoto. A floating bar by night and a rental space by day, the glass-roofed boat is one of Matsumoto's fantastic travel vessels come to life. Evoking its retro-futuristic image, Nagayama outfitted the interior with changeable stripes of colored lights embedded in the floor, chairs and tables that move up and down, and a bar clad with shimmering stainless-steel mesh.

As a mother, Nagayama finds it isn't easy to do it all. "[In Japan] it is rare for women architects running firms to have children," she says. Most who do practice with their husbands. Many of Japan's most successful women heading practices—such as Itsuko Hasegawa, Kazuyo Sejima, and Kumiko Inui—don't have children. But thanks to her accommodating staff and an iPad, Nagayama sets an excellent example for her colleagues everywhere. *Naomi R. Pollock, AIA*

View additional images at architecturalrecord.com.

Sisii Showroom

A showroom and office for the leatherwear company Sisii, this interior project occupies a prominent Kobe site. Created in collaboration with the landscape designer Toshiya Ogino, the unusual space is defined by a raised steel platform. Mirrored walls at the back expand the showroom visually while concealing a storage area. The elevated floor acts as an auxiliary workspace while defining the functional zones. Folding or cutting into the plate enabled Nagayama to designate distinct seating areas as well as several small gardens made by Ogino from local rocks, plants, and trees. Because of the greenery's constant need for light, the space is illuminated 24/7, casting a glow on the street.

PHOTOGRAPHY: © DAICI ANO

A Hill on a House

Faced with a commission to design a house for a family of four on a long, narrow site in a densely built neighborhood in central Tokyo, Nagayama had to figure out how to bring daylight inside without compromising her clients' privacy. Completed in 2006, the 2,874-square-foot structure dubbed A Hill on a House was her solution. Taking her inspiration from traditional enclosed Japanese gardens, Nagayama centered the house (above and above right) on a triangular, wood-decked courtyard adorned with potted trees. Completely open to the sky, it fills the adjacent rooms with plenty of direct and reflected daylight, while a blank concrete wall shields the house from the street.

Anteprima ION

Located within Singapore's ION Orchard shopping mall, Anteprima ION is Nagayama's most recent boutique interior for the fashion handbag brand. The products of a Japanese designer based in Milan, the knitted vinyl bags come in a rainbow assortment of colors—a source of inspiration for the architect. Lit from above and below by strips of linear recessed fixtures, the spectrum of bags shown along the dramatic curved wall dominates the space. Visible through the shop's all-glass facade, the bold display invites potential customers inside. Elsewhere within the boutique, mirrored walls enlarge the 1,582-square-foot shop and partition various merchandise areas.

Urbanprem Minamiaoyama

A commercial building in an upscale Tokyo neighborhood, the 3,875-square-foot Urbanprem Minamiaoyama was completed in 2008. Situated at the end of a quiet cul-de-sac, it greets the narrow street in front with a bowed concrete facade that maximizes the available floor area within the confines of the site's buildable envelope (left). Since its top is invisible from ground level, the continuously curving wall appears to go on forever. "It is completely without scale," comments Nagayama. Though punctured by slitlike windows with six different widths—the narrowest only four inches across—the facade does not reveal much information about the building's inner workings. In addition, two rows of windows correspond to each floor level (below left). The five-story structure contains retail at grade with rental office space above.

Azumaya Tea House

A tiny, four-tatami-mat teahouse, Azumaya may be one of Nagayama's smallest works to date, but it is also one of her most spectacular. Completed in 2007, it occupies a dramatic site on the coast of Chiba prefecture. The mini-building was designed as a freestanding addition to a second home created by Nagayama's mentor, Jun Aoki, for which Nagayama served as the project architect during her tenure in Aoki's office. While skylights bathe the interior with daylight from above, the robust timber structure frames stunning ocean views. "It looks like a whale's skeleton," says Nagayama.

Gracia Studio
Tijuana, Mexico

Jorge Gracia, who has located his office in the infamous town of Tijuana, is giving it a reputation for strong Modernist design.

FOUNDED 2004
DESIGN STAFF 4
PRINCIPAL Jorge Gracia
EDUCATION Iberoamerican University, M.B.A., 2003; B.Arch., 1997
WORK HISTORY Mas Design, 2002–04
KEY COMPLETED PROJECTS
Endémico Resguardo Silvestre, Valle de Guadalupe, Mexico, 2012; Culinary Art School, Tijuana, 2010; Casa Becerril, Tijuana, 2007; Todos Santos House, Todos Santos, Mexico, 2006; Casa GA, Tijuana, 2004
KEY CURRENT PROJECTS
Encuentro Guadalupe, Valle de Guadalupe, 2013; Encuentro Oaxaca, Oaxaca, Mexico, 2014
GRACIASTUDIO.COM

Jorge Gracia, the 39-year-old founder of Gracia Studio, has quickly built a reputation for distinctive Modernist architecture in his hometown of Tijuana, Mexico. The rumble-tumble border town south of San Diego has been known for a lot of things over the years—for gambling and drinking (especially during Prohibition) and, more recently, for drug wars. But not for design. "Tijuana is reinventing itself," says Gracia about his reason for staying and practicing in this city of 2 million. "The last few years have been calm," he adds, referring to the success of the antidrug offensive initiated by a reconstituted police force in 2009.

After starting a studio, Mas Design, in San Diego in 2002, and working closely with Mexican architect Sebastian Mariscal there, Gracia opened his Tijuana office in 2004. His first project was a house he built for himself and his family overlooking the city. With Casa GA (a name referring to the first initials of his and his wife's surnames), the architect demonstrated a proclivity for clean lines, raw materials, rectangular volumes, and taut planes. He wanted to show that he could not only "create better design" than his cohorts in Tijuana "but do it more cheaply." He found he could achieve it through a design-build approach. Currently, Gracia Studio has four designers who work with about 20 construction workers from various trades on an ad hoc basis.

Since starting his Tijuana firm, Gracia has gone on to design more houses and, in 2010, the Culinary Art School in Tijuana, a pair of structures distinguished by the use of garapa wood, poured-in-place concrete, and Cor-Ten steel. The architect believes in efficiency and economy of means: He recycled the school's concrete board forms to use as floors for La Caja Galería (2010), an art gallery located in a renovated Tijuana warehouse.

Making the most of leftovers also fits in with Gracia's commitment to generating new business opportunities for his clients. For example, he is planning an outpost for the Culinary Art School that will be connected to a winery for the Encuentro Guadalupe in the Valle de Guadalupe, south of Tijuana. The winery is part of a development designed by Gracia Studio that includes the much-talked-about Endémico Resguardo Silvestre, a hotel consisting of a cluster of 20 steel cabins perched on the hillside overlooking the vineyards (RECORD, June 2012, page 108).

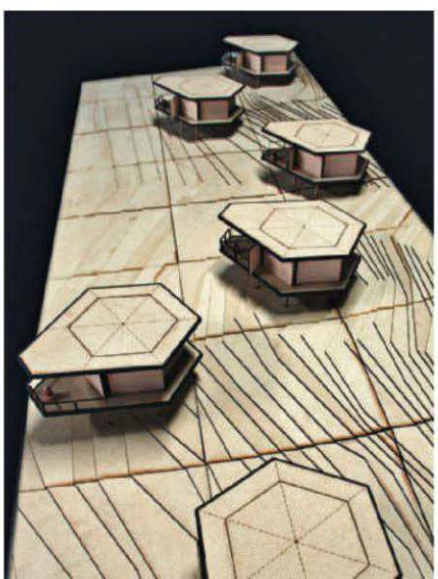
Gracia, who has an M.B.A. as well as a B.Arch. from Iberoamerican University in Tijuana, convinced the client, a consortium of backers developing the property, to include a separate building for cooking lessons. Already hotel guests are enjoying wine-tasting sessions, and Gracia hopes to see the program expanded to offer viticulture classes as well. "We try to push the client to do something extra for its business," says Gracia, who is also planning housing for the eco-development.

He and some of the investors from Encuentro Guadalupe are planning a hotel composed of clustered cabins in Oaxaca, Mexico. For the project Gracia has designed six hexagonal pods located in agricultural fields that grow the maguey plant (a form of agave), from which mescal is distilled. The scheme includes a store in the new hotel that will carry this rugged relative of tequila, so memorable to readers of Malcolm Lowry's 1947 novel *Under the Volcano*. "We look at architecture as a model for business," says Gracia. *Suzanne Stephens*

View additional images at architecturalrecord.com.

Encuentro Oaxaca

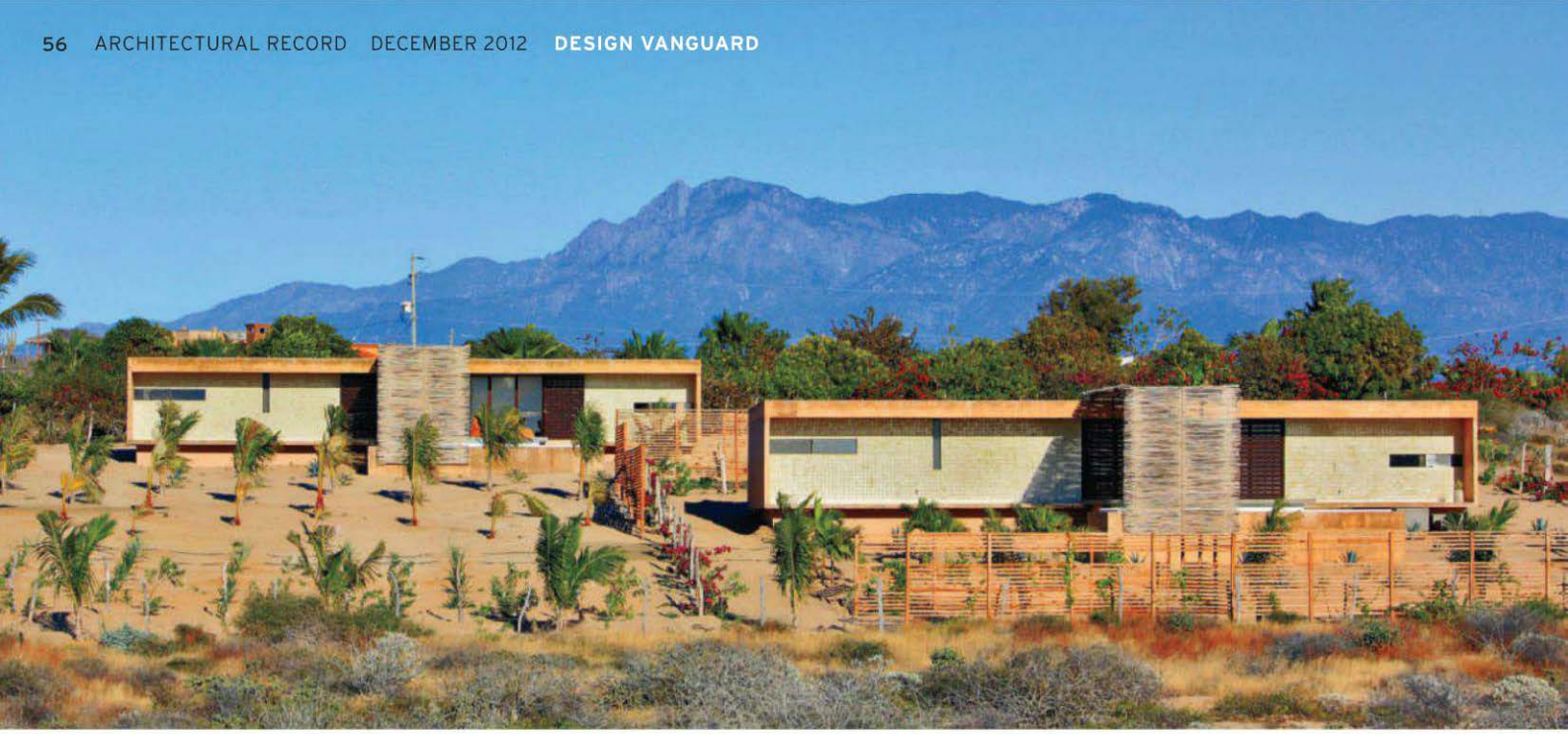
For a hotel project in Oaxaca, south of Mexico City, Gracia designed six hexagonal cabins on a farm that grows agave. Local people would make clay brick for the prefab-steel structures, each 870 square feet, including 460 square feet for the terrace.



PHOTOGRAPHY: COURTESY GRACIA STUDIO (LEFT); © LUIS GARCÍA (OPPOSITE)

Culinary Art School

For a 9,622-square-foot cooking school in Tijuana, Gracia designed a pair of structures facing each other on a 10,760-square-foot site. A wide interior pedestrian street separates the two buildings and also functions as a shared courtyard. The larger 22-by-108-foot volume of garapa wood and cast-in-place concrete contains administrative offices, classrooms, a library, and a subterranean wine cellar. The second building, a 20-by-154-foot rectangle with a steel frame and Cor-Ten and glass panels, contains cooking stations that open onto the courtyard.



Todos Santos House

With two vacation cottages completed in 2006 (one for the client, the second to rent), Gracia staggered the one-story structures on the 50,000-square-foot desert site so each would have expansive views of the Pacific Ocean. Located on the lower end of the Baja Peninsula, 975 miles from Tijuana, the rugged, sandy-colored poured-concrete volumes are inhabited four months a year. A straw canopy shelters the terrace and pool at the entrance to each 2,460-square-foot house, while locally crafted talavera tile sheathes the facade. To admit breezes but provide security, Gracia designed a woven-steel security gate to unfold at night across the front of the houses.

Endémico Resguardo Silvestre

This hotel, operated by Grupo Habita, the boutique-hotel company based in Mexico City, is composed of 20 Minimalist guest structures perched on a hillside above a vineyard. Gracia designed the rusty-brown steel-frame-and-panel lofts on pilotis to blend with the rocky inland terrain, located about an hour by car south of Tijuana. While the linear cabins, ranging from 200 to 240 square feet in size, were fabricated off-site, Gracia's younger brother, Javier, an architect who works in his office, lived on location to guide local laborers through the final phases of construction. The hotel forms the core of a 232-acre development known as Encuentro Guadalupe, which includes a winery (below), with a cooking school and housing also planned.

Encuentro Guadalupe

Since Endémico (above) opened last winter, a 19,375-square-foot winery has been completed at the bottom of the hill. The steel-and-glass rectilinear structure, which provides wine tastings to hotel visitors, also includes production facilities for the wine, plus an art gallery and the reception desk for the hotel. "Already it's very popular," notes Gracia. Next to come: a separate outpost for the Culinary Art School in Tijuana (page 55).

PHOTOGRAPHY: © SANDRA MUÑOZ (OPPOSITE); LUIS GARCÍA (THIS PAGE)

Envelope Architecture + Design Berkeley, CA

A San Francisco Bay Area firm deploys a minimal style to unsettle architectural expectations.

FOUNDED 2002

DESIGN STAFF 10

PRINCIPAL Douglas Burnham

EDUCATION Cornell University, B.Arch., 1989

WORK HISTORY Sole practitioner, 1998–2001; Interim Office of Architecture, 1993–98; Allied Architects, 1989–91

KEY COMPLETED PROJECTS Hipstamatic, San Francisco, 2012; Urbach/Hartman Residence, San Francisco, 2012; Locanda Restaurant, San Francisco, 2011; Pier 24 Photography Warehouse, San Francisco, 2008–09

KEY CURRENT PROJECTS Proxy, San Francisco, ongoing through 2015; John McNeil Studio, Berkeley, 2013; Oracle Racing, San Francisco, 2013

ENVELOPEAD.COM

Douglas Burnham wants to quietly rewire your experiences. He cites perception-teasing installations by artists such as James Turrell, Robert Smithson, and Michael Heizer as major influences, and early in his career he created similarly destabilizing work with San Francisco Bay Area design provocateurs the Interim Office of Architecture (IOOA). "It was a little bit like a drug experience, where the normative frame just sort of disappears," he says of IOOA's installation work in the 1990s. With his own firm, Envelope Architecture + Design, he creates simple geometries with restrained finishes, but uses an odd move or surprising material to coax those who encounter the work away from standard methods of reading or even perceiving architecture: "When we're working on projects, there is a kind of scraping clean of things—we try to strip away barriers between people and their experiences."

The Wisconsin native landed at IOOA a few years after earning a B.Arch. at Cornell University and then working for another small San Francisco firm. He stuck around at IOOA for about six years until, he says, "the firm started to fall apart." During its protracted breakup, Burnham took on the role of project architect on a house in Sonoma, California. That experience helped him land his first commission, another residential project, after he left the practice. Officially founded in 2002, his now 10-person firm has designed everything from restaurants to offices to urban interventions.

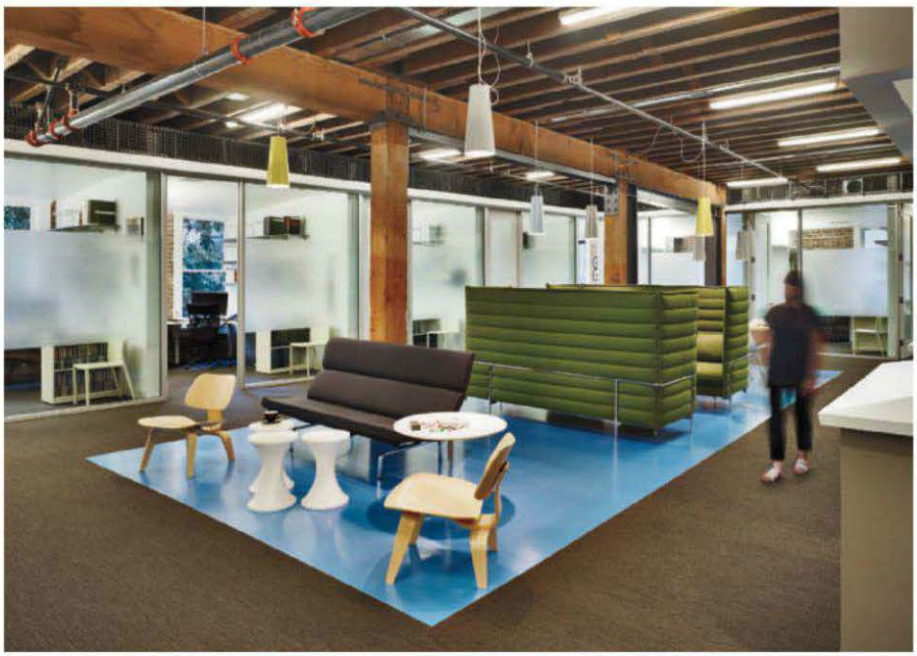
Clipper Street House

The firm used carefully quirky finishes in this renovation of a formerly rundown Victorian house in San Francisco's Noe Valley. The client—a stylist, skateboarder, and designer—became a colleague when she went on to work for Envelope for several years after the house was completed.

Where IOOA was known for technological experiments and industrial bricolage, Envelope's approach is subtler. "We have a modern, minimal hand," says Burnham. "It's a style, but it comes from a series of tactics for removing barriers and things that aren't required." The firm spikes its restraint with playful, sometimes jarring moves. Envelope turned a lot of heads with a 2007 renovation of a ramshackle Victorian duplex in San Francisco's Noe Valley (the Clipper Street House). The firm cleaned out a warren of partition walls from the interior. Outside, Envelope turned its minimalism into a big gesture. It painted the exterior almost entirely a deep blue-black. Clean, simple, but also confounding, their abstract treatment of the classic San Francisco "painted lady" still prompts passersby to reconsider its familiar architectural details.

One of the firm's new endeavors takes Burnham's penchant for reconfiguring expectations to an urban scale. In partnership with a local developer, Envelope won a competition to design and build a mixed-use residential project for a site in San Francisco's Hayes Valley, where a freeway had collapsed during the 1989 Loma Prieta earthquake. The recession stalled its building plans, but the city eventually granted a five-year lease to put two dormant lots next door to temporary use. Inspired by Archigram's Instant City, Envelope devised a series of modified shipping containers and other temporary structures to house a rotating cast of shops, restaurants, gallery spaces, gardens, and community facilities. "It's really a sideshow," says Burnham. "But it's also a framework in which content can be fed and curated on an active basis." Titled Proxy, the project has begun to transform a formerly gritty urban corridor into an ad hoc series of social and commercial spaces. Burnham believes the temporary project will be a model for a more nimble and responsive type of urbanism. "There needs to be a faster pace at which the city can change, because working on a 100-year time scale is no longer aligned with the pace of culture," he says. "Proxy is quickly reframing the city and what people expect from it." The project embodies Burnham's aim to make you rethink the building—or the entire neighborhood—with a simple but unexpected gesture. *William Hanley*

View additional images at architecturalrecord.com.



PHOTOGRAPHY: © TODD HIDO (OPPOSITE), CESAR RUBIO (THIS PAGE)

Durie Tangri Offices

Housed in a late-19th-century warehouse in the shadow of San Francisco's Transamerica Tower, Envelope's office for Durie Tangri Law draws on the building's utilitarian past and reflects a culture of making that is common to many of the legal firm's technology clients. The designers left heavy timber beams, pipes, and even data cables exposed in moves that are not unusual on adaptive-reuse projects. But they upped the industrial feel by demarcating meeting spaces with atypically institutional-looking green and blue rubber flooring. Glass partitions give the offices a sense of openness, while doors close for confidential conversations with clients.

Pier 24 Photography Warehouse

Envelope has a history of designing exhibition spaces. It made a series of kaleidoscopic cabinets for former SFMOMA curator Henry Urbach's first show at the museum (and also designed a house for him). The firm recently renovated one of San Francisco's historic pier buildings to house the Pilara Family Foundation's large photography collection—shoring up the structure while maintaining its industrial exterior. The space tucks unexpected vantages into an otherwise straightforward presentation of the art. Inside, room-scale boxes that act as galleries have narrow reveals between some walls—allowing peeks into adjacent spaces and creating visual connections without distracting from the images. On one corner, large windows frame a massive view of the water with the Bay Bridge soaring overhead.

Octavia Blvd Lots M+N

For a narrow site in San Francisco's Hayes Valley—on two lots created after the demolition of a freeway that collapsed in the 1989 earthquake—Envelope designed a five-story, multi-unit housing development. Tailored to first-time buyers, the design calls for spaces that average 400 square feet and can be used as either apartments or live-work studios. Set atop storefront retail, the units have built-in beds, kitchen appliances, and other amenities, as well as folding sunshades that double as screens for embedded entertainment systems. The units are designed to be combined as inhabitants start families or grow their businesses.

Proxy

When the sluggish economy halted the Octavia Blvd Lots M + N project (above), Envelope won a competition to design and develop an interim use for two adjacent, similarly stalled lots. It created a series of reusable structures to temporarily house everything from a coffee shop to art shows, with the idea that the programming, like the space itself, would be in a constant state of transition. The first phase, which includes a beer garden, a café, an ice-cream shop, art installations, and a bike-tour company, was completed last year. Three further phases will bring pop-up stores, exhibition spaces, and a covered event area. "It's moving the city toward an exciting heterogeneity and creating these energizing places," says Burnham. "It shows that you can use temporary strategies to activate places that are dormant—and it doesn't have to be there forever."

PHOTOGRAPHY: © RICHARD BARNES (OPPOSITE), ENVELOPE A+D (THIS PAGE)

Vo Trong Nghia Architects Hanoi / Ho Chi Minh City

Applying Japanese training to the vibrant but chaotic conditions of Vietnam, a firm makes the most of two cultures.

FOUNDED 2006

DESIGN STAFF 25

PRINCIPALS Vo Trong Nghia, Takashi Niwa, Masaaki Iwamoto

EDUCATION *Vo:* U. of Tokyo, M. Civil Engineering, Landscape, and Civil Design, 2004; Nagoya Institute of Technology, B.A., 2002. *Niwa:* Tokyo Metropolitan University, M. Engineering, Architecture, 2003; B.A., 2001. *Iwamoto:* U. of Tokyo, M. Engineering, Architecture, 2008; B.A., 2005.

WORK HISTORY *Vo:* Vo Trong Nghia Architects, 2006–present. *Niwa:* Noriaki Okabe, 2005–10. *Iwamoto:* Kazuhiko Namba + Kai Workshop, 2008–11.

KEY COMPLETED PROJECTS Binh Duong School, Binh Duong, Vietnam, 2011; Stacking Green, HCMC, 2011; Vietnam Pavilion, Shanghai, 2010; Bamboo Wing, Vinh Phuc province, 2009; wNw Cafe, Binh Duong province, 2006

KEY CURRENT PROJECTS Farming Kindergarten, Dong Nai province, 2013; Hill restaurant, Mexico, 2013

VOTRONGNGHIA.COM

It is about 450 miles from Quang Binh province in the middle of Vietnam to Ho Chi Minh City (HCMC), the noisy, frenetic commercial capital in the south. But Vo Trong Nghia's journey from one place to the other has less to do with mileage than it does with the radical change in life experiences that came with the move. Born in rural Quang Binh in a house without electricity, Vo helped care for his family's cows as a boy. Today he and his two partners—Takashi Niwa and Masaaki Iwamoto—run a thriving practice with about 15 people in their HCMC office and 10 in Hanoi. The firm has worked on projects in various parts of Vietnam, designed the country's pavilion at the 2010 Shanghai World Expo, and is even involved in a few projects in Mexico. It's a long way from Quang Binh.

Or not. Vo says that his architecture is rooted in the lessons he learned in his childhood. When you live in a hot, humid place without air-conditioning, you understand the need for shade, water, and natural ventilation. You grasp in a very direct and meaningful way the connection between buildings and their environments. You know the versatility of local materials such as bamboo and how to use them. All of this informs Vo's architecture, whether he is designing a small café surrounded by a cooling ring of water, a modern townhouse with stacks of lush planters on the front and back, or a school for 800 students that blurs the boundaries between indoors and out.

On his way from the farm to the city, Vo made a rewarding detour to Japan, where he studied architecture, landscape design, and civil engineering at the University of Tokyo and the Nagoya Institute of Technology on a Japanese-government scholarship. He says he learned about the Japanese "way of thinking toward climate and natural features" and discovered similarities with that of Vietnam. While in Japan, he met Niwa and then Iwamoto, who became his architectural partners and have moved to Vietnam. Together they are developing a body of work that integrates inexpensive, local materials and traditional skills with contemporary aesthetics and modern methodologies. So they often use bamboo, because it's a fast-growing, sustainable material familiar to local workers, but they usually assemble it off-site as prefabricated units to ensure better quality and accuracy in construction. And Vo looks at landscape in a broad way, examining how even a small project fits into the ecology of the city, as well as its immediate surroundings.

With Vietnam changing rapidly in recent years, Vo has seen the country lose much of its connection to its environment while generating a great deal of pollution. But he thinks architecture and architects can help turn things around and find better ways of building. He always looks for low-cost solutions that rely on working with natural forces rather than overcoming them. The most difficult challenge is changing the way people think, he says. In comparison, technical and money problems are easy.

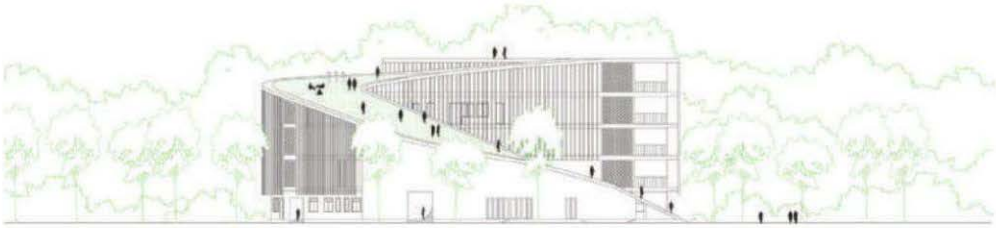
Right now the firm is working on a kindergarten in Dong Nai province that will allow the students and their teachers to grow food on a long, spiraling green roof; a house in HCMC's Tan Binh district, divided into five parts with small gardens in between; and a restaurant made of bamboo that is located in a botanical garden near Cuernavaca, Mexico. No matter where the project is or how big or small it may be, Vo and his partners apply a design approach shaped by their knowledge of farm sheds in paddy fields, the metabolism of Japanese urbanism, and the need to connect modern life with the environment that will sustain it. *Clifford A. Pearson*

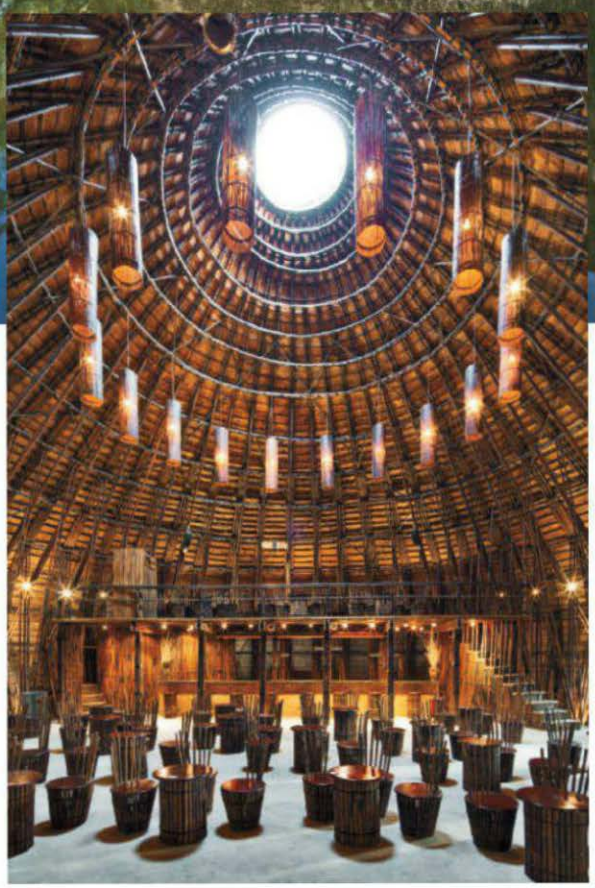
Stacking Green

While their city is becoming increasingly dense and polluted, residents of Ho Chi Minh City still love their plants and trees. So Vo designed this 13-foot-wide private house with cantilevered planters on the front and back, varying the height between them based on the type of plant and how high it grows (above and right). A pair of skylights and light wells give the reinforced-concrete structure the feeling of a traditional courtyard house, while tightly stacked courses of granite add texture to the interior spaces (opposite).

Binh Duong School

Located in the new town of Binh Duong, a 30-minute drive outside of Ho Chi Minh City, this school uses an S-shaped plan to wrap around a pair of courtyards and provide an uninterrupted circulation loop so students can access the entire complex without getting wet during the rainy season. Precast-concrete louvers protect covered walkways on each floor from the sun and rain, while allowing air to cool these areas. Outdoor stairs at both ends of the building lead to a green roof, while the sloping form reduces the bulk of the structure and keeps its maximum height (five stories) below that of the surrounding forest. Completed in 2011, the school will eventually accommodate 800 students.





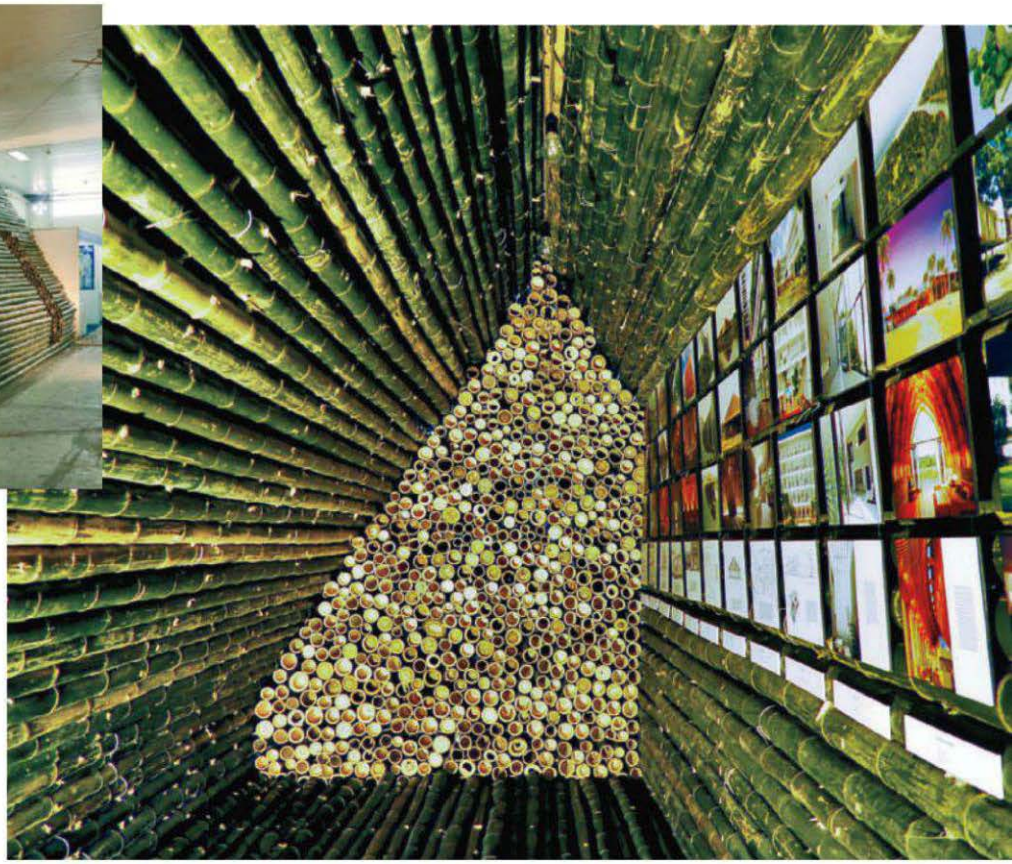
wNw Bar

Part of a complex in Binh Duong province that includes the wNw Cafe (following page), this domed bamboo structure was designed as a bar and entertainment space but is now used occasionally by the local community for town meetings and social events. The building's structural frame is made of 48 prefabricated units containing multiple bamboo elements bound together by rope. Fusing traditional construction with a modern design sensibility, the dome spans 50 feet in diameter and rises 33 feet to an open oculus.

wNw Cafe

A pair of concentric crescents surrounded by a reflecting pool and nestled one within the other, this café in Binh Duong province places customers in a man-made landscape that helps connect interior and exterior. Vo used computer simulations and aerodynamic design to shape the buildings and maximize the cooling effect of air moving across the water. Roughly 7,000 bamboo elements make up the structure, which is stabilized by wire cables strung from towers rising above the roof.

PHOTOGRAPHY (OPPOSITE PAGE): COURTESY VO TRONG NGHIA ARCHITECTS



Bamboo Booth

Built in just two days for the Vietnam Architecture Exhibition 2012 in Hanoi in April, this 10-by-28-foot booth gives eloquent testimony to the versatility of bamboo. Vo used 500 pieces of the material in a variety of ways: stacking them as "bamboo masonry," corbeling them into a curved arch for the roof, and even fashioning them into wooden nails and wedges, instead of using metal joints. A few strands of steel wire, though, were employed to decrease the deflection of the walls and roof.

Low-Cost House

Vo's firm designed this project as a prototype for low-income housing in the Mekong River Delta. In the summer of 2012, a pair of these houses were built for a total of $4,800 on the construction site of a kindergarten in Dong Nai province. The lightweight steel frame with roof-truss beams, translucent polycarbonate wall panels, and bamboo louvers on the inside are easy to assemble and readily available in Vietnam.

SsD Cambridge, MA/ New York City/Seoul

Jinhee Park and John Hong take on an age of austerity with a collection of carefully crafted projects that don't skimp on aesthetics.

FOUNDED 2003

DESIGN STAFF 6

PRINCIPALS Jinhee Park, John Hong

EDUCATION *Park:* Harvard Graduate School of Design (GSD), M.Arch., 2002; Seoul National University, B.F.A., 1995. *Hong:* Harvard GSD, M.Arch., 1996; University of Virginia, B.A., 1993.

KEY COMPLETED PROJECTS

Cloud, Heyri, South Korea, 2012; White Block Gallery, Heyri, 2011; Clover Restaurant Holyoke, Cambridge, Mass., 2011; Braver House, Newton, Mass., 2011; Big Dig House, Lexington, Mass., 2006

KEY CURRENT PROJECTS

Songpa Micro-Housing, Seoul, 2013; Novartis Cambridge Campus, Cambridge, Mass., 2015

SSDARCHITECTURE.COM

Don't let the name fool you—Single Speed Design (SsD)'s architectural approach is more like a 10-speed bicycle than a fixed-gear model, with principals Jinhee Park, 40, and John Hong, 43, shifting their approach with each new project. "For us, design is a process of negotiation," says Hong. The twosome took the name of the firm from the kind of transportation they used to zip around Cambridge, Massachusetts, where each earned an M.Arch. from Harvard's Graduate School of Design (GSD). Though today the firm's principals shuttle between their three offices in Cambridge, New York, and Park's native South Korea via grander modes of transit, bicycles—with their handsome utility and simplicity—seem an apt parallel for SsD's body of work.

Before the couple established SsD in 2003, the American-born Hong worked with two partners in New York at a commercial interiors firm the three had established, while Park completed her M.Arch. Their first major collaboration as SsD was on the Valentine Houses, a trio of townhouses in Cambridge. It was then that Hong decided to leave the firm he'd founded in New York to work with Park. "The Valentine Houses project had a roof on it," Hong jokes, explaining the move. SsD has since garnered acclaim for its small- and medium-scale work, from several installations to a newly christened, 16,145-square-foot art center—the elegant, ghostly White Block Gallery—in South Korea's trendy Heyri Art Valley. Through serendipitous circumstances, Park and Hong have clinched a series of commissions from developers who've heard about their work. The White Block's owner, for example, invited SsD to submit a scheme for the gallery after seeing the firm's work in 2009, when Park won the AIA's Young Architects Award.

The user experience is paramount to SsD, most evident in its psychedelic *Infinite Box* and the audiovisual installation *Cloud*. *Infinite Box,* which the duo crafted for South Korea's Gwangju Design Biennale in 2009, is a six-and-a-half-foot cube, though its mirrored interior walls give visitors who step inside it the illusion of a much larger space. *Cloud* is similarly interactive, toying with visitors' sensory perception by tracking movement beneath the LED-lit canopy to modify light and sound levels. "A small space is only small in dimension," says Park.

A stripped-down aesthetic is a common thread in SsD's work. For its 2006 Big Dig House, a private residence for a contractor associated with the Boston infrastructure project, the firm recycled some of the industrial refuse generated by the Big Dig. "All of our projects are guided by structural-engineering principles," says Park, explaining that the firm takes a cross-disciplinary tack that's crucial in the steadily changing—and broadening—profession. At the beginning of their careers, "there were a series of projects that we were lucky to have but were doing just because we could," says Hong. "Now we're designing with more conceptual clarity," adds Park.

As their practice gains speed, Park and Hong aim to continue to blur the boundaries between architecture, engineering, and fine art, and hope to expand their international practice. A microhousing project in South Korea, consisting of 120-square-foot apartments, is one of several SsD projects planned there. This and others in the works aren't necessarily glamorous, Park and Hong say, but answer a real and growing need in South Korea and other densely populated regions of the world. Because they address concepts, rather than aesthetic moves, "a lot of our projects aren't single-picture, magazine-friendly," says Hong. "It's about the space and experience. You have to be there." *Asad Syrkett*

PHOTOGRAPHY: COURTESY SSD/© CHANG KYUN KIM

White Block Gallery

Park and Hong clinched the commission to design the steel-frame and frosty-fritted-glass White Block Gallery in an invited competition in 2011. The 16,145-square-foot space, which is dedicated to global contemporary art in a variety of media, comprises a series of flexible exhibition and event spaces. Because its site is a no-fly zone bordering North Korea, the gallery was restricted to a three-story maximum height. So SsD devised a scheme that includes a long building with a stepped section that rises slowly over the terrain like a shallow staircase. SsD was the lone American design firm among the five invited offices. "We're finding that we can really get innovative work done in Korea," says Park.

Infinite Box

SsD created this project, a deceptively simple six-and-a-half-foot cube, for South Korea's Gwangju Design Biennale in 2009. While the plaster-and-wood volume takes an unassuming form, visitors step inside to a world of color (provided by luminescent fishing line) that is amplified by mirrors lining each of the box's walls. The challenge, Park and Hong explain, was to deal with an environment limited by its dimensions and expand its boundaries. SsD's design was one of 20 similarly rectilinear pieces created for the exhibition, each with its own riff on the theme of the articulated box.

Songpa Micro-Housing

In Seoul, the densely populated capital of South Korea and its largest metropolitan area (at 25 million residents), space is scarce. SsD's micro-housing scheme for a community of emerging artists in the city's Songpa district features 120-square-foot apartment units meant to minimize wasted space and maximize the usable floor area. Though the apartments are uniform in square footage, there are rectangular and square varieties with slightly different layouts. The metal screen planned for the building's facade provides security and privacy.

PHOTOGRAPHY (CLOCKWISE FROM TOP LEFT): © WOOSEOP HWANG (2); COURTESY SSD (3)

Cloud

Commissioned for a courtyard at the White Block Gallery, this work takes its name from the shape of the three loosely organized clusters of LED-lit plexi-rods, supported by a steel-and-aluminum frame, in this audio-visual installation. Sensors track visitors' movements through the space, and are used to manipulate the level of illumination and sound as crowds increase in size beneath the cluster of lights. In the absence of a flock of gallerygoers, *Cloud*'s light and sound levels respond to information about the temperature, humidity, and other atmospheric conditions by devices in the aluminum channels.

Island of Water

SsD's Island of Water is a 2010 plan to reestablish Ahamdo Island, a small strip of land in Incheon, South Korea, that in 1930 was accessible only via a footbridge passable at low tide. Today the area around Ahamdo Island has been filled in with infrastructure projects and annexed as part of the mainland. SsD's proposal involves inundating this land again and reintroducing native marshland plants to encourage and support the ecosystem that once flourished in the area. SsD's ambitious design includes a pontoon bridge that would rise and fall with the tide, and plans for an oyster farm. A steel-frame visitors' center planned for the site would allow views out over the newly created marshland, with a minimal footprint on the land.

Trace Architecture Office Beijing

A busy firm layers a commitment to social and environmental issues onto its projects in many different parts of China.

FOUNDED 2009

DESIGN STAFF 12

PRINCIPAL Hua Li

EDUCATION Yale University, M.Arch., 1999; Tsinghua University, B.Arch., 1994

WORK HISTORY Universal Architecture Studio, 2003–09; Herbert Beckhard Frank Richlan & Associates, 2001–02; Westfourth Architecture, 1999–2001

KEY COMPLETED PROJECTS Huancui Park Visitor Center, Weihai, China, 2012; Xiaoquan Elementary School, Sichuan province, 2011; Riverside Clubhouse, Yancheng, 2011; Gaoligong Museum of Handcraft Paper, Yunnan province, 2010

KEY CURRENT PROJECTS Tree Clubhouse, Beijing, 2013; Wuyishan Bamboo Raft Factory, Fujian province, 2013; Film Director's Center, Beijing, 2013; Kindergarten, Sichuan province, 2014

WWW.T-A-O.CN

China is a big country, and Trace Architecture Office (TAO) is leaving its mark all over it. The Beijing-based firm's portfolio includes a teahouse overlooking the Yellow Sea in northeastern Shandong province, a museum in southwestern Yunnan province near the Myanmar border, and a factory in Fujian province 140 miles from the Taiwan Strait. Hua Li, founding principal of TAO, prefers these projects because their locations "still have diversity; they're not yet globalized." These places have cultures that retain traces of local material usage and construction techniques and inform TAO's work. In turn, Hua's interest in leaving an architectural trace—both artistically and socially—sets his agenda and gives his firm its name.

"'Trace' suggests our concern for the social commitment and environmental impact of architecture," says Hua. He describes TAO's efforts both to manage its aesthetic ideal and its social concerns—balancing individual artistry with communal integrity, expressive forms with socially structured spaces, and global sophistication with local materials. To explain his outlook, Hua offers the example of his Xiaoquan Elementary School in Sichuan province. "Instead of making a centralized, single building, we designed a cluster of small structures to create a kind of urban condition." This helps form a community for children who both study and live at the school, as their parents have emigrated from Sichuan for work opportunities. At the same time, TAO inserted specific spaces to encourage exploration. For example, it cut an alcove into a wall and envisioned it as a seating area; children instead filled it with books to create an informal outdoor library. Hua commends the work done by the local contractor on the concrete structure, but "it's not like a Tadao Ando concrete wall," he says. He ground out some of the rough spots left over from the formwork. "With this trace of fixing the problem, you see the process of working. I think it's more meaningful to see the history of the building."

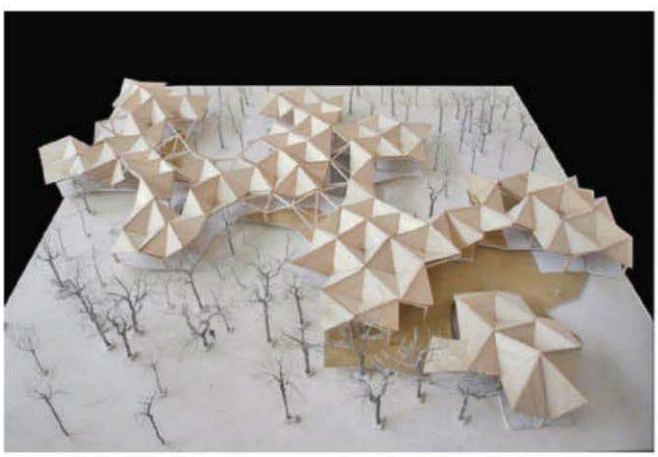
"'Trace' is the meaning recorded in the process of making things," says Hua. "It makes architecture more like an archaeological object, which expresses its real condition, in contrast to the form that is only an abstraction or representation. I think this is just like history. The history we know is only a small part of the real things that happened. Many other things are hidden or lost or silent. So to work with traces is our effort to reveal these hidden things." TAO's attitude can also be seen in its working method, which includes building physical models and using a lot of hand drawing. (Hua denies any conscious connection between "trace" and the paper he so often uses.)

Hua grew up in Lanzhou in the northwestern province of Gansu. "People there are straightforward and honest," he says. His neighbors taught him "to live a simple life, to care about things that are basic and fundamental." He left home to study at Beijing's prestigious Tsinghua University and then at Yale. There he was influenced by Raimund Abraham, who emphasized poetics over practicality. After graduating, Hua worked in New York for Herbert Beckhard, who had been a partner of Marcel Breuer and brought Breuer's concern for details and tectonics to his work.

In 2003 Hua returned to China and cofounded Universal Architecture Studio, which focused on large sports facilities, mixed-use complexes, and urban design. Working on mega-projects, though, proved frustrating, because they often didn't move beyond the drawing board. Hua wanted to build. So in 2009 he founded TAO to refocus his efforts on smaller works. Each of his projects responds to its particular setting, so there is no identifiable TAO look, which is fine with Hua. "We don't like to copy forms or repeat ourselves," he says. "To me it's more important to understand architecture's social commitment and meaning. I think it has the power to transform culture." *Clare Jacobson*

Tree Clubhouse

Tree-shaped columns with cantilevered beams form a rambling structure that zigzags between real trees in a riverside Beijing park. The project will be built in phases, so TAO designed a grid that can grow in parts.



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PHOTOGRAPHY: COURTESY TAO (LEFT); © YAO LI (OPPOSITE)

Xiaoquan Elementary School

"We're trying to do something different, to challenge the clichéd educational approach," says Hua. TAO's gathering of buildings and outdoor spaces allows children to pursue individual activities in addition to group exercises. The school replaces a building that was destroyed in the devastating 2008 Sichuan earthquake. To enact its design, TAO had to win over not only school administrators but also six organizations (including a group of Buddhist monks) that had donated money to the school's rebuilding.

Gaoligong Museum of Handcraft Paper

TAO designed this museum in Yunnan province as a cluster of volumes, echoing the ad hoc pattern of buildings in the adjacent village of Gaoligong. The museum's timber-framed buildings use nail-free *sunmao* joints, and its simple construction honors the local tradition of handcrafts. "We liked the possibility of using this traditional technique in a modern form," says Hua. He compares the quality of the construction to that of the paper it celebrates. "The handmade paper, at first look, seems quite rough," he says. "But its texture tells many stories, which you never see on machine-made paper. The architecture has a similar intention."

Streetacre City

Created for the 2011 Chengdu Biennale, this project finds room for the public amenities missing in many Chinese cities. "Currently in China, land is sold to profit-driven developers, and they always build super-high-density residential complexes that lack public facilities," says Hua. "Our idea is to improve the quality of public space and provide local services." TAO uses Chengdu's street grid—a rare public space—as the site for parks, gardens, exercise trails, restaurants, markets, and the like. The firm proposes layers of activity above the car traffic below. Residents of the surrounding towers can look down on the top layer of linear gardens that weave through their neighborhood.

Riverside Clubhouse

TAO took its design cues for this 5,380-square-foot building in Yancheng, 200 miles north of Shanghai, from the riverside site. The steel-framed, glass-walled building hovers above the ground, running an irregular loop around groves of bamboo and other vegetation. Hua calls it his "folded Farnsworth" for its transparency and fluid interior space. The program includes exhibition and meeting spaces, along with reception, lounge, and office areas.

PHOTOGRAPHY: © SHU HE (OPPOSITE); YAO LI (THIS PAGE, BOTTOM)

Easton+Combs New York City

A husband-and-wife team has gone back to basics, studying the material and structural innovations of centuries past to create new systems for building.

FOUNDED 2004

DESIGN STAFF 4

PRINCIPALS Rona Easton, Lonn Combs

EDUCATION *Easton:* University of Westminster, Dip.Arch., 1989; University College London, MScAAS, 1987. *Combs:* Columbia University, MSAAD, 2001; University of Kentucky, B.Arch., 1992.

WORK HISTORY *Easton:* RMJM, 1997–98; BDP, 1993–97. *Combs:* SOM, 1999–2000; Kleihues+Kleihues, 1994–97; Studio Daniel Libeskind, 1992–94.

KEY COMPLETED PROJECTS Ohne Titel Concept Showroom, New York City, 2011; Changing Room, Chicago, 2011; IAH Airport Parking, Houston, 2005

KEY CURRENT PROJECTS Passive House Case Study, 2012 (ongoing); EU School, Crete, Greece, 2012 (design study)

EASTONCOMBS.COM

Mill Center for the Arts

Easton+Combs's design for this performing-arts and community center in Hendersonville, North Carolina, was a finalist in a 2005 national competition. In their scheme, the architects placed a theater under a faceted roof that would allow light and air to circulate.

Lonn Combs and Rona Easton, married in life as well as in practice, have spent the last year living and working in Rome. Combs won a Rome Prize in Architecture in 2011 and, with Easton, has been studying Italian architect and engineer Pier Luigi Nervi's groundbreaking innovations with concrete. In a way, their time in Rome has been a mirror of their practice in recent years. Just as they are taking the time now to "slow down and learn to walk again," Combs says they decided a few years ago to narrow their focus to the essentials: studying materials, structural performance, and assembly.

In the reverse order of most independent architects' trajectories, the couple's collaboration officially began with their *largest* built project to date, a parking facility (2005) for George Bush Intercontinental Airport in Houston. Someone familiar with the architects' work connected them with the developer of the project. "He was willing to listen to us in terms of design ideas," says Combs in explaining the imaginative result. Their shift to a smaller scale began around the time the architects competed in the 2010 MoMA PS1 Young Architects Program, which they did not end up winning. For the temporary installation that PS1 builds each summer in its courtyard in Queens, New York, they proposed a cluster of colorful parasols made of extruded cellular-polycarbonate blades. "The challenge of imagining the design is one thing; building it yourself, and efficiently, is another," says Combs. "[PS1] opened up a focus on smaller installations and ways we could do our own building. It's been an interesting area of research, and it strengthened our outlook." That research led to two projects in 2011 that explored lightweight structural membranes: a temporary concept showroom for Ohne Titel, a New York–based fashion label, and an installation called *Changing Room* in Chicago's Extension Gallery for Architecture.

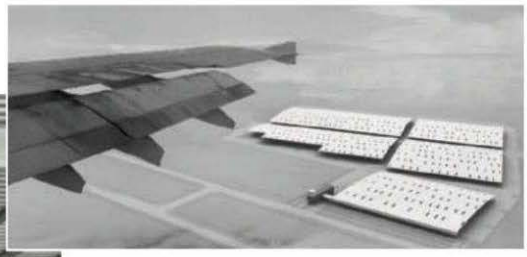
Combs and Easton, who met while working in Berlin during the building boom of the early 1990s, are now slowly growing back up in scale, with many projects on the boards "that we didn't anticipate in the last 18 months," says Combs. Speaking from Rome—the research period ended in July, but Combs has been teaching a fall studio at Rensselaer Polytechnic Institute's program abroad—the couple described a sleepless week as they prepared to enter a competition for an EU school in Crete. Their bioclimatic design strategy uses passive systems and explores prefabrication. They are also working on a prototype of a house with similar parameters. Easton says the duo's Nervi studies will come into play for the house (requested by a client who may build in Colorado), because it uses precast concrete.

As Easton and Combs prepare to come home, they say that stepping back, both physically and in their practice, has increased their confidence. "It's been a revelation in many ways," says Easton. "It's easy to look at the history of architecture and see beauty but something that's not relevant to you now. Being in Rome has fundamentally changed the way I think about that. You realize that 1,000 or 2,000 years is no time at all." *Laura Raskin*

Ohne Titel Concept Showroom

This temporary environment and display system for New York City–based fashion label Ohne Titel's fall/winter 2011 collection was made of folded and interlocking aluminum panels and inspired by textile weaves and patterns. It took less than 48 hours to install.

View additional images at architecturalrecord.com.



IAH Airport Parking Facility

This parking facility for a private commercial extension of George Bush Intercontinental Airport in Houston was the firm's first commission. The aerial montage above depicts the project as it would be if fully realized. Currently only two sheds have been built, as well as the gate building. "We made the move to separate the gate from the large-canopy buildings," says Combs. "It's a car city. We wanted people to have an architectural experience from their car, hence the length of the gate building—it's long and narrow."

Changing Room

Made of roughly 1,800 interlocking polycarbonate, CNC-cut pieces, *Changing Room* was designed for Extension Gallery for Architecture in Chicago. A herringbone-patterned curtain hung from the gallery ceiling, about three feet off the ground, forcing visitors to duck underneath. The three-leaf-clover-shaped pieces that created the curtain intersected three times, a design that was scripted with readily available 3-D-geometry software. While it was a striking object and environment in its own right, the architects used the installation to continue to explore their interest in lightweight building-skin prototypes; it was an extension of research they conducted for Lux Nova (right) and helped inspire the Ohne Titel showroom (opposite).

Lux Nova

Easton+Combs's scheme for the 2010 MoMA PS1 Young Architects Program kicked off the firm's deep study of materials, structural innovation, and assembly. The proposed pavilion (it did not win) for PS1's courtyard was inspired by Saint-Denis Abbey near Paris, which, in the 12th century, used polychromatic glass in the apse window. The abbot was so inspired by the results, he called it "lux nova" (new light). Here the architects aimed for a similar effect with fanned-out bands of extruded cellular polycarbonate.

Hironaka Ogawa & Associates Tokyo

A Japanese architect doesn't lose sight of his rural roots—integrating notions of the landscape and nature into his built work with skill and respect.

FOUNDED 2005
DESIGN STAFF 3
PRINCIPAL Hironaka Ogawa
EDUCATION Nihon University, M.Arch., 2000; B.Arch., 1998
WORK HISTORY Kengo Kuma & Associates, 2000–05
KEY COMPLETED PROJECTS Pleats.M, Saitama prefecture, Japan, 2012; Forest Chapel, Gunma prefecture, 2011; Chiyodanomori Dental Clinic, Gunma prefecture, 2011; Garden Tree House, Kagawa prefecture, 2010; Sundial House, Kagawa prefecture, 2009; Kimukatsu, Tokyo, 2006
KEY CURRENT PROJECTS Bellows House, Kagawa prefecture, 2013; Pleats.I, Saitama prefecture, 2013
OGAA.JP

Based in Tokyo but born in a rural town on the island of Shikoku, Hironaka Ogawa still draws inspiration from the countryside. Even as he starts to land bigger and more urban commissions, daylight, natural ventilation, greenery, and trees—the elements of his childhood landscape—continue to enrich his buildings.

For Ogawa, that perception began developing at a young age. His family home, built by his grandfather 90 years ago, is a large, wood-frame, Japanese-style house that blends with the scenery. "There was no division between the building and its surroundings," says Ogawa. "It opens onto the garden that connects to the fields that extend out to the mountains."

While Ogawa was growing up, Japan's "bubble" economy was booming and new construction was everywhere. His tiny hometown was no exception. Lured by the smell of freshly sawn lumber and the candy tossed in celebration from newly mounted ridge beams, Ogawa was drawn to building. His mother, perceiving his interest, gave him a gentle push in that direction, too.

Ogawa left that charming setting for Nihon University in Tokyo, where he entered many conceptual competitions as an architecture student. One of his entries caught the attention of jurist Kengo Kuma, who invited the young architect to join his firm after graduation. Under Kuma's tutelage, Ogawa worked on residential, commercial, and institutional projects. His five-year stint culminated in the supervision of the Adobe Repository for a Buddhist Statue. On the grounds of Anyo-ji Temple in Yamaguchi prefecture, the earthen-brick enclosure exemplified Kuma's commitment to local materials and practices—an approach that resonates with Ogawa.

The experience of using mud bricks had an impact on Ogawa when he opened his own office in 2005 with a commission for the facade and interior of a Tokyo *tonkatsu* restaurant. Slathered with a thin layer of earth, the building front evokes traditional architecture and reads as a blank mud wall during the day. But at night, acrylic panels inset behind the surface emit glowing patches of light that animate the wall in a decidedly contemporary way.

Today, Ogawa's staff has grown to three. Located in a central Tokyo commercial district, the practice occupies a private office inside a communal workspace shared with five other design-related companies. An economical solution that provides young firms with a separate conference room and the all-important reception area for meetings with guests (a custom in Japan), shared offices are becoming increasingly common. "With all these designers in one place, it is a very stimulating environment, full of energy," Ogawa explains.

While headquartered in Tokyo, Ogawa works extensively on Shikoku, where he has already built numerous houses and has more work under way. Though it is easy to take design cues from the landscape in his native Kagawa prefecture, Ogawa seeks out ways to incorporate nature wherever he is, even when building in Tokyo. "Trees aren't the only way to connect to nature," he says. "There is also light, wind, and rain." A case in point, his Emblem House of 2008 is enclosed with a Kuma-style screen whose checkerboard motif, inspired by the client's family crest, softens the boundary between inside and out.

In a change from previous generations, Ogawa and his peers are demonstrating a growing interest in the surrounding scenery and a genuine concern for its wellness. "When building anything, we have to demolish nature," he laments. "But there has to be a way to preserve the environment." *Naomi R. Pollock, AIA*

Garden Tree House

When the client for this project in Kagawa prefecture decided to build a home of her own adjacent to her parents, she knew that the trees she grew up with would have to go. But by integrating them into the building's support system, Ogawa gave the trees a new life. The transformation from leafy boughs to structural members entailed two weeks of kiln drying followed by bark stripping before the two massive trunks could be installed in the dining and kitchen areas.

View additional images at architecturalrecord.com.

Forest Chapel

Designed specifically for weddings, Forest Chapel appears as an abstract white box amid a garden site in Gunma prefecture. Leaving its plain wrapping outside, the modest building comes into full bloom in the interior, where 14 steel columns shaped like trees branch out to support the roof and guide the eye upward. Composed of arched steel angles, the graceful columns all curve differently but work in unison to share the load. "The angle size, the trees' shapes, and the number of columns all had to be coordinated," explains Ogawa. The architect was interested not only in creating artificial trees but also in protecting the existing greenery outdoors. Angled toward a mature zelkova tree preserved during construction, a full-height window wall ensures a garden view for the wedding guests.

PHOTOGRAPHY: © DAICI ANO

Pleats.M

An oddly shaped plot located near a busy intersection in suburban Saitama prefecture hardly seems like the ideal spot for a wedding hall. But Pleats.M (above and opposite) aims to disprove that assumption. Draped with steel-supported, stuccolike walls creased as sharply as origami paper, the 16,146-square-foot building deftly shuts out its surroundings while embracing a nondenominational chapel, an event hall, and other spaces for newlyweds and their guests.

Kimukatsu

Ogawa's first project after opening his firm, Kimukatsu is a restaurant in central Tokyo. Hired to design the interior and facade, Ogawa called upon a traditional mason to cover the shopfront with a thin layer of earth. A waterproof coating prevents the surface from melting when it rains, and acrylic panels embedded in the wall animate the plain surface at night when the interior lighting shines through.

Chiyodanomori Dental Clinic

A combined residence and workplace for a dentist and his family, the Chiyodanomori Dental Clinic is located in Gunma prefecture, where the winters are cold and the summers hot. To protect his clients from the vagaries of climate, Ogawa united the two parts in a single building and swaddled it with a solid exterior wall. Organized according to a square, nine-foot grid, the building incorporates 11 tiny gardens that fill the interior with daylight and fresh air.

FRPO (Rodríguez & Oriol Architecture) Madrid

A pair of Spanish architects pulls apart programs, then assembles designs with repetitive elements that create rich compositions.

FOUNDED 2007

DESIGN STAFF 5

PRINCIPALS Fernando Rodríguez, Pablo Oriol

EDUCATION *Rodríguez:* ETSA Madrid, M.Arch., 2003. *Oriol:* ETSA Madrid, M.Arch., 2005.

WORK HISTORY *Rodríguez:* Nolaster, 2005–07. *Oriol:* Nolaster, 2005–07.

KEY COMPLETED PROJECTS
MO House, Madrid, 2012; El Tártaro Club, Madrid, 2011; JL Apartment, Madrid, 2011; VS Apartments, Valladolid, Spain, 2008; Plaza de las Letras, Madrid, 2007; OS House, Santander, Spain, 2005

KEY CURRENT PROJECTS Access and Services Building, Madrid City of Justice (suspended); Woodstone House I, Cantabria, Spain, 2012; VT House, Madrid, 2012; Woodstone House II, Cantabria, 2013; WTVN Villas, Bali, 2013

FRPO.ES

When approaching a design problem, Madrid-based architects Fernando Rodríguez and Pablo Oriol of the firm FRPO try to find a method of attack rather than jumping right in with a solution. Their process often involves breaking the building program into its basic elements, which they then weave back together in surprising ways. Oriol explains, "We try to arrive at a systematic simplicity, establishing basic rules of play for the design process—but ones that are capable of assuming the full complexity of the program and result in spatial richness."

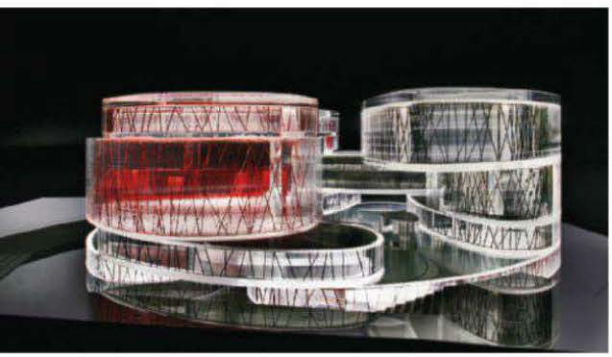
A case in point is their 2008 competition-winning design for the Access and Services Building at the Madrid City of Justice (with Estudio Cano Lasso; suspended due to lack of funds), where they tackled a program with disparate elements such as a TV studio, a sequestered jurors' residence, and an auditorium. Their design broke these elements into elliptical discs superimposed over one another at different angles, with terraces, overhangs, and voids in between.

The firm's method can produce very compact designs, such as the OS House on the coast of Cantabria, Spain (2005; with Marco González), or ones that spread like an amoeba between the trees (MO House, Madrid, 2012). It develops projects through multiple models, often shuffling around repetitive elements.

Using patterns of repeated cells in projects is not unusual among other graduates of Madrid's school of architecture, including Luis Mansilla and Emilio Tuñón and the partners in Estudio Entresitio. A number of "organicist" buildings from the 1960s are based on the same principle, such as the striking White City vacation apartments in Alcúdia, Mallorca (1964), by legendary Madrid teacher Francisco J. Sáenz de Oiza. In FRPO's projects, however, cells are not repetitive in size or shape, and their combinations do not necessarily follow regular patterns. The process is both more intuitive and more empirical, responding to the specific conditions of each problem.

The two architects, both 35, became friends in their first year at architecture school in 1995. They pooled resources with other students to share a rented studio, where group members helped each other on school presentations, a common practice in Spain that is often the seed for future firms. Incorporated as Nolaster, the group continued to work together on various projects after graduation, and finally dissolved in 2007. By then Rodríguez and Oriol had won the City of Justice commission.

Such networking continues to be one of the firm's basic strategies for finding work in these difficult times. For a major competition like the City of Justice, they approached more experienced colleagues—the Cano brothers—for help. Now, like other Spanish firms, FRPO must look abroad for work. Oriol studied for a year at Chicago's IIT, and Rodríguez spent a year in Berlin. These experiences helped prepare them for competitions for Chicago's Union Station (honorable mention), the World Trade Organization extension in Geneva (second prize), and a pavilion for the Museum of Modern Art in Warsaw. Despite hard times, the architects are optimistic about the future. "Our position is better than a few years ago," Oriol maintains. "Spanish society is better educated, and people are better prepared to appreciate what architects do. For our part, we have to build bridges of understanding with the society in which we live." *David Cohn*



Madrid City of Justice

The Access and Services Building stacks 14 programmatic elements on five independent vertical cores. The elliptical shapes overlap within the circular building envelope. The firm won a 2008 competition with Estudio Cano Lasso, but the project has been suspended due to a lack of funding.

View additional images at architecturalrecord.com.

MO House

This lightweight structure in northern Madrid is built of computer-cut, cross-laminated wood walls, floors, and roofs, and floats on micropiles so as not to harm tree roots. Eleven pavilions (living, bedrooms, kitchen, studio, etc.) spread out between the trees and are linked by wide circulation spaces into which activities can spill. The stucco exterior, painted-wood interior walls, and continuous concrete floors unify the design. The pavilions' skewed layout creates tangled views through them of indoors and out, and a series of semi-enclosed exterior spaces. The design exemplifies the architects' search for "systems that generate complexity," explains Rodríguez.

PHOTOGRAPHY: © FEDERICO LÓPEZ (OPPOSITE); MIGUEL DE GUZMÁN (THIS PAGE)

OS House

For protection from sea winds, the architects excavated a sunken garden on the southern exposure of this lot on the Cantabria coast and built the house over it. Patios for light and circulation slice through the compact volume to create a hierarchy of uses. The core living area with bedrooms and studio functions independently from less-defined spaces for children, grandchildren, and guests. Spaces open into one another in every direction for flexibility. "The rooms are simple rectangles," says Pablo Oriol, "but all the connections result in complex spatial relations, with transparency from room to room." The dry-assembled steel structure is clad in zinc.

Museum of Modern Art in Warsaw

Warsaw's modern-art museum organized an invited competition for a pavilion promoting its upcoming new building. FRPO proposed a transparent "art box" set in an "info forest" of flat wood masts, inviting visitors to "exchange thoughts, drawings, or messages." The architects explain, "Citizens interchange experience with curators through contributions to ... the space around the events container."

World Trade Organization

The architects cite Anish Kapoor's *Cloud Gate* sculpture in Chicago's Millennium Park as an inspiration for their proposed addition to the WTO headquarters in Geneva. A glass and aluminum "bubble" houses new offices and is linked to the existing building via an underground wing containing a cafeteria, library, and auditorium. The compact shape offers good energy performance and minimizes the visual impact of the building on its parklike setting near Lake Léman.

IMAGES: © JAN BITTER (OPPOSITE, TOP); JOSÉ HEVIA (OPPOSITE, BOTTOM); COURTESY FRPO (THIS PAGE)

MMX Studio Mexico City

Four designers use context as a springboard and animate their projects with suprising material applications.

FOUNDED 2009

DESIGN STAFF approximately 10

PRINCIPALS Jorge Arvizu, Ignacio Del Rio, Emmanuel Ramirez, Diego Ricalde

EDUCATION *Arvizu:* Iberoamerican University (UIA), M.CM, 2011; UIA, B.A., 2004. *Del Rio:* National Autonomous University of Mexico (UNAM), B.A., 2001. *Ramirez:* The Bartlett, London, M.Arch., 2005; UNAM, B.A., 2001. *Ricalde:* The AA, London, M.Arch., 2009; UNAM, B.A., 2001.

WORK HISTORY *Arvizu:* Alberto Kalach, 2000–02; TEN Arquitectos, 1998–99. *Del Rio:* Molestina Architekten, 2007–08; Alberto Kalach, 2002–06. *Ramirez:* David Chipperfield, 2007–09; SOM, 2005–07. *Ricalde:* LBC, 2004–07; HH Architekturbüro Schaan, 1998.

KEY COMPLETED PROJECTS NP Installation, New York City, 2012; FNO Pavilion, 2011; Eco Pavilion, 2011; TEA Terrace, 2010; CSC House, Morelos, Mexico, 2010; MeroToro Restaurant, 2009

KEY CURRENT PROJECTS CAP House, 2012; ERV Pavilion, 2012; DRL Housing Development, 2013; CM Master Plan, 2015

MMX.COM.MX

No matter what level of success Mexico City–based MMX Studio may someday attain, its name will always serve to remind its four partners of their humble beginnings. The term in Roman numerals for 2010, MMX would mark the firm's first full year in practice—"if we made it through the one-year test," says principal Emmanuel Ramirez. The name also underscores where they come from, culturally speaking. "It refers to Mexico," adds Ramirez. While experiences abroad helped the partners expand their thinking about architecture, "at the end of the day we are all Mexican."

Ramirez met Ignacio Del Rio and Diego Ricalde at the National Autonomous University of Mexico. Their paths crossed again when they worked at the office of Alberto Kalach, where they would meet their other partner, Jorge Arvizu. The four drifted apart, some pursuing graduate studies and jobs internationally. A competition to design the Mexican pavilion for the 2010 Shanghai World Expo brought together Ramirez and Ricalde (who were in London) with Arvizu (who was in Mexico). Their entry was a finalist. "It was a trial for working together," says Ramirez. The four men opened up shop—without a single commission—at the end of 2009 in a small room in the Colonia Condesa neighborhood.

Responding to the limitations of the local workforce, MMX's designs employ simple materials and construction techniques. "We are not interested in innovating with material," says Ramirez. "We are interested in using everyday materials in different ways." The team explores form making by designing installations with such things as wine bottles and credit cards. On larger-scale work they have employed poured concrete, concrete masonry units, and brick—with which local work crews are well versed—as some of their principal building blocks. But as with their smaller projects, they find surprising uses for nontraditional materials. For the firm's first commission, the interior of Condesa's trendy MeroToro restaurant, the architects animated the space with a wall made of reclaimed railroad ties. And they created a shading device on a rooftop deck for a private residence with swaths of burlap, which is typically used for rice or coffee sacks. To pursue investigations on a larger scale, the team, which was awarded the Architectural League of New York's Prize for Young Architects + Designers this year, regularly enters domestic and international competitions.

MMX's designs emerge as responses to their surroundings. "We don't like to think of our work as objects," says Ramirez. "We need to engage with the context rather than just making forms." This approach is evident in the plan of the Santa Catarina house, which took cues from a magnificent laurel tree in the middle of the plot. Similarly, the team's idea for its Eco Pavilion, which is composed of rope and steel chain, took shape as an extension of the existing art museum whose courtyard it occupies. To ensure a consistency in their work, one of the partners is assigned to lead each project, but all four participate in the design sessions. "We focus on the strategy and principles rather than formal solutions," says Ramirez.

Today MMX and its 10 or so designers occupy an old rowhouse in Condesa. As they take on larger commissions—they are now designing a 24-unit housing development and a master plan for a K–12 campus—keeping their sights trained on the local influences that are right in front of them will continue to define their work in an increasingly global world. *Beth Broome*

Eco Pavilion

Made from natural fiber rope and steel chain, this temporary pavilion at the Museo Experimental El Eco was MMX's first competition win. While defining a space for outdoor performances, the installation also preserves the feel of the open courtyard. Photographer Yoshihiro Koitani superimposed multiple shots of a man passing through the space to create this image.

View additional images at architecturalrecord.com.

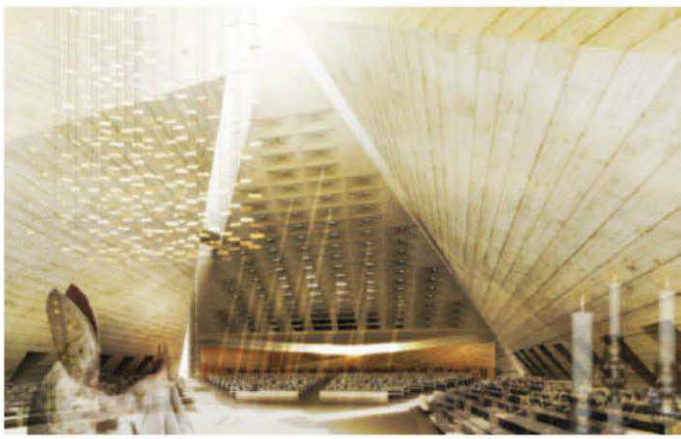
Casa Santa Catarina

MMX designed this two-bedroom weekend house in a remote village in south-central Mexico for a couple who hope to retire here one day. The compound will eventually contain two more houses for other family members. Two nesting polygonal volumes took shape in response to the plot's focal point—a stately laurel tree—as well as the mountain views to the north. The client's budget, which mandated that the architects work with local builders, determined the main building component: concrete masonry units—the only material with which the workers had experience. The block is coated with a lime plaster wash to protect against humidity and is arranged with apertures that provide screening and filter daylight into an interior courtyard.

PHOTOGRAPHY: © YOSHIHIRO KOITANI

FNO Pavilion

Made of about 20,000 credit cards, this installation welcomed visitors to the Luis Adelantado gallery on the occasion of *Vogue* magazine's 2011 Fashion Night Out in Mexico City. A sponsor of the event, American Express provided MMX with the cards, from which it fabricated this "big textile" that formed a screen by the gallery entrance. Metal brackets held together two different components—one folded and one flat. The team did tests with cardboard and then with Rhino before the units were linked together off-site.

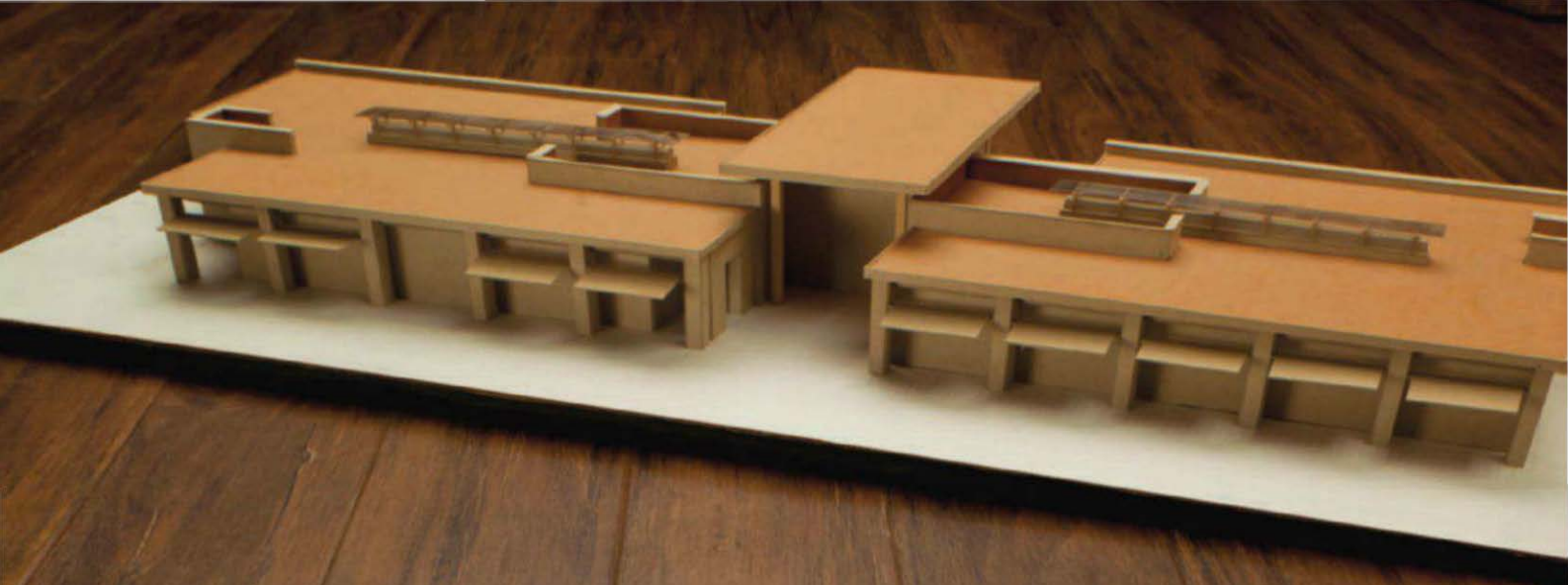


Helsinki Waterfront Master Plan

This open competition, sponsored by the Finnish government, asked designers to rethink Helsinki's South Harbor for the future. The challenge was how to activate the waterfront as a public amenity, while still accommodating the heavy transportation and infrastructural needs. "Instead of bringing the city to the water's edge," says MMX's Emmanuel Ramirez, "we deconstructed the edge to bring the water back to the city." To do so, the team's scheme opens up canals and creates a series of islands. Responding to the important role that the harbor plays for the city, MMX visualized "water blocks," as extensions of city blocks, that could host different recreational attractions, like a swimming pool, floating stage, or ice-skating rink.

Cancún Cathedral

The brief for this invited competition outlined the need for a new cathedral in an urban context that would accommodate a congregation of 1,500 while including four to five chapels that could each hold hundreds of people. The challenge became designing a main space that wouldn't compete with the chapels, as well as creating an identity for each of these smaller volumes. Made of board-formed concrete, the cathedral is basically a cluster of discrete buildings—the chapels—whose walls form a void at the center, which becomes the nave. The team says it did not want an iconic shape but rather thought of the cathedral more as a form rising out of the landscape.



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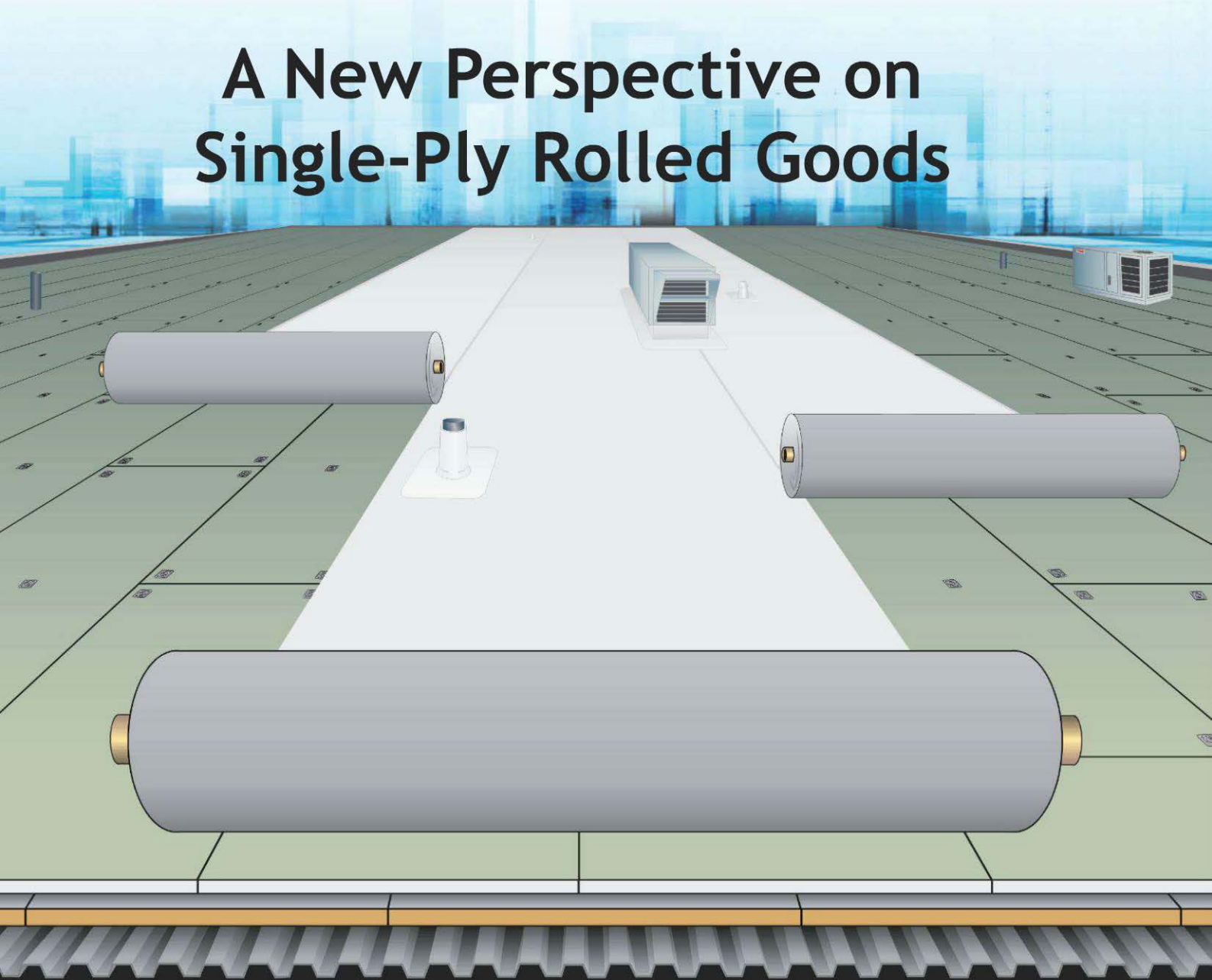

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BIG-LEAGUE DREAMS

Professional sports and urban identity are inextricably linked. The buildings hosting the teams that local fans cheer leave an indelible mark on their hometowns—and often red ink on municipal ledgers. In this issue, in collaboration with our sister magazine *Engineering News-Record*, we explore the relationship between sports facilities and their urban surroundings, and take a close look at three noteworthy examples: the BBVA Compass Stadium in Houston, the Olympic Stadium in Kiev, Ukraine, and Brooklyn's Barclays Center. We also report on the innovative project-delivery method helping speed construction on the future home of the NFL's 49ers in Santa Clara, California—a glimpse of what's to come for an enduring building type.
Joann Gonchar, AIA

PHOTOGRAPHY: © DAVID SUNDBERG/ESTO

BARCLAYS CENTER, BROOKLYN

ECONOMIC ENGINES?

Cities forge ahead with plans for new professional sports venues, despite their high cost and the tepid pace of development.

BY JAMES S. RUSSELL

URBAN GLUE In Cincinnati, residential buildings (right) with ground-level retail space and restaurants have started going up between Paul Brown Stadium and the Great American Ball Park. The first phase of a waterfront park also recently opened. When the park is completed, a 45-acre swath of green (above) will link the two venues.

NEW DIGS As part of its winning bid to design a new stadium for the Minnesota Vikings, HKS produced several preliminary schemes. The client, the Minnesota Sports Facilities Authority, cautions that the final design for the $975 million facility, which will replace the 30-year-old Metrodome, could look much different.

THE VIEW of Cincinnati's skyline from the Kentucky side of the Ohio River reveals the alluring, if complicated, relationship of sports facilities and cities. On the western edge of downtown, the $455 million Paul Brown Stadium usually fills to capacity with cheering Bengals fans when the NFL team plays at home. Designed by NBBJ, this brawny cylinder of layered concrete and glass, topped by a grandstand of cable-tensioned steel, preens for motorists cruising around the freeway ramps that wrap it on two sides.

Bookending the city's skyline to the east, the $337 million Great American Ball Park (2003), home of the Cincinnati Reds, nestles deeper into the riverbank, intentionally less obtrusive. At the ballpark, designed by HOK Sport (now Populous) with GBBN Architects, only the spindly lighting towers—everyone in town compares them to toothbrushes—rise high.

The sight of thousands of Bengals fans in their orange jerseys streaming out of the stadium and through the downtown streets serves as a reminder that sports is deeply embedded in the city's identity—even in a corporatized era of millionaire players, billionaire owners, and billion-dollar stadiums. Planners and city boosters everywhere inevitably want to harness that emotional connection as an engine of urban redevelopment, though they have not found it easy.

In Cincinnati, a kind of urban glue has belatedly begun to take hold on what was once 18 acres of parking that divided the two stadiums. The first two residential buildings of The Banks have gone up, and include street-level restaurants that extend west from the Great American and cater to fans, residents, and the downtown lunch crowd. The development will someday comprise 300 apartments, 300,000 square feet of office space, and a 200-room boutique hotel.

Nearby, the first phase of what will be the 45-acre Phyllis W. Smale Riverfront Park, designed by Sasaki, opened last spring. It brings the river closer to the city with a terraced grand stair and a waterfall. When completed, the park will extend a string of existing riverfront parks past the baseball stadium to wrap Paul Brown at the river's edge.

This waterfront anchored by stadiums looks like a textbook case of sports spurring growth—an oft-cited reason for trading in the old stadium for a new one. "The stadiums drive tenant interest in The Banks," says Tracy Schwegmann, the development's marketing director. "And entertainment attracts retail." Reds spokesman Michael Anderson adds that the new park gives families "something to do before the game begins."

The costs, however, have been staggering. Largely underwritten by public funds, the stadiums have saddled Hamilton County with debt. Though The Banks is built atop a publicly financed parking structure, Carter, the Atlanta-based developer, missed an opportunity to build the architecturally distinctive project expected for such a prime waterfront location. The small part of the park completed so far only begins to suggest the waterfront's potential.

The high costs and tepid pace of redevelopment are not unique to Cincinnati, and have made some cities leery of financing big-league sports facilities with public dollars. Still, cities continue to build.

To name a few: In Minnesota, the Twin Cities will remodel the Target Center arena and build a new NFL stadium for the Vikings, designed by HKS. Chris Hansen, a hedge-fund investor from San Francisco, plans to build an arena in Seattle if he can find a basketball-team tenant. The NBA's Golden State Warriors will move from Oakland to a planned San Francisco arena being designed by Snøhetta and AECOM's sports practice (formerly Ellerbe Becket). Two football-stadium bids are competing in Los Angeles.

Obviously, the economy has played a part in declining taxpayer support, while cautionary tales abound. Hamilton County paid $34.6 million in debt service in

IMAGES (FROM FAR LEFT): COURTESY SASAKI; © JASON MEYER/FEINKNOPF; COURTESY MINNESOTA SPORTS FACILITIES AUTHORITY

"Stadiums and arenas don't work alone," says Robert Mankin, an NBBJ sports specialist. "They can act as a catalyst."

2010 for its share of the costs of the Bengals and Reds stadiums, according to the *Wall Street Journal*—more than 16 percent of its budget. The story called the Paul Brown financing deal "one of the worst professional sports deals ever struck by a local government." Tax revenues that back debt have fallen short elsewhere too, increasing financing costs by $43 million for the NFL Colts' 2008 Lucas Oil Stadium in Indianapolis, according to Bloomberg News. And critics maintain that professional sports facilities are generally poor generators of economic activity. According to Neil deMause, who analyzes public stadium deals in his book and website *Field of Schemes*, "Each new job can cost on the order of $250,000; that's a terrible bang for the buck." He adds, "Economists have found very little impact on sales-tax receipts and per capita income."

Most of the new facilities are in big-city downtowns where, the thinking goes, they can add amenities as business districts attract more residents. Those downtowns in turn deliver fans to the teams and their restaurants, and unique neighborhoods enrich the game-day experience. "Stadiums and arenas don't work alone," says Robert Mankin, an NBBJ sports specialist. "They can act as a catalyst."

Yet as Cincinnati has learned, football and baseball stadiums aren't busy enough to ignite the redevelopment process. NFL teams play only seven or eight games at home; baseball stadiums can host 80 dates or more. Arenas generate more economic value. Because they can mix basketball, hockey, amateur sports, concerts, and family events, they can be busy more than 200 days a year.

Mankin points out that NBBJ's Staples Center arena, opened in downtown Los Angeles in 1999, became more successful once the Anschutz Entertainment Group (AEG)'s 4 million-square-foot L.A. Live sports-and-entertainment complex rose around it in the following decade. The arena "works in concert with the adjacent convention center and the Nokia Theatre across the street," he says.

Now AEG wants to boost L.A. Live with the $1 billion, 78,000-seat Farmers Field, a football stadium designed by Gensler. The developer says it will build the facility without public money. AEG is competing with Majestic Realty's proposal for an NFL stadium 18 miles east, in the City of Industry. Designed by the sports-facility expert Populous, it is also self-financed. The project that lands a team first will proceed.

Sports facilities do most for cities when they reinforce redevelopment trends already under way. Fans can dine and drink in Denver's downtown LoDo because the adjacent 1995 Coors Field is not isolated from the redeveloped warehouse district by acres of parking. San Francisco's Caltrans commuter-rail station serves the 12-year-old AT&T Park through the South of Market neighborhood that's boomed since the 1990s. Downtown fans filter through Seattle's historic Pioneer Square to reach baseball and football stadiums that cut dramatic silhouettes on the skyline.

URBAN SYNERGIES
The proposed Farmers Field football stadium designed by Gensler would join a sports-and-entertainment district in Los Angeles (left). Snøhetta's scheme for an NBA arena (opposite) near San Francisco's Bay Bridge includes plazas and gardens that would be open to the public.

Other cities hoping to kindle such synergies with new facilities have garnered citizen support for public financing. In Minneapolis, teams and owners overcame significant taxpayer skepticism by agreeing to cover well over half the cost of renovating the 22-year-old Target Center and building the new $975 million Vikings stadium. The recent collapse of the inflatable roof on the Metrodome, the Vikings' current home, and the team's threat to move, added urgency to the effort. Local governments will lend as much as $145 million to the $537 million Seattle arena project for a site adjacent to the two existing downtown stadiums. Much of that cash will be applied to a variety of off-site improvements.

The ugly financial climate does not mean that stadiums and arenas will be built less expensively, because trends in public expectations and technology are likely to add to costs. Cities are asking for memorable designs. That's why Forest City Ratner hired first Frank Gehry and then SHoP Architects to put a good face on the Barclays Center, the new Brooklyn home for the NBA's Nets (page 100). SHoP has recently been asked to lead a group that will propose a new Major League Soccer stadium for New York City.

Because the Warriors wanted to build on a 13-acre pier on San Francisco Bay near the Bay Bridge, the team partnered Snøhetta with AECOM "to add architectural firepower," says Warriors president Rick Welts. The Oslo-based Snøhetta had never worked on a sports building, but designed the immensely popular waterfront Oslo Opera House. Welts was also impressed with "the extraordinary reviews" for the addition that the firm is designing to the San Francisco Museum of Modern Art. The Warriors have released early studies showing entry and retail pavilions with folded roofs leading to ramps that curve around an oval arena.

As much as half the site may be devoted to plazas and gardens that will be open to the public, rather than to parking.

With fans addicted to mobile devices or inclined to watch on high-definition home screens, teams are using apps and scoreboard bells and whistles to help fill seats. Designers push harder to optimize sightlines and calibrate acoustics to pump up crowd excitement.

Owners are saying goodbye to soggy hot dogs sold in smelly, echoing concrete concourses. Along with luxury boxes, fans are finding a variety of clubs and celebrity-chef restaurants linked to premium seats. With pressure to self-finance, teams and facility owners use these amenities to capture even more of the fans' leisure dollars—but sometimes at the expense of neighborhood businesses, according to David Stone, who leads AECOM's sports practice out of Chicago.

DeMause—who, despite his criticism of stadium deals, nevertheless loves sports—says he has stopped predicting the end of publicly financed sports-venue construction. Facilities continue to be built, even though economists line up against owners' rosy economic forecasts, faltering performance leaves practically new buildings empty, and hoped-for surrounding development is slow to emerge. Despite all these obstacles, big-league sports and urban life seem forever bonded. You can't forget the "family experience, the tribal connection that you only get by being at the game," says Stone. ■

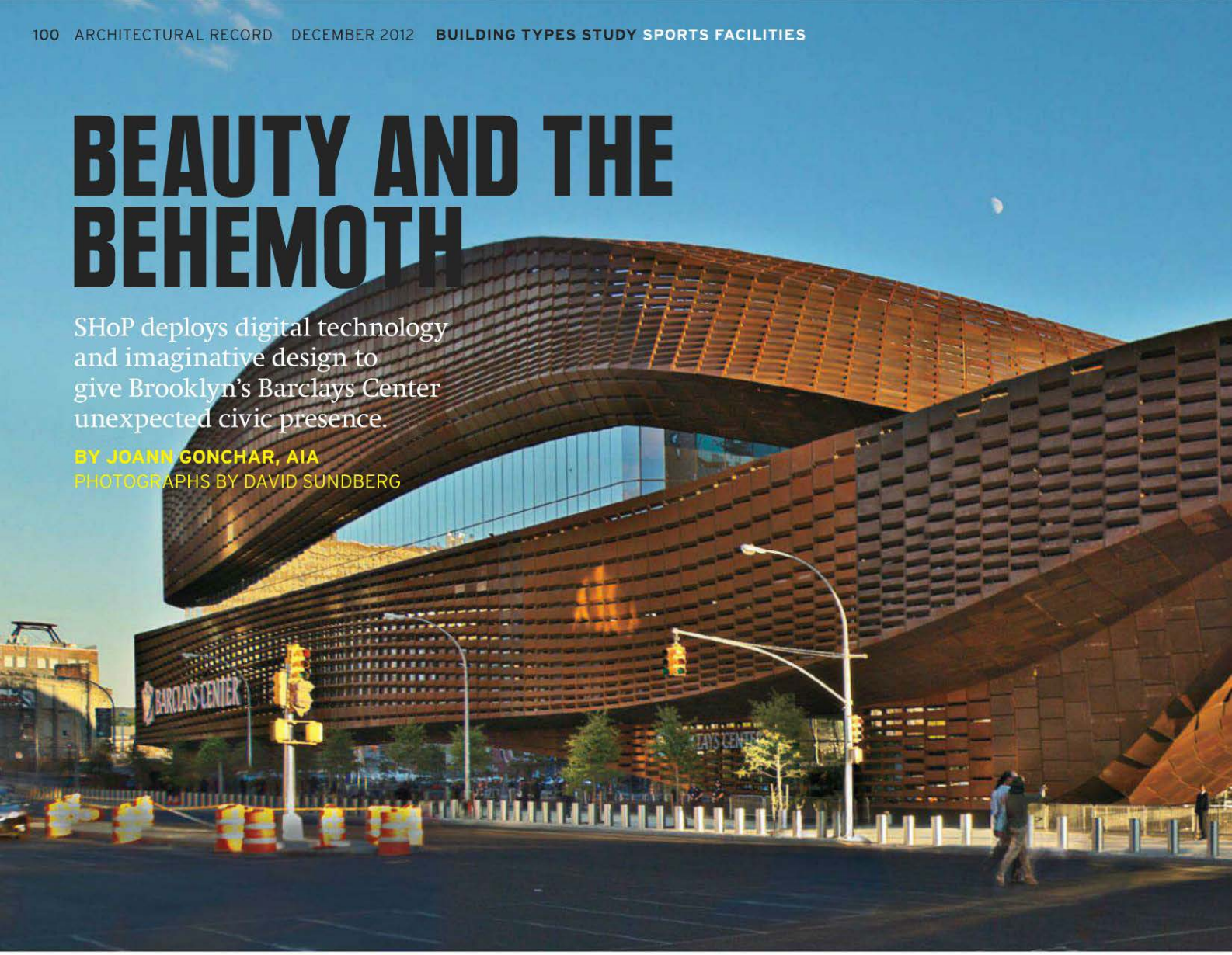
James S. Russell is the architecture critic at Bloomberg News and author of the book The Agile City: Building Well-being and Wealth in an Era of Climate Change.

IMAGES (FROM LEFT): COURTESY GENSLER; SNØHETTA

BEAUTY AND THE BEHEMOTH

SHoP deploys digital technology and imaginative design to give Brooklyn's Barclays Center unexpected civic presence.

BY JOANN GONCHAR, AIA
PHOTOGRAPHS BY DAVID SUNDBERG



THE GARGANTUAN structure sits just beyond several neighborhoods of quaint brownstone rowhouses characteristic of this New York City borough. But Barclays Center, the 18,000-seat multipurpose arena in Brooklyn, occupies its own space on a wedge-shaped piece of land defined by the intersection of two traffic-clogged commercial arteries. The 675,000-square-foot building's facade is made up of 12,000 pre-weathered (intentionally rusted) steel panels that wind around the building like scales on a giant, but intriguing, reptile. The panels, no two of which are the same, swoop up and down and surround a canopy that hovers 30 feet above an entry plaza. At the center of this 80-foot-long cantilevered awning is an irregularly shaped oculus incorporating 3,000 square feet of digital signage and serving as the arena's marquee.

Barclays, with its brawny-yet-elegant skin designed by SHoP Architects, serves as home court for the NBA's Nets and opened with a concert in late September by rapper Jay-Z (who is part owner of the basketball team). The building is the first piece of the controversial $4.9 billion plan by Forest City Ratner Companies (FCRC) to redevelop Atlantic Yards—22 acres that straddle 11 subway lines and a commuter railroad. The development, which has been long delayed by community opposition and the recession, calls for a 16-tower, mixed-use complex, including 6 million square feet of residential space. Three of these towers will share Barclays' trapezoidal site, and in renderings appear almost grafted onto the arena's base. The first one, which SHoP designed, is slated to start construction later this month.

SHoP's involvement with Atlantic Yards began in July 2009 when FCRC asked the firm to cloak a utilitarian scheme for the arena by sports-facilities specialist Ellerbe Becket. Now part of AECOM, Ellerbe Becket had in turn been hired six months earlier by the project's design-builder, Hunt Construction Group, after a design by Frank Gehry was scrapped as too costly. SHoP's charge was to reinvent the arena's enclosure, adding pizzazz without changing its already fixed "performance envelope," says Christopher Sharples, a SHoP principal.

Ellerbe Becket's 1999 Conseco Fieldhouse in Indianapolis provided the inspiration for the layout: FCRC's CEO, Bruce Ratner, had visited Conseco (since renamed Bankers Life Fieldhouse) and reportedly asked that it be re-created in Brooklyn. Although an exact facsimile was impractical, the Brooklyn arena does borrow some of the older facility's best features, says Stephen Duethman, AECOM's project manager. He points to the raked seating, with an upper bowl sloped 36 degrees, intended to make fans feel as though they are right on top of the action. The sightlines are excellent, even from the last row of seats, which are about 160 feet from the court's sidelines. The squeak of players' shoes on the glossy herringbone floor is audible almost everywhere in the seating bowl, which makes the game seem even closer.

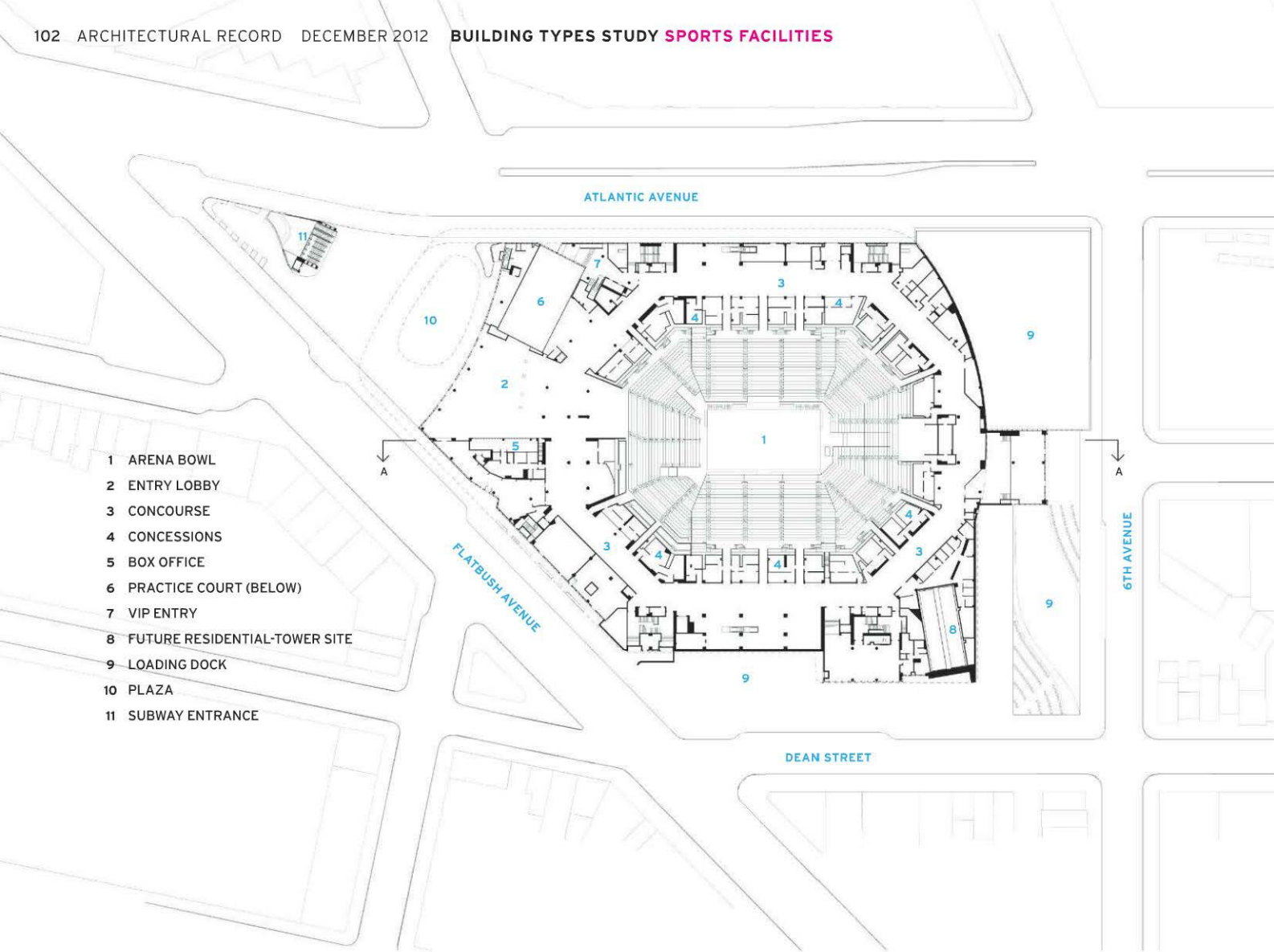
The layout of Barclays has other features to recommend it, including framed views from the entry lobby, the concourses, and some of the bars and concessions into the stadium bowl. Glazing on street level and on the structure's upper levels, between the sinuous bands of steel, allows a visual connection to the surrounding urban context.

The interior finishes, which were part of SHoP's contract, are less successful than the spatial configuration or the powerful facade. In the concourses, the gray terrazzo floors, the black paint of the metal deck supporting the structure above, and the suspended linear lighting fixtures create a cold and gloomy feeling. Even the vendors' signage—a typical source of lively cacophony in sports venues—consists of block letters illuminated from behind only in white light.

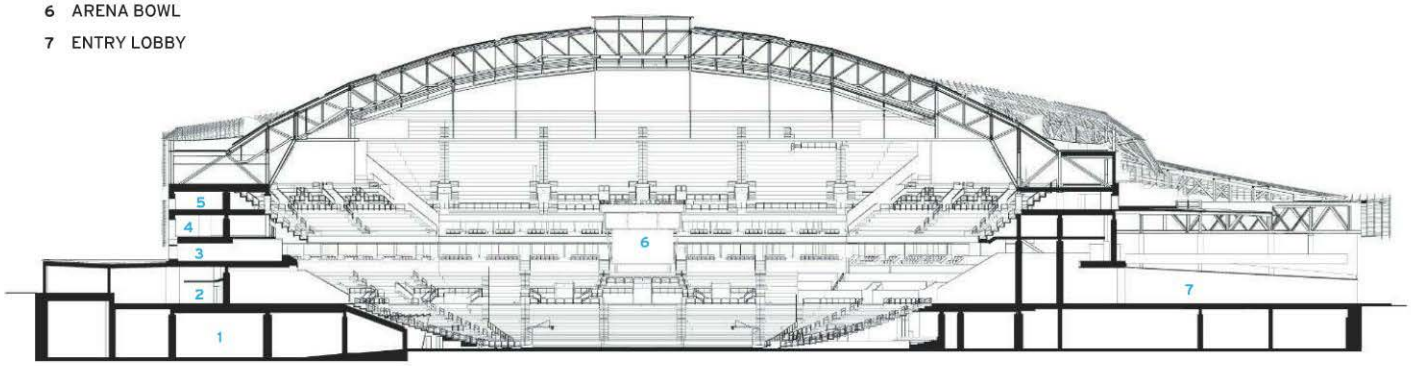
If the building's inside is dreary, the extroverted exterior more than compensates. The facade's 12,000 panels of A588 steel (an alloy that does not need to be painted and forms its own corrosion-retarding layer) make up 950 "mega-panels," 5 feet wide and between 10 and 40 feet tall. These larger assemblies were transported to the site as a unitized system, including their supporting steel latticework, which varies from 18 inches to 5 feet deep, and a curtain wall of aluminum panels and insulated glazing units.

SHoP relied heavily on digital tools for the skin's design

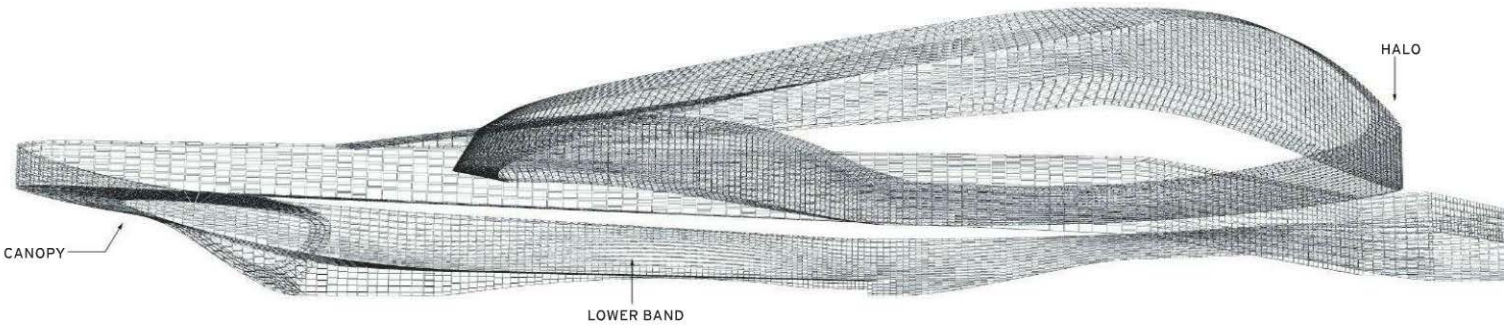
SPECTACLE OF SPORT
Swooping bands of weathering steel panels wrap around Barclays Center and form a canopy that theatrically cantilevers 80 feet over the entry plaza. The doughnut-shaped canopy includes 3,000 square feet of digital signage.



MAIN CONCOURSE LEVEL 0 50 FT. 15 M.

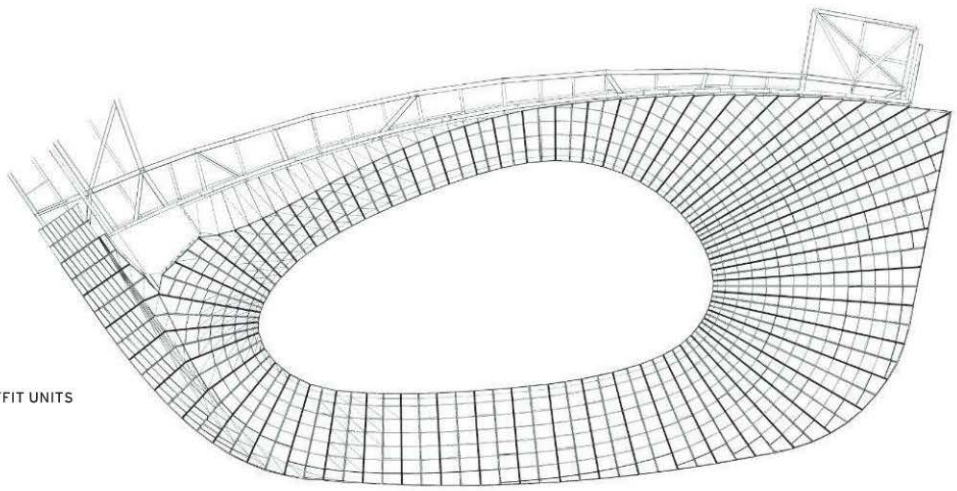


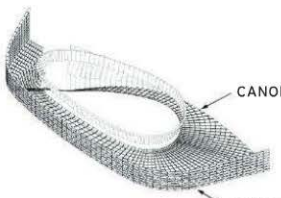
SECTION A-A 0 50 FT. 15 M.



FACADE LATTICEWORK SYSTEM

CANOPY VERTICAL UNITS

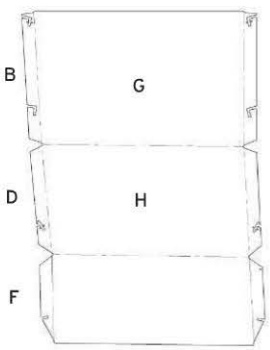




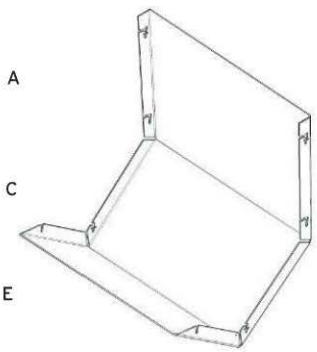
CANOPY SOFFIT UNITS

	TAB LENGTH (OD)	BEND ANGLE	BEND DIRECTION
A	2.25"	89.86°	UP
B	2.25"	89.98°	UP
C	2.25"	90.094°	UP
D	2.25"	92.12°	UP
E	2.25"	90.267°	UP
F	2.25"	92.487°	UP
G	–	132.685°	UP
H	–	104.918°	UP

LATTICEWORK PANEL



UNFOLDED VIEW SCALE: 1:10



ISOMETRIC VIEW SCALE: 1:20

DIGITALLY DEVELOPED

The architects established the facade's surface geometry first with Rhinoceros and then further developed the form with CATIA. The resulting fabrication model included such details as material thickness, weight, bending radii, and tab length for each of the 12,000 panels, no two of which are alike.

and fabrication, first using the software Rhinoceros to establish the surface geometry and then CATIA to further develop the form. Working with the firm's affiliate, SHoP Construction, the architects virtually "unfolded" the 12,000 individual panels and exported them to another program that "nested," or placed, them on 59¼-inch-wide, 3/16-inch-thick steel sheets in a way that would optimize yield. The resulting digital-fabrication model included highly detailed information, such as panel weight, bending radii, and the design of the attachments to the underlying structure. The model even includes information about temporary structural supports needed during shipping of the mega-panels.

To produce the patina, the fabricator subjected the CNC-cut and machine-bent panels to a simulated weathering process by misting them with water. The panels were suspended from a conveyor belt, and each was exposed to 12 to 16 wetting-and-drying cycles per day for three and a half months.

The result is a rich coating of rust—one that makes the arena seem surprisingly in sync with the borough's industrial heritage, as though it could already be 100 years old. But even if Barclays feels as though it belongs on its site, like an architectural relic, it can't be declared a civic triumph just yet, since it is only the first component of the much larger project now expected to take 25 years to realize. Not until a few of the planned 14 residential towers are built, including some of the promised 2,250 units of affordable rental housing, and at least a few of the anticipated eight acres of public space are completed, will anyone be able to determine if Atlantic Yards, with the arena as its linchpin, will add to or detract from the streetscape of Brooklyn. ■

ARENA'S INNARDS
Public spaces like the main entry atrium (top right) are arranged around the steeply raked seating bowl (above left) to provide framed views inside. In the concourses (above), the metal deck of the structure over it has been painted black, making it disappear behind the subtly canted linear light fixtures that march down the length of the corridorlike spaces.

credits

ARCHITECT: SHoP Architects – Christopher R. Sharples, William W. Sharples, Coren D. Sharples, Kimberly J. Holden, Gregg A. Pasquarelli, Jonathan Mallie (principals); Ayumi Sugiyama, Nadine Berger, Christopher Lee, Adam Modesitt (project managers)

ARCHITECT OF RECORD: Ellerbe Becket/AECOM

CONSULTANTS: Thornton Tomasetti (structure); WSP Flack+Kurtz (m/e/p); Goldstick Lighting Design/Tillotson Design (lighting); Pentagram (way-finding)

CLIENT: Forest City Ratner Companies/Brooklyn Nets

DESIGN-BUILDER: Hunt Construction Group

SIZE: 675,000 square feet

COST: $1 billion

COMPLETION DATE: September 2012

SOURCES

WEATHERING STEEL FACADE: ASI Limited

ESCALATORS/ELEVATORS: Otis

MILLWORK: Miller Blaker

PAINTS AND STAINS: Benjamin Moore

A LANDMARK REINVENTED

GMP transforms Kiev's storied Olympic Stadium by sheltering it under an elegant cable-supported roof.

BY CHRIS FOGES

PHOTOGRAPHS BY MARCUS BREDT

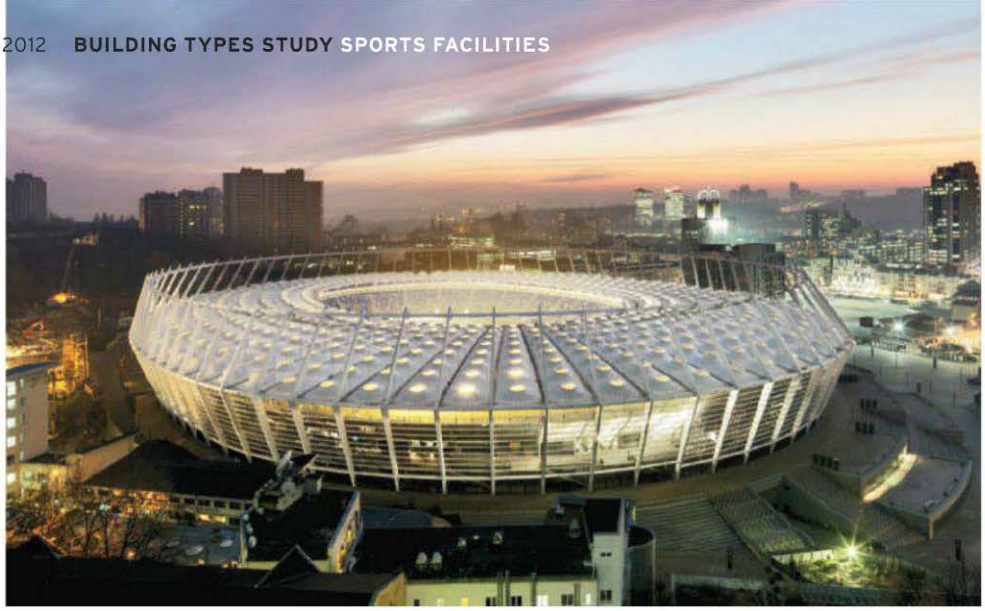
THE TUMULT of Kiev's postwar history is evident in its architecture: The bombast of Stalin's elephantine classicism was abruptly superseded by swaths of grimly utilitarian housing after Khrushchev's turn against "unnecessary excess." Following the disintegration of the U.S.S.R., speculative developers in the Ukrainian capital reacted to these drab slabs with crass Postmodernism. The pendulum may have swung again with the $380 million renovation of the city's Olympic Stadium. Its design, by the German architectural firm von Gerkan, Marg und Partner (GMP), harks back to what project director Christian Hoffmann sees as the better qualities of Kiev's 1960s rationalist architecture: technical ingenuity and tectonic clarity.

The stadium was renovated to host a major soccer tournament, Euro 2012—seen as an important way of improving Ukraine's image. However, the building's role as a national symbol is balanced against its responsibilities as a piece of the city. "We have designed stadia elsewhere that are more spectacular," says Hoffmann, "but here we are in the middle of the city and didn't want to be so 'noisy.'"

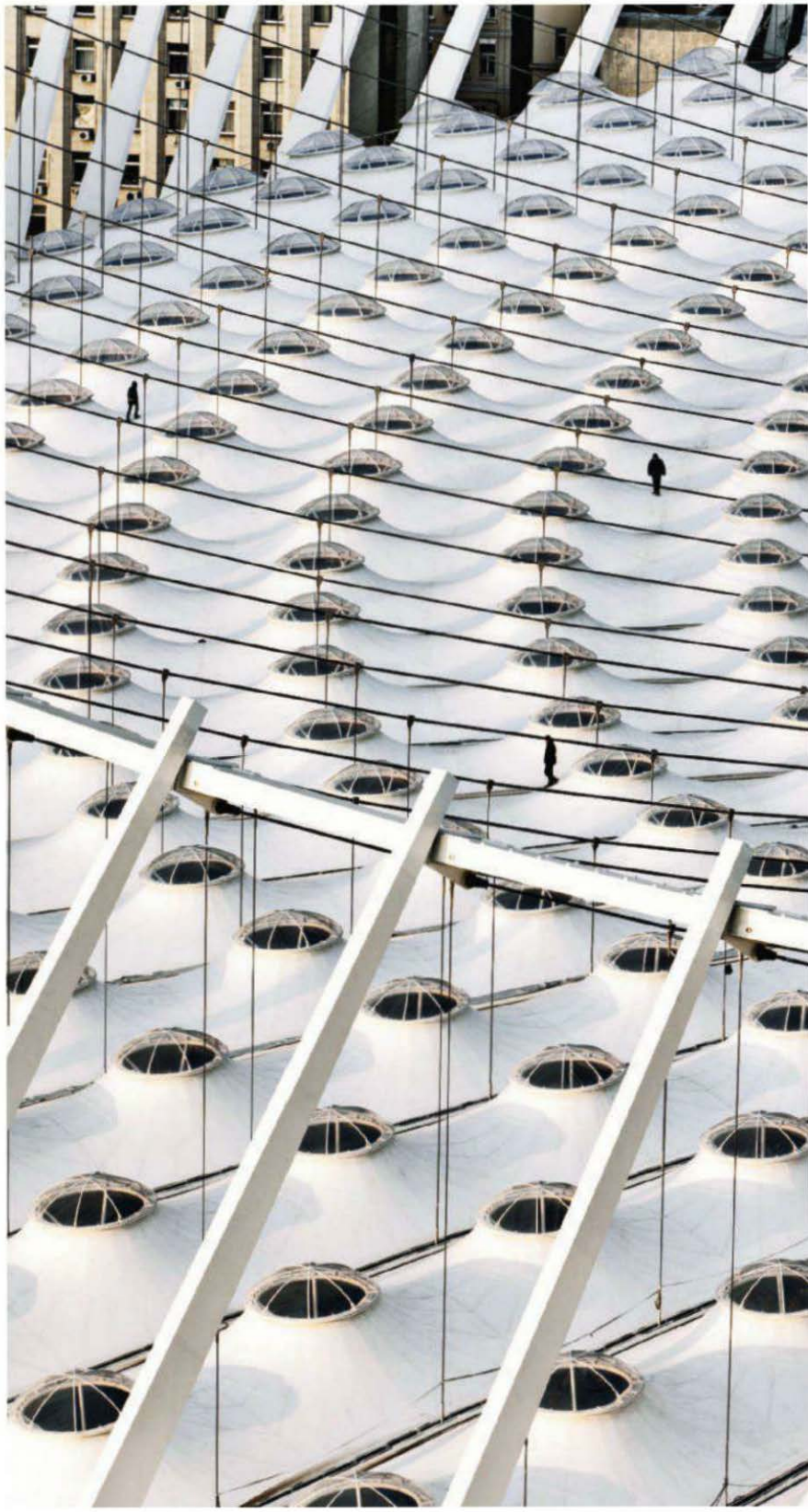
The open-air Olympic Stadium, named for its supporting role in the 1980 Moscow Games, developed in stages. The lower tier was built in 1936 against a hillside. The east stand cut into the slope; to the west, terraces bridged the gap

ON A PEDESTAL Kiev's Olympic Stadium is surrounded by raised terraces, a plaza to the west with a garage below, and a recently landscaped park. The lobby of an adjacent hotel serves as the stadium's VIP entrance.

View additional images at architecturalrecord.com.



UNDER COVER The originally open-air stadium is now under the cover of a cable-net-supported roof that includes 640 domed skylights (right). The facility's prerenovation capacity of 83,450 was reduced to 68,000 with the incorporation of boxes in the west stand and the replacement of benches by individual seats on the upper tier. Seats on the lower tier were respaced at 19.7 inches on center, and heights adjusted to ensure good sightlines. The seats in six shades of blue and yellow—Ukraine's national colors—are arranged in a digitally generated "pixel" pattern (below) that camouflages any empty blocks, particularly when the stadium is seen on TV.



APERTURES Flying masts (above) support the roof domes. Although the perimeter steel columns were fabricated in Ukraine, the PTFE-coated glass-fiber textile that forms the self-cleaning roof (right), the cables, and the connecting components were manufactured elsewhere.

between the bowl and the ground. A prestressed-concrete upper tier was added in 1968. Its delicate waffle slab and sharply angled beams balance on a single row of columns around the lip of the lower bowl. Although this elegant structure could not take the load of a roof, GMP wanted to retain the upper bowl "out of respect for the intelligence and the aesthetic sense of its engineers," says Hoffmann. Kievans also identified strongly with the building, "so we weren't forced to bring something new. Instead we saved it, and tried to show it in a good light."

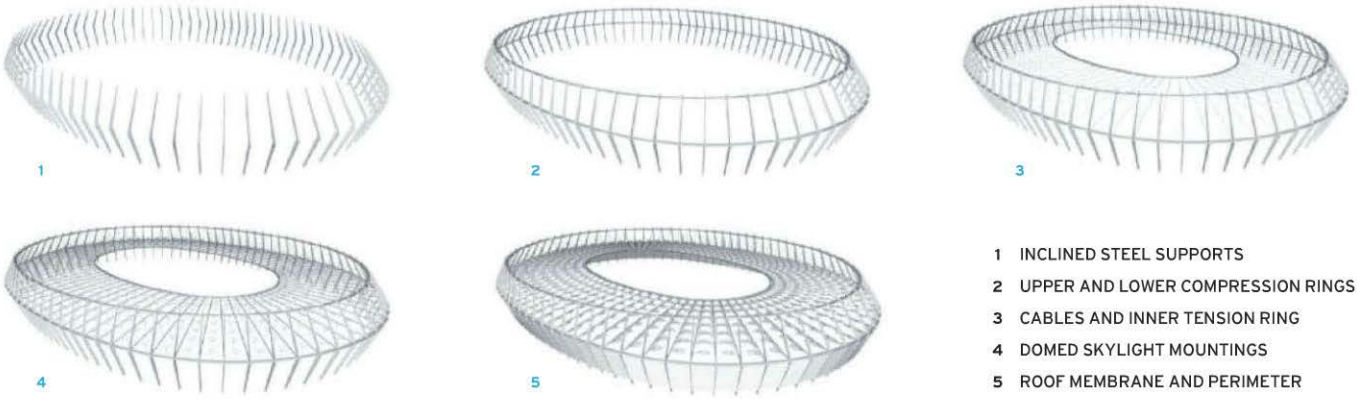
The upper tier is now encased like an exhibit in a giant vitrine. An exoskeleton of 80 slender steel columns stands up to 42 feet clear of the concrete, supporting a cable-net roof over seating areas. This complex but economical structure works like a bicycle wheel: Radial spokes tie the central tension ring to a pair of perimeter compression rings. Glass screens between the uprights shelter circulation spaces and give the frame a "body."

Even in its enhanced state, the 1,015-foot-long-by-722-foot-wide stadium remains largely hidden by buildings and the city's topography until one turns onto a new plaza to the west. The glass-and-steel enclosure sits like a crown above a new granite-clad plinth that wraps the lower bowl and merges with an adjacent hotel, designed by local firms. Sixty steps up, a terrace surrounds the stadium, from which spectators enter through 40 gates.

Movement from peripheral circulation spaces into the arena generates a sense of compression and release. Crowds funnel through a narrowing gap between tiers, or through the tight confines of upper-tier vomitories, into what is now a giant interior. White steel and gray concrete give way to the brilliant green field and a blur of blue and yellow seats lining the vast sweep of the bowl.

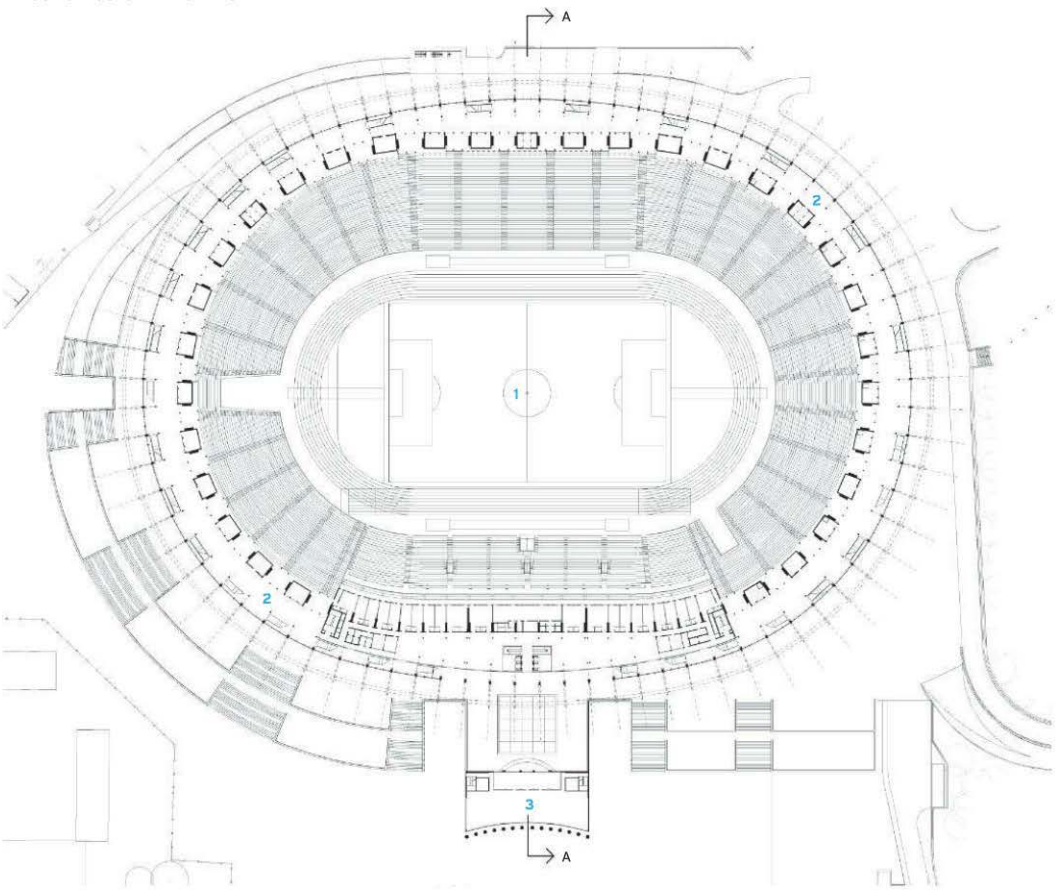
The sensation is heightened by the near-miraculous lightness of the canopy, an undulating polymer-coated membrane dimpled with 640 transparent domes, each the size of a small car, supported by flying masts. Star-shaped textile panels reinforce each opening, but the impression of a twin-

PHOTOGRAPHY: COURTESY GMP (THIS PAGE, LEFT)



1 INCLINED STEEL SUPPORTS
2 UPPER AND LOWER COMPRESSION RINGS
3 CABLES AND INNER TENSION RING
4 DOMED SKYLIGHT MOUNTINGS
5 ROOF MEMBRANE AND PERIMETER GLAZING

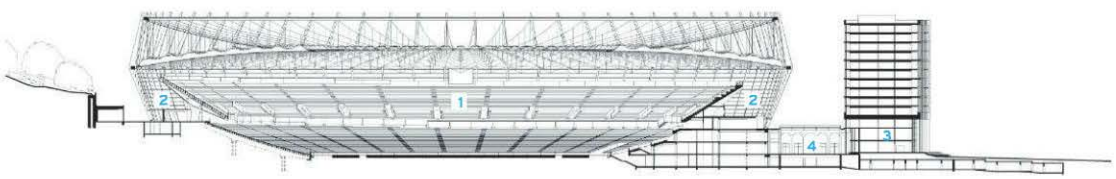
ROOF-STRUCTURE DIAGRAMS



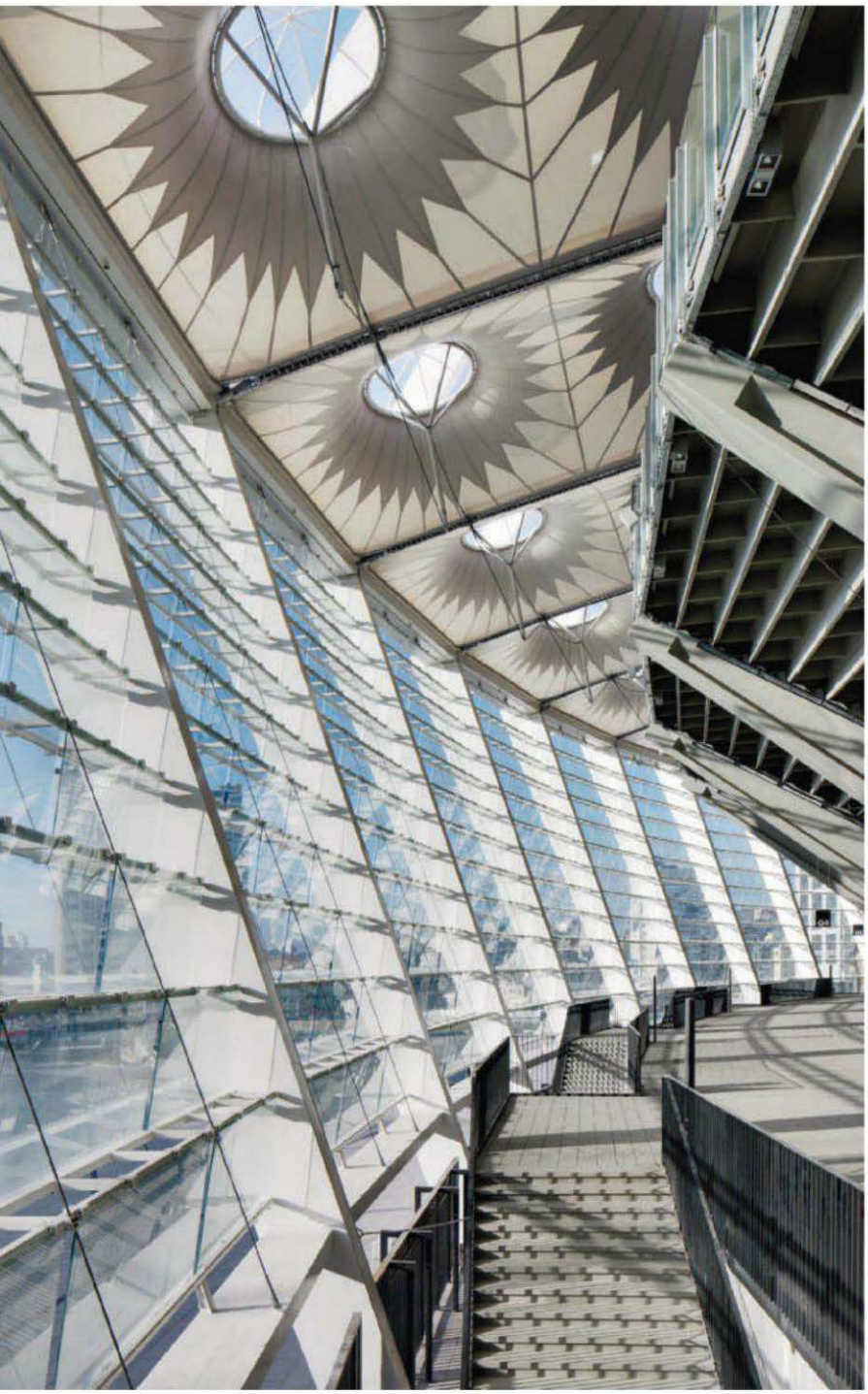
BRACE-FREE Rigid joints between the perimeter steel columns and the compression rings obviate the need for diagonal bracing. The new structure is generally aligned to the existing concrete frame, but exceptions were made to create the symmetry required by the cable-net roof. Likewise, due to the varying depth of the canopy, the inclined tops of columns around the ends of the stadium are at a steeper angle than those along its long sides.

FLOOR PLAN–LEVEL 2

1 STADIUM BOWL
2 CONCOURSE
3 HOTEL
4 VIP ENTRY COURT



SECTION A-A



GIANT VITRINE Faceted 50-foot-tall glass facades preserve views of the existing stadium structure from the street and shelter new circulation galleries set against the concrete upper tier (above). On the east side, the top tier is accessed both by stairs from the main entrance level and by bridges from the park that rises behind the building.

kling night sky is apparently the happy by-product of a strictly rational pursuit of structural efficiency; legible order and the absence of "expressionist" caprices are consistent principles in GMP's work.

Scale lends a sense of occasion, but two key decisions—to preserve the shallow, 31-degree angle of the 80-foot-wide upper tier and to retain the running track (required for a national stadium)—place spectators up to 300 feet from the field, albeit with improved sightlines throughout. Many fans believe that the best atmosphere is found in soccer stadiums with steep, pitch-hugging stands, but Hoffmann argues that the size and passion of the crowd are what counts. Wide, shallow bowls also allow heat to escape and sunlight to reach the grass, and are kinder to vertigo sufferers.

Other improvements are less visible: The partially reconstructed west stand incorporates press areas, corporate hospitality, and players' facilities. A glazed roof over a curious Italianate entrance court, built in the 1950s, links the stadium and hotel. It is remarkable that the few largely superficial alterations to GMP's design demanded after a 2010 change in government were restricted to these areas. A holistic approach to structure, form, and function was the project's defense in challenging political and economic circumstances, suggests Hoffmann, but is rooted in a conviction that buildings should withstand changes in fashion or use over time. Kiev's new stadium should wear well; it may not be loud, but it is very strong. ■

Chris Foges is editor of the London-based journal Architecture Today.

credits

ARCHITECT: von Gerkan, Marg und Partner – Volkwin Marg, Christian Hoffmann, Marek Nowak, designers; Martin Bleckmann, project leader; Michael König, Christoph Salentin, Olaf Peters, Heiko Faber, Sebastian Möller, Roman Hepp, design-phase project team

ASSOCIATE ARCHITECTS: Private Creative Architectural Bureau Y. Serjogin

CONSULTANTS: Schlaich Bergermann und Partner (roof and facade structure); ST raum a. Landschaftsarchitektur (landscape); Conceptlicht (lighting)

CLIENT: Olimpiysky National Sports Complex

GENERAL CONTRACTOR: Kyivmiskbud; AK Engineering; Master-Profi Ukraine

SIZE: 1.6 million square feet

COST: $380 million

COMPLETION DATE: November 2011

SOURCES

ROOF MEMBRANE: Verseidag Duraskin

GLAZING: Guardian Europe, Pilkington

ENTRANCES: Rayners

WOOD DOORS: Neuform

FIRE-CONTROL DOORS: Novoferm

ACOUSTICAL CEILINGS: AMF

MUSCULAR MESH

Populous's new BBVA Compass Stadium for Houston's soccer team vividly conveys energy and dash.

BY INGRID SPENCER

PHOTOGRAPHS BY GEOFFREY LYONS

DESTINATION DYNAMO Splashes of bright orange, the color of the Houston Dynamo, erupt in polycarbonate patches from the mesh-covered faceted exterior on the soccer stadium's entrances (above and opposite, bottom). Designed by Populous, the venue's open-air pitch affords fans views of Houston's skyline to the northwest (opposite, top).

IN A COUNTRY fueled by a love for sports, it seems strange that only 23 years ago there were no soccer-specific stadiums in the U.S. As United States Soccer Federation spokesperson Neil Buethe puts it, "It's the most popular sport in the world everywhere but the U.S.," and adds, "But now soccer is rapidly catching up to football, basketball, and baseball." Buethe credits globalization and the support of investors with the growing adulation of the sport, noting that Major League Soccer stadiums in America currently total 12, with more on the boards or in the planning stages.

Joining the list of new venues is BBVA Compass Stadium, designed by Populous (formerly HOK Sport) as home for the Major League Soccer team the Houston Dynamo. With its unique metal-mesh facade and prominent location in downtown Houston's gentrifying East End district, the stadium stands out: The fans literally have a glowing (when lit at night) 22,000-seat destination from which to cheer on their team. "These guys have a huge fan base, and after years of sharing the University of Houston's stadium they finally had the chance to have a home of their own," says Populous lead designer Jeff Spear.

The way the 343,500-square-foot stadium fits into the urban context is part of its appeal. Significantly, the stadium limited parking to 1,800 spots on the 12-acre site. It helps that a light-rail station is under construction across the street and additional cars can be stowed in nearby lots, including at Minute Maid Park, home of the Houston Astros baseball team. Visitors can easily walk from one stadium to the other and the convention center. As a phalanx of bars, restaurants, and galleries keeps expanding, the area should turn into a lively, busy part of the city.

The $65 million stadium also accommodates other sports—rugby, lacrosse, even boxing—as well as musical events on the 5,000-square-foot, 80-foot-wide-by-60-foot-deep stage. Located in the south end zone, it can be hidden during sporting events by demountable seats.

Yet the stadium's status as a soccer venue meant it required an intimate atmosphere—fans need to feel they're a

part of the action. While a roof amplifies noise and helps increase the level of excitement for the games, BBVA Compass is open-air, with only canopies over 12,000 of its 22,000 seats. Nevertheless, the 75-by-115-foot, unheated Bermuda-grass pitch feels close from any seat on the lower level, as well as from the upper level's 33 suites, all located less than 10 rows from the playing field. In addition to the seating, the lower level provides locker rooms and assorted service areas.

For the design of the stadium, the team of architects and engineers used building-information modeling (BIM) to enable a highly collaborative effort, from schematic design through construction documentation. By working with one main model, updated weekly, the involved parties could get the stadium into construction quickly and have it finished in just 14 months—a boost for the team and its fans, who had been waiting through five years of city negotiations.

Bright orange now appears on seats and signage, as well as on polycarbonate-sheathed walls beneath the signature metal-mesh facade. Clad with 94,000 square feet of anodized-

credits

ARCHITECT: Populous – Dennis Wellner, principal in charge; Bruce Beahm, project manager and lead project architect; Chris Lee and Jeff Spear, lead designers; Jim Jamis, project architect; Brent Roberts, project manager; Jason Carmello, design team; Alan Bossert, interior designer; Shannon Swanson and Laura Weible, graphic designers

ENGINEERS: Walter P. Moore (structural); ME Engineers (m/e/p); WGA (civil); Howe Engineering (life safety)

CLIENT: City of Houston, Harris County

DEVELOPER/TEAM OWNER: AEG, Golden Boy Promotions, Brener Group

SIZE: 343,500 square feet

COST: $65 million

COMPLETION DATE: May 2012

SOURCES

EXPANDED METAL MESH: AMICO

PRECAST-CONCRETE SEATING BOWL: Heldenfels Enterprises

MASONRY: Camarata Masonry Systems

GLASS: Viracon

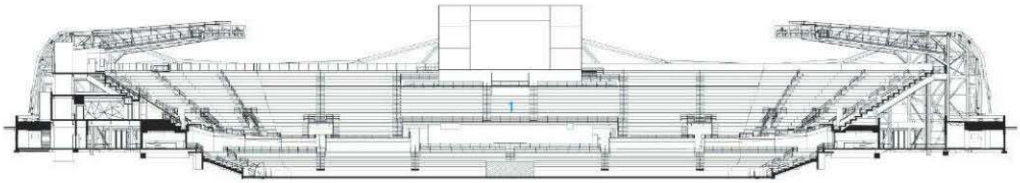
PORTABLE SEATING/STAGE PLATFORMS: StageRight

GRANDSTANDS: Dant Clayton

FOLDING GLASS WALL: NanaWall

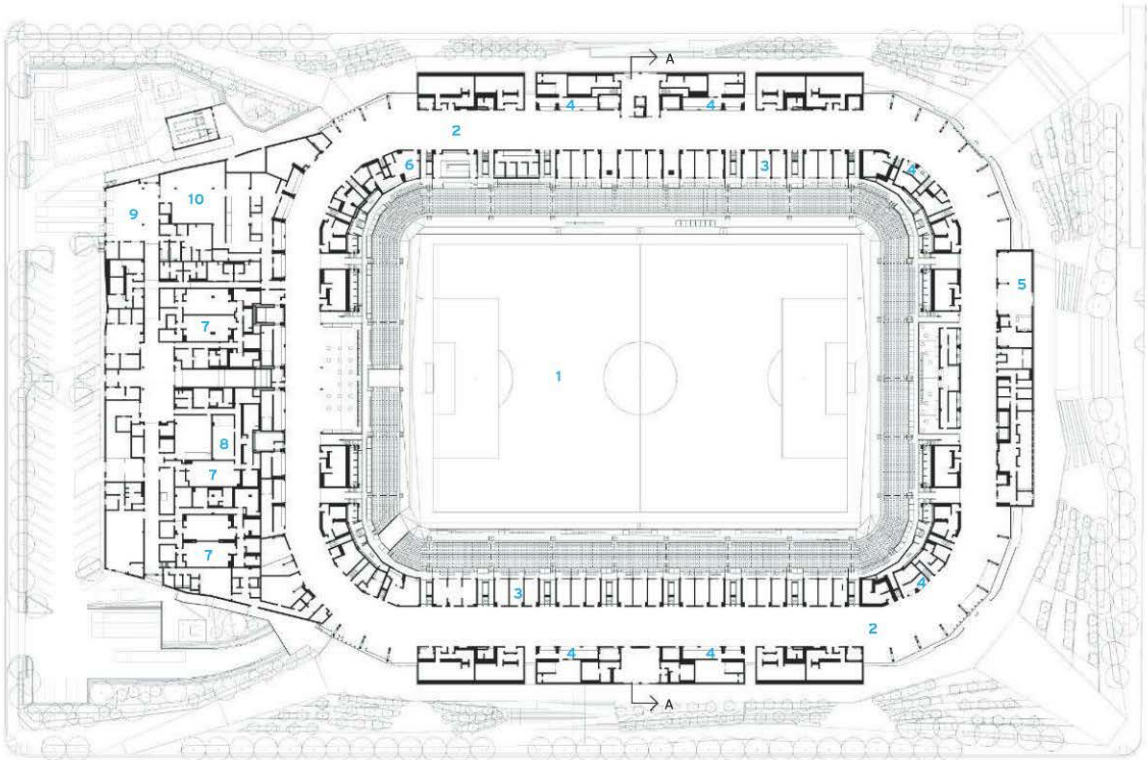
PAINT FINISH: Tex-Cote, PPG Amercoat

METAL FRAME AND CURTAIN WALL: YKK AP



SECTION A-A

0 50 FT. 15 M.



MAIN CONCOURSE

0 100 FT. 30 M.

1 STADIUM BOWL
2 CONCOURSE
3 SUITES
4 CONCESSIONS
5 TEAM STORE
6 MEDIA/PRESS
7 LOCKER ROOMS
8 TRAINING ROOM
9 LOADING
10 COMMISSARY WAREHOUSE

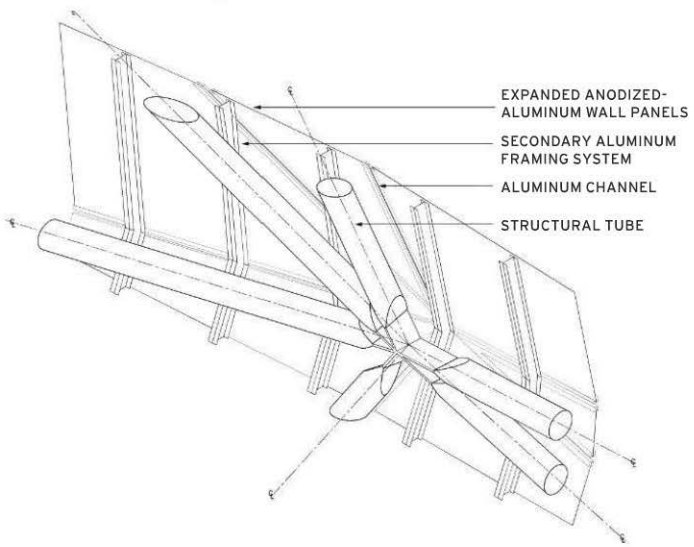
FACETED FACADE
Anodized-aluminum panels, which are machine-expanded to create a tessellated skin, wrap the stadium's steel structure (detail, below). "Every facet is a triangle, and every corner is a connecting note," says structural engineer Bart Miller. "It gave us some efficiency of construction."

aluminum panels, which were machine-expanded to create a tessellated pattern, the steel armature is lit from below to turn the stadium into a glowing, circular urban beacon. If Herzog & de Meuron's 2008 Beijing National Stadium (aka the Bird's Nest) comes to mind, Spear offers a certain rationale: "We wanted the structure to reflect both the musculature of the players and the industrial history of the area."

The apparent random shape of the building represents an efficient choreography, says Bart Miller of Walter P. Moore, the structural engineer for the project. Triangles form the facets of the skin, and the corners function as connecting nodes—so that every steel connection is exactly the same. The mesh allows air to flow freely through the stadium, but since it had to withstand hurricane-strength winds, the engineers gave the fabricators a deflection limit for load-testing different materials at various thicknesses.

Since the stadium opened in May, the games have sold out, and the Dynamo has had an undefeated home-game season so far. The architecture should get some credit. ■

Ingrid Spencer is a contributing editor and former managing editor of RECORD *who now writes about design from Austin, Texas.*



EXTERIOR SKIN NODE ISOMETRIC

0 3 FT. 1 M.

GIVING 'TEAM BUILDING' NEW MEANING

Designers and contractors rely on collaboration to complete a stadium a year earlier than originally planned.

BY NADINE M. POST

RENDERING: COURTESY HNTB

HOMECOMING
The new Santa Clara Stadium will have 68,500 permanent seats and will be able to expand to 75,000 seats for the Super Bowl. A nine-story tower capped with a rooftop terrace will house the venue's 165 suites.

FOR FIVE uneasy years, the building team responsible for delivering the San Francisco 49ers' $1 billion new home had hung together through three work hiatuses, a recession, and a regrouping caused by a site relocation 45 miles to the south—from San Francisco's Candlestick Point to Silicon Valley's Santa Clara. Then, in early fall 2011, things changed. Suddenly the snail's pace became a race.

Based on an early opportunity to secure financing, the 49ers and the Santa Clara Stadium Authority, which will own the new Santa Clara Stadium, decided to accelerate the opening by one year. They are pulling out all the stops to finish in time for the 2014 NFL season. "It was like drag racers warming up their tires with short bursts forward at the starting line before the race begins," says Jon D. Magnusson, president and CEO of the project's Seattle-based structural-engineering firm, Magnusson Klemencic Associates (MKA). "Then, all of a sudden, it was go, go, go."

Plans by the Los Angeles office of HNTB Architecture call for a nearly 1.9 million-square-foot facility with 68,500 permanent seats and the ability to expand capacity to 75,000 for the Super Bowl. A nine-story tower capped with a roof terrace will house the venue's 165 suites. For construction, the stadium authority named the 49ers' Stadium Development Company (StadCo) as its agent. It will lease the facility under a long-term agreement. Major financing is from a group of banks led by Goldman Sachs.

The project has at least two claims to fame. The 49ers team is the first sports franchise—and perhaps the first organization of any kind—to use a hybrid, collaborative project-delivery model that Magnusson dubbed integrated bridging design-build (IBDB). "We landed on this delivery system in 2005 after looking at prior stadium projects with cost overruns and disputes between the owner, the architect, and the contractor," says Larry MacNeil, the 49ers' executive vice president for development. "We are trying to eliminate potential disputes and limit the owner's ultimate risk."

The second distinction is that the steel structure, designed to resist seismic loads through a braced frame, is the first

NFL stadium to use buckling-restrained braces (BRBs). The 529 BRBs, which resist lateral loads, have structural and architectural benefits, in terms of earthquake resistance and design flexibility, over conventional braced frames or shear-wall structures (see sidebar, opposite page). "This is the most extensive use of BRBs on any sports facility, to my knowledge," says Wayne Searle, CEO of SME Steel of West Jordan, Utah, which is the lead firm for the project's steel contractor, the SME/Hirschfeld Joint Venture.

The IBDB delivery model is an enhancement of bridging design-build. Under bridging, the design team selected by the owner takes the project through design development. The owner then typically selects a design-build contractor, and that contractor, in turn, hires its own designers of record. But under IBDB, the architect and engineer that first work for the owner are transferred to the design-build contractor and become the designers of record in the design-build phase. "For this project, in a seismic zone, the need for continuity of the structural engineer from start to finish is paramount," says Jeffrey R. Appelbaum, managing director of Cleveland-based Project Management Consultants (PMC).

PMC crafted the delivery model for the 49ers based on bridging design-build models developed for other sports venues. And to help the architects resist pressure to compromise the architecture during the design-build phase, the 49ers have "contract limits with HNTB that say it will not produce any design in phase two that would be inconsistent with phase-one design," says Appelbaum.

The "integrated" in IBDB means the presumptive design-build contractor is brought in at the project's onset to help with estimates and constructibility under a preconstruction-services contract. The owner has the option to hire a different design-build contractor if it is not satisfied with its proposed guaranteed maximum price (GMP), or for any other reason. Major subcontractors are also brought in early to assist with design.

"We landed on this delivery system after looking at prior stadium projects with cost overruns and disputes," says Larry MacNeil, 49ers executive vice president.

dormant in 1998. Devcon continued to assist the 49ers with estimates and other services.

The project almost came alive again in 2001, but no team was selected. Then, in 2006, the 49ers issued two requests for proposals (RFPs)—one for the architect and one for preconstruction services. That RFP had Devcon listed as a partner, says Jonathan Harvey, the joint venture's codirector and a Devcon vice president. In March 2006, the San Francisco office of Turner Construction was selected as the national contractor with sports construction experience. The site switch and a modest redesign happened in 2008.

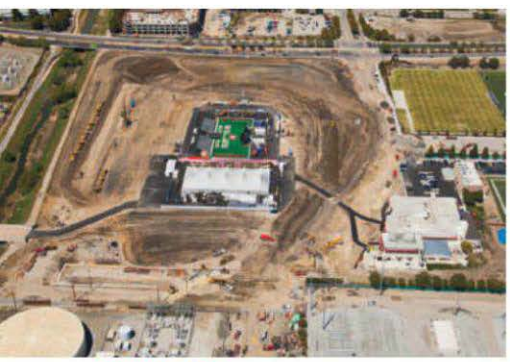
StadCo retained the joint venture as the design-build contractor earlier this year after a GMP had been established. Turner/Devcon's $854 million design-build contract is actually with the stadium authority. HNTB and MKA's contracts were transferred to Turner/Devcon in June.

The job kicked into high gear over Labor Day weekend in 2011, when the 49ers' MacNeil gathered his team to consider whether an early completion was doable. Within a few days, the members of the building team, who had been working together on and off for five years, decided they could get the job done, but it would mean pushing hard. To regroup, the team, among other tactics, phased and streamlined the design schedule, "stacking it" over construction. "We shortened design by seven months and went out to bid seven months earlier," says Harvey.

Speeding things up was not easy, adds David J. Masel, Turner/Devcon's general superintendent and the acknowledged mastermind of the "rush" strategy. "We had to take into account all contingencies. We didn't have the design or drawings, so we plugged historical data into scopes of work," he says.

Buy-in from all of the design and construction teammates—from individuals, not just the firms—was essential for the accelerated plan to work, says Jack W. Hill, StadCo's

COMING UP ROSES
After three hiatuses and a site switch, construction of the stadium began in April. Rather than relying on the more typical "racetrack" oval sequencing, the design-build contractor has split the site into four quadrants. Crews are working on each concurrently.



APRIL 19, 2012

JULY 29, 2012

SEPTEMBER 20, 2012

The 49ers hired the local Turner/Devcon Joint Venture for preconstruction services one month before hiring HNTB. But the Santa Clara–based 49ers and Devcon Construction, of Milpitas, California, go way back. The 49ers first engaged Devcon, which is well established in the Santa Clara area, for preconstruction services in mid-1997, when San Francisco passed ballot measures for the stadium and a mall project at Candlestick Point, the 49ers' current home. That effort went

49ers Seismic Solution Is an NFL Stadium First

During both the conceptual and schematic design phases for the San Francisco 49ers' stadium, the structural engineer developed a matrix of 66 structural-system scenarios. Then the design and construction team evaluated each for schedule and cost. The team ultimately selected a steel frame, with composite metal decking and structural precast seating treads and risers. Buckling-restrained braces (BRBs) resist earthquake loads.

"A BRB works like an ordinary steel brace but performs better under seismic loads due to the fabrication of a brace with 'controlled' tension and compression capacity," says Brian A. Dickson, a principal with the stadium's structural engineer, Magnusson Klemencic Associates. A BRB system uses significantly less steel than an equivalent moment-resisting frame. An equivalent concrete shear-wall system would weigh six times more. Compared with other systems, the reduction in weight and the better seismic performance translate into savings in foundations. "We estimated foundation costs to be 20 percent less than if a concrete shear-wall system were used," says Dickson.

Each of the 529 BRBs has a steel core surrounded by concrete mortar encased in a steel tube. The high-performance braces are on every level of the new Santa Clara Stadium, which varies in height from four to eight stories. The BRBs range in weight from 2,500 pounds to 13 tons and are up to two feet in diameter near the base, where seismic forces will be greater. BRBs interfere less with the architecture, particularly the floor layouts. They also allow a more open look. And they are no more difficult to erect than conventional braces. Begun on July 30, steel erection for the 1.9 million-square-foot project is more than 90 percent complete. *N.M.P.*

INNOVATION The stadium's buckling-restrained braces include a steel core surrounded by concrete mortar encased in a steel tube. They offer improved seismic performance over ordinary steel braces.

1 MORTAR-FILLED STEEL-TUBE CASING
2 STEEL CORE
3 STEEL CONNECTOR COMPONENTS

IMAGES (CLOCKWISE FROM FAR LEFT): COURTESY EARTHCAM (3); TURNER/DEVCON JOINT VENTURE; MAGNUSSON KLEMENCIC ASSOCIATES

project executive. Hill, an owner's representative based in Dallas, joined the team over that Labor Day weekend.

IBDB allowed the team to quickly devise a phased permitting plan and site-utilization and staging plans. The full-team cooperation allowed HNTB to obtain commitments from MKA on a phased delivery of documents for structural packages and on a greater overlap of design and construction than is typical, says Hill. "There are probably not too many projects with as much camaraderie and connectivity," says Joseph J. Diesko, HNTB's vice president and director of sports architecture. "A lot of owners believe adversarial relationships produce better results," he adds. "That is not the case here. This has been a great process."

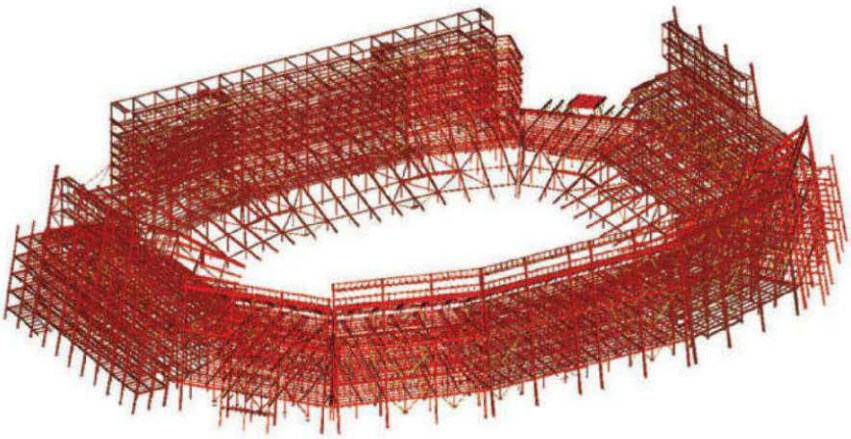
In the accelerated scheme, structural steel was on the schedule's critical path. Turner/Devcon first asked MKA what could be done to get the basic steel design in a huge hurry—by early November 2011. "Then we worked with our estimators to make sure the right allowances were in the estimates," says Robert L. Rayborn, the joint venture's co-director and a Turner construction executive.

As a result, in the middle of design development, MKA moved into construction documents. "We had to consider the structural set and let MKA go, or we would not be able to coordinate the mill orders," says Diesko. The architect "froze" the structure, as if it were an existing building, much earlier than is typical, adds Lanson Nichols, an HNTB vice president.

The strategy worked. "We got our first design-development package to buy structural steel and vertical transportation in November 2011," says Harvey.

After design development, the new schedule eliminated a typical "pencils down" period for the design team—a period the design-builder would normally use to create the GMP. The strategy sliced two months off the project's 28-month construction schedule. Turner/Devcon's contract calls for substantial completion in August 2014. That cuts out a typical three-month buffer between substantial completion and the first game.

About a year ago, the team met with the city to develop a multiple drawing-package review strategy for phased permitting of the steel structure, the foundations, and the concrete. To expedite the steel permit, MKA proposed combining a peer review of the structure, which the 49ers wanted, with plan checking. For this, the city agreed to deputize Los Angeles–based structural reviewer John A. Martin &



FAST AND LIGHT Steel erection (below) began in late July, and the frame's topping is expected this month. The stadium's structural system (left) includes buckling-restrained braces. It uses less steel than an equivalent moment frame and weighs significantly less than an equivalent shear-wall system.

Associates as part of the building department.

MKA split the structure into eight plan-check packages, submitting them in stages from November 4 to February 17. While Martin & Associates reviewed one package, MKA continued to engineer others. This strategy saved at least two months over a more typical two-step foundation-and-superstructure review process, says Brian A. Dickson, an MKA principal.

Construction began on April 23 and has been speeding along. One of Turner/Devcon's strategies for accelerating the work was splitting the building into four quadrants and constructing them concurrently instead of relying on more traditional, "racetrack" oval sequencing. Crews used four drill rigs for the auger-cast piles and are erecting steel with four crawler cranes, one for each quadrant.

Turner/Devcon is using building-information modeling (BIM) for interference checking. To date, there are 402 requests for information, instead of three or four times that amount, thanks to IBDB with BIM, says Harvey. BIM also was used to locate and build the deep utilities below the slab on grade so they could be built ahead of piles instead of afterward. Crews worked 24-hour shifts from May 1 to May 15. That move cut the time in half for the deep utilities work, says Harvey.

Steel erection began on July 30, with topping out expected later this month. On September 4, tower cranes started lifting in escalators. And in late October, crews installed the first piece of structural precast concrete for the seating treads and risers. The project is on course for substantial completion one month ahead of the accelerated schedule, says Harvey.

The IBDB and acceleration strategies have worked out so far, says the 49ers' MacNeil. "We are pleased with the design-build team," he adds. But with about a quarter of the project complete, construction isn't slowing down. Says MKA's Magnusson, returning to his drag-racing metaphor, "We haven't deployed the parachute yet." ■

Nadine M. Post is editor at large at RECORD*'s sister publication* Engineering News-Record.

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Learning Objectives

1 List various alternative project-delivery methods.

2 Explain "integrated bridging design-build" and discuss its advantages and disadvantages.

3 Describe some of the strategies that the designers and builders of the new Santa Clara Stadium are relying on to accelerate construction.

4 Describe how buckling-restrained braces resist lateral loads and explain why they are being used at the new Santa Clara Stadium.

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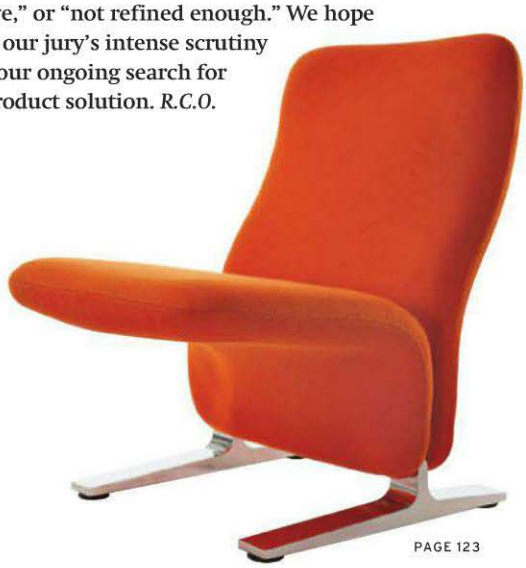
2012 Record Products

Edited by **Rita Catinella Orrell**

Each year ARCHITECTURAL RECORD's editors put out a call for manufacturers to send us the best new building products on the market – from furniture to flashing – and invite a jury of architects, designers, and product specialists to review product data sheets, photos, and sometimes real samples, to help us determine which are the most outstanding.

This year, for the first time, manufacturers submitted their entries through a digital process, which the jury then used to vote remotely during a first round of judging. In September, the jurors met in our New York City office for a second round of judging, which resulted in the selections we present here, alongside a group of Editors' Choice winners selected from products published throughout 2012.

Our jury was as tough as you'd expect. They didn't want products to sacrifice aesthetics for performance or ones that were unnecessarily complex. They liked modularity and flexibility and dismissed entries that they felt were "too heavy," "too expensive," or "not refined enough." We hope the results of our jury's intense scrutiny will help in your ongoing search for the perfect product solution. *R.C.O.*



PAGE 123

TOP PICK *This button identifies the jury's favorite product in each category.*

Jurors *All jurors based in New York City*

Stephen Horner is principal/owner of MediumBase Lighting Design & Consulting, which he established in spring 2011. Offering project-based lighting-design services for architectural, landscape, and urban environments, the firm's outlook is guided by Horner's training in social/cultural anthropology and 15 years of lighting-design and industry experience.

James Gainfort is the principal of James R. Gainfort, AIA Consulting Architects, an architectural firm offering consulting services to owners and architects in the specialized field of building exteriors. He has been a lecturing faculty member at Columbia University Graduate School of Architecture, Planning and Preservation; Pratt Institute; and New York University School of Continuing Education.

Sara Demel is a certified lighting professional and senior project manager at SBLD Studio. A member of the USGBC, she is an active participant in the New York State Energy Research and Development Authority Energy Smart Program and is a member of the Illuminating Engineering Society. Demel has worked on projects including the Federal Reserve Bank and NASDAQ in New York City, and the American College of Cardiologists in Washington, D.C.

Florian Idenburg & Jing Liu founded Solid Objectives–Idenburg Liu (SO–IL), an idea-driven design office, in 2008. SO–IL has worked on projects ranging in scale from the master plan of a cultural campus in Shanghai to a series of prints for the Guggenheim Museum.

Clayton Whitman, IIDA, LEED AP, is an associate principal at the A&D firm Callison. As a multidisciplinary interior designer, he often facilitates product research and development and manufacturer coordination, with an emphasis on sustainable design and luxury retail. Whitman has a B.F.A. in interior design from Cornish College of the Arts in Seattle.

Tomas Janka is a founding partner of Arial 10, an architecture and design firm with a variety of projects in the U.S. and abroad. He received a degree in architecture from the École Spéciale d'Architecture in Paris and an M.Arch. from Harvard's GSD. Prior to forming Arial 10, he worked on projects around the world for offices such as REX, OMA, Massimiliano Fuksas, and Ateliers Jean Nouvel.

Andreas Hausler, Assoc. AIA, LEED AP BD+C, has 28 years of experience as a designer, detailer, job captain, project manager, technical designer, and quality director. He is currently a vice president and sustainable-design leader with Cannon Design's New York City office, which he joined after a 17-year career with Kohn Pedersen Fox (KPF) in New York and London. His last project with KPF, the International Commerce Center in Kowloon, Hong Kong, was recently completed and ranks among the tallest buildings in the world.

Juror portraits by **Axel Dupeux**


Wilson Associates


Maregatti Interiors


Anderson Mikas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CIRCLE 22

Furnishings

Site Furnishings | Solar-Shading Fabric | Seating

"Hot Mesh is a peppy, light, and airy chair with a fun cane motif. Great for those modern cafés or rooftop pools."
Clayton Whitman

Twig Bench

This modular public-seating system from Tournesol Siteworks, with an organic form inspired by twigs, can be used both indoors and out. Available in lightweight concrete (it also comes in linear low-density polyethylene), the seating system uses 50% to 75% less material than a typical precast-concrete bench. tournesolsiteworks.com CIRCLE 200

Nelson Thin Edge Buffet

Crafted by famed industrial designer George Nelson, the Nelson Thin Edge Buffet was introduced by Herman Miller in 1952. Now the wood cabinet system, made of 64% to 85% recycled materials, has been reintroduced as part of the Herman Miller Collection. It comes in several wood veneers, including walnut, white ash, and santos palisander. According to the company, every variety is 88% to 91% recyclable at the end of its lifetime.
hermanmiller.com CIRCLE 202

KoolBlack Technology

Hunter Douglas Contract's KoolBlack Technology is a series of shading fabrics made of polyvinyl chloride (PVC)–coated fiberglass yarn. The shades reflect heat, protecting against solar heat gain, and, according to Hunter Douglas, deliver up to 25% improvement in solar heat-gain coefficient. Specifiers can choose from five colors and 3% to 5% transparency.
hunterdouglascontract.com
CIRCLE 201

Hot Mesh

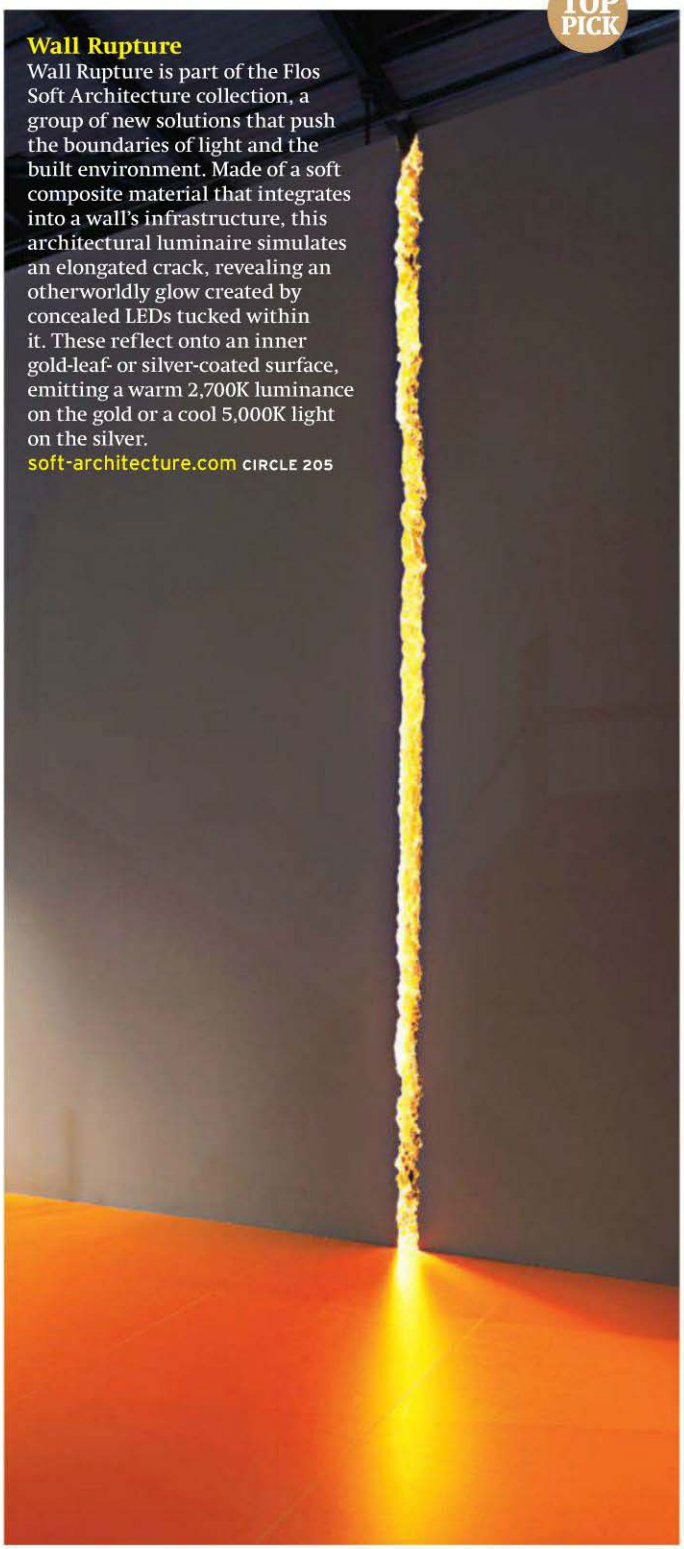
Hot Mesh, from Minneapolis-based furnishings manufacturer Blu Dot, is a series of indoor/outdoor chairs featuring a geometric, meshlike pattern in powder-coated steel. The chair, which can be stacked for easy storage and comes in white, black, bright blue, and mustard yellow, retails for $99. Jurors cited Hot Mesh for the simplicity of its design, a signature of the Blu Dot brand. bludot.com CIRCLE 204

Concorde

The Concorde, from Dutch furniture manufacturer Artifort, was originally created by French designer Pierre Paulin for the waiting room of the Concorde aircraft fleet (circa 1960). Reintroduced by Artifort and available through the furniture showroom M2L, the armless metal-frame chairs can be used in commercial or residential settings and come in a variety of punchy or deep-hued Artifort fabrics.
m2l.com CIRCLE 203

Lighting

LED | Recessed | Task | Surface | Controls



TOP PICK

Wall Rupture

Wall Rupture is part of the Flos Soft Architecture collection, a group of new solutions that push the boundaries of light and the built environment. Made of a soft composite material that integrates into a wall's infrastructure, this architectural luminaire simulates an elongated crack, revealing an otherworldly glow created by concealed LEDs tucked within it. These reflect onto an inner gold-leaf- or silver-coated surface, emitting a warm 2,700K luminance on the gold or a cool 5,000K light on the silver.
soft-architecture.com CIRCLE 205

MultiSource-Capable LED Recessed Light Fixture

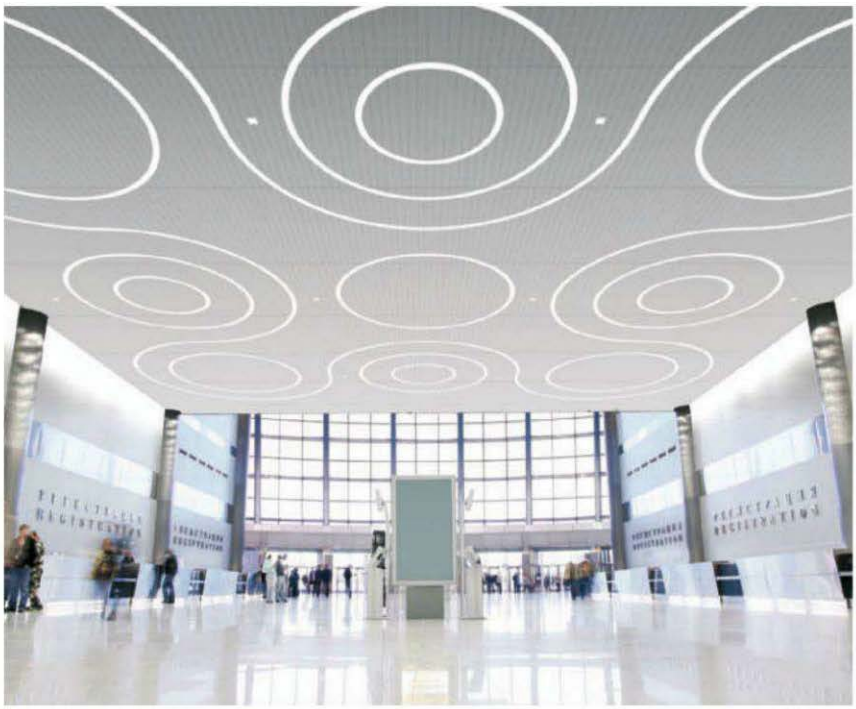
Designed to be obsolescence-proof, the steel housing of this beefy little fixture accepts 4"-round and 4"-square apertures and comes equipped with plug-and-play interchangeability for evolving technologies and different lamp types: remote phosphor LED modules, LED PARs, and MR16 metal-halide lamps. Post-installation relamping and source change-outs are easily accommodated through the aperture.
kurtversen.com CIRCLE 206

Radio Shadow Sensor

Part of Lutron's Quantum Total Light Management system, this daylight sensor works in conjunction with the company's Hyperion solar-adaptive shading, detecting levels of daylight and overriding the Hyperion default to ensure that the shades don't close because of "false alarms," such as cloudy skies or shadows from neighboring buildings. The unit is made of fire-resistant polycarbonate.
lutron.com/hyperion CIRCLE 207

Otto Watt

Designed by Alberto Meda and Paolo Rizzatto, Luceplan's dimmable, eight-watt LED desk fixture enables the user to simply adjust the color temperature from warm white to cool white by rotating the diffuser. For optimum flexibility and comfort, the head swivels 360°, and the reflector comes equipped with a glare-free filter.
luceplan.com CIRCLE 208



"Wall Rupture is an exciting shift from pure lines without being a radical departure. The product combines architectural integration and fixture design in a unique way."
Stephen Horner

Full Circle

Breaking away from the usual linear installations of recessed fluorescent fixtures, Winona Lighting has devised a whimsically curvilinear luminaire system that accommodates standard T5s in curved and straight sections of varying lengths, organic shapes, and full-circumference versions. Equally suitable for suspended and hard ceiling applications, Full Circle comes with flush or regressed opal acrylic lens options.
winonalighting.com CIRCLE 209

Fraqtir Point

The Lighting Quotient's LED technology combines principles of refraction and total internal reflection to produce a precise asymmetric distribution that uniformly illuminates surfaces from one edge and provides high light output from a small 7.5"-long-by-2"-diameter package. Developed for interior applications, Fraqtir Point has an extruded-aluminum heat sink for optimal thermal management, a factor responsible for peak LED performance. Options include 0.1% dimming capabilities and several mounting configurations, including surface, pendant, cantilever, or track.
elliptipar.com CIRCLE 211

Tagora

Like finely sliced metal pipe, this 10⅝"-diameter-by-13"-high aluminum ceiling luminaire has an urbane industrial look that morphs from bold to warm to cool depending on which of the three color combinations are selected: black/orange, gray/white, or beige/white. Available for 12-volt halogen, fluorescent, or metal-halide lamps, the Tagora can (left) is part of a more extensive line that includes two additional ceiling models at 22 7/16 x 7 1/2" and 38 3/16 x 9" and three similarly shaped suspension fixtures.
artemide.com CIRCLE 210

Silverback

Evocative of classic mid-20th-century Scandinavian design, this 17.8 x 4.3" fluorescent fixture features a reflective metallic base that visually recedes into ceiling and wall surfaces. Designed for Louis Poulsen by the Danish firm KiBiSi—a collaborative industrial-design enterprise founded by Bjarke Ingels Group, Lars Larsen, and Jens Martin Skibsted—Silverback features a white opal diffuser that emits a comfortable ambient light.
louispoulsen.com CIRCLE 212

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CIRCLE 43

Plumbing & HVAC

Fixtures | Fittings | Ceiling Fans | Controls

"The Axor Bouroullec Collection is a product you can't miss. Its flexibility, efficiency, and holistic approach make it an extraordinary piece."
Tomas Janka

TOP PICK

Axor Bouroullec Collection

Pure white and fluid in its modularity, the extensive line of bath fittings and fixtures designed by Erwan and Ronan Bouroullec with Axor invites many interpretations. A juror favorite for plumbing, the component-based group has easily drillable basins that free up placement of the softly curved chrome faucets, integral shelf options—including an ingenious hybrid tap/shelf for lav, tub, or shower—and Corian-topped wood furniture. Sinks and shelves are mineral-cast resin, and the tub is acrylic.
hansgrohe-usa.com/axor CIRCLE 222

RedLINK Wireless Controller for M-Series

Configured to connect to the Honeywell RedLINK Internet Gateway, this wireless module is unique in that it controls ductless HVAC systems through radio frequency, which facilitates installation and retrofits. Additionally, the controller is composed of up to 89.8% recyclable materials and has modular components that can be easily separated for recycling.
mitsubishipro.com CIRCLE 223

Haiku

With typical models spanning 12', Big Ass Fans has not been known for a minimalist approach to air movement—until now. The jury HVAC top pick, the 5' moso-bamboo ceiling fan (also available in a glass-infused matrix composite) was designed to maximize airflow in small commercial and residential spaces as effectively as its supersized counterparts. Plus, an innovative direct-current motor is said to be 80% more efficient and less susceptible to overheating and wear than similar alternating-current offerings.
haikufan.com CIRCLE 224

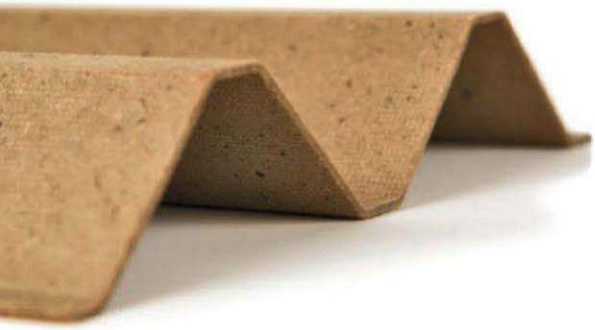
TOP PICK

ComfortZone Metris Collection

The graceful contours of this versatile faucet collection from Hansgrohe were developed with the Stuttgart, Germany–based Phoenix Design to embrace the notion that all users are not alike. Available in chrome and brushed nickel, the ComfortZone Metris line accommodates a variety of needs and preferences with a range of height options for five single-hole models—including one that swivels—as well as widespread and wall-mount versions. Coordinating bidet, tub, and shower options are also available.
hansgrohe-usa.com CIRCLE 225

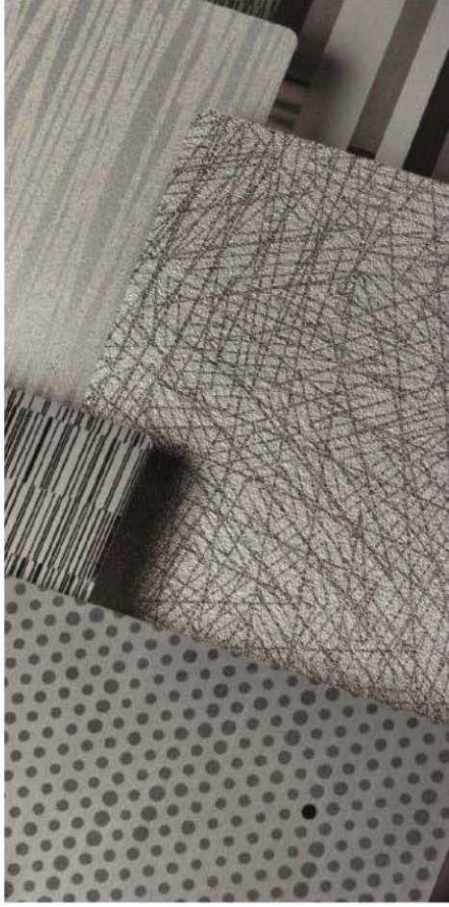
Materials

Wood, Plastics, and Composites | Metals | Masonry



ECOR

Made from 100% recycled, nontoxic, and formaldehyde-free materials, ECOR is a new generation of highly versatile molded-fiber-panel products that present a healthier alternative to traditional particleboard. To fabricate the panels, underutilized cellulose-fiber materials, including postconsumer cardboard and forest and agricultural fibers, are bonded together using water, pressure, and heat to create a material that is strong, lightweight, and easy to shape. ecorglobal.com CIRCLE 213



Frontino

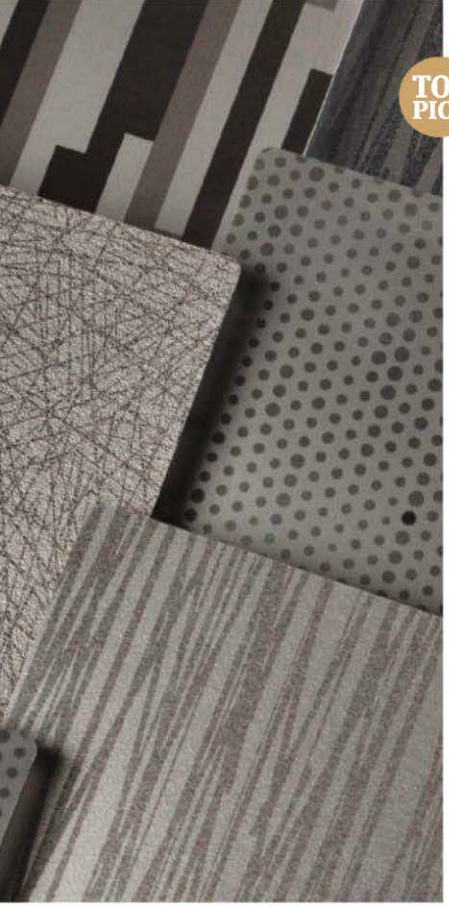
Häfele America's Frontino sliding cabinet-door system operates on a unique single track that allows doors to sit flush when closed. Unlike hinged cabinet doors, sliding doors maximize available space for those working in the kitchen. Frontino is made of several parts that consist of various metals including galvanized steel and aluminum, as well as different plastics.
hafele.com/us CIRCLE 214

HPL Design Laminates

InteriorArts is a new collection of high-pressure-laminate designs from Chemetal and Treefrog Veneer. Featuring 74 options in a 4 x 8' size, the affordable line includes neutral to bright colors in a variety of rich natural textures or high-gloss finishes. InteriorArts is also scratch-resistant and Greenguard Children & Schools–certified.
ialaminates.com CIRCLE 215

Glazed Thin Brick

Fireclay Tile's Glazed Thin Brick, for interior or exterior applications, features rich organic textures in recycled materials. The brick uses a range of 30% to 100% local recycled content, and is finished with a selection of nine VOC-free natural glazes. San Jose, California–based Fireclay sources the brick from local supplier McNear Brick and Block. In addition, 100% of all glaze overspray is collected and recycled, and any waste produced is inert and nonhazardous.
fireclaytile.com CIRCLE 216



TOP PICK

Diamond Finish and Eco-Etch Patterns

The Stainless Steel line from Forms+Surfaces includes various finishes and patterns for wall systems, elevator interiors, and other applications. The company's latest developments include Diamond (shown, center), a durable finish for stainless steel that features multidirectional lines and faceted shapes that have been tested to hide scratches and scuffs. In addition, four new Eco-Etch Patterns (shown surrounding Diamond) are applied to stainless steel through the company's advanced photolithographic bead-blasting system, which uses no harmful acids or chemicals and generates no toxic waste.
forms-surfaces.com
CIRCLE 217

"The Stainless Steel line from Forms+ Surfaces has a dynamic finish that changes aspect with different angle degrees and light."
Sara Demel

Tom Kundig Collection

After years of collaboration on custom steel architectural elements and furnishings with Seattle-based metal shop 12th Avenue Iron, Olson Kundig Architects has now designed the firm's first line of commercially available products. Inspired by the way people interact with buildings, the Tom Kundig Collection consists of 25 cut-and-folded steel hardware pieces ranging from door pulls to rollers.
12thavenueiron.com CIRCLE 218

Perennial Wood

Perennial Wood from Eastman is a new category of long-lasting, U.S.-sourced wood. This real Southern pine, also chosen as one of Material ConneXion's and BuildingGreen's top materials of the year, has been modified on the molecular level to resist changes from moisture and remain dimensionally stable for decades. The material can be used for decking and porch flooring, and is also available to manufacturers of furniture, windows, and doors. perennialwood.com CIRCLE 219

Architectural-Mesh Handrail Infill Panels

Pre-engineered to fit standard-size handrail attachments, these panels from Cambridge Architectural are cost-effective and functional, maximizing fall protection and safety. This durable mesh infill has a long life cycle and requires no special chemicals or tools to clean and maintain. It is composed of recycled content and is 100% recyclable.
cambridgearchitectural.com
CIRCLE 220

Metal Laminates

Chemetal has developed seven new panel designs in its 300 Series that are made with recycled and recyclable aluminum. The panels have a fine texture with a horizontal pattern and come in 4 x 8' and 4 x 10' sizes. The additions feature handcrafted designs that include Factory, an old-style factory/warehouse door motif, as well as rusted-steel and deep bronze-aluminum options. Some of the aluminum finishes contain up to 85% recycled content, which contributes to LEED MR Credits 4.1 and 4.2.
chemetal.com CIRCLE 221

Finishes

Carpet Tiles | Coatings | Wallcoverings | Ceilings

"Vivid from KnollTextiles is a more affordable, durable rendition of Trove's wallcovering. A great way to add an artful supergraphic to a space without the fine-art cost."
Clayton Whitman

Walk the Plank

Interface explores the soft side of wood with the rich patterning of this 9 x 39" plank-shaped carpet tile designed to mimic the look of deeply grooved repurposed timber. A jury favorite, the collection is made of up to 62% recycled content and 100% nonvirgin yarn—a combination of reclaimed nylon carpet fiber and salvaged fishing nets—with a recycled backing. Available in eight variegated colorways, Walk the Plank is meant to send a positive message that reinforces the company's strong commitment to sustainability.
interface.com CIRCLE 226

ColorCast Ecotoner Colorants

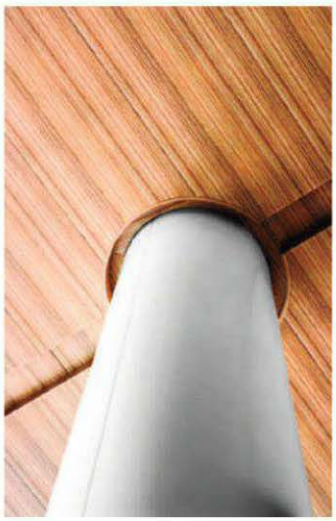
The reformulated tinting system added to all Sherwin-Williams latex and water-based coatings delivers a full range of luxurious, color-accurate hues and optimum coverage with zero VOCs. Packaged in recycled plastic containers, this innovative colorant system is Greenguard-certified for both Indoor Air Quality and Children & Schools.
sherwin-williams.com CIRCLE 227

Color Wash

Milliken global creative director Cresta Bledsoe and print research scientist Scott Parry developed this tufted, loop/tip-sheared carpet tile using human- and nature-driven patterning and proprietary high-resolution digital print technology. Made of PVC-free, 100% Milliken-Certified WearOn Nylon Type 6,6, the modular collection provides a visually rich sensory experience in 40 colors and two styles: Matter, a soft organic pattern, and Medium, a linear exploration of nuanced color change. It is CRI Green Label Plus–approved and includes 25% recycled content.
millikencarpet.com CIRCLE 228

Vivid Collection

Translating their vibrant, painterly style into a sustainable contract wallcovering for KnollTextiles, designers Jee Levin and Randall Buck, the creative team behind the New York City–based Trove, apply sweeping bursts of digitally printed color onto a nonvinyl Type II material made of 69% cellulose and polyester and 31% recycled polyester. The three patterns, dubbed Swerve, Sway, and Swoosh, cost $54 per yard, come in four to six vivid colorways, and meet the air-quality standards of California IAQ Section 01350. knolltextiles.com CIRCLE 229



Micro-Perforated Arboreal Wood Ceiling

Made of FSC-certified wood veneers on 99% recycled aluminum cores, this lightweight ceiling system is notable for its near-invisible perforations and noise coefficients as high as NRC 0.95. Available in a variety of species, including bamboo, the panels are cured with a durable, zero-VOC ultraviolet finish and can be shaped with the same versatility as metal. Additionally, the panels have been designed for easy above-ceiling access to facilitate commissioning and maintenance.
ceilingsplus.com CIRCLE 230

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CIRCLE 33

Specialties & Conveying Systems

Shower Doors | Marker Boards | Elevators

OpenSpace

Duravit collaborated with Vienna-based design group EOOS to create OpenSpace, an original shower concept that folds against the wall after use, creating more usable space. The system, designed for small bathrooms, has doors made of 0.31"-thick safety glass that can be lifted and folded into a neat chrome frame, exposing a full-length mirror, then lowered back into the shower position when desired.
duravit.us CIRCLE 251

FloraDrain FD40-E

This green-roof system from ZinCo USA was designed to work with ZinCo's 8"-deep substrate that is suitable for urban rooftop farming of vegetables and fruits such as lettuce, onions, melons, and strawberries. Made of recycled polyethylene, FloraDrain can be easily used in combination with roof gardens, patios, walkways, and other spaces.
zinco-usa.com CIRCLE 250

Beyond Architectural Walls

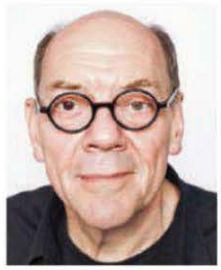
Entering into more structural designs, Allsteel has introduced a movable, frameless glass-wall system featuring a unique built-in scissor-lift mechanism, which functions like a pneumatic jack, to level the glass within the floor channel and allow faster installations. Created in partnership with inventor Eberhard von Huene, the system features ½"-thick soundproof glass strong enough to accommodate an optional privacy-panel system that hangs directly on the glass (shown on right wall).
allsteeloffice.com CIRCLE 252

Cleo Mobile Magnetic Markerglass

Designed by the Providence-based Kaiju Studios, Cleo is a two-sided magnetic marker glass that comes in two versions: the Divider, which reconfigures or stows away by nesting together, and the Easel, which provides storage and display features for presentations. Framed within mobile steel units, the tempered safety-glass systems easily glide from one space to another.
skydesign.com CIRCLE 253

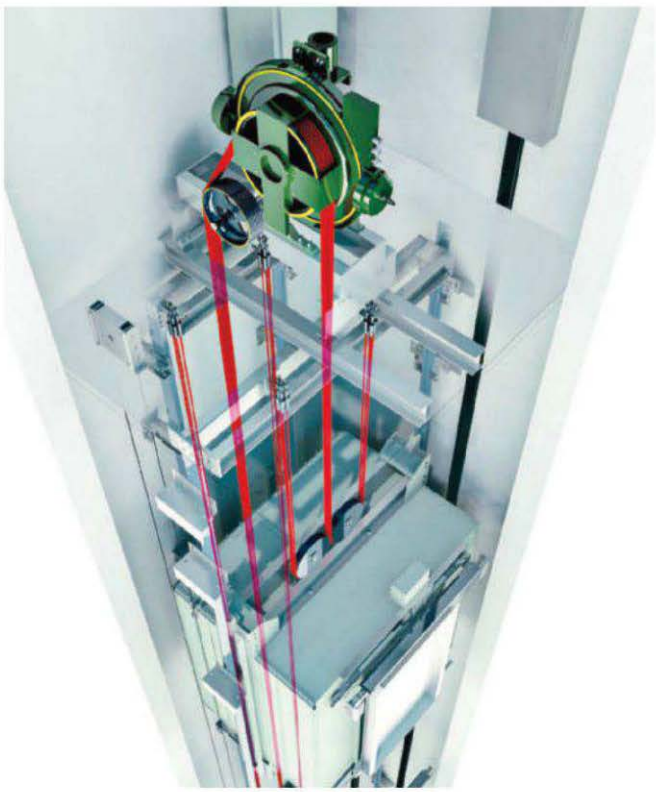
TOP PICK

"KONE's ReVolution sounds like a great idea for a facility that must retrofit existing elevators without significant disruption."
Andreas Hausler



Geared-to-Gearless Modernization Solution

The top pick in the Conveying Systems category, ThyssenKrupp Elevator Americas' geared-to-gearless modernization solution allows existing geared elevators to be upgraded with cutting-edge gearless elevator technology. ThyssenKrupp's modernization experts customize plans that include removal of existing geared machines, controllers, and motor generators. Facilities are then modernized with the latest technology in micro-processor controls with advanced dispatching, an efficient AC drive system, and compact gearless machines. thyssenkruppelevator.com CIRCLE 254



KONE ReVolution

KONE's geared-to-gearless elevator-modernization system also scored high with the jury. The company's gearless machine technology and innovative 2:1 roping configuration provide the benefits of gearless technology with minimal or no disruption to the existing building structure. This is done by placing the slim-line deflector sheaves within the car-top cross-head and counterweight to divide the hoist cable deflection into four separate hitch points in the overhead. kone.us CIRCLE 256

PowerMax Photovoltaic Modules

CertainTeed's PowerMax photovoltaic modules feature rack-mounted, copper-indium-selenide (CIS) thin-film technology with one of the best cost-to-power ratios in the industry. The panels are manufactured by CertainTeed's sister company Avancis, a pioneer in CIS technology since 1998. The black panels are durable, simple to install, and suitable for use on all types of roofing, curtain walls, and canopies. They offer the highest electricity-conversion efficiency for thin-film solar modules in the world, says the manufacturer. certainteed.com CIRCLE 255

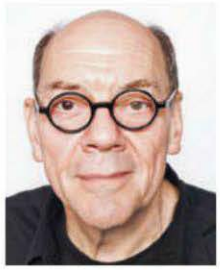
Glass Stair Treads

Cast in one solid piece in thicknesses ranging from 1.5" to 6", the steps from ThinkGlass do not have the visible lines common in laminated glass stair treads. An antiskid laminate film gives the stair a safe, slip-resistant surface. A variety of organic textures, colors, and edge treatments is available, and stairs may be curved, straight, or spiral. LED lighting can also be embedded within the steps (shown). thinkglass.com CIRCLE 257

Thermal & Moisture Protection

Siding Panels | Weather Barriers | Insulation

"EcoClad XP is a beautiful, very sustainable cladding material. Impressive qualities include high recycled content and that it's durable, organic, and nontoxic in every respect."
Andreas Hausler



TOP PICK

Rainscreen Clip System

This system from Wood Haven provides a complete engineered siding that ensures fast and easy installation with a fastener-free face. It includes specially milled lumber in a variety of species, colors, and widths; prefabricated trim and corner boards; predrilled rot-resistant furring boards; marine-grade aluminum rainscreen clips; and stainless-steel screws. Prefinished siding is available as reclaimed or FSC-certified wood.
rainscreenclip.com CIRCLE 231

HydroGap Drainable Housewrap

HydroGap, the newest moisture-management product from Benjamin Obdyke, effectively eliminates excess moisture, preventing the damaging effects of mold and rot. Its patent-pending 1-millimeter spacers allow at least 100 times more bulk water to drain from a wall compared with standard housewraps. The low-profile drainage space of HydroGap also eliminates the need for design changes in the wall assembly. The drainage efficiency of the trilaminate substrate is 96% per ASTM E2273.
benjaminobdyke.com CIRCLE 232

EcoClad XP

KlipTech's EcoClad XP (Xtreme Protection) is the world's first entirely recycled paper-fiber cladding panel that comes with a 15-year UV and product warranty. Made completely in the U.S., EcoClad XP is offered in over 300 wood grains and colors with several different finish types. The panels are made of FSC-certified postconsumer recycled paper and rapidly renewable bamboo fiber for both interior and exterior applications, and contain no VOCs, benzenes, or toxic chemicals.
kliptech.com CIRCLE 233

StoEnergy Guard

This integrated cavity-wall solution from Sto Corp. can be used under multiple cladding types—including stone, siding, and stucco—to address new building-code requirements. Leveraging cavity-wall design and rainscreen technology, the system integrates a fluid-applied waterproof air barrier, sheathing-joint and rough-opening protection, proven drainage technology, and approved continuous insulation into a flexible system designed to meet individual climate-zone and building-code requirements. stocorp.com CIRCLE 234

Evolution™

Thermal and Moisture Protection

Thermal and Moisture Protection Roof and Wall Panels

Division 7 Thermal and Moisture Protection Specification Section 07411 - Manufactured Roof Panels

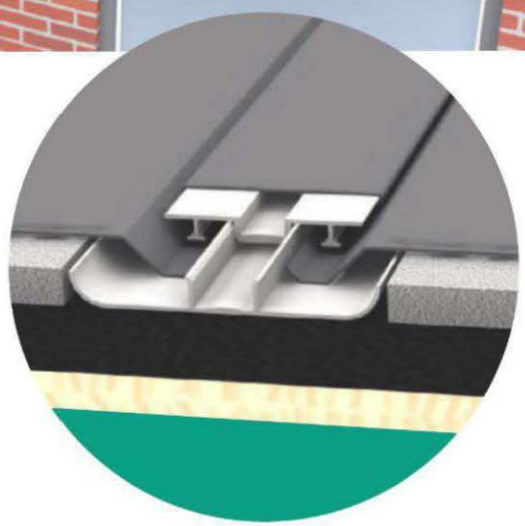
The Overly *Evolution* metal wall and roof system is without raised batten or standing seams and exposed fasteners. The system consists of a hidden drain channel, compression bar, cover cap and cladding sheets. The smooth, contemporary design appears monolithic when viewed from just a short distance. It's an 'Evolution' to all the standard metal wall and roof systems available throughout the history of the industry.

Applications

The Overly *Evolution* system can be installed on sloped roofs and vertical walls. Panels can be curved and/or tapered for barrel vaults and domes or spherical shapes. The system features hidden fasteners and an internal drainage component which removes any moisture that migrates into the system and skillfully designed joints which allow for expansion and contraction. The system is the exterior exposed component of a wall/roof composite assembly. Several composite assemblies are available ranging from thin to thick as determined by aesthetic preferences or as necessary to meet performance requirements such as thermal, structural and fire ratings.

Materials

- Aluminum Alloy 3003-H14, Standard Thickness 18 gauge (.040")–16 gauge (.050") available in painted K500 finishes, brushed and mill finishes
- Stainless Steel type 304 and type 316, 24 gauge (.024") – 20 gauge (.036") available in 2B, 2D, #4 and several custom directional and non-directional finishes
- Titanium Grade 1, gauges .018" – .024" available in standard mill or matte finishes
- Zinc, gauge .028" – .032" available in natural or pre-weathered finishes
- Recycled content varies upon material selected. 100% recyclability of all metal components



System Design Data

- Width of Compression Cover: 2.75"
- Mininum/Maximum Spacing between Compression Covers: 12" – 48"
- Maximum Length of Panels: 40'
- Compression Extrusion Thickness: .056"
- Channel Extrusion Thickness: .056"
- Test data in accordance with ASTM E 283, ASTM E 330, ASTM E 331 and UL 580 (Class 90 available upon request)

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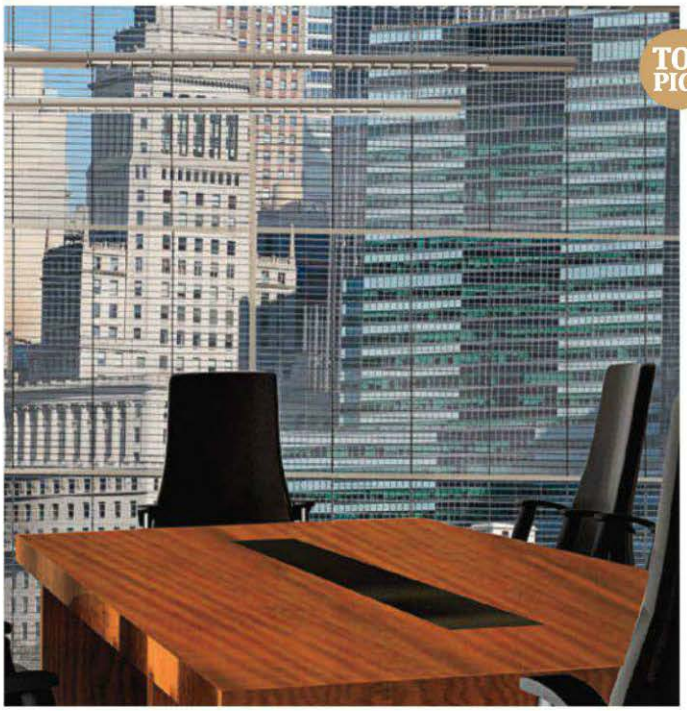
CIRCLE 49

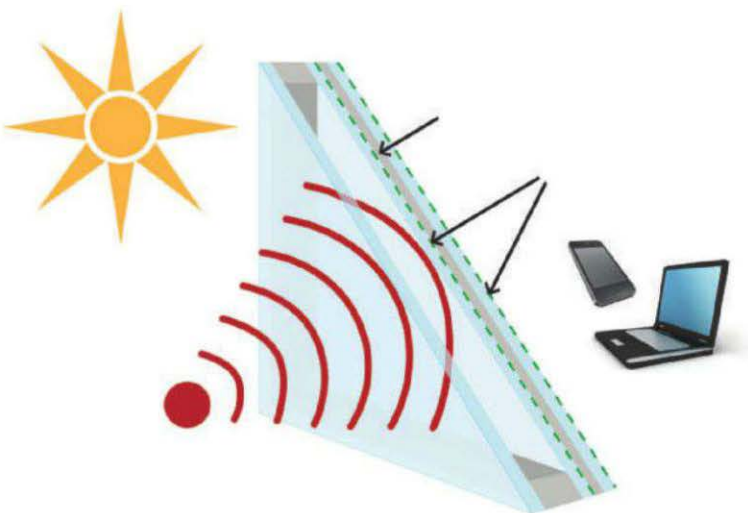
Openings

Glass and Glazing | Windows | Curtain Walls



Guardian SunGuard PVGU

With the appearance of between-the-glass vertical blinds, Guardian SunGuard PVGU combines photovoltaic-glass units with advanced architectural glass to create the world's first window unit that simultaneously offers energy efficiency, power generation, and transparency. SunGuard converts up to 12% of direct sunlight into energy and offers a solar heat-gain coefficient of 0.14, a U-value of 0.3, and a light-to-solar heat-gain coefficient of 3.5.
guardian.com CIRCLE 235



CyberShield

CyberShield is a glass coating for interior and exterior walls specifically engineered for RF shielding, the reduction of the transmission of radio-frequency electromagnetic radiation. Available in laminated, insulating laminated, and double-laminated insulating glass, it offers electrical attenuation with an average of 45 decibels across a frequency range from 35 megahertz to 18 gigahertz, while optimizing visible-light transmission with a neutral glass color. The Pilkington DATASTOP coating is conductively connected to the window frame around the perimeter of the window to ensure maximum effectiveness.
viracon.com CIRCLE 236

Flood Vents

Flood Solutions manufactures a full line of heavy-duty, aluminum, FEMA-compliant, engineered flood vents that will not rust or rot. Offering significant savings on flood-insurance premiums, the vents are available in four colors, six sizes, and three models, and cover between 124 and 362 square feet per vent, depending on the model. They feature a 0.125" extruded-aluminum frame, 0.063" blades, ¼" perforated aluminum rodent screen, and No. 8 aluminum-mesh insect panel.
floodsolutions.com CIRCLE 237

Pearl Onyx and Opal Onyx Vivistone

The Vivistone line of glass slabs consists of a graphic interlayer laminated between two lites of glass—either two transparent ones or one transparent lite and a reflective glass backer. Interlayers feature ultra-sharp, full-scale, repeatable, and highly configurable representations of stone, including the newest Pearl Onyx and Opal Onyx options. All slabs are available in ¼", ½", and other standard glass thicknesses.
forms-surfaces.com
CIRCLE 238

"Most of these winners mark the latest in a decade-long continuum of advances in both materials and assembled products related to building openings. The best combine excellent thermal performance with aesthetic appeal."
James Gainfort

OptiQ Ultra Thermal Windows

Developed in partnership with the U.S. Department of Energy, OptiQ windows feature a polyamide thermal break that allows the extruded-aluminum windows to achieve a high thermal performance that is further enhanced by accommodating 1" and 1¾" triple insulating glass. OptiQ is ideal for new or retrofit commercial construction and is available in multiple configurations with options for customization.
kawneer.com CIRCLE 239

Zola Lift-Slide Doors and Tilt & Turn Windows

Zola Windows' 20'-wide-by-8'-high lift-slide door (shown in background) consists of two 10'-wide moving glass panels and premium German hardware. The doors come in a range of woods, including 100% FSC-certified pine, oak, and meranti wood, and feature exterior remote-controlled shading or bug screens that can roll out of sight when not in use. Zola's Tilt & Turn windows can both swing and tilt inward with a turn of the ergonomically shaped handle; a multipoint locking mechanism provides safety and a tight air seal. A Passive House version of the window is available for highly energy-efficient buildings.
zolawindows.com CIRCLE 240

INvent Retro XLT Windows

Wausau's INvent Retro XLT windows feature a narrow, beveled exterior face and replace classic steel and wood windows while offering high performance. The series' low U-factors help meet Model Energy Codes, are tested to meet AAMA AW-100 Architectural Performance Class ratings, and are backed with a warranty of up to 10 years. Configurations include fixed, in-swing and out-swing casement, top-hinged, awning, and hopper vents.
wausauwindow.com CIRCLE 241

SteelBuilt SG Curtain Wall System

SteelBuilt SG is a structural silicone glazed curtain-wall system from Technical Glass Products that enables architects to create smooth, monolithic glazed facades with all the advantages of steel framing: larger free spans and glass sizes, and improved thermal performance. Modular steel back mullions can accommodate free spans up to 40' (nominal) in single members (splices required for longer spans) and support glazed infills up to 2.5" thick.
tgpamerica.com CIRCLE 242

D Min Door Pull

This elegant door pull was designed by West Chin, principal of New York City–based West Chin Architect, for FTF Design Studio. The pull is 100% flush, flangeless, and available in dark statuary bronze (shown), powder-coated white, or satin nickel finishes. The pull measures 3¼" wide by 1¾" thick by 6" high.
ftfdesignstudio.com CIRCLE 243

YES SSG TU Vent Window

The thermally broken YES SSG TU vent window for storefront, window, or curtain-wall applications meets the requirements of the 2012 IECC. It offers an overall system U-factor of 0.41 with standard low-E insulating glass for zones 4–6; an overall system U-factor of 0.37 with a high-performance insulating glass for zones 7–8; and an Ultimate Performance version with a U-factor of 0.34, which far exceeds the 2012 IECC.
ykkap.com CIRCLE 244

The KnollTextiles Glass Collection

Made of clear or low-iron tempered safety glass, this collection from Skyline Design includes seven patterns (four shown) that translate the linear, undulating, and organic designs of KnollTextiles fabrics—including two archival patterns—into glass. Suited for corporate and healthcare environments, the glass is 100% recyclable and made to order to minimize waste. Skyline Design employs clean manufacturing processes, including low-VOC paints and finishes and eco-friendly etching techniques.
skydesign.com CIRCLE 245

Whether clear-cut designs for glass, highly polished ideas for wood or well-cast roles for metal: you can turn them into reality with Hawa sliding hardware systems. After all, our high-quality products have held open the doors to projects around the world for decades – with attractive design solutions and uncompromising Swiss quality. Visit our showroom in Dallas or www.hawa.com for more information. **CIRCLE 38**

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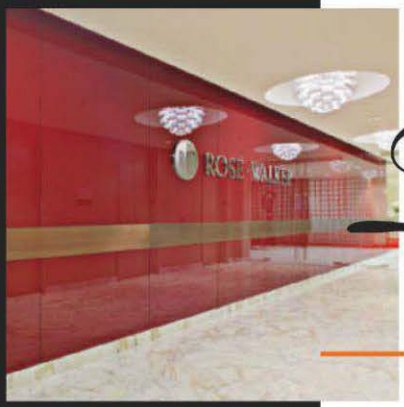
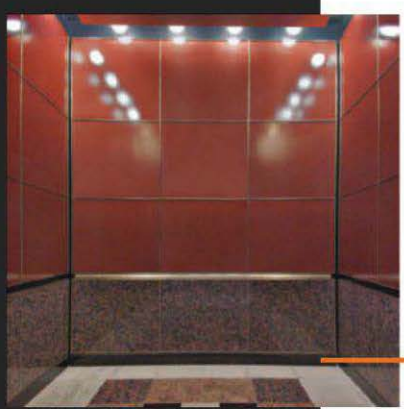
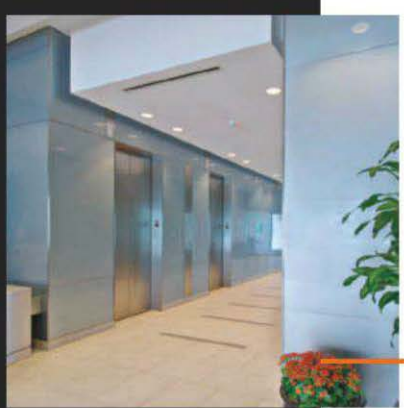


WALLS

CEILINGS



ELEVATORS



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CIRCLE 36

Equipment

Residential Appliances | Office Equipment | Soap Dispensers

SureFlo Dispensers

Bobrick's SureFlo dispensers for foam and liquid soap offer a sleek, chrome-plated alternative to common models. Maintenance staff can fill the system easily from the top, and one jug of the dispenser's bulk soap replaces the waste of five undercabinet cartridges. Optical sensors eliminate the need for the hand-waving commonly associated with other automatic dispensers' sensor systems, helping reduce false activations while decreasing waste.
bobrick.com CIRCLE 246

"Gaggenau's cooktop is an appliance that I'd love to have at home. The freedom this innovative product offers is extraordinary."
Tomas Janka

Flo Family of Dynamic Monitor Arms

The field of ergonomic office-equipment design has a new player. Designed to encourage good posture and reduce eyestrain, Herman Miller's Flo Family of monitor arms includes six adjustable supports for touch screens weighing up to 45 pounds and up to 24" in width. Cited by the jury for its "pleasing design," the Flo Family is created with 75% recycled and 99% recyclable materials, and is Cradle to Cradle Certified.
hermanmiller.com CIRCLE 247

Futura ProfiLine Dishwasher

This high-powered, stainless-steel-finished dishwasher from Miele includes a speedy 23-minute wash cycle and is currently being tested for Energy Star status, which requires water usage of 5.8 gallons or less per cycle. Futura ProfiLine offers the flexibility to clean both delicate items—like cutlery and china—and tougher pots and pans.
mieleusa.com CIRCLE 248

CX 491 Induction Cooktop

The CX 491 from Gaggenau is the first continuous-induction cooking surface, according to the company. The single slab of glass ceramic allows up to four pots or pans of varying sizes and dimensions to go anywhere on the cooktop. Sensors detect the position of each item of cookware, and 48 micro-inductors emit and transfer heat accordingly.
gaggenau.com CIRCLE 249

Editors' Choice 2012

The editors combed through a year's worth of products featured in the magazine to highlight a few favorites, from sculptural glass walls to a hardwood-flooring line made from reclaimed shipping pallets.

Lasvit LiquidKristal

LiquidKristal is a new line of architectural glass designed by Ross Lovegrove for the Czech-based Lasvit Group. The transparent glass, which is curved in form and wavy in texture, is the result of a unique thermal-transfer technique. The finished product can be easily customized, allowing large-scale pattern aggregations over multiple sheets that can be used as clear partitions or insulated glass units for exterior facades and storefronts.
lasvit.com CIRCLE 258

Reclaimed Hardwood Flooring

Portland, Oregon–based Viridian Wood Products has introduced two new 100% reclaimed and FSC-certified, commercial-grade, exotic hardwood-flooring products. Both the Jakarta Market Blend and Fishtail Oak flooring are milled from reclaimed shipping pallets and crates sourced from docks and harbors.
viridianwood.com CIRCLE 260

Energy Smart LED Bulbs

Similar to incandescent light sources, GE Lighting's LED Energy Smart bulbs provide all-around "omnidirectional" light, rather than just pushing light out the top of a lampshade. The bulbs have a soft-white appearance when turned off, a consumer preference GE discovered through research. The bulbs will last for over 20 years based on three hours of use per day.
geconsumerproducts.com CIRCLE 259

Progetto Triennale Tile

In 1960, Gio Ponti and Alberto Rosselli designed the "4 times curved" ceramic wall tile, a Moorish shape with four curves made in various colors for the Italy-based Marazzi Group. Due to technical difficulties in producing the complex, puzzle-like form at the time, it never entered the company's line. Now, with the help of state-of-the-art water-jet cutting technology, Marazzi has developed a new collection of stoneware based on Ponti and Rosselli's original design. marazzitile.com CIRCLE 261

BASYS Sensor Faucets

Sloan Valve's BASYS sensor-activated commercial faucet line includes deck- and wall-mount models, spray-module options, two sensing-technology options, and four power choices: battery, hard-wire, solar, and turbine. An interchangeable crown offers solar panels or an LCD display that provides wash times and water temperatures. sloanvalve.com CIRCLE 262

Cradle-to-Cradle Bioplastic

Made from plants, not oil, InPro's NatureWorks Ingeo biopolymer is the first of its kind to become Cradle to Cradle Silver Certified. Combining Ingeo, PETG, and recycled content, the company has arrived at a more durable formula than was possible with plain PETG. inprocorp.com CIRCLE 263

Ultra Series 90° Wall Unit

Composed of Beveled Direct Set windows, each side of Kolbe's Ultra Series 90° wall unit spans more than 6 square feet. The interior is framed in maple, and the exterior is clad with aluminum with a clear anodized finish. The wall unit's low-E insulating glass coatings block 95% of UV light, reject unwanted solar heat, allow natural daylight, and maintain outside views. kolbe-kolbe.com CIRCLE 264

ArcForm

Adding a seamless, luminous curve to the ceiling plane, ArcForm features advanced LED engineering and state-of-the-art MesoOptics technology to deliver precise, 3-D, symmetrical batwing light distribution. Manufactured by Philips Ledalite, it controls high-angle glare and conceals the light source. ledalite.com CIRCLE 265

Dri-Design/DuPont Corian Cladding

Dri-Design and DuPont Corian collaborated on the first exterior-wall system that will include Corian surfacing as a standard offering. In the new system, Corian EC panels are fastened to Dri-Design's pressure-equalized, rainscreen metal wall-panel system for building cladding.
dri-design.com/CorianEC
CIRCLE 269

Reclaimed-Wood Windows and Doors

Jeld-Wen claims to be the first major manufacturer of reclaimed-wood window and door products. Part of the company's Custom Wood line, the openings are made from rustic Douglas fir originally used for snow fencing, barns, houses, and factories.
jeld-wen.com CIRCLE 267

Pegasus 3D Collection

Seves Glassblock is transforming the traditional glass block into a more sculptural material that plays off light and space. The new Pegasus 3D collection includes three glass designs engraved on the outer surface: a mosaic motif, a wave effect, and Diamante (shown).
sevesglassblock.com CIRCLE 268

Sliding Glass Door Systems

Offering a balance of privacy and openness, the frameless interior sliding doors from Klein can be specified with self-closing, telescoping, or bi-parting features. The panels have a track at the top to provide a minimalist detail at the jambs and floors.
klein-usa.com CIRCLE 266

Nest Learning Thermostat

The Nest Learning Thermostat "learns" heating and cooling habits in a week; it then automatically adjusts to save energy while a building is empty. An energy-history option allows users to see how much they've saved over time. Nest is also wireless and can be controlled from a laptop, smartphone, or tablet. The second generation of the product is compatible with 95% of low-voltage heating and cooling systems.
nest.com CIRCLE 270

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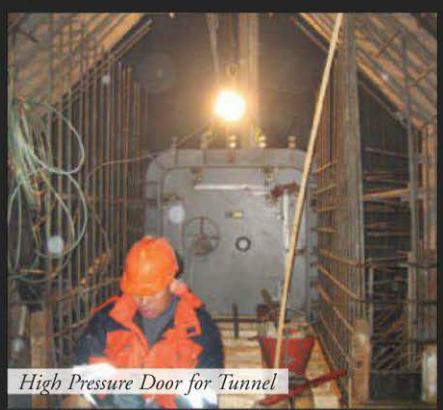
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CIRCLE 66

Ultima Create!
Armstrong's Ultima Create! custom ceiling panels allow designers to incorporate original artwork or digital images into full-color ceiling art. Available for both the Ultima and Health Zone Ultima products, the high-performance acoustical ceiling panels are ideal for retail, hospitality, health-care, education, corporate, and other commercial spaces.
armstrong.com/ultimacreate CIRCLE 271

Hurricane-Tough Folding Door System
San Diego–based manufacturer LaCantina Doors received an impressive hurricane-impact rating of DP70 on its thermally controlled line of aluminum folding doors. Designed for coastal or other storm-prone regions, the doors were tested in winds up to 165 mph and come in various configurations.
lacantinadoors.com CIRCLE 272

Switch Light Bulb
Inside the new Switch Lighting LED replacement bulb, a special liquid creates a self-cooling environment that allows for maximum brightness with fewer LEDs. According to the manufacturer, it offers the first 100-watt-equivalent (We) A19 incandescent replacement bulb, as well as other standard A19 LED lamps in 40We, 60We, and 75We versions (shown).
switchlightbulbs.com CIRCLE 273

NanaGlass SL25
NanaGlass SL25, a frameless opening glass-wall system, can be installed on the perimeter of balconies and patios to protect them from the elements. Manufactured by NanaWall Systems, the panels easily slide open and stack to one or both sides; top-supported in a single track, they can ride a fixed balcony railing or extend to the floor.
nanawall.com CIRCLE 274

Aeroblades
This new LED-based street luminaire from Cree Lighting was designed and engineered with the British lighting-design firm Speirs + Major. The Aeroblades series features an innovative thermal-management system that allows for higher lumen output and significantly boosts lifetime, efficacy, and color consistency.
cree.com CIRCLE 275

Tall Wood Takes a Stand

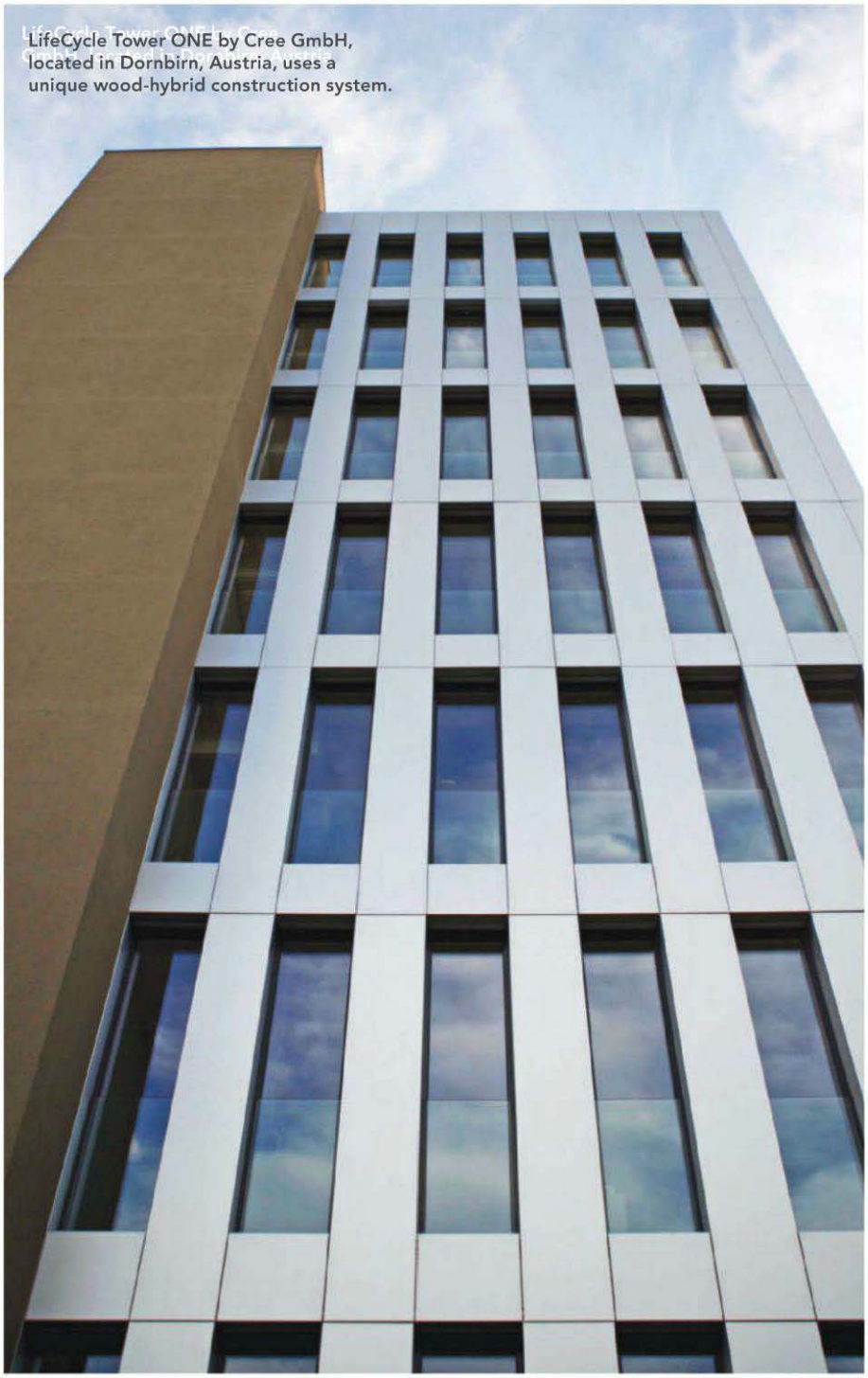
Tall wood buildings proven safe and cost effective

Sponsored by reThink Wood | *By Karen Bryan*

There's a quiet shift on the horizon—one that has the potential to change North American skylines.

Heightened awareness of the environmental benefits of wood combined with advances in wood technology and manufacturing have aligned to make tall wood buildings not only possible but safe and cost effective.

While the increasing number of code-approved, light-frame wood construction projects reaching five and even six stories has helped North American building professionals raise their comfort level with wood, a number of forward-looking architects, engineers, and developers want more. In fact, a recent report from Canadian architect Michael Green of MGA and J. Eric Karsh from Equilibrium Consulting Inc.—*The Case for Tall Wood Buildings: How Mass Timber Offers a Safe, Economical, and Environmentally Friendly Alternative for Tall Building Structures*—outlines a compelling case for building even taller wood buildings. The comprehensive study shows that mid-rise (six to 12 stories) and tall buildings (up to 30 stories)



LifeCycle Tower ONE by Cree GmbH, located in Dornbirn, Austria, uses a unique wood-hybrid construction system.

Photo courtesy of Cree Buildings, Inc.

CONTINUING EDUCATION

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Learning Objectives

After reading this article, you should be able to:

1. Recognize that mid-rise (six to 12 stories) and tall buildings (up to 30 stories) can be safely, efficiently, and economically built using mass timber construction techniques.
2. Discuss the different types of design approaches to mass timber construction for tall wood buildings.
3. Explain the similarities and differences between the structural composite panel and lumber products that allow building professionals to design and construct tall wood buildings.
4. Distinguish the differences between design approaches to accessing the acceptable structural passive fire protection measures in a mass timber building.

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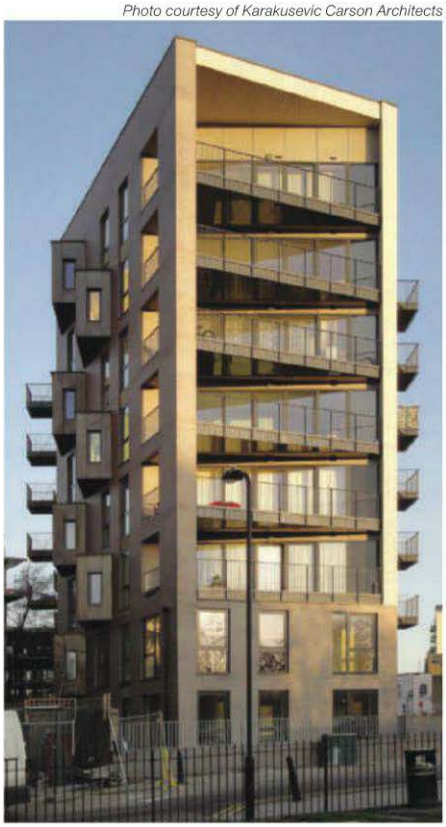
Photo courtesy of Karakusevic Carson Architects



When it was constructed in 2011, Bridport House was the largest timber-built apartment block in the world.

can be safely, efficiently, and economically built using mass timber construction techniques. In response, architects and engineers around the world are increasingly exploring and verifying the possibilities.

These "tall wood" concepts are anything but theoretical. Mass timber building techniques have been successfully proven in a number of projects worldwide, including a 10-story wood apartment building in Australia, an eight-story apartment building in the U.K., and an eight-story office building in Austria. Around the world, other tall wood projects are also on the books.

WHY WOOD?

Wood is a cost-effective, renewable resource with lower manufacturing greenhouse gas emissions than other building materials; it has the lowest embodied energy among major building materials (including steel and concrete).[1] When considering wood's carbon storage capabilities, mass timber buildings could actually have a negative carbon footprint because the wood continues to store carbon absorbed from the atmosphere during the tree's growing cycle.[2]

TALL WOOD BUILDING REPORT

In February 2012, Green and Karsh issued the *Tall Wood* report, which was funded with support from the Canadian Wood Council (CWC) on behalf of the Wood Enterprise Coalition (WEC) by Forestry Innovation Investment (FII).

Citing climate change as the principle reason for promoting the idea of using sustainably grown wood to build tall buildings, Green says, "We must find solutions for our urban environments that have a lighter climate impact than today's incumbent major structural materials. The *Tall Wood* report is a major step in that direction. Indeed, it introduces the first significant challenge to steel and concrete in tall buildings since their adoption more than a century ago."

The 240-page report highlights the feasibility of using mass timber building techniques and engineered wood building products, including cross laminated timber (CLT), laminated veneer lumber (LVL), laminated strand lumber (LSL), glued laminated beams (glulam), and others to build structures up to 30 stories. The report also details the ways in which tall timber structures can offer safe, economical, and environmentally friendly alternatives to steel and concrete.[3]

THE INSPIRATION BEHIND TALL WOOD BUILDINGS

What's driving the move to use wood in taller buildings? While cost effectiveness is usually viewed as the main reason to use wood, most building professionals involved in this movement cite the environment as their inspiration. They are driven by the need to find safe, carbon-neutral, and sustainable alternatives to steel and concrete. Tall wood structures allow designers to achieve both of these objectives: higher density at lower cost and a smaller carbon footprint for their projects.

While tall wood buildings are increasingly common in Europe and now Australia, the U.S. and Canada are still looking for sustainable building solutions, says Nabih Tahan, AIA, with Cree Buildings, Inc., a subsidiary of Cree GmbH in Austria, the developers of the LCT ONE. "Architects are realizing that the old ways of doing things will not continue to work; we are ruining the environment. Because of this, we're now seeing an industrial revolution for wood. Wood is a renewable product that can do much more than we have yet asked of it."

Advancements in mass timber building techniques and the development of engineered wood building materials such as CLT, LSL, and LVL are also allowing building designers to take wood higher than ever. The *International Building Code* (IBC) already allows wood-frame construction for five stories (and more if the structure includes a mezzanine or terrace) in many types of building occupancies, including multi-family and offices. These buildings, which utilize dimension lumber and structural wood panels as well as engineered lumber components, have proven themselves to be cost-effective alternatives to steel and concrete.[4] Mass timber construction allows wood to move to the next level.

WHAT PRODUCTS MAKE TALL WOOD POSSIBLE?

Technical development and growing availability of the following structural composite panel and lumber products enable the tall wood opportunity:

Cross laminated timber (CLT) is an engineered wood panel typically consisting of three, five, or seven layers of dimension lumber oriented at right angles to one another and then glued to form structural panels with exceptional strength, dimensional stability, and rigidity. CLT is manufactured to customized dimensions; panel sizes vary by manufacturer. It is currently available in North America with dimensions up to 19-1⁄2 inches thick, 18 feet wide, and 98 feet long. While length is usually limited by transportation restrictions, longer panels can be manufactured. CLT panels are typically installed like plywood in terms of grain orientation. Wall panels are oriented with the grain of the outside layers parallel to the vertical loads of the application. Floor and roof applications have the grain of their exterior layers oriented parallel to the span direction.

Rendering courtesy of MGA

In their *Tall Wood* report, authors Green and Karsh present a strong case for wood buildings up to 30 stories tall.

Laminated veneer lumber (LVL) is produced by bonding thin wood veneers together using waterproof adhesives under heat and pressure and then sawn to desired dimensions. The wood grain of the veneers is oriented parallel to the length of the member. Since it is manufactured with kiln-dried wood veneers and because each veneer layer is oriented in the same direction, LVL has predictable structural performance and dimensional stability, being virtually free from warping and splitting. LVL can be manufactured in a broad range of widths, depths, and lengths.

Laminated strand lumber (LSL) is also an engineered structural composite lumber product manufactured by aligning thin chips or strands of wood up to 6 inches in length and then gluing them under pressure. Like LVL, the wood grain of the strands is oriented parallel to the length of the member, and then the wood member is machined to consistent finished sizes. Common LSL sizes range up to 8 feet wide and 64 feet long. It is strong when either face- or edge-loaded, but typically has lower strength and stiffness properties than LVL.[5]

Glued laminated timber (glulam) is composed of individual wood laminations (dimension lumber), specifically selected and positioned based on their performance characteristics, and then bonded together with durable, moisture-resistant adhesives. The grain of all laminations runs parallel with the length of the member. Glulam can be used in horizontal applications as a beam, or vertically as a column. Glulam is available in depths from 6 to 72 inches or greater and in lengths up to 100 feet and longer. Glulam has excellent strength and stiffness properties; pound for pound, it is stronger than steel,[6] and is available in a range of appearance grades for structural or architectural applications.

WHAT IS MASS TIMBER CONSTRUCTION?

Mass timber construction uses large prefabricated wood members such as CLT, LVL, and LSL for wall, floor, and roof construction. Glulam can also be used in beam and column applications. Engineered for strength, these wood products offer a creative way to use smaller wood elements from sustainably managed forests while resulting in members that are strong and reliable, with almost no shrinkage.

Since CLT panels resist high racking and compressive forces, they are particularly cost effective for multi-story and long-span diaphragm applications. Some specifiers view CLT as both a product and a system that can be used interchangeably with other wood products; it can also be used in hybrid applications.

There are a number of different types of design approaches to mass timber construction for tall wood buildings. Builders can use a conventional platform-based CLT system, as was used for the 10-story Forté apartment building in Australia. The two other design examples include the LifeCycle Tower and FFTT systems. The LifeCycle Tower approach developed by Cree GmbH features hybrid panels composed primarily of glulam and concrete. In some cases, steel connectors may be used to provide ductility in the structure when needed to address wind and earthquake forces. The FFTT system, outlined in Green's *Tall Wood* report, uses a solid wood or concrete central elevator/stair core and CLT floor slabs in a balloon-frame system.

What is LifeCycle Tower?

LifeCycle Tower (LCT) is a unique wood-hybrid construction system developed by Cree GmbH, an Austrian-based general contracting, product development, and technology firm. This timber-based construction system relies on a central stiffening core for the elevator, stairs and shafts. A prefabricated hybrid wood/concrete slab system is supported by that core on the interior and by glulam posts on the exterior. The initial research

WOOD IS...

- Strong, lightweight, and versatile
- Sustainable, natural, recyclable, and renewable
- Carbon efficient, since it sequesters carbon and reduces greenhouse gases in the atmosphere
- Cost effective and abundant—easy to source locally
- Reliable, providing proven performance for seismic, wind, and other loading conditions
- Energy efficient, with lower thermal conductivity
- Warm, visually appealing, and inviting

Rendering courtesy of Lend Lease

At 10 stories tall, Forté in Melbourne, Australia, was the tallest timber apartment in the world when it was completed in 2012.

concluded that this system can be used to build sustainable structures up to 30 stories.

LCT system components can be produced by many different enterprises, providing excellent opportunities for regional craftsmen and the timber industry. Floor panel slabs are prefabricated using a proprietary design featuring a layer of reinforced concrete bonded to glulam beams. This process creates a decking panel that performs well both thermally and acoustically; the concrete also provides an added layer of fire protection. Lighting, HVAC, sprinklers, and mechanical systems are then housed in the voids between the structural glulam beams within the slab. Glulam columns support the floor slabs on the exterior. A wood-frame curtain wall, including windows, insulation, and sheathing, is also attached to the glulam columns in the shop. A series of metal plates, tubes, and pins is preinstalled in all the elements to speed up the on-site assembly process and connect all the elements.

Cree GmbH demonstrated their LifeCycle Tower methodology with LCT ONE, a demonstration project built in Austria that now serves as the firm's headquarters. While the concrete foundation and core was being built on site, the wall and floor panels were produced off-site. In March 2012, the speedy construction took place; eight stories were erected in just eight days.

What is FFTT?

FFTT, a term coined by Green and Karsh, stands for 'Finding the Forest Through the Trees.' The non-technical acronym represents the mass timber panel approach described in his *Tall Wood* report. Green's FFTT methodology uses mass timber panels and glulam as primary structural members to achieve potential building heights of up to 30 stories.

The structural details of FFTT feature a 'strong column-weak beam' balloon-frame approach, which uses large-format mass timber panels (CLT, LVL, or LSL) for the vertical structure, lateral shear walls, and floor slabs. The 'weak beam' component is made of steel beams bolted to the panels to provide ductility and to allow the building to perform under wind and seismic loading conditions. The 'strong column' uses engineered wood (glulam) columns and large-format mass timber panels as vertical structure, lateral shear walls, and floor slabs. Concrete is used for the foundation up to grade.

The system offers a number of benefits, including adaptability to different building types and quick installation. Green says the tilt-up wall configuration of a balloon-frame approach allows the builder to build up to six floors at a time, instead of erecting the building one floor at a time. "They tilt up the walls, and then carefully put the floors into place," says Green. "Height of the walls, comprised of CLT, LSL, or LVL, is limited only by manufacturing and transportation restrictions of a panel, and by the contractor's ability to lift a large panel into place if they're building in a dense urban area. It is a very different way to build a tall building."

WHY USE WOOD IN TALL STRUCTURES

There are many advantages that will lead to the increased use of wood in tall buildings, including environmental benefits, financial advantages, faster installation, and others.

Environmental Benefits

Although cost is the main reason cited for the use of wood in five- and even six-story buildings, climate change has been the biggest motivator for those developing systems that allow taller wood structures. Wood is the only major building material that grows naturally and is renewable. Life cycle assessment studies consistently show that wood outperforms steel and concrete in terms

Photo courtesy of Cree Buildings, Inc.

LifeCycle Tower ONE's prefabricated hybrid wood/concrete slab system is supported by a central stiffening core on the interior and by glulam posts on the exterior.

COST BENEFITS: FOUR- AND FIVE-STORY STRUCTURES

Wood-frame structures built using dimension lumber and traditional construction methods are also getting taller, and wood's cost competitiveness is a driving force in that growth.

- Emory Point, a mixed-use project near Emory University in Atlanta, Georgia, is a 442-unit project that includes one five-story wood-frame building over slab-on-grade and three four-story wood-frame buildings over one-story concrete podiums. Brad Ellinwood, P.E., of Ellinwood + Machado Consulting Structural Engineers, says they considered a number of systems but wood was the most economical. When they evaluated the cost of the structural frame portion only, the wood design cost approximately $14 per square foot compared to $22 per square foot for a 7-inch post-tensioned concrete slab and frame. The huge wood-frame project was completed in just over a year, which provided additional cost savings.

- Applewood Pointe at Langton Lake is a senior housing project in Roseville, Minnesota. The 48-unit four-story wood structure had a one-hour fire rating; it was sited over a three-hour rated pre-cast concrete parking garage, for a total of 123,964 square feet. According to Roger Johnson with JSSH Architects of Minnetonka, Minnesota, wood-frame was the most cost-competitive option, at $80 per square foot complete.

WOOD VERSUS ALTERNATIVE MATERIALS

Numerous studies have been conducted comparing the environmental impacts of using wood versus other materials. In 2005, the Consortium for Research on Renewable Industrial Materials (CORRIM) conducted two landmark studies on the life cycle environmental impacts of wood compared with steel and concrete. Phase I of the research examined the impacts of comparable wood versus concrete homes in Atlanta and Minneapolis; these results found wood to be better for the environment in terms of embodied energy, air and water pollution, and global warming potential. Phase II of the research looked more closely at carbon footprint, and found that the carbon stored in wood products offsets many of the emissions from other products.

of embodied energy, air pollution, and water pollution. It also has a lighter carbon footprint—because wood products continue to store carbon absorbed by the trees while growing, and wood manufacturing requires less energy and results in less greenhouse gas emissions.

In fact, wood buildings lock in carbon for the lifetime of a structure, while the manufacture of steel and concrete produces large amounts of CO_2. The International Energy Agency (IEA) estimates that for every 22 pounds of cement created, 13 to 20 pounds of CO_2 are produced.[7]

Cost Competitive

Because mid-rise wood structures have proven to be cost competitive, many in the industry expect that tall wood structures built with mass timber building techniques will be cost competitive with concrete and steel structures up to 30 stories. The fact that architects have their choice of different configurations provides flexibility, giving them the ability to use various mass timber building products depending on market availability. As additional design development occurs, and as additional manufacturing capacities come online, most experts expect costs to become even more competitive.

Besides offering a cost-effective construction option, owners and developers will also save money because mass timber structures can be installed much more quickly than steel or concrete. For example, development company Lend Lease estimates that the $11-million Forté apartment building in Melbourne, Australia, was built 30 percent faster because the materials were prefabricated. Off-site panelization saves money by speeding erection, which leads to quicker occupancy. Wood structures are also lighter weight compared to concrete, which can reduce foundation costs. This feature is particularly important in areas with poor soil where foundation costs are already high, as was the case with the Forté project.

Cree Buildings' Tahan says they expect costs to decrease as the company makes further improvements in technology and system design. During the research phases, Cree GmbH did a cost analysis, comparing a mass timber structure built using the LifeCycle Tower design and a wooden core with a concrete building with a concrete core. "Overall, our analysis showed that costs were not much different, and the larger the volume, the more affordable wood becomes," Tahan notes. "In addition, the CO_2 differences are huge."

When PE International, a firm specializing in sustainability, compared the CO_2 equivalents of the LifeCycle Tower mass timber building technique with a similar building of reinforced concrete, they determined that using wood resulted in a 92 percent reduction in CO_2. In comparison, costs of the wood and concrete systems were relatively close.[8]

Tall Wood Fire Safety

While fire safety is often considered one of the primary barriers to building tall structures with wood, research shows otherwise. Mass timber buildings behave very well in fire, primarily because the wood's thick cross-section chars slowly. Once formed, char protects the structural integrity of the wood inside and prevents further degradation. In addition, mass timber assemblies also have fewer combustible concealed spaces. The solid wood panels themselves essentially form the fire-rated assemblies between building compartments, reducing a fire's ability to spread undetected.

There are two design approaches to accessing the acceptable structural passive fire protection measures in a mass timber building. Encapsulation is used to provide fire-resistance rating to timber structures, but charring is increasingly accepted around the world as a valid means of achieving reliable and safe structural performance in fire.

Encapsulation. Designers can apply one or two layers (depending on the fire assembly required by code) of fire-rated gypsum board to the underside of floors and throughout the building to reach the desired protection level. This method is similar to standard construction techniques used to construct fire-rated floor, roof, and wall assemblies in both combustible and noncombustible building types.

Charring. The solid wood members used in mass timber construction allow a char layer to form. This, in turn, helps insulate the remaining wood from heat penetration. The fire-resistance rating of large-sized members can be calculated based on minimum structural thicknesses and the remaining sacrificial thickness available for charring. By combining modern fire suppression systems and compartmentalization, structures can be detailed to safely resist fire without encapsulation, using charring calculation methods. This eliminates the need for the gypsum board, reducing building weight and cost while showcasing the natural beauty of the exposed wood.[9]

Structures built using hybrid panels similar to those used in the LCT ONE project in Austria can take advantage of the additional fire protection properties provided by the concrete in the slabs. Cree GmbH has developed fire-rated assemblies for their wood hybrid panels offering 90-minute and two-hour ratings.

CLT FIRE TESTING RESULTS

In October 2012, the American Wood Council (AWC) conducted a successful fire resistance test on a load-bearing CLT wall at NGC Testing Services in Buffalo, New York. The test, conducted in accordance with ASTM E-119-11a (*Standard Test Methods for Fire Tests of Building Construction and Materials*), evaluated CLT's fire resistance properties. The five-ply CLT wall (approximately 6-7/8 inches thick) was covered on each side with a single layer of 5/8-inch Type X gypsum wallboard and then loaded to 87,000 lbs., the maximum load attainable by the NGC Testing Service equipment. The 10 x 10 foot test specimen lasted three hours, five minutes, and 57 seconds (03:05:57)—well beyond the two-hour goal.

See endnotes in the online version of this article.

Continues at ce.architecturalrecord.com

The Makings of a Great Subfloor

High-performance panels stand out in strength, moisture resistance, and sustainability

Sponsored by Huber Engineered Woods

Probably no other element receives as much wear and tear in a building as flooring. What goes underneath the top flooring layer is critical in determining the performance and longevity of a building's entire flooring system. Used for structural and foundation support, subfloors ideally minimize moisture absorption and help prevent excessive movement, sagging, unequal heights, separation, or squeaking within the floor system. This article will offer a comparative analysis of the various types of subflooring available for single-family homes, focusing on the characteristics that determine a quality subfloor and their implications for long-term performance. Prevailing standards for each type of product will be discussed as will the basic principles of a sound subfloor in multifamily and light commercial projects.

SUBFLOORING—WHAT IS IT?

Subflooring is the rough floor and, for single-family homes, typically the only layer between the decorative flooring and the joists. Subflooring is one of the fundamental elements of interiors. A stable, level subflooring is critical to the durability and longevity of the finished flooring materials. There are several types of subflooring available.

Plywood

Until the 1980s, tongue-and-grooved plywood was the predominant structural subfloor material used in homes. Plywood is fabricated from glued strips of wood veneer layered at alternating 90-degree angles and then heat treated. Cross-laminated and layered, plywood is stronger and not susceptible to the expansion and contraction that affects dimensional lumber. Typically, plywood is available in 4-foot x 8-foot sheets that are either 5/8 or 3/4 inches thick. The tongue and grooved sheets interlock to create a secure base for finished flooring. To prevent hearing squeaks later through the finished flooring, subfloor caulking adhesive on the top of the floor joists can be applied before screwing the plywood sheets to the floor joists.

Experts maintain that most hardwood flooring including engineered wood and laminates can be installed directly over 5/8-inch or 3/4-inch-thick plywood subfloors. Engineered or solid wood flooring less than 1/2 inch thick can be installed over a plywood subfloor. However, in the case of a weak subfloor that flexes up and down when walked on, an additional layer of 3/8-inch or 1/2-inch-thick plywood underlayment, glued and screwed down over the weaker subfloor, will add stability. Installing thinner wood flooring over an already weak or thin subfloor may cause the whole floor system to flex up and down when walked on.

Oriented Strand Board

Using 3-inch to 4-inch strands of wood that are also layered and configured in a crossing pattern, then glued and pressed, oriented strand board (OSB) is more dense than plywood and absorbs less moisture. Installation usually consists of gluing and nailing the OSB sheets to the floor joists. Typically, 3/4-inch-thick solid wood flooring is installed directly on top of a 3/4-inch-thick OSB subfloor, with hardwood floors at a 90-degree angle across the floor joists to stabilize and strengthen the whole floor structure. In cases where hardwoods are installed parallel with the floor joists, a second layer of plywood underlayment can be added to increase stability. Alternatively, blocking can be added between the floor joists. When installing engineered, solid, or floating floors that are less than 1/2 inch thick, manufacturers recommend an additional layer of 3/8-inch or 1/2-inch-thick plywood underlayment. The additional underlayment should be glued and screwed down over 3/4-inch-thick OSB subfloor to add stability. As an alternative 2 x 6 blocking can be installed between the floor joists for added stability.

When a roofless, partially built structure takes on water, both plywood and OSB can absorb water, which can lead to swelling and require sanding or replacement before finish flooring can be installed. Many consider OSB more structurally consistent than plywood, as it does not carry the delaminating issues that plywood does. On the other hand, OSB can experience edge swelling when exposed to significant amounts of moisture. According to PATH, a public-private partnership for advancing housing technology, edges—particularly if they are cut edges—can expand by up to 15 percent. In addition, PATH notes that when plywood gets wet, it expands evenly throughout the panel, dries more quickly, and shrinks to its original size more rapidly than OSB.

Subflooring is a critical structural element that can determine the performance and longevity of the entire flooring system.

All photos and illustrations courtesy of Huber Engineered Woods

Concrete Slab

Concrete slabs, which typically consist of a 4- to 6-inch-thick 3,500- to 5,550-lb-strength concrete pour, can be susceptible to moisture problems. Because water is used in mixing the newly poured slabs and can take several months to dry out, testing should be performed prior to installation of flooring finish. This can be as simple as taping the several sheets of plastic down in several areas of the slab, and waiting a few days. If moisture develops under the plastic, wood flooring should not be installed until the moisture situation is rectified. Depending on ground water levels, slabs can emit excessive moisture at different times of the year. It's worth noting that slab floors with plastic installed prior to the pour will be more apt to minimize moisture transfer.

It is not recommended that 3/4-inch solid wood flooring be nailed or directly glued down over a concrete slab as floor failure might result from moisture transfer. Alternatively, a "sleeper system" can be built over the slab using wood strips spaced 12 inches apart over which plywood can be placed. In another method, two layers of wood subfloor can be cross-layered diagonally over the slab. In any case, for best results, plastic should be laid down on the slab to retard any moisture transfer from the concrete. For a glue-down engineered wood floor over concrete slab, it is advisable to ensure that the slab has less than 4 percent moisture content year-round. A water-resistant adhesive should also be used.

High-Performance Paneling

High-performance paneling is an engineered wood with many of the same characteristics and qualities as OSB and plywood, but with distinct advantages. Developed to address the

CONTINUING EDUCATION

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Learning Objectives

After reading this article, you should be able to:

1. Identify four types of subfloor.
2. Describe the characteristics that make for a safe, sound, sustainable subfloor.
3. Explain the importance of Evaluation Service Report standards.
4. Detail the implications of excessive moisture in a subfloor.

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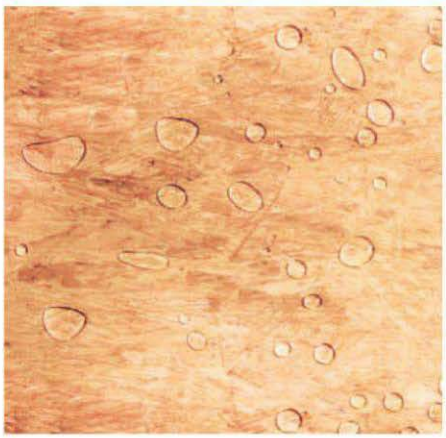


Advanced, moisture-resistant resins make water bead up, and not penetrate, high-performance subflooring.

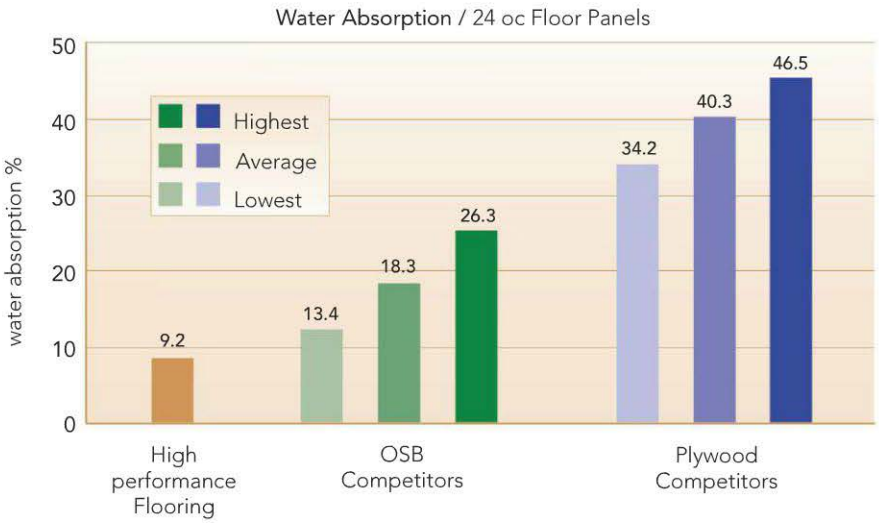
need for moisture-resistant subflooring, high-performance panels are essentially enhanced OSB that feature a resin integrated with the wood to resist water absorption and reduce the swelling common in the OSB subflooring. Specially engineered through advanced resin technology to resist water absorption, high-performance panels minimize not only edge swell, but warping, cupping, and delaminating, thereby eliminating the need for sanding and costly rework. While typically the panels do not need to be sanded due to edge swell, some sanding may be required to ensure levelness of the floor system. Water repellent coatings are not recommended with high-performance subflooring.

"Due to severe rain, floods, and snow this year, we have recently faced a very high moisture level in Kentucky. No matter what we tried when building with plywood, we had problems with the floor squeaking, delaminating, and swelling as a result of the moisture," stated Builder Joe Pusateri of Elite Homes in Louisville, Kentucky. "In the past, we had to add a day into our building scheduling to repair the damaged plywood spots caused by the moisture-related issues. Once we began using high-performance subfloors, we were able to remove that step in our building process, which saved us time in the long run to concentrate on other parts of the build and deliver the best possible living environment to the future homeowners."

In addition to being moisture resistant, high-performance panels are a more durable alternative to a traditional plywood or OSB underlayment. Through an optimal balance of density and advanced resin technology, the panels deliver greater stiffness and strength as well as superior nail holding capability. The flooring is available in 19/32-inch, 23/32-inch, 7/8-inch, 1-inch, and 1 1/8-inch thicknesses, and install and remain flat.

Like plywood and OSB, high-performance subfloors represent an excellent substrate for a variety of floor coverings including carpet, tile, and hardwood flooring. Wood flooring is glued or nailed directly to the high-performance panels or applied after in conjunction with other wood flooring underlayment materials. Architects should note, however, that moisture contents are critical when installing hardwood flooring. Ideally the inside of a home should be HVAC controlled to help with acclimation of the wood products at the time of hardwood flooring installation. To reduce the chances of buckling, cupping, and gapping of the hardwood flooring, the moisture content of the subfloor panels and hardwood flooring should be less than 12 percent before installing hardwood flooring, and ideally the difference in moisture content between them should be within 4 percent. Manufacturers recommend a pin-style moisture meter or similar should be used to determine moisture content of both the high-performance subflooring and the hardwood flooring.

Ceramic tile floors can be particularly challenging as they do not tolerate any type of movement within the subfloor without cracking. With less deflection than plywood or OSB, high-performance panels can be a better subfloor option for ceramic tiles. However, ceramic tiles should not be installed directly over high-performance panels; an approved underlayment must be installed prior to tile installation. The Tile Council of America *Handbook for Ceramic Tile Installation* should always be consulted for acceptable methods of tile installation on structural panel substrates.



All testing was conducted by an independent IAS accredited testing facility in September 2008. This small sample testing was done in accordance with the applicable ASTM standards and test methods. OSB values are based on lowest, average and highest water absorption levels of four manufacturers. Plywood value is based on the lowest, average and highest water absorption levels of three manufacturers. Testing samples correspond to single manufacturing locations from one production date.

TO THE HIGHEST STANDARD

Architects should be aware of the higher standard to which high-performance paneling is certified.

Both plywood and OSB are considered structural panels and treated equally in the building codes. The International Building Code defines OSB as wood structural panels intended for structural use complying with the requirements of Department of Commerce PS 2, Performance Standard for Wood-Based Structural-Use Panels. Section 2303.1.4 of the IBC states that every panel shall be designed and fabricated in accordance with the applicable standard and identified by the trademarks of an approved testing and inspection agency indicating conformance with the applicable standard. Two of the more recognizable companies that have been accredited by the International Accreditation Service (IAS) for testing and inspection of wood structural panels in the U.S. are the Timber Engineering Company (TECO) and APA–The Engineered Wood Association. PS 2 is a voluntary product standard that establishes the performance criteria for structural panels based on their end-application. It details testing procedures to qualify the product and quality control provisions to manufacture the product. All manufacturers of OSB must comply with the requirements outlined in PS 2 and plywood must meet either PS 2 or PS 1.

All approved testing and inspection agencies for wood structural panels, specifically OSB, test and inspect to the same PS 2 standard. When a panel is identified in the grade stamp by the trademark of an approved testing and grading agency, it indicates that the panel conforms to PS 2. Individual testing agencies do not have their own performance standards. They only test to ensure that panels satisfy the requirements of the IBC by ensuring

conformance to PS 2. For the purpose of design, panels bearing the trademark of TECO or APA should be considered equally capable of satisfying minimum performance requirements. High-performance panels may be subject to meeting performance requirements that exceed the PS 2 minimums and will be indicated by being stamped with an Evaluation Service Report (ESR) number or some other identifying mark.

ESRs are reports issued by evaluation services, like the International Code Council (ICC) Evaluation service, which is the most preferred resource used by code officials to verify that new and innovative building products comply with code requirements. ESRs are mostly referenced by architects, structural engineers, and other design professionals when specifying and selecting building materials. They detail the code requirements or acceptance criteria used to evaluate the new product and the evidence submitted to prove its conformance.

Manufacturers of engineered strand products with properties superior to those established under PS 2 can differentiate their products with an ESR. For years builders have had choices in dimensional lumber selection by product quality via grades—SS, #1, #2. Architects and builders now have the same choices in panel products with an ESR.

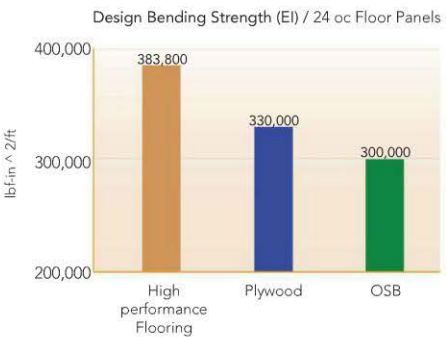
ESR 1785 states that some high-performance panels adhere to a higher standard than those qualified under PS2-10 for bending strength, bending stiffness, planar shear strength, axial compression strength and stiffness—all prerequisites to building a quiet stiff floor. Bending strength, which represents how much load a panel will hold along the 8-foot length before failure, is a critical component of the overall structural integrity, safety, and longevity of a building. High bending strength helps sustain a quiet, stiff floor over the lifetime of a home.

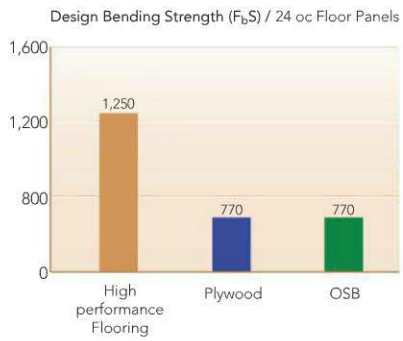
Bending stiffness represents how much load an engineering subflooring panel will resist bending on the 8-foot length under a heavy load. High bending stiffness will feel firm under foot and will not bounce or sag under a heavy load. Flooring that bounces or sags can crack tile, loosen hardwood flooring nails, and cause vibrations, resulting in floor squeaks and costly rework. As can be seen in the figure below, the bending stiffness of high-performance panels outstrips that of plywood and OSB.

High-performance subflooring is a suitable substrate for finish flooring options.

A subflooring's strength and stiffness can also lead to lower costs. Mike Hancock of Hancock Building & Design in Edmond, Oklahoma, likes high-performance panels for their high strength and minimal deflection. "The product allows me to use thinner sheets for the same cost as thicker plywood products," Hancock says.

Through evidence submitted on product performance, PS 2 requires a 23/32 OSB subflooring panel to meet a parallel bending strength (EI) of 300,000 lbf-square inch/foot, and plywood subflooring panel to meet 330,000 lbf-square inch/foot. One manufacturer of high-performance subflooring, however, engineers, manufactures, and tests to meet a parallel EI of 383,800 lbf-square inch/foot, which is 16 to 28 percent higher than that of plywood and OSB, meaning it offers superior strength and stiffness, less sagging or bounce, and consistent performance when installed on the jobsite.





Additionally, APA–The Engineered Wood Association, conducted 2,000 nail-withdrawal tests on OSB and plywood of different thicknesses using different types of nails and over multiple conditions, and determined, through the testing, that the equivalent specific gravity for nail withdrawal strength of APA OSB and plywood is 0.40. High-performance panels have shown an equivalent specific gravity of 0.44, which was derived from testing evidence submitted for ESR-1785. This calculated to an allowable nail withdrawal value of 23 lb/inch of thickness for an 8d common nail, so a 23/32 panel would be 16 lb of nail holding strength. APA plywood and OSB only have a value of 13 lb. The implication of this is that high-performance products can perform more consistently and better regarding fastener holding power, meaning more structural stability and fewer floor squeaks than plywood or commodity OSB, leading to a smoother, less costly construction process with fewer callbacks.

Shane Lyle of Strathmore Floors in Atlanta, Georgia, specializes in finished flooring services and often handles rework associated with plumbing leaks. He maintains that homebuilders who choose high-performance panels for subflooring spend less on construction costs, as it creates less rework for flooring professionals. "Due to rising costs in the construction industry in 2003 and 2004, we saw homebuilders switching from high-performance subflooring to commodity oriented strand board because they felt it would decrease building costs," says Lyle. "We found that the OSB reacts poorly to moisture and many times the subfloors and hardwoods in these homes had to be replaced. To fix the homes, we had to hire a full-time sanding crew, creating expensive and time-consuming rework."

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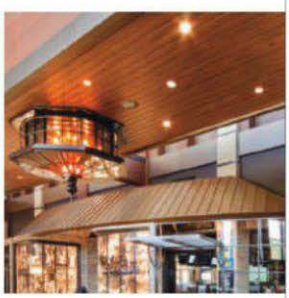

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Create the tallest towers, the most ridiculous shapes, the truly impossible structures. Children and adults alike are encouraged to put their skills to the test and let their imaginations run wild with blocks—small, big, and virtual—in this new exhibition that also features a selection of architectural and construction toys from the Museum's collection.

PLAY WORK BUILD was developed in partnership with Imagination Playground and is designed by Rockwell Group.

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NATIONAL BUILDING MUSEUM

Ongoing Exhibitions

Frames for Living:
The Work of William Wurster
Cambridge, Massachusetts
Through December 28, 2012
William Wurster (1895–1973) was a pioneer of Modernist architecture and one of the most influential architecture educators of the 20th century. Appropriate to the California landscape and climate, his houses capture living space from the outdoors and feature high ceilings and overscaled windows that belie their small size. *Frames for Living* examines the innovative houses that are often regarded as Wurster's greatest accomplishment as a designer. At the Massachusetts Institute of Technology. For more information, visit mit.edu.

Eero Saarinen: A Reputation for Innovation
Los Angeles
Through January 3, 2013
Born in Finland, Eero Saarinen is recognized today as one of America's most influential architects of the 20th century. This exhibition at A+D Architecture and Design Museum highlights his short but brilliant career that is bookended with two iconic buildings: the unbuilt Smithsonian Gallery of Art and Dulles International Airport. For more information, visit aplusd.org.

California's Designing Women, 1896–1986
Los Angeles
Through January 6, 2013
Presented at the Autry National Center, this unprecedented exhibition honors 46 women designers and includes more than 200 examples of textiles, ceramics, furniture, lighting, jewelry, clothing, and graphics. These functional and decorative objects—from Arts and Crafts to Art Deco to Mid-Century Modern and beyond—exemplify California's national and international reputation for unrestrained creativity. For more information, visit theautry.org.

Field Conditions
San Francisco
Through January 6, 2013
This exhibition at the San Francisco Museum of Modern Art bends and blurs the boundaries between conceptual art and theoretical architecture, using the notion of the "field" to frame an investigation into the construction, representation, and experience of space. Nearly 30 works in various media by both contemporary artists and practicing architects will be on view, including pieces by Daniel Libeskind, Sol LeWitt, and Lebbeus Woods. For more information, visit sfmoma.org.

A Long-Awaited Tribute: Frank Lloyd Wright's Usonian House and Pavilion
New York City
Through February 13, 2013
In 1953, six years before the Frank Lloyd Wright–designed Solomon R. Guggenheim Museum opened to the public, two of his structures—a pavilion and model Usonian house—were built on the future site of the museum to house a temporary exhibition displaying the architect's lifelong work. This exhibition at the Guggenheim Museum comprises selected materials from the Solomon R. Guggenheim Museum Archives, highlighting the first Wright buildings erected in New York City. For more information, visit guggenheim.org.

The Lost Vanguard: Russian Modernist Architecture, 1922–32
Chicago
Through February 16, 2013
This exhibition at the Graham Foundation features the work of Modernist architects in the Soviet Union in the years following the 1917 revolution and the period of instability during the subsequent civil war. *The Lost Vanguard* demonstrates that in little more than a decade, some of the most radical buildings of the 20th century were completed by a small group of architects who developed a new architectural language in support of social goals of communal life. For more information, visit grahamfoundation.org.

Echoes of Silence: Philip Trager, Early Photographs, 1967–83
New York City
Through February 17, 2013
Philip Trager is widely acknowledged as one of the foremost photographers of architecture and dance of the 20th century. This exhibition at the New York Public Library Stephen A. Schwarzman Building focuses on Trager's early work. Included in the exhibition are seldom-seen landscape studies and photographs taken in San Francisco, Barcelona, and Paris. It also includes several selections from an unfinished commission to document the architecture of Frank Lloyd Wright. For more information, visit nypl.org.

Detroit Disassembled
Washington, D.C.
Through February 18, 2013
In this exhibition at the National Building Museum, Andrew Moore examines the tragic beauty of the unsettled and unsettling territory of a ruined Detroit. Thirty monumentally scaled photographs depict windowless grand hotels, vast barren factories, collapsing churches,

offices carpeted in velvety moss, and entire blocks reclaimed by prairie grass. These images disclose how the forward march of the assembly line has been thrown spectacularly into reverse in Detroit. For more information, visit nbm.org.

Building: Inside Studio Gang Architects
Chicago
Through February 24, 2013
Studio Gang Architects is a team of 40 architects, designers, and thinkers who have produced some of the most inventive and award-winning architecture today. Featured not as a survey or retrospective, Studio Gang Architects projects in this exhibition at the "Art Institute of Chicago are showcased in an engaging workshop-like environment that reveals the practice's creative processes as they address pressing contemporary issues through architecture. For more information, visit artinstituteofchicago.org.

Tokyo 1955–1970: A New Avant-Garde
New York City
Through February 25, 2013
MoMA presents *Tokyo 1955–1970,* the first museum exhibition to focus on the city of Tokyo during the remarkable period from the mid-1950s through the 1960s, when it transformed itself from the capital of a war-torn nation into an international center for arts, culture, and commerce. For more information, visit moma.org.

Skyline Adrift: Cuban Art and Architecture
Ghent, New York
Through May 2013
This politically and aesthetically groundbreaking show of multidisciplinary, site-specific installations by two Havana-based architects (Yilena Lourdes Feitó Echarri and Yoandy Rizo Fiallo) and two internationally established Cuban artists (Alexandre Arrechea and Armando Mariño Calzado) will be on display at the OMI International Arts Center. The exhibition reflects current Cuban creative sensibilities across a broad spectrum of sculpture, architecture, and installation art. For more information, visit artomi.org.

Competitions

International Parking Design Competition
Submission Deadline: December 31, 2012
Each year the International Parking Institute (IPI) recognizes trends in parking-facility design that are aesthetically pleasing as well as functional, green, and sustainable. In its 31st year, the annual IPI Awards of Excellence competition will honor parking facilities completed or renovated since January 1, 2010. There is an entry fee of $375 for IPI members and $600 for nonmembers. For more information, visit parking.org.

eVolo 2013 Skyscraper Competition
Registration Deadline: January 15, 2013
eVolo magazine invites architects, students, engineers, designers, and artists to redefine skyscraper design through the implementation of novel technologies, materials, programs, aesthetics, and spatial organizations. There are no restrictions in regards to site, program, or size. Participants must answer the question: What is a skyscraper in the 21st century? For more information, visit evolo.us.

National Humanities Medal Design Competition
Submission Deadline: February 1, 2013
The National Endowment for the Humanities is seeking a new design for the National Humanities Medal, which is bestowed annually by the president in a White House ceremony. The winning designer will receive $3,000 and be invited to an unveiling of the final medal in Washington, D.C. For more information, visit humanitiesmedaldesign.challenge.gov.

Timber in the City: Urban Habitats
Registration Deadline: March 6, 2013
This competition challenges architecture students and young professionals, working individually or in teams, to design a mid-rise, mixed-use complex for a site in the Brooklyn waterfront neighborhood of Red Hook. A panel of judges will award the winning teams with cash prizes totaling $30,000, and the projects will be publicly exhibited at the 2014 Association of Collegiate Schools of Architecture annual meeting in Miami and the American Institute of Architects 2014 convention in Chicago. For more information, visit acsa-arch.org.

Bentley System's 2013 Design Competition
Submission Deadline: April 5, 2013
This competition invites university, college, high school, and technical-school students to submit projects designed using Bentley software, along with a short essay describing their work. Project submissions will be judged by an independent panel of educators and industry professionals from around the world. The judges will assess creativity and skill in applying design and engineering principles. For more information, visit bentley.com.

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