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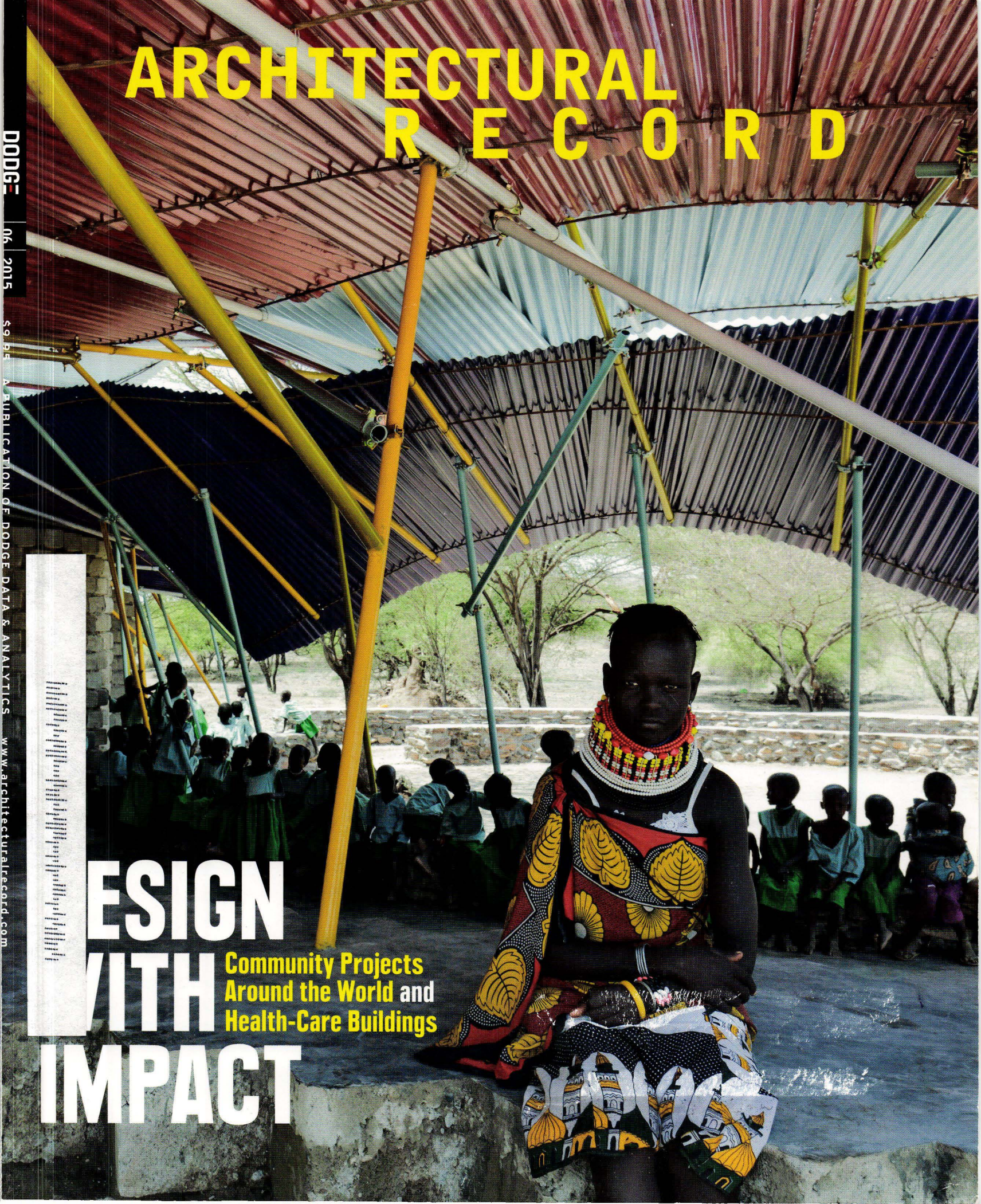

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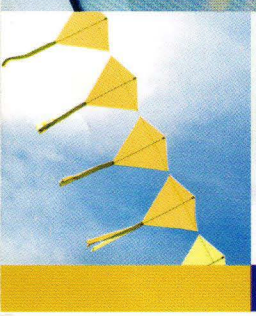

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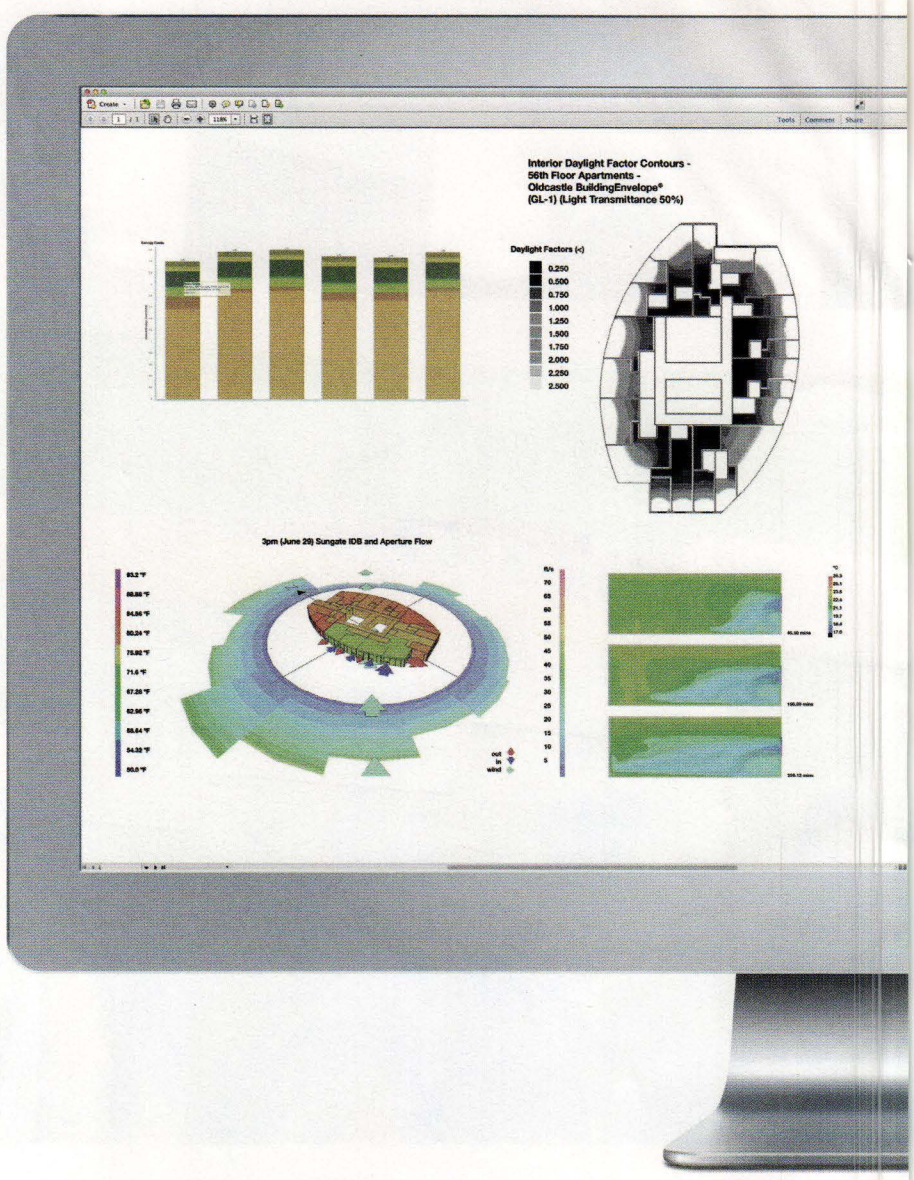

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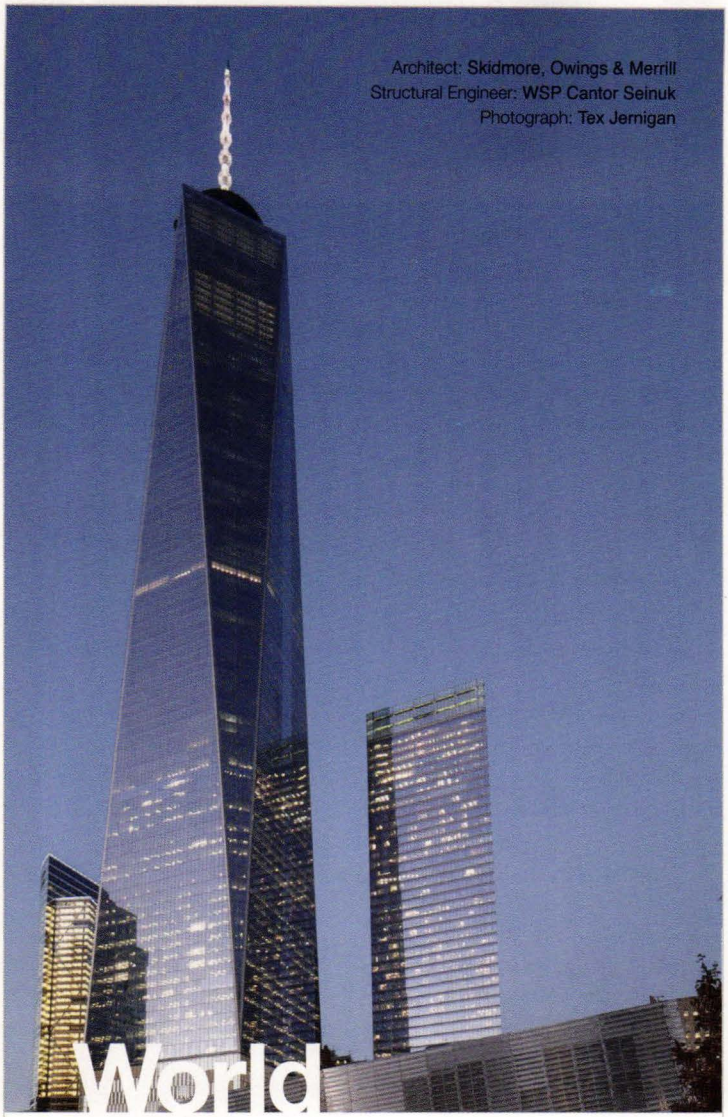

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CIRCLE 65

ARCHITECTURAL RECORD

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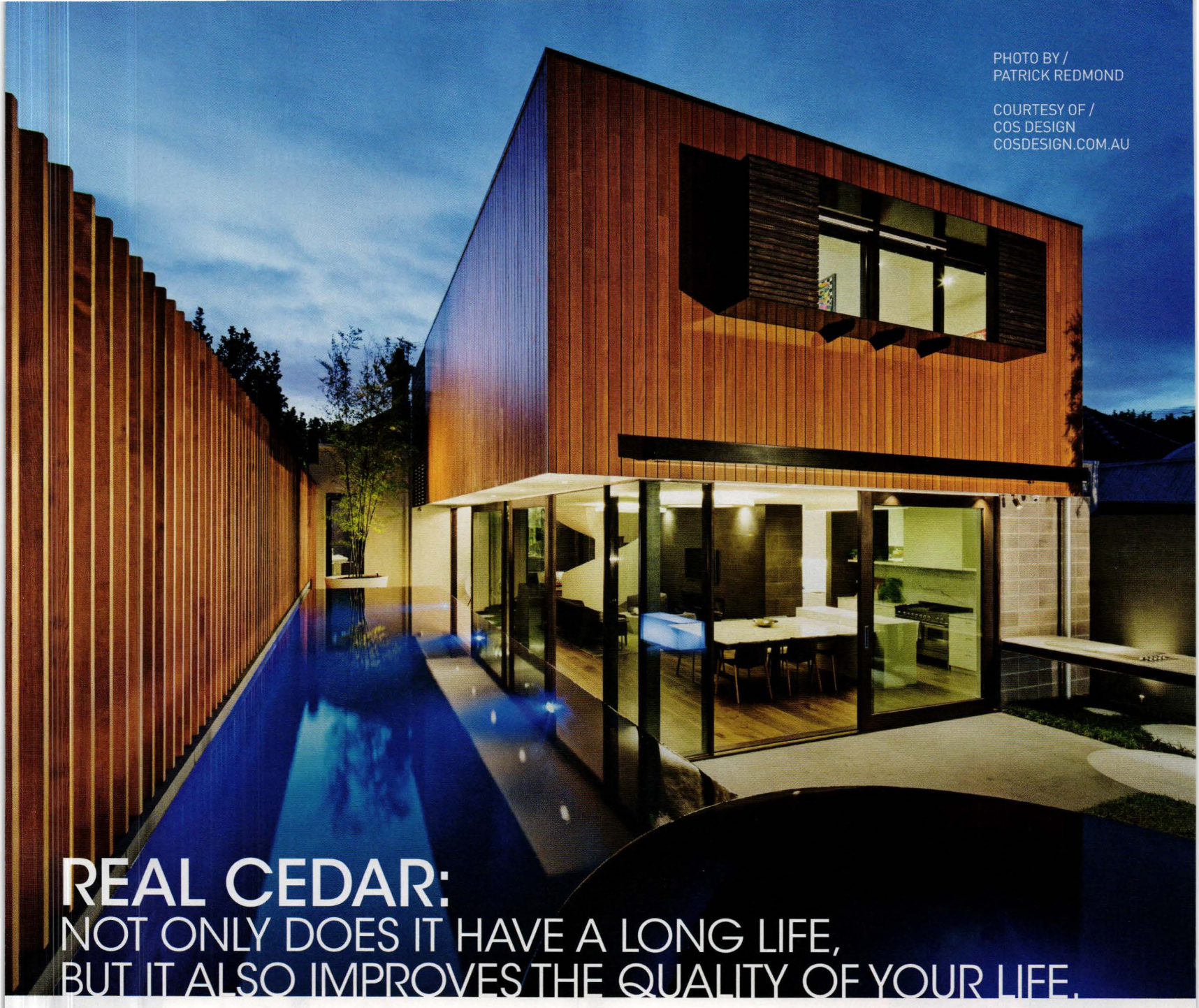

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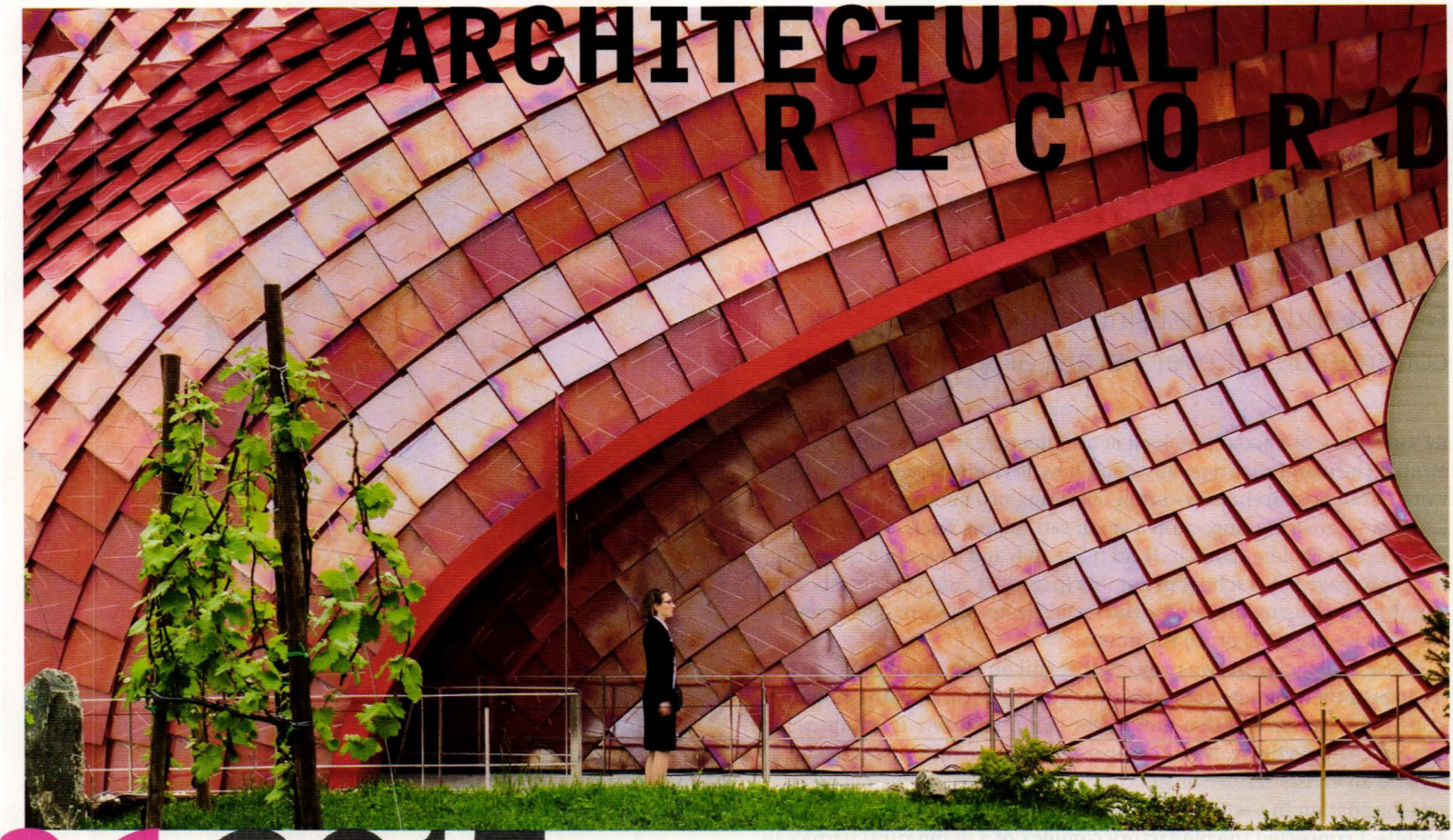

ARCHITECTURAL RECORD

06 2015

NEWS

DEPARTMENTS

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BUILDING TYPE STUDY 959 HEALTH CARE

ARCHITECTURAL TECHNOLOGY

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ON THE COVER: KONOKONO VACCINATION CENTER, BY SELGASCANO. PHOTO BY IWAN BAAN.

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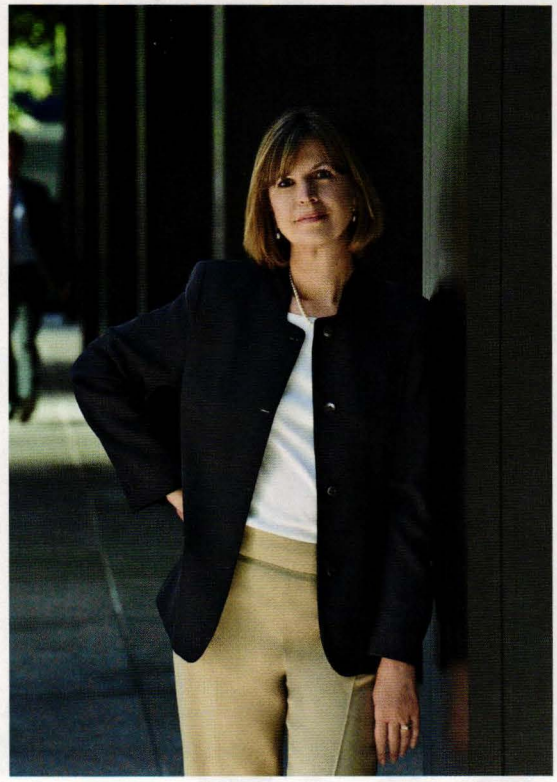
The Transformative Power of Architecture and the Arts

Design and culture bring change to communities at every scale, around the world



IN THIS issue of RECORD, we look at architecture in communities around the world that typically don't have access to good design. The work of talented architects—often operating pro bono or at reduced fees—can have a big impact on a small settlement. Such exemplary projects as a cholera clinic in Haiti (page 104) and a vaccination center in Kenya (page 94), a school in Zambia (page 108), and, closer to home, a multiunit housing project for the formerly homeless in downtown Los Angeles (page 88) prove the point.

We've also included two projects that call on the arts or culture to transform their remote communities. "Art is a form of nourishment," said Susan Sontag, and that hunger for cultural sustenance is universal. In a Senegalese village, New York–based architect Toshiko Mori created an artists residence and community center, sponsored by an arts foundation in Connecticut (page 98), while Beijing-based He Wei Architect converted the old factory complex of a dying rural hamlet in China into a cultural center celebrating the local tradition of making oils and cereals—and now the village attracts 20,000 tourists a year.

The transformative power of art and culture on communities in the U.S. is well known. Artists looking for cheap studio space and living quarters start a migration into a neglected urban neighborhood; before long, a few bars and restaurants arrive, followed by boutiques, clubs, and hipsters. Soon real-estate investors arrive and, voilà! You have SoHo in New York; Deep Ellum in Dallas; the Warehouse District in New Orleans. Meanwhile, the struggling artists have long moved on.

Recently I wandered around the Arts District in downtown Los Angeles. This is not where the big cultural institutions are on Bunker Hill—Gehry's Disney Concert Hall and Isozaki's Museum of Contemporary Art, to be joined in September by the Broad Museum, designed by Diller Scofidio + Renfro.

The Arts District is actually a branded business-improvement district farther east, in a rundown neighborhood of old warehouses, industrial buildings, and parking lots near the Southern California Institute of Architecture (SCI-Arc). Artists and creative types have been living there—and in Chinatown and Little Tokyo nearby—for decades. But, though still scruffy in character, the neighborhood has been prettifying very quickly in the last few years, with new shops, cafés, and warehouses renovated for offices and loft living opening up. Numerous construction projects are under way. Along one edge of the neighborhood is the spanking new white-stucco condo and mixed-use development One Santa Fe, designed by Michael Maltzan, which snakes dramatically along for a quarter mile, almost parallel to SCI-Arc, which was originally a freight depot. The apartments are mostly market-rate (20 percent are set aside as affordable) and will bring even more upscale urbanites to the neighborhood.

And, yes, the arts are about to boom in the Arts District too. Near One Santa Fe is a former flour mill complex—now closed, forlorn, and shabby—that will become the home of Hauser Wirth & Schimmel, a huge branch of the Swiss gallery franchise. The seven buildings and courtyard of the complex will be adapted for 100,000 square feet of art and installation space—for commercial shows as well as what the gallery is calling "museum-caliber exhibitions"—plus a restaurant. The design consultant is New York–based Annabelle Selldorf, architect of many prestigious galleries in New York, London, and elsewhere. This kind of cultural enterprise, with an opening planned next year, clearly will be a neighborhood game-changer.

Some cities are trying to deal with the transformative power of culture and still maintain economic diversity (see our news report on page 20 about New York's new cultural plan). And we salute good architects who have a hand in creating places for art, education, and health—especially when they do so at every scale, for people of all incomes. Undeniably, the arts bring life to communities—whether to once-gritty neighborhoods in wealthy Western cities or to the world's remotest villages. ■

Cathleen McGuigan

Cathleen McGuigan, Editor in Chief

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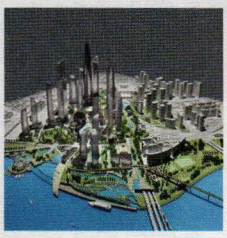

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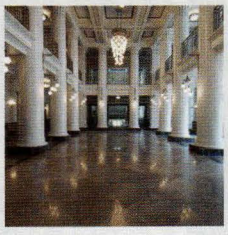

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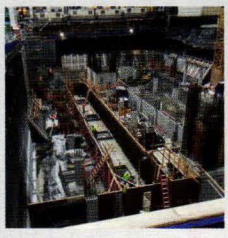

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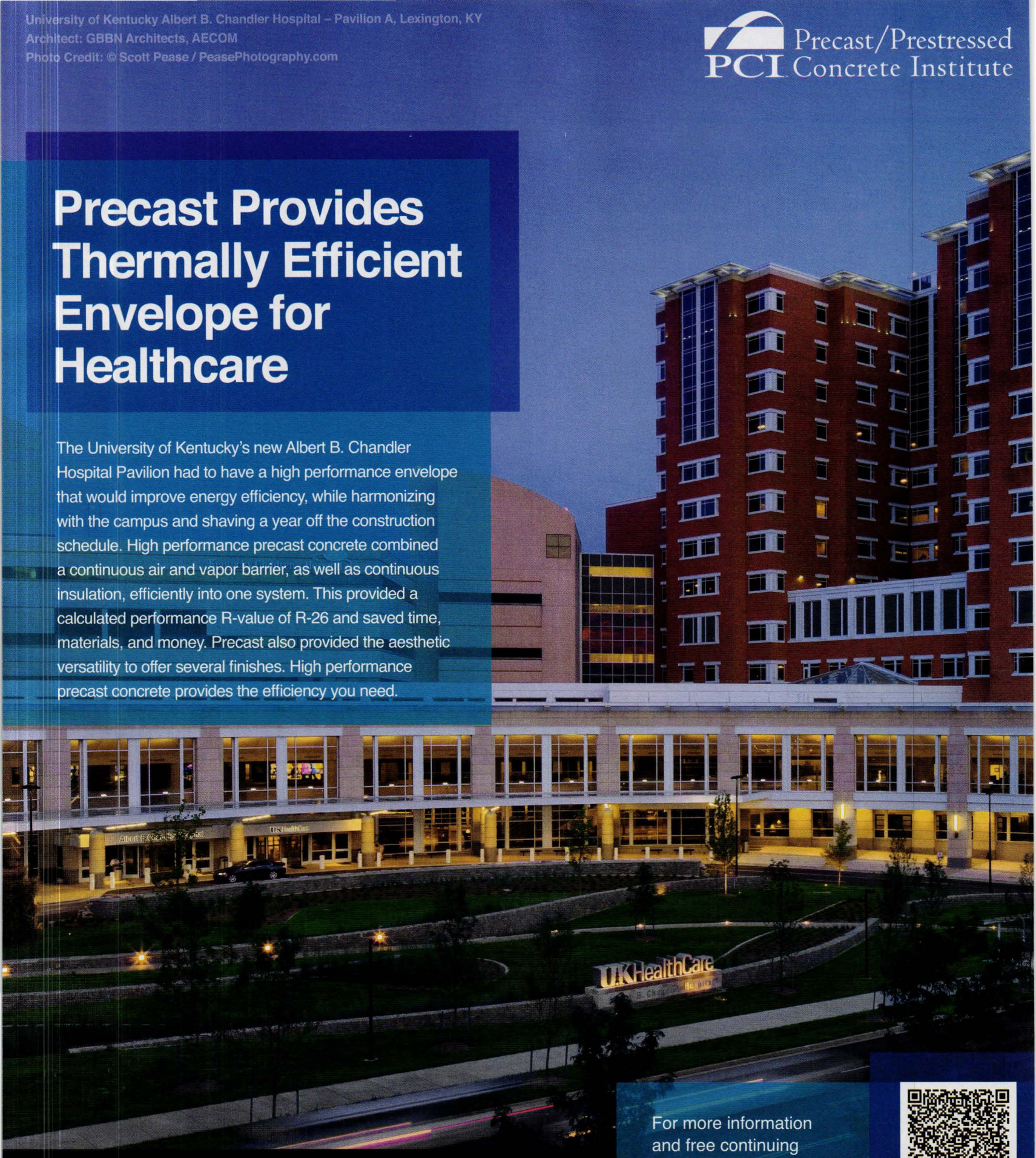

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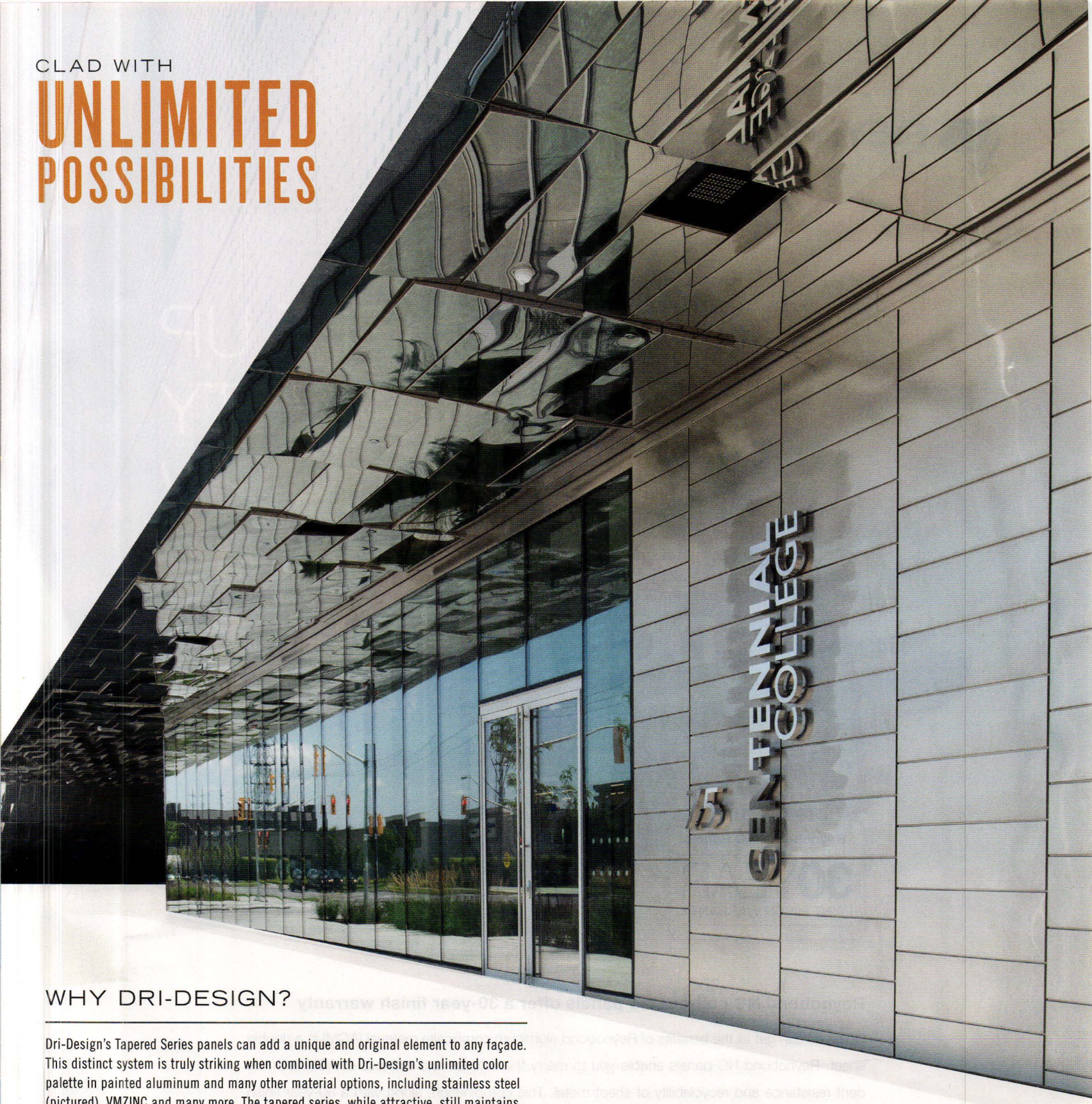

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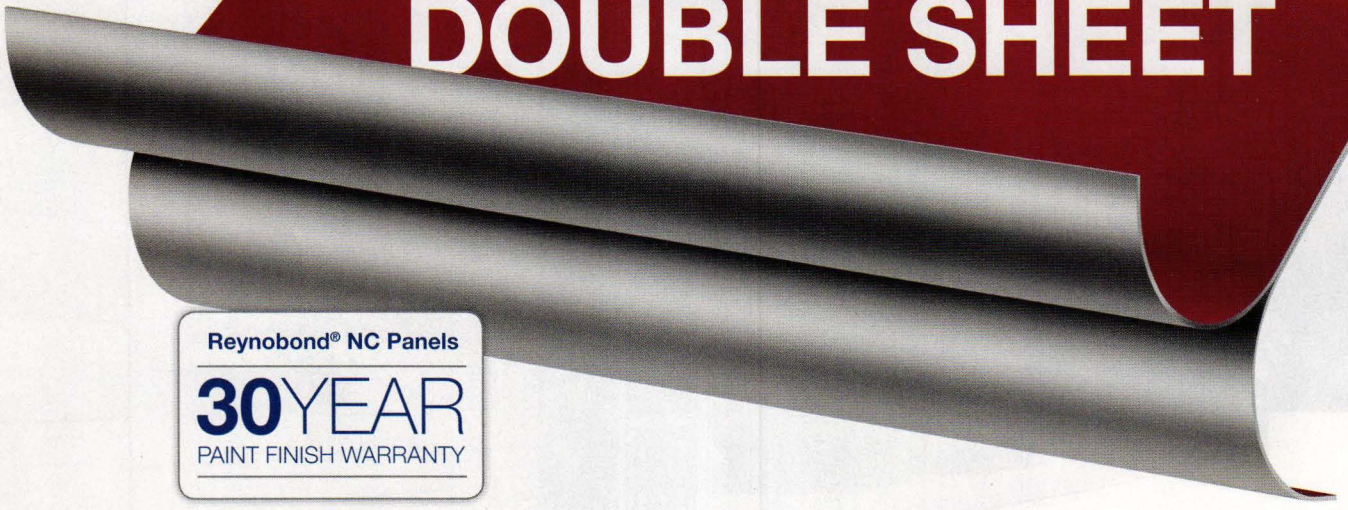

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perspective

I am not a politician.

–Jean Nouvel, speaking to RECORD *about worker conditions at his Louvre Abu Dhabi site, after an event at New York's Museum of Modern Art on May 11th. The French architect went on to explain, however, that he has visited the construction site and workers' accommodations and found fair conditions.*

From the Rubble: Architects and Preservationists Assess How to Aid Nepal

BY ANNA FIXSEN

Dharahara Tower in Kathmandu is just one of many historic monuments destroyed in Nepal's recent earthquake. Dozens of visitors were killed in its collapse.

PHOTOGRAPHY: © NIRANJAN SHRESTHA/ASSOCIATED PRESS

AROUND LUNCHTIME on April 25, droves of visitors were busy ascending the 213 steps to the summit of Dharahara Tower—one of Kathmandu's most iconic structures—to take in views of the city and the surrounding valley. At 11:56 a.m., according to survivors, the world started spinning as a 7.8 magnitude earthquake ripped through eastern Nepal. Within minutes, the 19th-century tower collapsed. Rescue workers pulled dozens of corpses, covered in pink dust, from the rubble.

The quake—the most violent Nepal has seen in 80 years—killed an estimated 8,000 people, leveled villages, and rendered stupas, temples, and other historic monuments into piles of brick and splintered beams. Hundreds of thousands are homeless. The weeks after the disaster have created desperate demand for temporary shelter and stabilization of historic buildings, leaving architects and preservation organizations to assess the best ways to contribute to relief efforts.

The Dharahara tower is just one of as many as 70 historically significant sites to be severely damaged or destroyed by the earthquake, according to Rohit Ranjitkar, the Nepal director of the Kathmandu Valley Preservation Trust. Other destroyed sites include the Swayambhunath Stupa—an important Buddhist temple—and structures in Kathmandu's Durbar Square, the Durbar Square in the city of Patan, and other cultural centers, some centuries old.

Ranjitkar was in the Patan Museum when the earthquake hit and recalls watching the roof undulate above him. "I thought, oh, my God, the roof is going to collapse on my head." Luckily, the museum was spared, but the damage to Nepal's culture is irreparable, he says. "The biggest loss is the heritage of our country," says Ranjitkar. "This is something that was left from our ancestors, and we have to keep it for our children and our grandchildren. We are like middlemen: we want to carry on all of our historical monuments—it has to continue somehow."

Ranjitkar is working with the local community and architecture students to rescue artifacts and salvage architectural elements such as wooden doors and windows, carefully storing them in the museum until they rebuild the temples. "We are pretty sure we will rebuild in the next three years, at least the Patan Durbar Square. Kathmandu might take a little more time," he says.

UNESCO, the United Nation's educational and cultural agency, is undertaking "an international expert mission" to assess the damage

Visit our online section at architecturalrecord.com/news.

and then "advise and provide support to the Nepalese authorities and local communities on [monument] protection and conservation, with a view to recovery," the organization's director general Irina Bokova said in a statement.

The World Monuments Fund (WMF), meanwhile, plans to focus on lesser-known sites. The organization is confident that many buildings can be restored. "In the heritage field, we sometimes get overwrought about authenticity, thinking the only thing that makes something authentic is that it's the exact same thing," says Lisa Ackerman, executive vice president and chief operating officer, "but a lot of buildings survive because they are constantly renewed."

Like the restoration efforts, the humanitarian response to the crisis has also been slow, hindered by erratic aftershocks, fresh avalanches in remote villages, and destroyed roads. To satisfy the short-term need for shelter, international aid organizations such as the UN's High Commissioner for Refugees has sent thousands of tarpaulins and lanterns to eastern Nepal.

Architects are also attempting to do their part. Pritzker Prize–winning architect Shigeru Ban—who has been designing emergency structures since the early 1990s—has been taking stock of the situation and proposed, along with his humanitarian organization Volunteer Architects' Network (VAN), a three-phase plan. As a temporary solution, VAN will distribute simple plastic sheets and tents as shelters. As soon as conditions stabilize, the organization will join forces with local architects and universities to build transitional housing of the kind Ban's firm has already been working with in New Zealand, Japan, Haiti, and elsewhere. In the next few months, the organization anticipates building permanent housing. Other architecture organizations, including the Royal Institute of British Architects—which teamed up with the International Federation of the Red Cross—are also calling on their members to lend expertise and financial support.

Nepal's prime minister has promised to repair infrastructure and give loans up to $25,000 to rebuild homes, public buildings, and schools within two years, and religious and historic sites within the next five years.

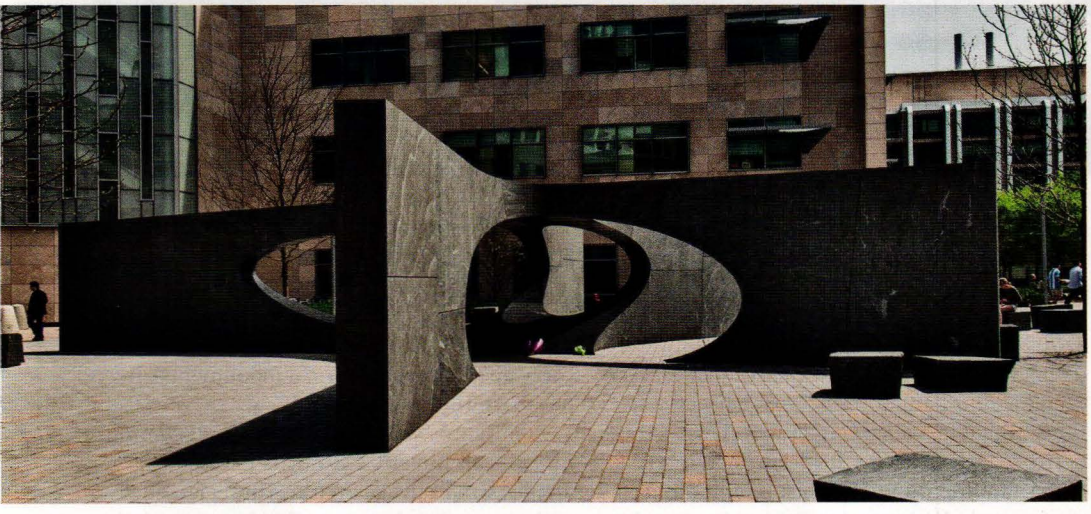
The on-the-ground situation remains precarious as monsoon season swiftly approaches, creating increased urgency for shelter and adequate sanitation. But what Ranjitkar fears most is the loss of international interest: "Everybody is in the city now and wants to work with us. But maybe after a couple of months we will lose that energy. It's human nature for people to lose interest." ■

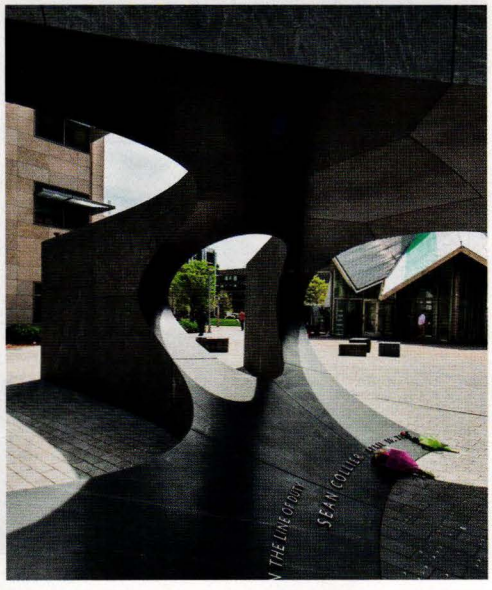
MIT Unveils Memorial for Officer Killed by Boston Bombers

BY CATHLEEN MCGUIGAN

DURING THE sentencing phase of convicted Boston Marathon bomber Dzhokhar Tsarnaev's trial in April, an extraordinary memorial was unveiled at MIT. Dedicated to the campus police officer killed by the Tsarnaev brothers as they fled, the Sean Collier Memorial is both a poetic sculptural form and an amazing feat of engineering and technology. The structure was designed by the Boston architecture firm Höweler + Yoon (H + Y) as a five-way vault of solid masonry: five asymmetrical arms or buttresses that support a shallow central arch to create a space for visitors to pause and reflect. The Collier memorial sits on the spot where the officer was shot, just in front of the MIT Stata Center designed by Frank Gehry. In counterpoint, it creates a powerfully solid yet sinuous presence.

Made of 32 blocks of gray granite from a quarry in Virginia, the memorial was digitally designed and fabricated as a self-supporting structural system. Meejin Yoon, a founding principal of the firm and head of the department of architecture at MIT, worked on the design with her academic colleague John Ochsendorf, an engineer well-known for his research and work with masonry vaults, as well as with the Institute's architecture and engineering students. The Virginia Mist granite was cut by robot in Wisconsin—each piece milled within a .5-millimeter tolerance—and assembled on-site. Sean Collier's brother Rob Rogers was the construction manager. The words he spoke at Collier's memorial service are carved into the piece: "Live long like he would. Big hearts, big smiles, big service, all love."





The dry-masonry technique of such a complex form is a tour de force that combines "the most ancient stone technology with the most contemporary tools," said H + Y principal Eric Höweler. Its design also seems to exemplify the MIT motto *Mens et manus* or "Mind and hand." With the underside of its vaults polished and external surfaces rough, subtly emphasizing the improbably thin elegance of the monument's arms and central arch, this stunning structure is both grounded and flowing, somber and joyful—a tribute not only to the man who lost his life but to the minds, hands, and hearts of those who created it. ■

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CIRCLE 34

New York Embarks on Two-Year Culture Survey

BY CARA GREENBERG

WHEN PEOPLE call New York a cultural capital, they're probably thinking of the Met, Lincoln Center, Carnegie Hall—not El Puente, a South Williamsburg–based center for Latino arts and culture, or Arts East New York, a hive of visual and performing arts in Brooklyn. That may soon change. Such less known but vital elements of the city's cultural life will get a boost—as will arts education in public schools and individual artists—when legislation mandating the creation of a comprehensive citywide cultural plan, passed late last month by New York's city council, comes to fruition in the years ahead.

"We needed a blueprint, a clear strategy, for supporting culture in New York City for the next generation," says Stephen Levin, one of two City Council members who, along with Jimmy Van Bramer, sponsored the bill. "We need to reach people who may not have access to cultural resources; to keep artists, who've become an endangered species because of the cost of living; and to make sure community-based cultural organizations get the support they need."

The notion of a cultural plan for New York first took root in 2012, after a member of Levin's staff brought the Chicago Cultural Plan, that city's ambitious framework for future cultural and economic growth, to his attention. "Chicago mayor Rahm Emmanuel put a lot of resources into the cultural plan," says Levin, "but the Bloomberg administration wasn't interested in supporting a piece of legislation like that."

Organizations such as Brooklyn's El Puente (above) will benefit from New York's proposed cultural plan.

Now that the city has a more receptive mayor, Bill de Blasio, and a new cultural affairs commissioner, Tom Finkelpearl, the timing is right. Over the next two years, the Department of Cultural Affairs will conduct a survey of the city's cultural life in all five boroughs as the first step (the law requires recommendations to be submitted by July 1, 2017). "This is an opportunity to get to know the whole spectrum of culture in New York City," Finkelpearl says. "We'll develop a comprehensive plan after all that is taken into account."

If specifics are thin at this stage, that's to be expected says Julie Burros, a key figure in the implementation of Chicago's cultural plan. Currently Boston's Chief of Arts and Culture, she is masterminding the launch of a similar initiative there. "Every city's plan is different, and New York has yet to determine what issues need addressing," she says, citing Chicago's first architecture biennial in October as a direct outcome.

Alisa Solomon, director of the arts-and-culture concentration of the M.A. program at Columbia Journalism School, thinks the robust survey could inform future development and planning. "As housing changes to luxury high-rises, the population changes, and so does cultural production," she says. "The city's plan will widen the lens to include all the vibrant culture in this city, not just the giant tourist-drawing institutions." ■

IMAGE: COURTESY EL PUENTE

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CIRCLE 93

Innovation Conference Returns to L.A.

BY BETH BROOME

IN APRIL, 300 architects, industry professionals, and students gathered at the W Hollywood Hotel in Los Angeles for ARCHITECTURAL RECORD's second annual West Coast Innovation Conference. In the spirit of RECORD's past conferences, which the magazine has been holding in New York for the past 13 years, the event included world-class designers and other experts—from architects practicing outside the field to principals of large firms to materials specialists—expanding the boundaries of the discipline and pushing the profession forward.

Anne Fougeron at L.A. Innovation.

Founder of Beijing- and L.A.-based MAD Architects, Ma Yansong, kicked off the day with a presentation of his work, which fuses the latest technology with a contemporary interpretation of traditional Asian responses to nature—from his rippling residential towers, Huangshan Mountain Village, to the dramatically rolling forms of his Harbin Culture Center, both in China. "Some say my work is futuristic," said the architect. "But for me it is reminiscent of the canyon, the desert—something that has been there forever. I want people to experience these buildings and wonder about their place in this long history."

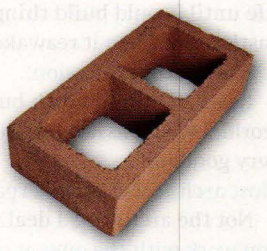
Henry Cheung, who trained as an architect and is now a design director at innovation consultancy IDEO, talked about the architect's role as visionary, asking, "How do we inject creativity into a profession that is so restricted?" But if anyone in the audience was dismayed by his sobering reminder of codes and other real-world constraints, they were quickly swept into the fantastical explorations and experimental work of David Benjamin, who presented his biodegradable mycelium brick tower installation for MoMA's PS1; his immersive theater for musician Björk; and his intrepid work with a mussel population in New York's East River. Sheila Kennedy, who directs materials research for Boston's Kennedy & Violich Architecture, continued the science-fiction foray with her investigations into infusing plants with nanoparticles to harvest energy and create luminescence.

Bringing the event back down to earth, RECORD deputy editor Suzanne Stephens moderated a panel of principals from some of the country's—and world's—biggest firms, Perkins+Will, HDR, and AECOM, asking how, as practices grow, they can foster greater design creativity. And Brazilian photographer Leonardo Finotti, who was commissioned by MoMA to contribute to its current exhibition on Latin American architecture, shared his sublime images from across South America and beyond. The day concluded with San Francisco–based Anne Fougeron, who showed her award-winning work, narrating the presentation with her story—how urban context and the worlds of art and politics have inspired her modernist vocabulary. "I'm trying to compose a sense of order out of many competing things," she said. "And trying to create buildings that will outlast us all in a world that doesn't seem that interested in this level of quality."

RECORD will host the next Innovation Conference in New York on October 7. ■

PHOTOGRAPHY: ©STEVE HILL

The face of MASONRY.



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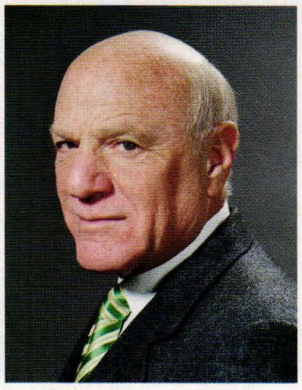
CIRCLE 69

[NEWSMAKER]

Barry Diller

BY FRED A. BERNSTEIN

BARRY DILLER is one of New York's great patrons of architecture. A denizen of "lower West Chelsea," he looks out on the High Line, as well as Jean Nouvel's 100 Eleventh Avenue, from the Frank Gehry–designed office of his media company, IAC. Meanwhile, with his wife, Diane von Furstenberg, Diller was one of the first supporters of the High Line. With that established as one of the world's great parks, Diller is determined to build another one: an artificial island on the site of pier 54, called Pier 55, designed by British polymath Thomas Heatherwick. Diller and von Furstenberg worked with Heatherwick lining up support from some city officials and pledging more than $100 million before the plan was made public in November. He took RECORD's phone call in his Manhattan office.



You've loved architecture for a long time?

I once wanted to be an architect. I can't pinpoint the exact age. But around 13, 14, or 15, I started doing drafting. And I loved it. But I never pursued it. It just dropped off my life until I could build things other than mud castles. And then it reawakened.

It's a difficult profession.

Really? With so much building all over the world, I would assume being an architect is a very good job.

Most architects are underpaid.

Not the architects I deal with.

You work with the ones at the top of the profession.

I guess they might be saying, "Oh, my God, can't we get out of this?" But, to me, it seems so joyful to build things. Not only to conceptualize them, but to take them from an idea, whimsical or not, into an actual thing. You know we're building this island . . .

You're talking as if it's been approved.

Let's say this: it's not been disapproved.

Aren't there more approvals needed?

In the course of the project, we will need other approvals, including one from the Army Corps of Engineers, but we've done an awful lot of advance work, so we don't anticipate any problems.

A lot of people say it would be better to spend the money on parks that need improvements.

My answer to that is, of course I would like all parks to be funded nicely. But, as was the High Line, this was elective. It's not something that was demanded. A pier needed to be torn down, and rather than not do anything in its place, we thought this would be something really appealing. That doesn't negate anybody else's work—it doesn't have anything to do with anybody else's work.

How did you choose Heatherwick?

I had been dazzled by the British Pavilion in Shanghai, so we invited him to present. We considered others, but he was the best.

So how's it going?

Yesterday, Turner Construction sent over six big pieces of paper on which are drawn each stage of construction: the barges that have to go in the river, the cranes that go on top of them, and the layers that will develop over the next two or three years. We're now into really final plans and trying to sort through the actual "how are you going to build this island?" To participate in that, if you're an architect, what a joy!

Before working with Heatherwick on the island, you worked with Frank Gehry on your office building. How was that?

Frank is a joy to work with. He said to me, at the very beginning, "If I'm going to do it, you're going to have to be in it with me. Truthfully, all my best work is when I have had a client who really collaborated with me." But we didn't agree on everything, for sure.

It's great that you built that party space on the ground floor.

The first week we were there, we had a lunch in the space, for 60 or 80 people, and I said, "People will want to use the space. Why don't we let anybody use it who's decent and God-fearing?" What's great is, it makes millions of dollars a year. We had two bar mitzvahs there, and one of them, the guy insisted on showing the party decor to me. It must have cost at least a million dollars, turning it into an arcade. It keeps the place alive.

How do you feel about some of the other buildings that have gone up around it?

I thought the Nouvel was going to be okay, but I truly despise it. And I look at it all day.

Is that on the record?

I don't care. I don't know Nouvel. It's just so unattractive.

There's no question that public spaces can be civilizing. I guess that's why you supported the High Line and why you are going to build Pier 55.

We do them for the future, and for New York. And because I like being part of the process. ■

For the complete interview, visit architecturalrecord.com/news.

noted

Obama Library goes to Chicago

The Barack Obama Foundation announced that Chicago will be the home for the future Presidential Center, to include a library and a museum. While an architect has yet to be named, the building will be located on one of two sites near the University of Chicago.

Cooper Hewitt Announces Winners of Annual National Design Awards

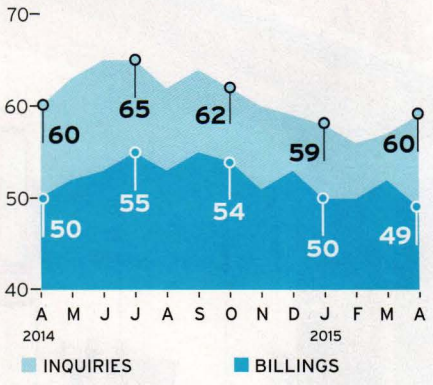
Cooper Hewitt, Smithsonian Design Museum revealed the winners of its 16th annual design awards program. They include the late Michael Graves for lifetime achievement, MOS Architects for architecture and design, and Coen + Partners for landscape architecture. Recipients will be recognized at a gala on October 15 in New York.

BIG said to replace Foster + Partners on 2 World Trade

The Wall Street Journal reported that Danish firm BIG will replace London-based Foster + Partners on the design of 2 World Trade Center, under a proposal by 21st Century Fox Inc. and News Corp. The deal will be finalized in the coming months, according to the report.

Cornell Sues Pei Cobb Freed & Partners

Cornell has charged I.M. Pei's firm with "architectural malpractice" for its expansion of Cornell's Johnson Museum of Art completed in 2011. The University charges that it has experienced "at least" $1.1 million in damages due to design flaws that resulted in cracked ceilings, excessive condensation, and leaks.



ABI Drops in April

The Architecture Billings Index (ABI) dropped in April, down to 48.8 from 51.7 in March. "Severe winter in many parts of the Northeast and Midwest has apparently delayed progress on projects," says AIA Chief Economist Kermit Baker. The new-projects inquiry index, however, rose to 60.1 from 58.2 in the previous month.

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CIRCLE 70

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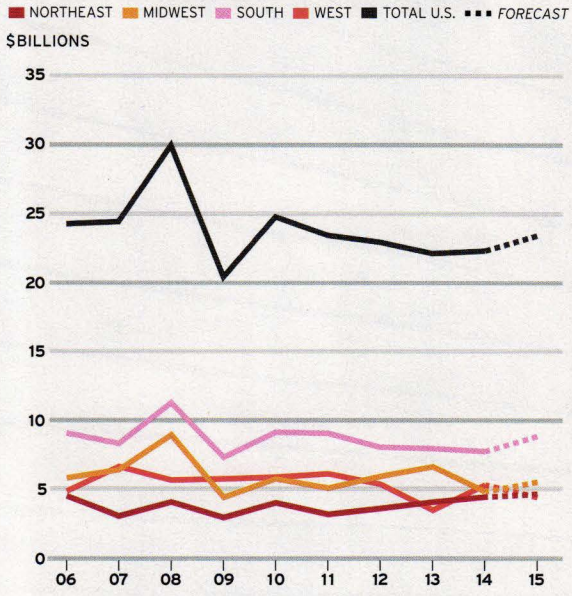
MARKET FOCUS
HEALTH CARE

Construction activity for the health-care sector has been flat over the past four years. The lackluster performance is expected to continue this year due to lingering questions surrounding the Affordable Care Act.

Health-Care Starts by Region

In addition to U.S. total and 2015 forecast figures



Top Metro-Area Markets

Ranked by total health-care starts 1/2014 through 3/2015

	REGION	$MILLIONS
1	NEW YORK CITY	2,730
2	HOUSTON	1,526
3	CHICAGO	1,126
4	SAN FRANCISCO	1,021
5	SAN DIEGO	945

The Dodge Index for Health-Care Construction 3/2014 – 3/2015

The index is based on seasonally adjusted data for U.S. health-care construction starts. The average dollar value of projects in 2006 serves as the index baseline.

Top 5 Design Firms

Ranked by health-care construction starts 1/2011 through 3/2015

1. **HKS**
2. **ESa**
3. **AECOM**
4. **Rafael Viñoly Architects**
5. **NBBJ**

Top 5 Projects

Ranked by health-care construction starts 1/2014 through 3/2015

$900 MILLION

PROJECT: California Pacific Medical Center Van Ness and Geary Campus for Sutter Health
ARCHITECT: SmithGroupJJR
LOCATION: San Francisco

$800 MILLION

PROJECT: NYU Langone Medical Center, Helen L. and Martin S. Kimmel Pavilion
ARCHITECTS: Ennead Architects/NBBJ
LOCATION: New York City

$800 MILLION

PROJECT: Kaiser Permanente San Diego Central Hospital
ARCHITECT: CO Architects
LOCATION: San Diego

$800 MILLION

PROJECT: David H. Koch Center, New York-Presbyterian Hospital
ARCHITECTS: HOK with Pei Cobb Freed & Partners and Ballinger Associates
LOCATION: New York City

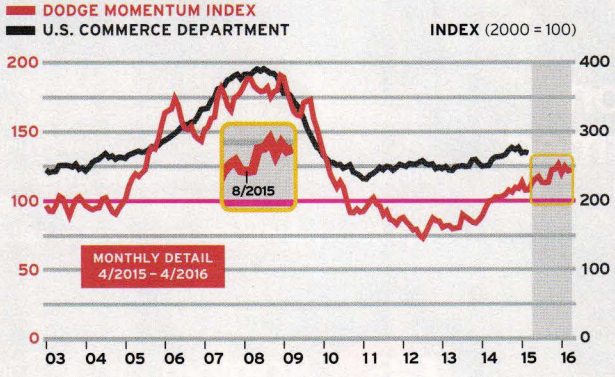
$540 MILLION

PROJECT: North Tower Expansion at Houston Methodist Hospital
ARCHITECT: WHR Architects
LOCATION: Houston

MOMENTUM INDEX EDGES HIGHER

After retreating 2.5% in March, the Momentum Index rose 0.8% in April to 122.6. Although planning activity has plateaued, the index is still up 8.5% compared to 12 months earlier.

The Dodge Momentum Index is a leading indicator of construction spending. The information is derived from first-issued planning reports in the Dodge Data & Analytics Reports database. The data lead the U.S. Commerce Department's nonresidential spending by a full year. In the graph to the right, the index has been shifted forward 12 months to reflect its relationship with the Commerce data.



Dodge Data & Analytics tracks projects from predesign through construction to capture hard construction costs, square footage, and other key statistical information. The Top Projects are ranked on the basis of the construction cost of their health-care-related components only.

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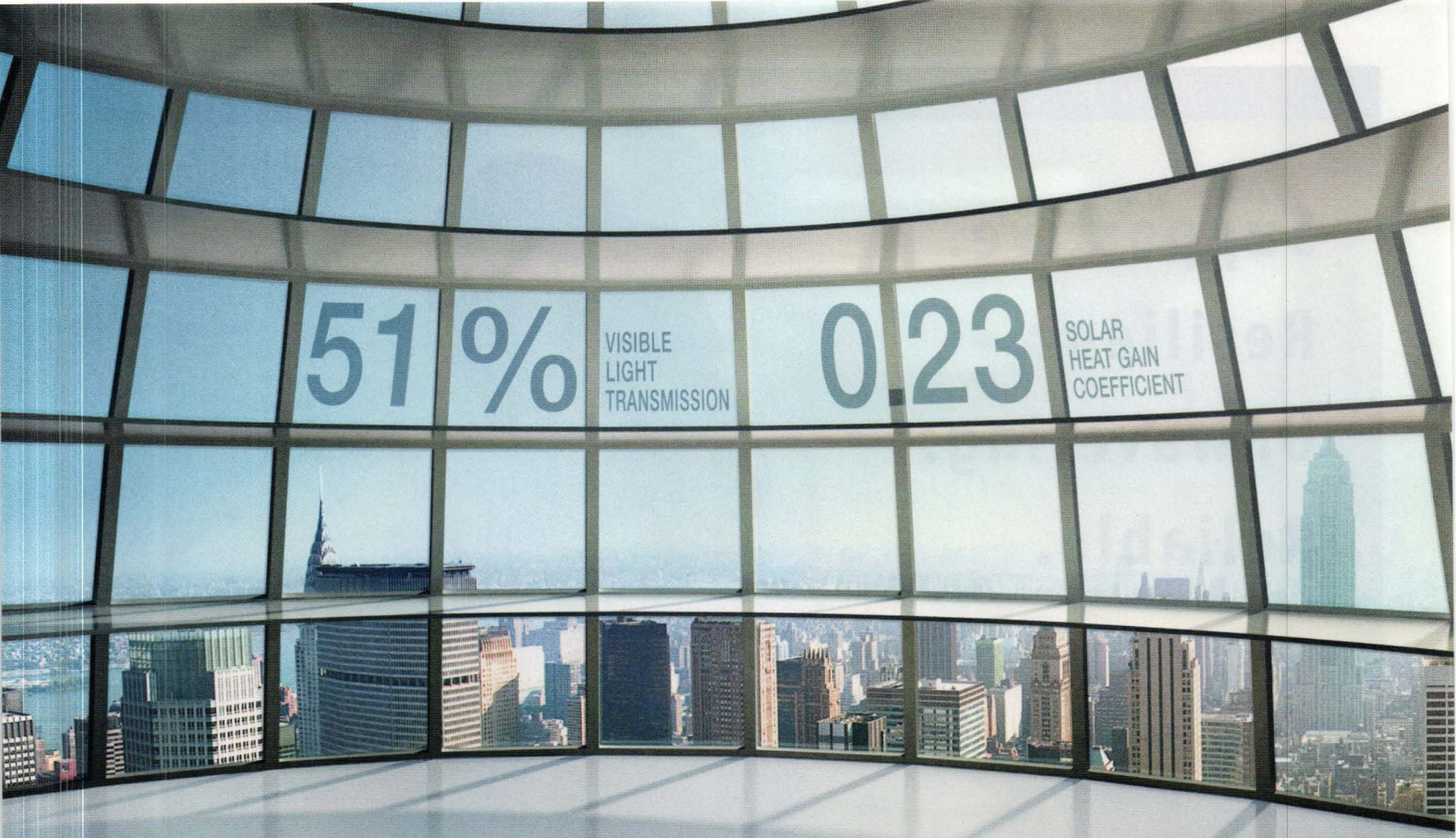

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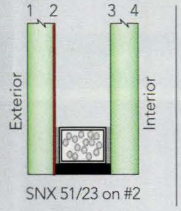

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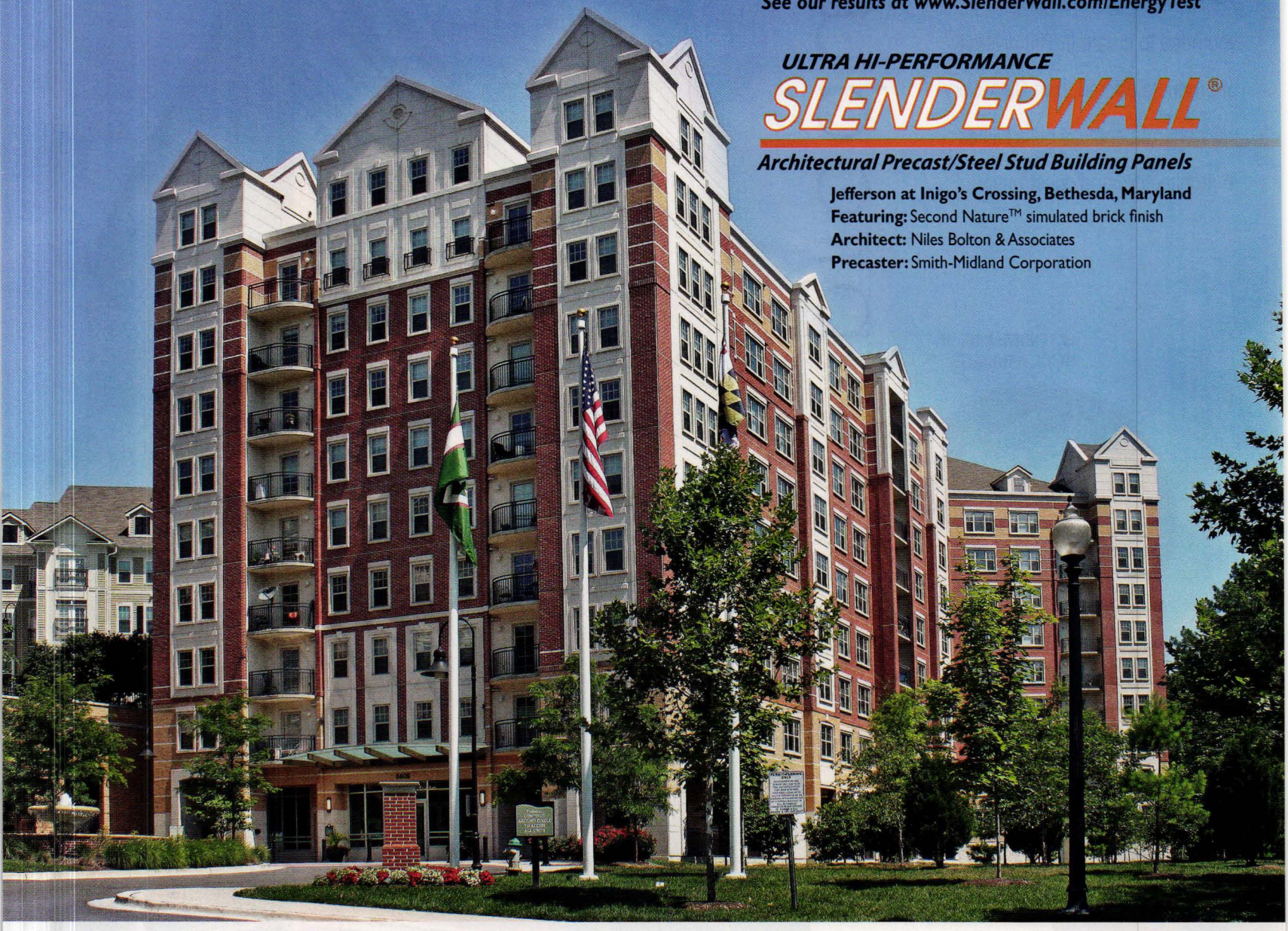

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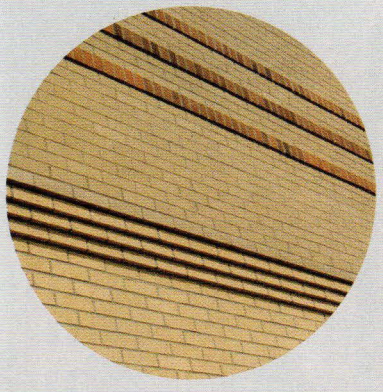

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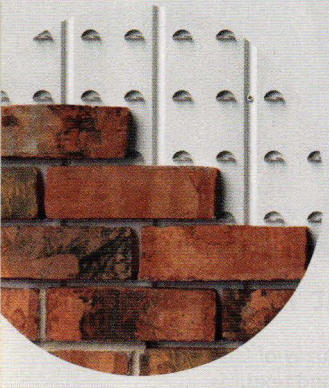

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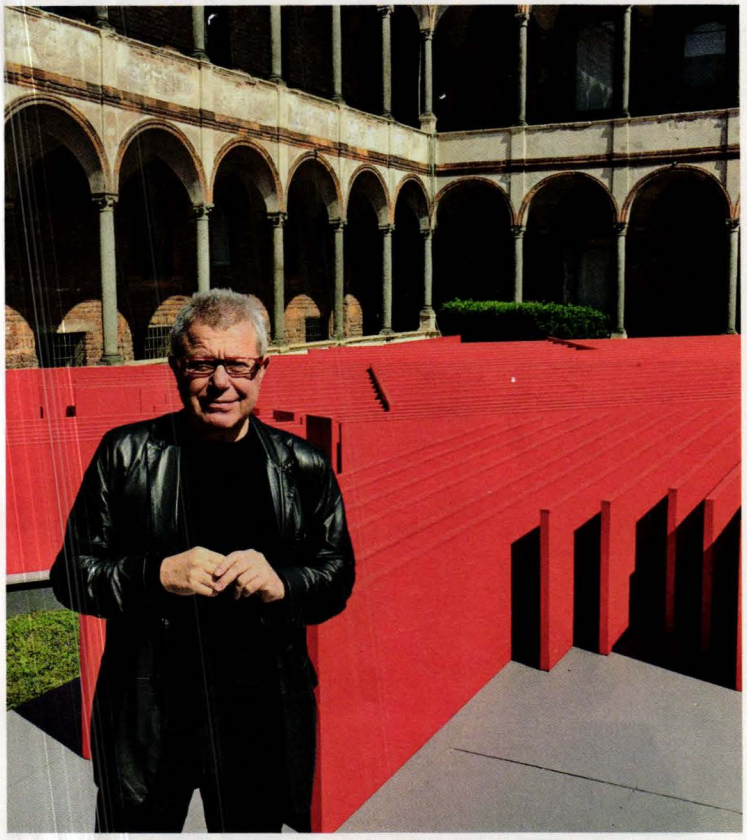
CIRCLE 74

Salone del Mobile 2015

Architects and manufacturers take inspiration from the past at Milan's annual furniture fair

BY JOSEPHINE MINUTILLO



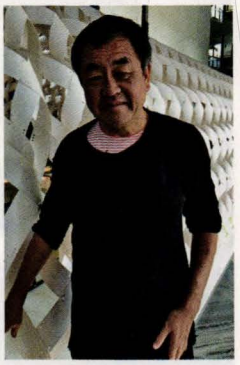
WITH MILAN'S rich history in architecture, art, and design, it is inevitable that its illustrious past will be drawn on by the annual Salone del Mobile. This year in particular, despite Milan also serving as host of the futuristic Expo 2015 (page 39), the past took center stage at the furniture fair, with old palazzi and churches as backdrops for the most interesting exhibits, and reissues of classic designs stealing the spotlight from new product introductions, which were fewer and less interesting than usual.

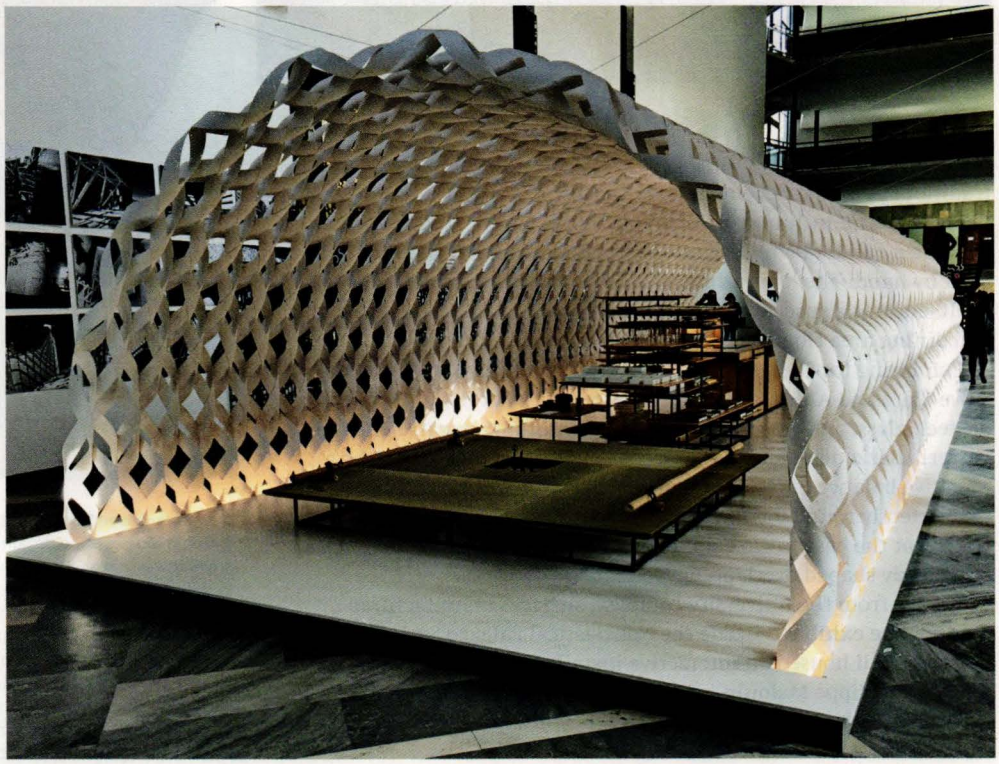
The Italian magazine *Interni* typically engages international architects and designers for temporary exhibits that become spaces for experimentation during the Salone. Working off the "energy for life" theme of the nearby Expo 2015, this year *Interni* presented *Energy for Creativity* at the University of Milan. Within the many courtyards of the sprawling university complex, built starting in 1456 as a hospital, were large-scale installations by such luminaries as Daniel Libeskind, Alessandro Mendini, and Philippe Starck.

Libeskind, who has a large office in Milan, is a regular participant in the Salone. "This week in Milan is a chance to look at architecture and design in a free way," he says. "No city in the world has this type of event that's open to the public." His installation, a celebration of color and straight lines, was set within what's known as the Pharmacy Courtyard. The low, crisscrossing metal panels were painted in a red the architect developed for Italian paint manufacturer Oikos. According to Libeskind, "We created a palette of 33 colors with a unique, solvent-free, and sustainable chemistry."

Tokyo and Paris–based architect Kengo Kuma also has an annual presence here. He was invited by Japanese kitchen manufacturer Kitchenhouse, for whom he designed a Shanghai showroom, to create an exhibit outside the university's grand hall. Inspired by the traditional Japanese hearth, or *irori*, Kuma made what he refers to as "fire and cocoon." "The fireplace used to be the center of the home," Kuma explains. "In the 20th century,

Daniel Libeskind in front of his installation at the University of Milan (left). Kengo Kuma (below) beside his "cocoon" for Japanese kitchen manufacturer Kitchenhouse. Based on the *irori*, a traditional Japanese sunken hearth, Kuma's installation features a fire pit beside a cooking and dining area (bottom).





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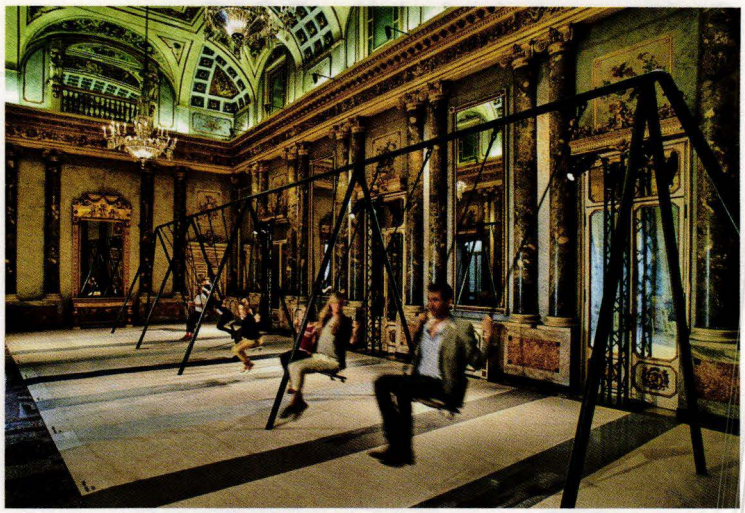

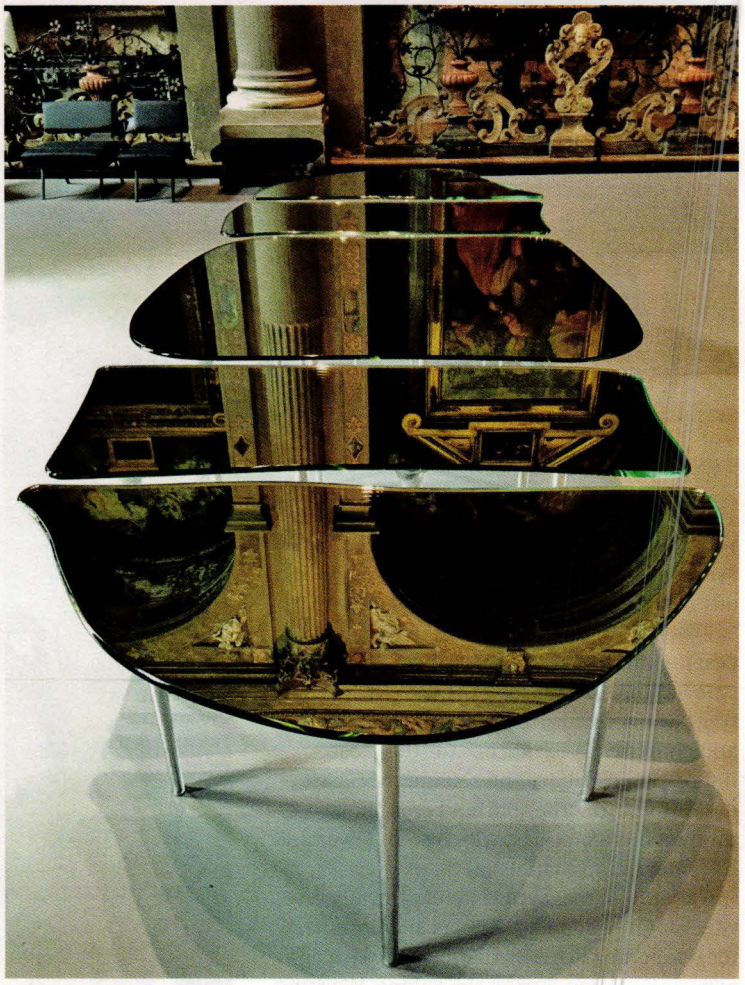

rooms got divided in an unhealthy way. I want to combine the traditional and the new in an open space."

Made from 1 millimeter-thick vulcanized paper, Kuma's cocoon of twisting and weaving strips was developed on the computer but built by hand. The long, white, cloudlike structure, which supports itself, encases a space where a low platform with a fire pit, kitchen, and dining area flow into each other.

Exhibiting for the first time in Milan, New York–based architects Steve Blatz and Antonio Pio Saracino created *Black Hole*. Composed of steel, glass, and wood (provided by sponsors Marzorati Ronchetti, Vetreria Bazzanese, and Zordan), the small tower is meant to be a "creative balance of chaos and order," according to Blatz. Within the perfectly round form, visitors could recline on the circular wood seating at the base to gaze up through the oculus, composed of irregularly shaped overlapping wood discs.

Not far from the university complex, surfaces manufacturer Caesarstone exhibited inside the Neoclassical Palazzo Serbelloni. Its grand hall housed an interactive installation by Canadian-born designer Philippe Malouin, where the flooring and seats of an eight-piece swing set showcased newly launched designs and textures from Caesarstone's collection.

New York–based Steve Blatz and Antonio Pio Saracino designed a small tower in wood, glass, and steel in the main courtyard at the University of Milan (top, left). Visitors enjoy a swing set Philippe Malouin created for Caesarstone in an 18th-century palazzo (top, right). Massimiliano Locatelli's all-glass table for Glas Italia at his firm's office in a deconsecrated church (bottom).

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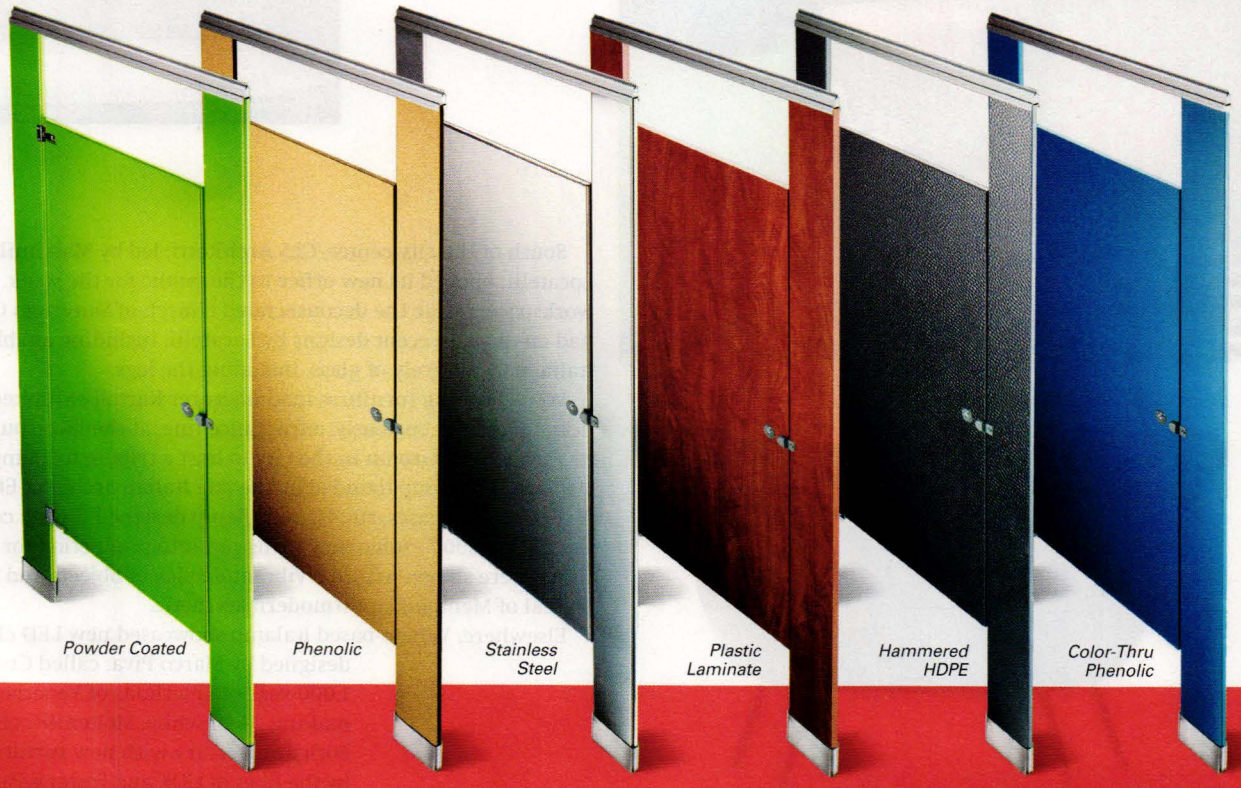

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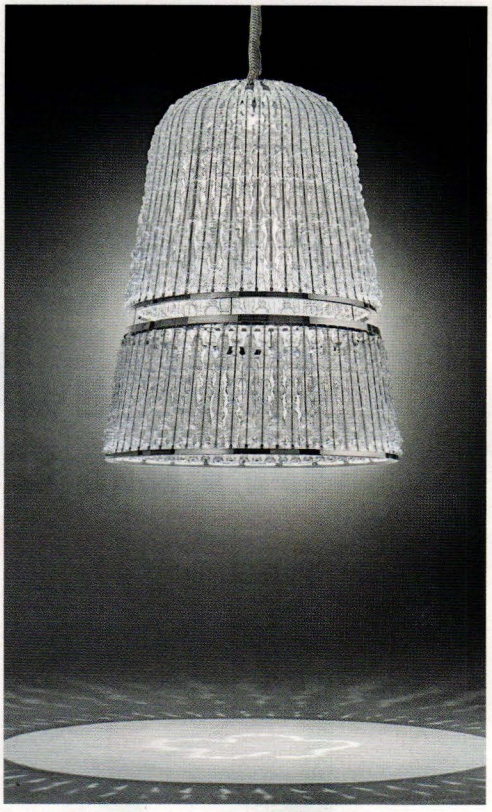
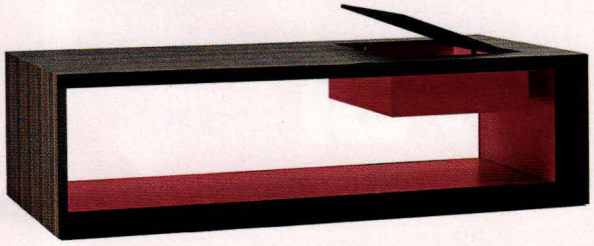


Kartell turned its showroom into a postmodern extravaganza (left). Architect Marco Piva interpreted the 1,000-year-old history of glass-making in Venice with a series of LED chandeliers for Italamp called Crowns (right). Molteni&C celebrated its 80th anniversary with the reissue of a Gio Ponti chair (middle) and a new table by HOK Product Design (bottom, left). Knoll honored Harry Bertoia with a new plastic version of his metal side chair (bottom, right).



South of the city center, CLS Architetti, led by Massimiliano Locatelli, opened its new office to the public for the week. The unusual workspace, inside the deconsecrated church of San Paolo Converso, also had on display recent designs by Locatelli, including a table for Glas Italia made entirely of glass, including the legs.

While leading furniture manufacturer Kartell exhibited new products, including, curiously, a fragrance line, at the fairgrounds, it used its flagship showroom in the city to host a tribute to Memphis, the 1980s design group founded by the late Italian architect Ettore Sottsass. A collection of vases, stools, and a lamp designed for the company by Sottsass in 2004—some now being put into production for the first time—were shown within a vibrant display of objects and fabrics typical of Memphis's postmodern aesthetic.

Elsewhere, Veneto-based Italamp showcased new LED chandeliers designed by Marco Piva, called Crowns, using 1,000-year-old methods of Venetian glass-making. Meanwhile, Molteni&C celebrated its 80th anniversary with new furniture designs by the likes of HOK and Foster + Partners, as well as reissues of classic Gio Ponti designs. Knoll, too, honored Harry Bertoia with a new polypropylene version of his iconic metal side chair on the centennial of the designer's birth. ■

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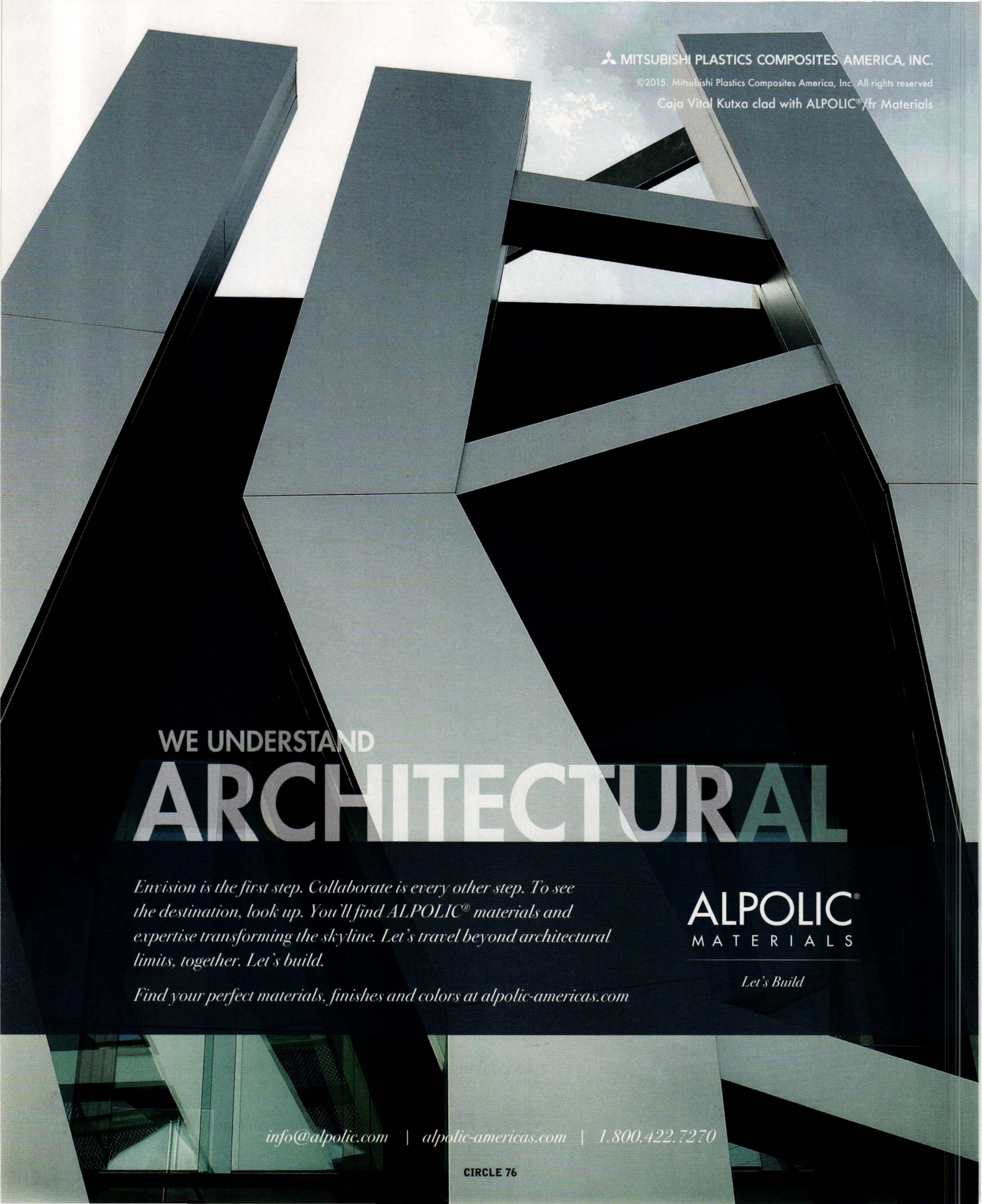
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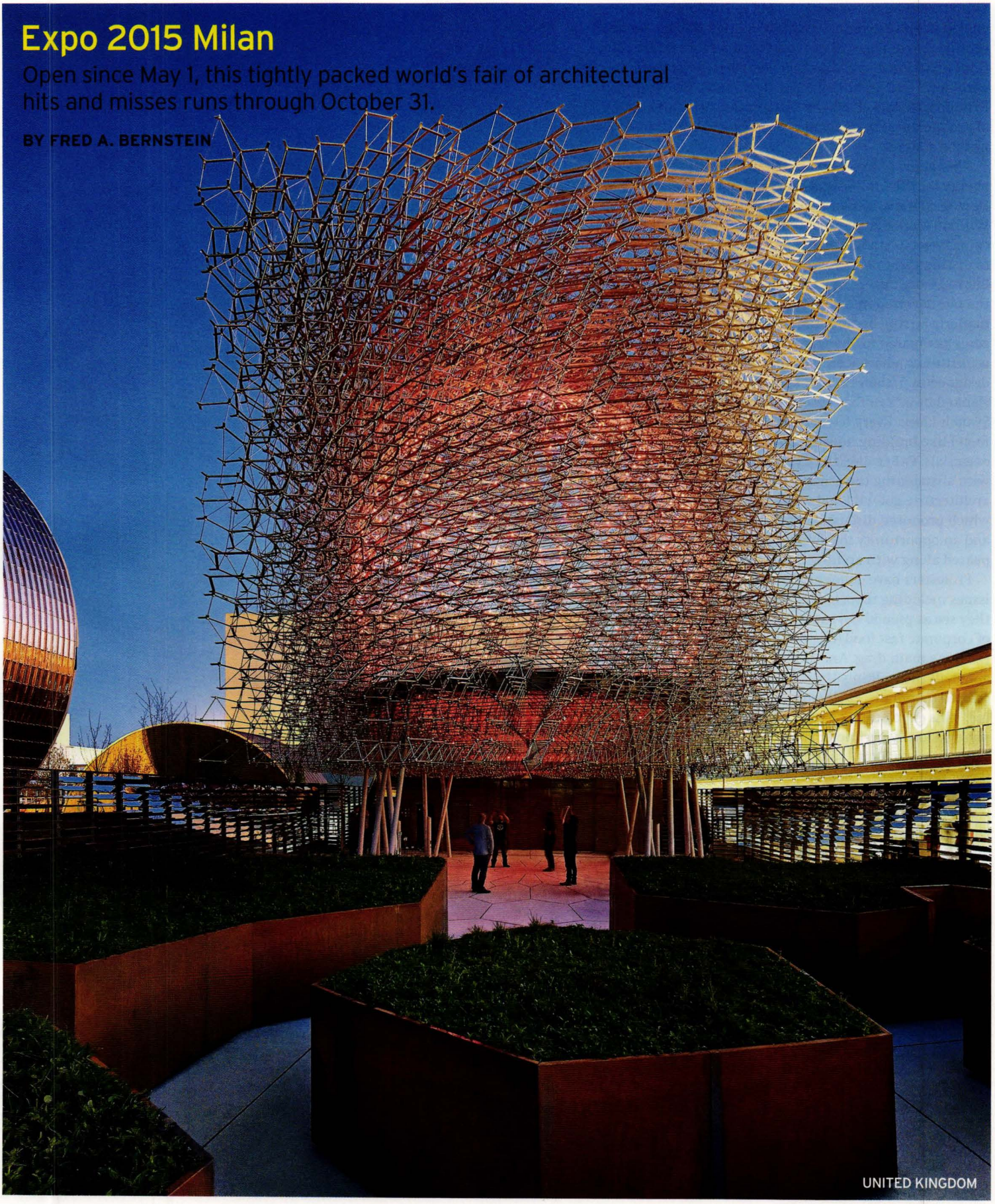
CIRCLE 76

Expo 2015 Milan

Open since May 1, this tightly packed world's fair of architectural hits and misses runs through October 31.

BY FRED A. BERNSTEIN



PHOTOGRAPHY: COURTESY UKTI

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THE FIRST WORLD exposition, held in London in 1851, occupied Joseph Paxton's Crystal Palace. But during the last century, expos (also called world's fairs) evolved into collections of national pavilions that competed for attention with novel and grandiose building designs. The Shanghai Expo in 2010 kicked off the "Asian century" with a show of architectural pyrotechnics that reportedly attracted 73 million visitors.

The theme of Expo 2015 in Milan is "feeding the planet: energy for life." Initially, a master plan by architects Jacques Herzog, Mark Rylander, Ricky Burdett, Stefano Boeri, and William McDonough proposed that each participating country get a "standardized" pavilion, giving them a chance to distinguish themselves with content, not starchitecture. But Expo organizers succumbed to political pressure, and the fair devolved into another architectural bake-off, particularly jarring because the site is relatively small at 490 acres (compared to Shanghai's 1,300 acres). This creates unfortunate adjacencies. The impressive Chinese pavilion designed by Yichen Lu, for example, looks almost ridiculous flanked by a "Zen Express Street Food Corner" and a gaudy Swatch kiosk. Every few hundred yards, there's a large, motel-like building housing restrooms, cafés, and other essentials. Otherwise, the expo is a free-for-all. The problem with abandoning the original master plan isn't that the architecture got wild and woolly, but that the theme—which promised discussion of a vitally important subject, and an opportunity to compare apples to apples—disappeared along with architectural restraint.

Protesters have denounced the expo for a wide range of issues including reported corruption, expense, and what they see as pseudo-environmentalism, given the presence of corporate fast food (like McDonald's and Coca-Cola) on the fair's main drag. And almost everyone has complained about all the walking. Unlike previous world's fairs, which offered monorails, cable cars, and innovative "people movers," this expo offers no transportation other than a bus plying a lonely perimeter road. "I know it's a problem; we're going to fix it," said the CEO of the fair, Giuseppe Sala. (I met him when, exhausted, I decided to hitch-hike, and Sala gave me a lift on his golf cart.)

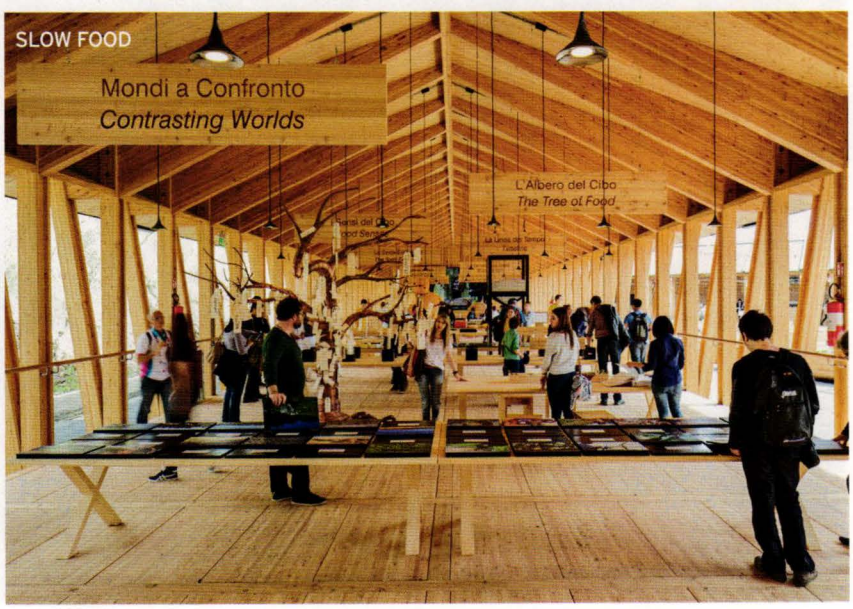
There were also delays getting the pavilions finished in time for opening day. Pavilion Zero, hugging the main entrance to orient visitors to Expo, was among the unready. It turns out to be the best pavilion by a long shot. Designed by Italian architect Michelle de Lucchi as a series of domed buildings, it illustrates key Expo themes. In the first room, de Lucchi built a wooden library that is as heroically scaled as the all-wood Teatro Farnese in Parma. In the succeeding rooms, models, videos, and immersive environments demonstrate the effect of man's search for food on the planet.

Another pavilion that opened late is the Future Food District, a working supermarket with sci-fi touches conceived by Turin-based architect and MIT professor Carlo Ratti. Future grocery shopping may involve "printing" meals, and robots that gather our favorite items, adding personalized cocktails of nutrients, and wrapping the results in edible spray-on packaging. Most of the innovations seem hokey—perhaps the way television seemed at the 1939 New York World's Fair—but at the very least Ratti's clean-lined supermarket promises an architecturally elegant future. ■

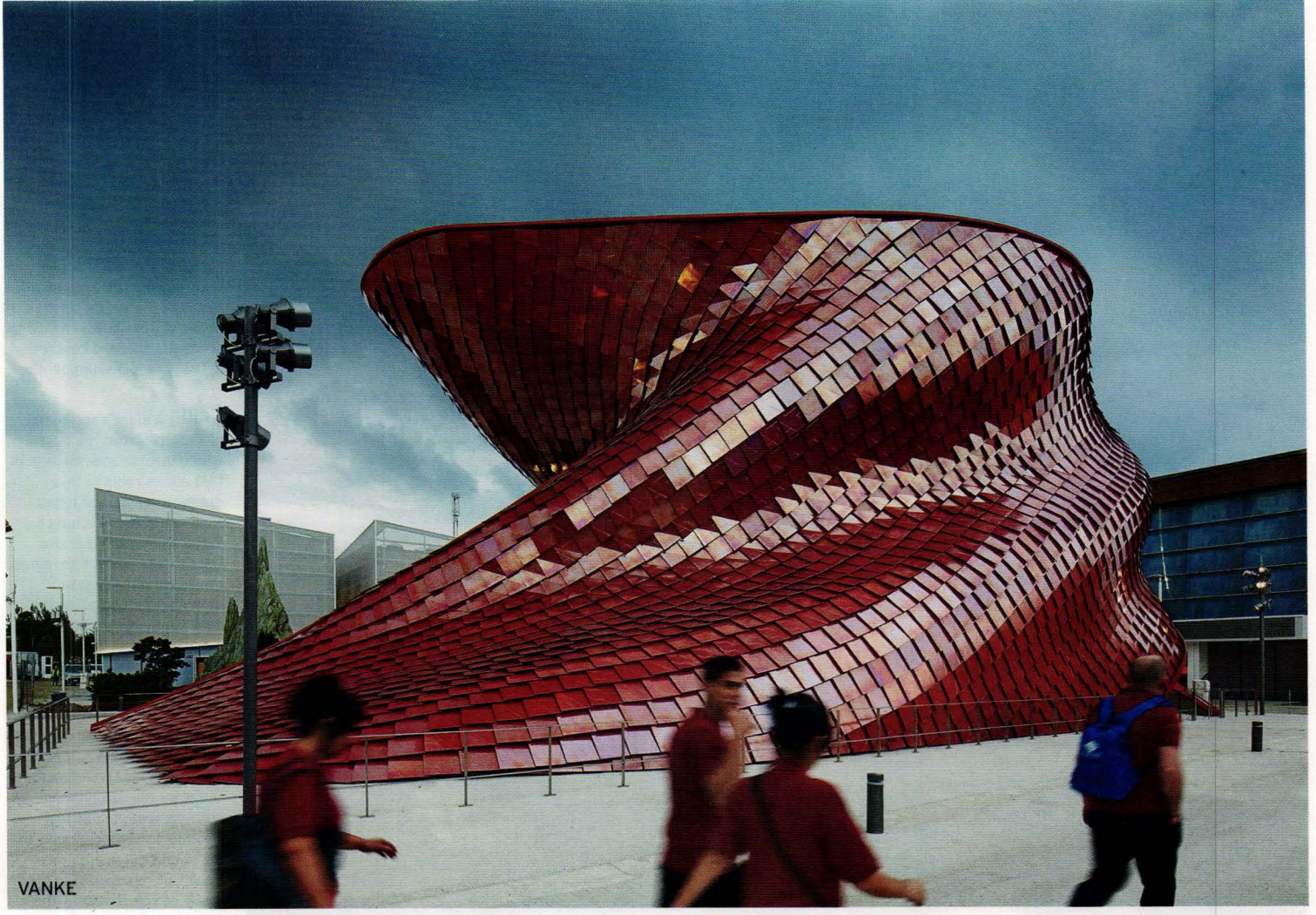
United Kingdom (Previous page) Size isn't everything. The UK learned that at the 2010 Shanghai Exposition with its Seed Cathedral, a diminutive yet stunning pavilion by Thomas Heatherwick (RECORD, August 2010, page 53) seen in photographs around the world. This time, British artist Wolfgang Buttress designed and built an aluminum erector set–like "beehive" with fellow Britons—engineer Tristan Simmonds, the architecture firm BDP, and the fabrication team at Stage One. While Heatherwick's pavilion occupied a giant plinth, this one sits on a narrow lot, cleverly landscaped to suggest a meadow.

United States Since 1999, the U.S. has been hobbled by a law that prevents government funding of expo pavilions. That means America either doesn't participate, as in the 2000 Hannover Expo, or depends on corporate sponsors. This time, New York architect James Biber built a handsome, educational, and largely ad-free building on a shoestring budget. A huge U.S. flag with a knife and fork in the blue field (part of a crisp graphic identity created by Michael Bierut) entices visitors. So, too, does a 7,200-square-foot green wall, where vegetables, grains, and herbs grow on metal frames that swivel as the sun changes position. Visitors move up a large ramp made of recycled Coney Island boardwalk planks, to exhibitions on agriculture and nutrition by Tom Hennes of Thinc Design. Hennes also produced a series of films about the American way of eating, projected on multiple screens around the ground floor.

Slow Food Though Jacques Herzog resigned from the Expo planning team, he agreed to design a pavilion for his friend Carlo Petrini, the founder of the Slow Food movement. On opening day, a dozen people milled around the pavilion (three buildings arranged around a triangular vegetable garden), sampling its offerings—"slow wine" and "slow cheese" served at a long counter. Though the pavilion, filled with informative signage, never really explains why slow is better, the architecture does convey what Herzog intended for the standardized pavilions. The simple, cabin-like structures the architect calls shacks are made



PHOTOGRAPHY: © PAUL RAFTERY (BOTTOM AND OPPOSITE, BOTTOM); TOM HENNES (TOP); HUFTON + CROWE (OPPOSITE, TOP)



VANKE

ITALY

CHINA

"The Power of the Future." It includes an interactive system that allows Italy's great fruit and vegetable markets in Florence, Rome, and Palermo to communicate. This is one of a few buildings that will remain, as a center for technological innovation, after the expo closes. Its permanence will provide a chance to study whether the concrete actually reduces air pollution.

China A significant number of Expo pavilions are built with glulam beams, a material that allows roofs to take dramatic twists and turns. New York–based architect Yichen Lu used glulam for the Chinese pavilion to mimic the shape of a Chinese mountain range and, at the back (sadly not visible to most fairgoers), the skyline of Beijing's central business district.

Bahrain Dubai will host the next world expo in 2020, and a number of Persian Gulf countries are exhibiting at this one. Bahrain has the strongest showing, thanks to the young Dutch architect Anne Holtrop. Exploring how space can be shaped without being fully enclosed (the approach taken by Mies van der Rohe for the Barcelona Pavilion at that city's 1929 expo), Holtrop designed a one-story building that houses Bahraini antiquities in rooms that open onto desert gardens. Made of precast concrete panels connected with elegant brass hardware, the pavilion can be disassembled and moved after the expo's six-month run.

almost entirely of ordinary lumber and masterfully detailed. When the fair is over, the long buildings will be transformed into a dozen cabins, possibly for school gardens where students can learn Petrini's methods. Drawings and models illustrate how the transformation could occur: not slowly but fast.

Vanke The Chinese real-estate developer known for its architectural bona fides and a pavilion by Duoxiang Studio at the 2010 Shanghai Expo hired Daniel Libeskind, who designed a building that, surprisingly, lacks acute—or any—angles. Its vaguely serpentine form is, according to Libeskind, derived from Chinese *shitangs* (dining halls), though the architect gave it a reptilian skin of metal-infused red porcelain tiles, which shimmers alluringly. Inside, a show by New York exhibition designer Ralph Appelbaum Associates looks at communal dining in China. Less communal is the VIP area, up one flight of stairs, where company executives wine and dine potential clients.

Italy Designed by Studio Nemesi of Rome, the 150,000-square-foot building is wrapped in white concrete panels molded to look as if they were spun from threads. The concrete, made by Italcementi, is said to capture pollution and thereby reduce smog (a claim made for years about various "photocatalytic" building materials, which at the very least requires more research). The interior is less coherent. Rooms open onto a glass-roofed atrium with angled surfaces that suggest a poor imitation of a Frank Gehry design—and the exhibition seems purposely vague, with topic titles like


BAHRAIN

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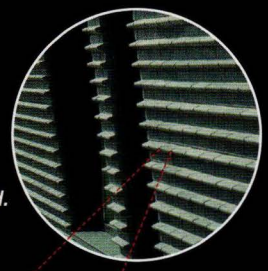

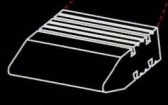

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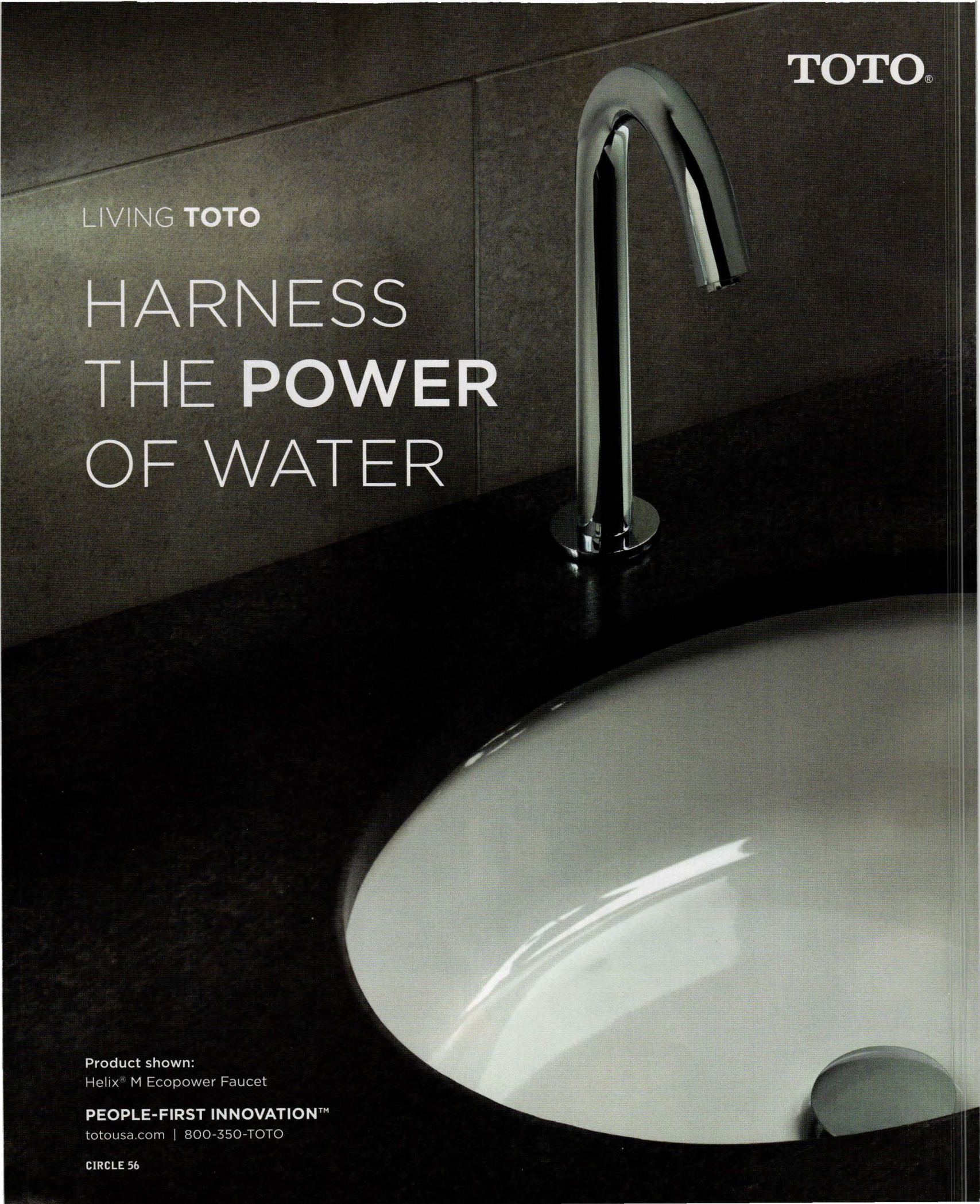
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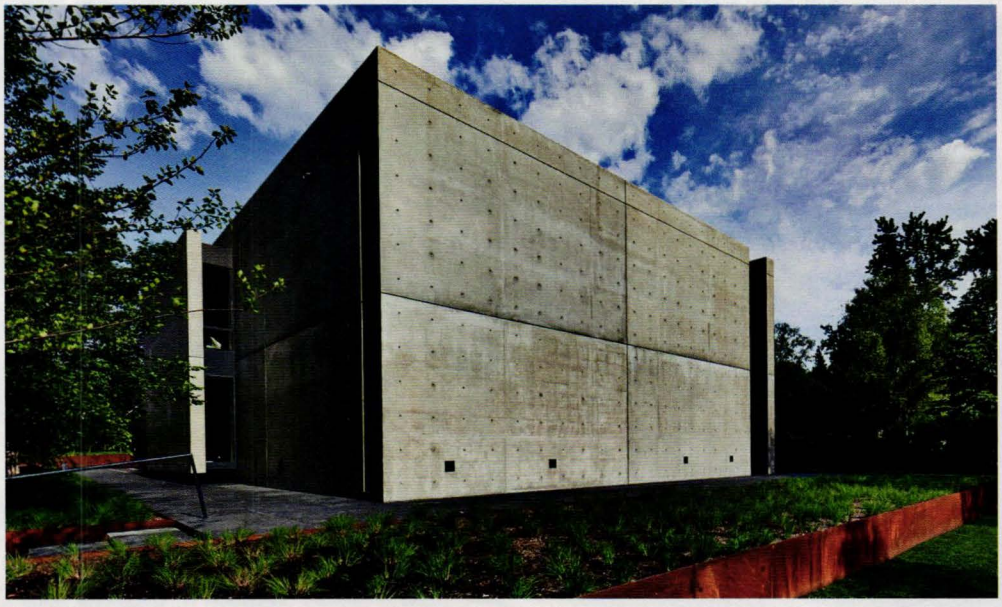
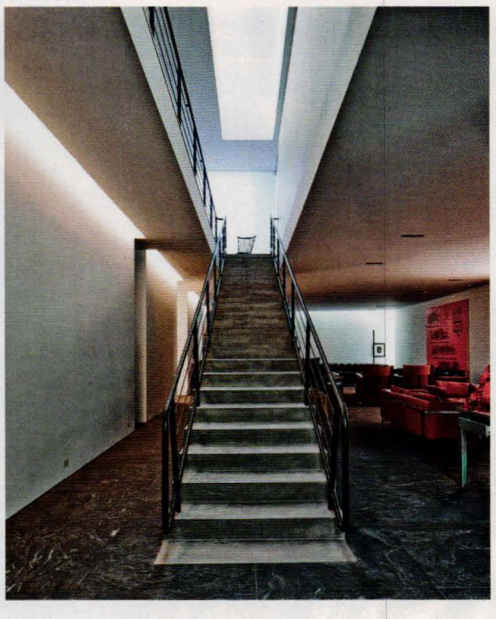
CIRCLE 56

THE DRESNER RESIDENCE REFLECTS ARCHITECT STEVEN SIVAK'S INTEREST IN CONCRETE AND HIS CLIENT'S MINIMALIST STYLE. BY LAURA RASKIN





"THE KEY WORD for this project was 'alignment,'" says Ann Arbor, Michigan–based architect Steven Sivak. For years he was fascinated by cast-in-place concrete but never had the chance to build with it. Then he met Linda Dresner—the owner of an eponymous well-known designer boutique, in Birmingham, Michigan—whom Sivak calls a "severe, minimalist modernist." He also met her husband, part-owner of a ready-mix concrete company. "This is my chance," Sivak thought.

In a suburb outside Detroit filled with early 20th-century houses, Sivak designed the ultimate concrete box. It sits on a Cor-Ten–sided grassy plinth that negotiates the site's topographic changes and emphasizes its objecthood. (Neighbors tried to stop the project but were unsuccessful; aesthetics, at least in Birmingham, cannot be regulated.)

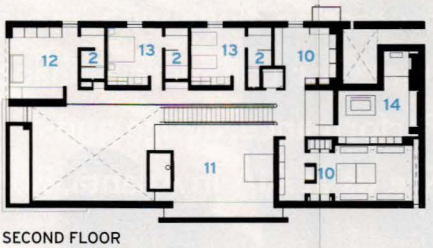
Completely blank on its street-facing elevation and where the corners turn, the two-story house appears to be a bunker. Daylight is plentiful on the interior, thanks to an almost entirely glazed rear facade and ample skylights as well as narrow incisions that conceal an entrance and windows.

Sivak's model was Tadao Ando's Pulitzer Arts Foundation building in St. Louis, Missouri. To achieve a similar glass-smooth finish, the architect used CNC-milled phenolic-coated birch plywood formwork and self-consolidating concrete (SCC). Developed in Japan and mainly used in the U.S. for commercial projects, Sivak learned of SCC from Dresner's husband; the mixture includes a chemical that makes the concrete pour like water. "It was not an easy journey," says the architect, or an inexpensive one. "It took a lot of prototyping, experimentation, and uncertainty."

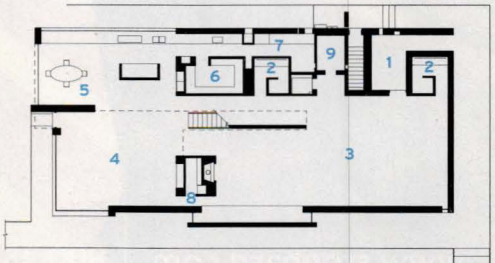
Inside the house, Sivak's strategy was to be "as visually quiet as possible." Granite flooring covers the ground level while white oak gives the second story a warmer tone. Sivak says: "Having worked on this project, I have tremendous insight into this minimalist arm of modernism. I want to do a stone house next." ■

Clockwise from top, left: the house sits on a Cor-Ten–sided plinth, with landscape design by Andrea Cochran; a skylight illuminates the stair to the second floor; the rear of the house is glazed; the ground floor includes a double-height dining room.

1 ENTRY
2 BATH
3 LIVING ROOM
4 DINING
5 KITCHEN
6 PANTRY
7 LAUNDRY
8 STORAGE
9 FRONT CLOSET
10 MASTER CLOSET
11 MASTER BEDROOM
12 OFFICE
13 BEDROOM
14 MASTER BATH



SECOND FLOOR



FIRST FLOOR

0 20 FT.
6 M.

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CIRCLE 39

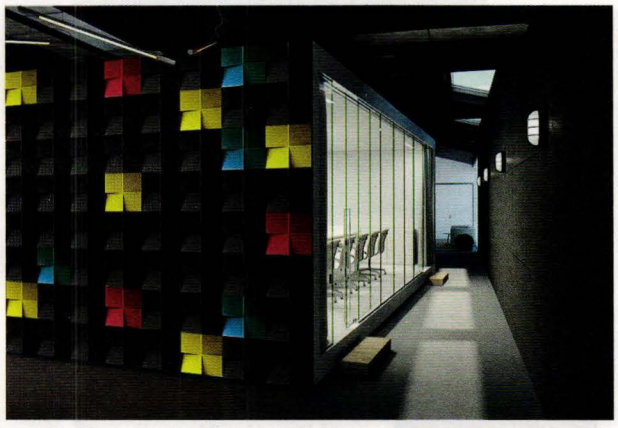
In the Spotlight

More than 700 product manufacturers and distributors will descend upon Chicago for the 47th annual NeoCon—the largest commercial interiors trade fair in North America. Following are just a handful of products not to be missed at the show.

By Sheila Kim

Muratto Organic Blocks

Rapidly renewable cork—which is also inherently antimicrobial and resilient—is produced as eye-catching sound-dampening acoustic wall tiles by Portugal-based Muratto. Distributed in the U.S. through Sustainable Materials, the molded dimensional units are offered in five styles (shown: Chock) and 10 vibrant through-body colors. sustainablematerials.com CIRCLE 212



Altered

A carpet tile collection from Shaw Contract Group, Altered comes in two 18" x 36" and two 9" x 36" plank styles, each in 12 colorways, helping to vary the compositions for one-off results. The series is constructed with the company's Cradle-to-Cradle–certified Eco Solution Q nylon. shawcontractgroup.com CIRCLE 213

Make

Skyline Design's newest glass series comprises four base designs—Hexagons, Letters (right), Threads, and Triangles—which can be customized using algorithms that adjust density, stroke, line weight, scale, and distortion, depending on which pattern option is selected. These can be etched onto one or both sides of the glass. skydesign.com CIRCLE 215

AER-DEC

Sloan's integrated sink combines—in a single basin—the manufacturer's Touch-Free Soap Dispenser, BASYS Sensor-Activated Faucet, and High-Speed Hand Dryer to eliminate water spillage on the floor. The patent-pending AirBasin, available in custom widths, is made of Corian and features dam openings that redirect the airflow from the dryers to eliminate backsplash and updraft. sloanvalve.com CIRCLE 214

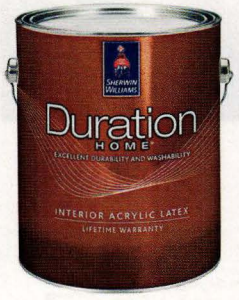
products neocon preview

Exclave

Herman Miller developed Exclave as a suite of work tools that transform underutilized office spaces into more functional ones. It comprises a rail-based wall system for supporting white- and tack-boards and video equipment; a selection of table shapes with varying heights; mobile easels; and storage units. hermanmiller.com **CIRCLE 216**

Minerality Wood/Stone

Offered in tile and plank formats, Tarkett's Minerality Wood/Stone rubber flooring blends natural wood-grain and stone-texture looks to create a unique pattern. It is slip-resistant, shock-absorbing, and can be custom colored, making it well suited to health care and corporate settings. The product is also phthalate free, recyclable, and FloorScore certified for good indoor air quality. tarkett.com **CIRCLE 217**

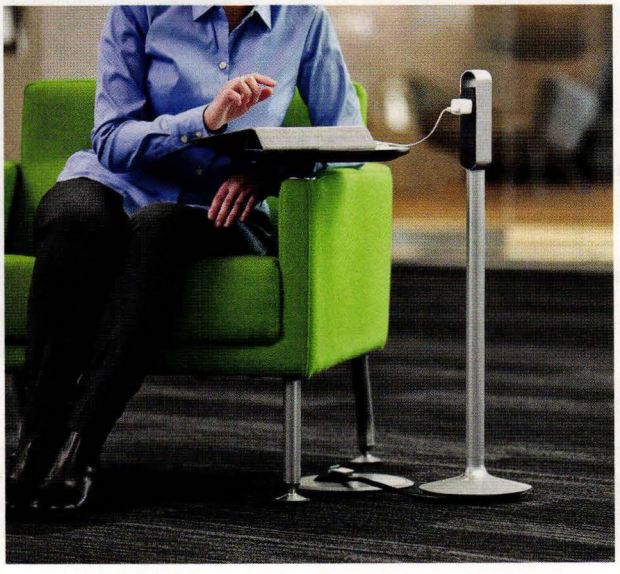


Duration Home and Emerald

Flat-paint finishes are attractive and popular but often not easily cleanable. The Emerald and Duration Home lines from Sherwin-Williams are interior acrylic latex paints that satisfy both needs with a new washable flat finish. sherwin-williams.com **CIRCLE 218**

Sliding Door Hardware

Doug Mockett's sliding-door hardware is ideal for spaces that may not accommodate swing doors. The stainless-steel set includes all the essential components—mounting brackets, track, rollers, floor guide, and door handles—save the door. The track spans 78¾" in length, making it suitable for openings ranging from 30" to 44", and can support doors weighing up to 150 pounds. mockett.com **CIRCLE 220**

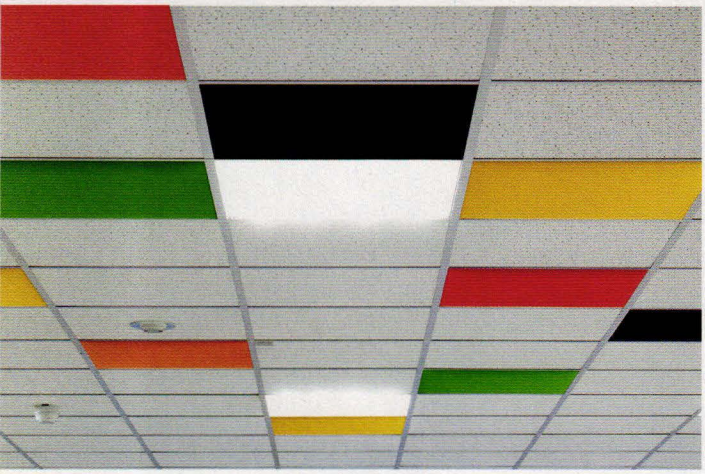


Thread

After researching workplace and education trends, Steelcase concluded that employees and students rely more than ever on mobile devices yet don't always find conveniently located charging spots. To remedy this, the company's Thread system installs easily by running an ultrathin track under carpet to a low-profile connector that powers floor-standing hubs with outlets. steelcase.com **CIRCLE 219**

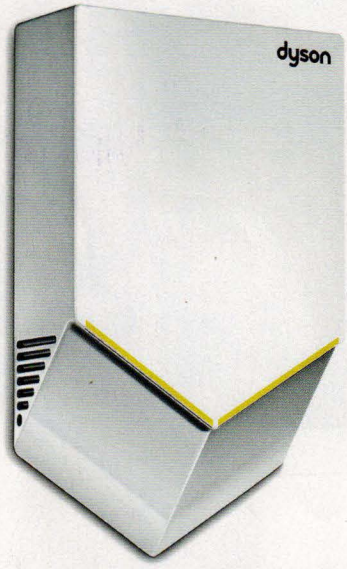
IN

Acoustic panel company Snowsound USA has launched IN, a ceiling series that allows architects and interior designers to create maximum visual and acoustical impact without changing most existing systems. The elegant, lightweight, and frameless units—available in nine fabric colors—are sized at 2' square or 2' x 4' to fit into standard drop-ceiling grids. snowsoundusa.com CIRCLE 221



Tjep.Cubism

This new collection designed by Frank Tjepkema for Wolf-Gordon includes four wallcoverings, an upholstery fabric, and a drapery textile, all with intriguing geometric patterns that play on the cube. Metamorphosis (above) sports a tiled pattern based on the shape that seemingly fades in places. The polyester-olefin covering comes in 10 colorways. wolfgordon.com CIRCLE 222



Airblade V

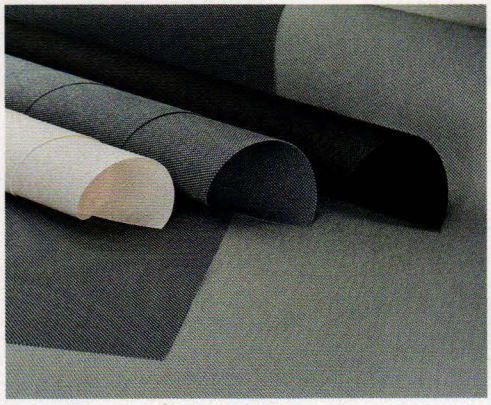
The sculptural Dyson Airblade V hand dryer isn't just a pretty face but a workhorse that dries in 12 seconds. The sensor-activated unit emits two directional sheets of 420mph air, scraping water off hands like an invisible squeegee, and utilizes a HEPA filter to remove bacteria from the air it distributes. Previously offered in sprayed nickel, it also comes in a white finish. dyson.com
CIRCLE 225

Divergent Collection

Showing at NeoCon but launching later this year, Mannington Commercial's Divergent vinyl flooring comes in 18" square tile or 18" x 36" plank formats, in a range of designs. Its UV-cured aluminum-oxide no-wax wear layer is low-maintenance and resists cuts and gouges, making it durable for such high-traffic zones as cafeterias, corridors, labs, and public spaces. manningtoncommercial.com CIRCLE 223

SoHo Collection

These new roller-shade textiles from MechoSystems are woven of a polyvinyl-PVC blend in a 2" x 2" basketweave, resulting in a soft hand, smooth texture, and optimal solar-shading and glare-control performance while maintaining visibility. All GreenGuard Gold–certified, the shade cloths are available in 12 sophisticated neutrals, in 1 (1100 series), 3 (1600), or 5 (1900) percent openness. mechosystems.com
CIRCLE 224



PHOTOGRAPHY: (BOTTOM, RIGHT) DOTSON COMMERCIAL PHOTOGRAPHY

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BY RIEDER

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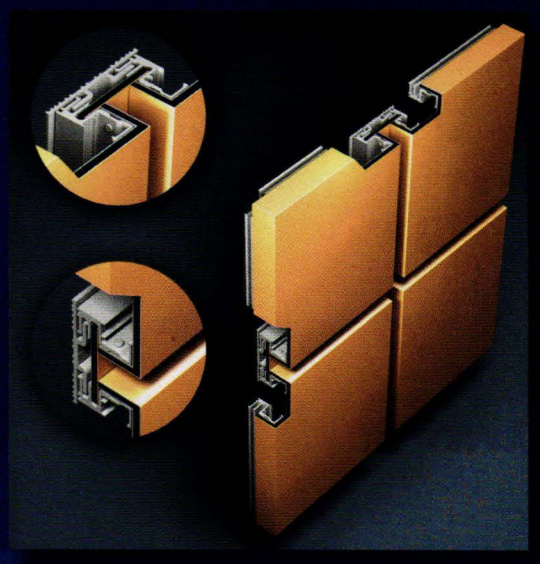

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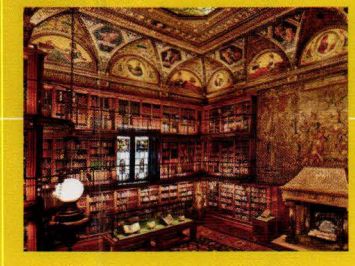
CIRCLE 41

ARCHITECTURAL
RECORD

Guess the Architect Contest

ENTER NOW! A monthly contest from the editors of RECORD asks you to guess the architect for a building of historical importance.

CLUE: AN ARCHITECT'S COMPETITION-WINNING SCHEME FOR A HOSPITAL BROUGHT FRESH AIR, LIGHT, AND VIEWS TO TUBERCULOSIS PATIENTS AND BECAME A LANDMARK EXAMPLE OF MODERN DESIGN FOR HEALING.



The answer to the May issue's Guess the Architect is **CHARLES MCKIM** of **MCKIM, MEAD & WHITE**, who designed the Morgan Library and its Renaissance-inspired east room for John Pierpont Morgan in New York in 1906. For more details, including the winner, go to guessthearchitect.com.

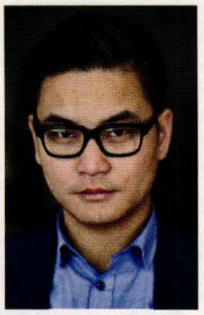
By entering, you have a chance to win an iPad mini.
See the complete rules and entry form online at guessthearchitect.com.

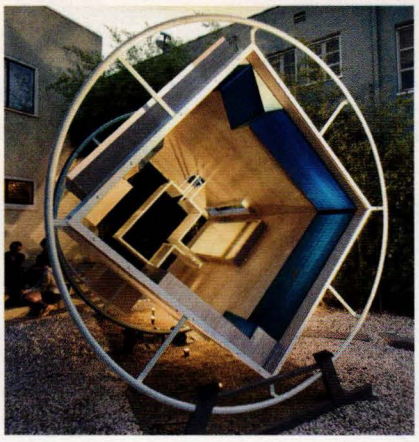
PHOTOGRAPHY: COURTESY THE MUSEUM; THE MORGAN LIBRARY (BOTTOM)

Cartoon Network

Bureau Spectacular designs playfully theoretical structures.

BY LAURA RASKIN





Bureau Spectacular's Jimenez Lai (above). A few of the firm's projects: rotatable architecture at L.A.'s Materials & Applications in 2008 (left); the Taiwan Pavilion at the 2014 Venice Architecture Biennale (below); and 99 Chairs, commissioned by New York's Storefront for Art and Architecture in 2013 (bottom).

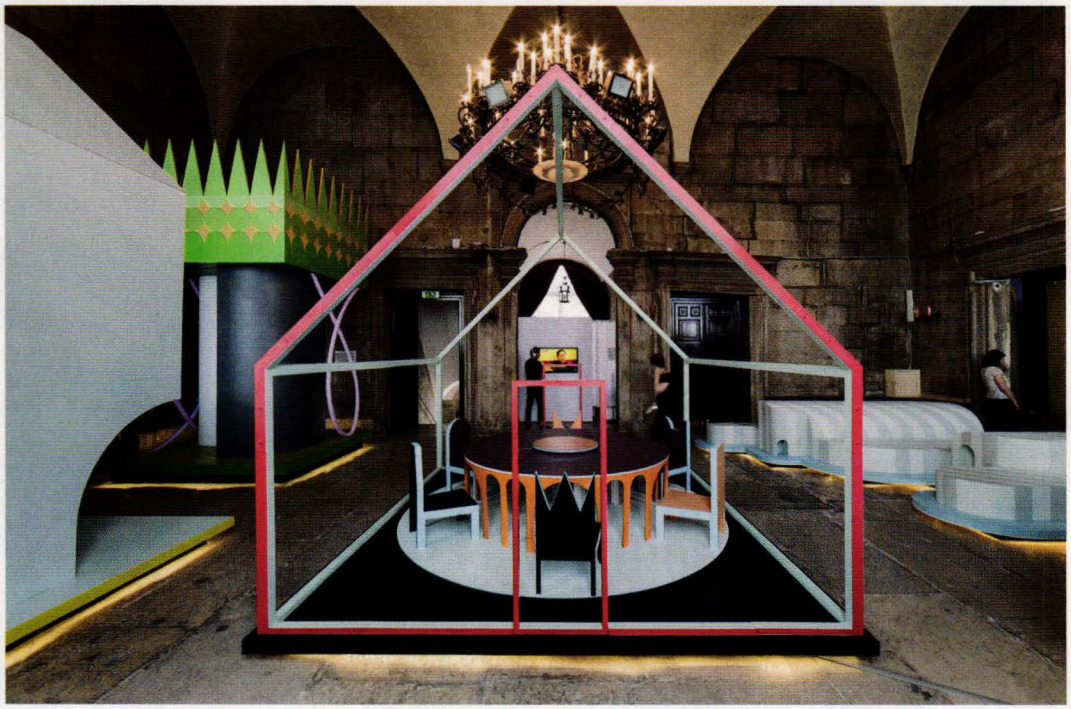
ARCHITECT JIMENEZ LAI braved communal desert living at Taliesin West in 2004–05 while studying at the Frank Lloyd Wright School of Architecture in Scottsdale, Arizona. One wouldn't guess that from the projects of Lai's firm, Bureau Spectacular—many of which morph domesticity, outsized furniture, fantasy, and narrative into pavilions and installations—but the experience made a visceral impression.

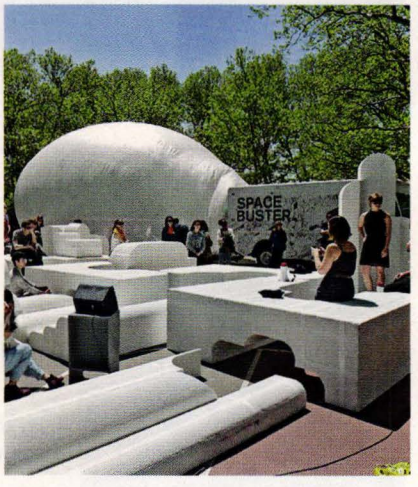
"At the time, the other students and I saw the poetics of Wright's work, but there were strong techniques deployed and follow-through that I'm trying to emulate," says Lai, who moved his formerly Chicago-based firm to Los Angeles last fall so that he could teach at UCLA. A current seminar is about movies and storyboarding, a natural topic for Lai, whose graphic novel, *Citizens of No Place*, published by Princeton University Press in 2012, addressed urbanism and the tradition of paper architects with manga and DC Comics–like drawings.

Lai was born in Taiwan and raised in Toronto, earning his M.Arch from the University of Toronto. After graduating, he lived in a shipping container in Rotterdam while working for the artist Joep Van Lieshout and then in the offices of OMA and REX. He founded Bureau Spectacular in 2008 while teaching at Ohio State University. "For me, it was really important to be in the academy and have a practice," he says.

For the 2014 Venice Architecture Biennale, Lai designed the Taiwan Pavilion, building nine "houses," each devoted to a single function such as sleeping or eating. Called *Township of Domestic Parts: Made in Taiwan*, the houses were colorful and graphic—almost postmodern. He was playing with scale, architectural models, furniture, and the standardization of the domestic program. Lai, who maintains Taiwanese citizenship, flew to Taipei and "presented the project plan with my broken Mandarin" for the chance to design the pavilion. "I wanted to see if there was a way for me to contribute to Taiwan through architecture," he says. He told his parents, who are not architects, "Consider it to be the Olympics of the sport."

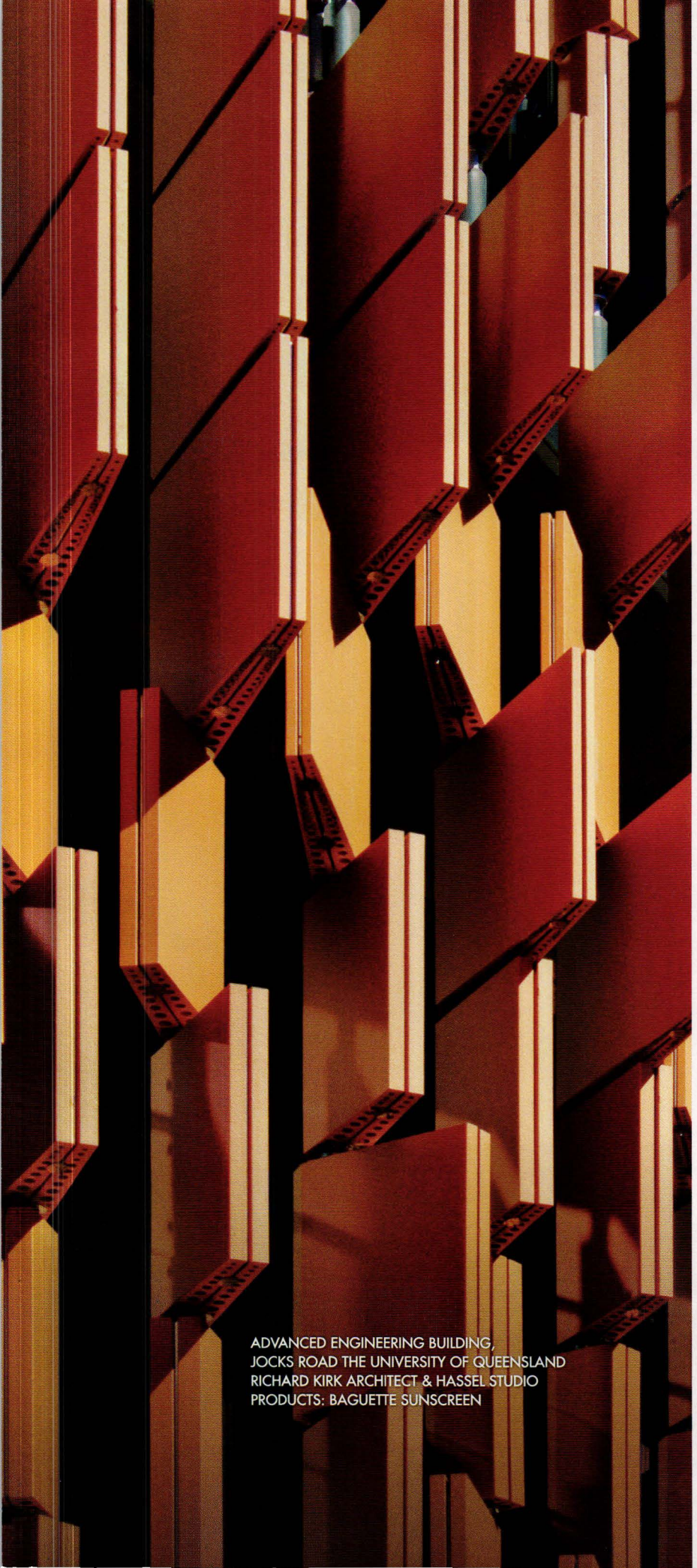
Currently Lai has an exhibition at the Los Angeles gallery Jai & Jai called *Beachside Lonelyhearts* (through July 10), where he's covered the walls, ceilings, and floors with white canvas and drawn symbols and shapes referring to a seaside story. Lai calls it a giant "cave painting," a subject he's interested in because of its relationship to architectural notation. He's also working on an exhibition for L.A.'s Architecture + Design Museum about the city's housing typologies. For the Chicago Architecture Biennial, opening in October, he's developing an installation that will play with the idea of architecture as a stage set—"a backdrop for people to behave a little differently," he says. "The U.S. has never before had a major architectural biennial," he continues. "It's kind of amazing and exciting to consider a critical mass forming here."





Bureau Spectacular is now a band of three, but Lai credits all who have passed through the office (where he often cooks for colleagues). Asked why he named the firm as he did, Lai jokes that he's always liked the acronym (BS). "It was also at a time when I was more immature. I didn't quite have the sense of subtlety that I have now." He says that the optimism of the full name is still valid: "We're still looking at things in the best light." ■

IMAGES: © SCOTT MAYORAL (TOP, LEFT); IWAN BAAN (CENTER); COURTESY BUREAU SPECTACULAR (TOP, RIGHT; BOTTOM)



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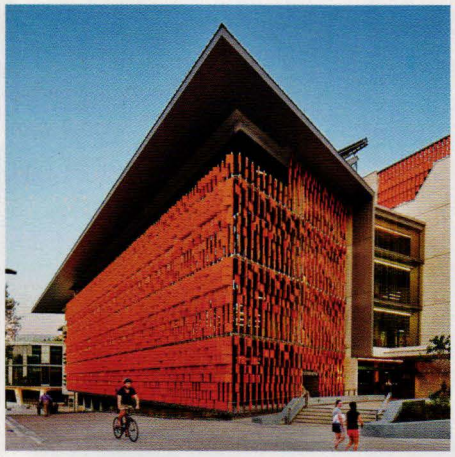

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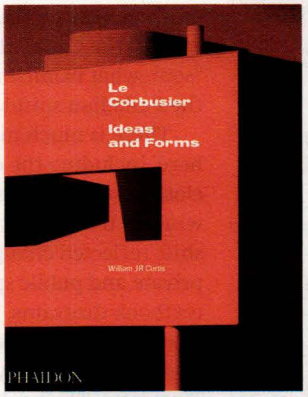
Le Corbusier: Ideas and Forms, *by William J.R. Curtis (revised and updated). Phaidon, April 2015, 512 pages, $150.*

Reviewed by Philip Nobel

IN THE PREFACE to his classic *Le Corbusier: Ideas and Forms*, published in 1986 and for the quarter century since the most thoughtful and complete analysis of the architect, William J.R. Curtis compared his subject's impact to that of Freud, Joyce, and Picasso. But why stop there? If the pronouncement-making passion of the early Corbusier makes him another Freud (explaining away the darkness, an answer for everything), then the later Corbusier—the architect of post-rational dreamscapes like La Tourette and Ronchamp—is another Karl Jung. There simply is no viable extra-architectural comparison. If Le Corbusier is Joyce for the rigorous novelty of the Villa Savoye, then his earlier villas show him to be a sumptuously intelligent Nabokov. And, of course, Picasso, looked at a certain way, was only a Corbusier who failed to build.



William J.R. Curtis relaxes at the Villa Savoye in 2011 (above). In addition to his book on Le Corbusier, he has written about Balkrishna Doshi, Denys Lasdun, and modern architecture in general.

Curtis may get closest when he compares the architect's influence to Palladio's. Our modernism—or our manner of practicing architecture now—remains Corbusian through and through. In character, privileging the rational and irrational in equal parts; in method, attempting to achieve a personal synthesis while whipsawing between inspirations; and in form itself, we are all his descendants. Architecture today is never nearly so Wrightian, so Gropian, or so Kahnian. And, if it may at times appear glassily, griddily Miesian, we need only remember that Le Corbusier also got there first.

So go back and read about the man Charles Edouard Jeanneret became and the things he thought and did. There is, still, no better single source than William Curtis. In preparing this thoroughly updated and lavishly published second edition of *Ideas and Forms*, he has sifted again through Le Corbusier's minutely archived life and work—what Curtis acknowledges is an obsession—assimilating new research by others and correcting some points he found were made less certain by the passage of years. It is an historian's task but undertaken with a critic's zeal. Trying at all points to balance his narrative between Corbusier's life, the political and cultural forces acting on that life, the architect's work in many different media, and the particular context for its creation, Curtis needs that strong critical center as a guide for his curiosity.

There is no manifesto here. You won't find the "hidden ideological commitments" that the author, in one of four essay-like chapters in a new final section of the book, suggests play a role in too many contemporary Corbusier studies. As there are no new forms to examine, this edition necessarily focuses anew on the man's ideas. It examines "not just theories and lyrical expressions in texts," Curtis writes, but also those that are implicit in images and constructions. As a result, it shows many more drawings, including sketches, the intimacy of which forms a pleasant contrast to the panopticon sweep of the text.

Curtis writes that "Le Corbusier had a rare capacity to imagine spaces during the design process and to materialize architectural ideas and intuitions." This edition of *Ideas and Forms*, though striving for and achieving something like a total understanding of the forces affecting Corbusier's life and work, is at root concerned with exploring one thing: that "rare capacity"—which is to say, the ability to turn life into buildings. And that's why, architects, yes: you'll need to buy this new version of a book that you probably already own and have already read. ■

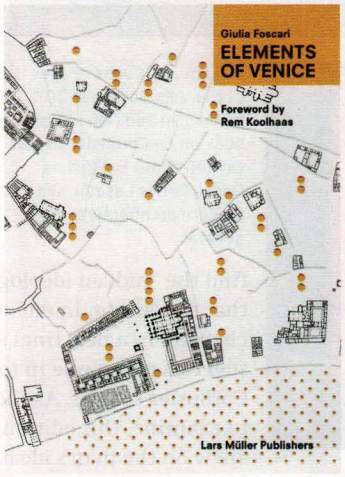
Philip Nobel is the editorial director of SHoP Architects and the author of Sixteen Acres: Architecture and the Outrageous Struggle for the Future of Ground Zero.

PHOTOGRAPHY: © JEAN-BRICE VIAUD (TOP)

Elements of Venice, *by Giulia Foscari with a foreword by Rem Koolhaas. Lars Müller Publishers, October 2014, 696 pages, $32.*

Reviewed by Suzanne Stephens

TO SAY Giulia Foscari's book is a beautifully put together trove of information about Venice's luxuriantly scenic architecture sounds gushy. Actually, it is an understatement. Foscari's distinctive analysis of the variegated riches that are a feast for the eye in this city of encrusted layers pays proper homage to its subject. By zeroing in on the architectonic vocabulary of facades, walls, ceilings, stairs, doors, and other elements, the author, who is a young architect in Hamburg, provides an intensive look into the creation of this water-bound urban place. The 6½-by-4¾-inch pages of this glossy paperback are artfully packed with texts, drawings, and photographs (though sometimes reading the tiny type is like taking an eye exam). Yet, because it can be easily held in your hands, you want to take it with you to visit the architecture under scrutiny, as inspirational perhaps as carrying an illuminated book of hours into a Gothic cathedral.



The impetus for Foscari's investigation stems from a research project she embarked on with Rem Koolhaas for his 2014 Venice Biennale exhibition and book, *Elements of Architecture*. While Koolhaas dissected the components of architecture, such as floors, walls, roofs, ceilings, and facades, in a general way, Foscari has applied the method to the particular city where she was born. She quotes from scholarly resources, and places the different parts and pieces of Venice's medieval, Renaissance, Baroque, and modern buildings against a tapestry of sociopolitical and economic history.

Hers is not a dry summation of facts but a compendium that also includes speculative observations. For example, the way the Doges Palace's double order of columns elevated the Grand Council chambers leads Foscari to say that this 14th-century design strategy could be "almost a prophetic precursor of Le Corbusier's principle . . . of raising the buildings aboveground by supporting them on pilotis."

Foscari's analytic comparison of stairs by Jacopo Sansovino to those by Andrea Palladio stands out to those of us who, over time, may have lost some footing in such Venetian particulars. As she notes, Sansovino approached the stair as a promenade, connecting floors with dynamic diagonal flights at the Palazzo Gaddi in Rome (1530) and the Palazzo Grimani in Venice (1550s).

Palladio treated his stairs quite differently: the eight types he isolated in *I Quattro Libri* would not be called promenades. For Palladio, the stair was a "vertical conduit," seen in the mesmerizing spiral of the Scala Ovata that he designed in 1561 inside the Convent of La Carita (later the Gallerie dell'Accademia). Going on to the modern, Foscari finds Carlo Scarpa's stair in the Casa Balboni (1974) a "somewhat ironic interpretation of the Palladian spiral staircase."

There is much more to absorb here, including the evolution from cloth-covered panels to bottle-glass as window treatments and how that shift reflected changing notions of private and public space. Instead of textbook diagrams, the examples are beautifully illustrated with reproductions of paintings by Carpaccio and Tintoretto. The book is not the sort where you will find all the information (including many dates) about a landmark in one place. The organization of chapters, based on different typologies, means that we look at the facade of the Doges Palace first, and return to the building in a later chapter on ceilings. Nevertheless, this compelling history is stuffed with intriguing facts, quotations, and anecdotes from a long line of Venice's literary admirers. You embark on a procession without getting lost—unlike finding your way around la Serenissima itself. ■

In analyzing architectural components significant to Venice's heritage, Foscari compares such elements as stairs by Carlo Scarpa (above) with historic predecessors.

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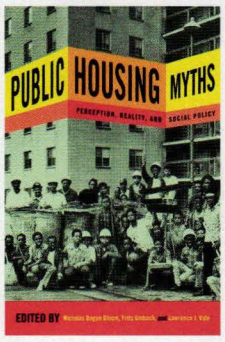
CIRCLE 59

Public Housing Myths: Perception, Reality, and Social Policy, *edited by Nicholas Dagan Bloom, Fritz Umbach, and Lawrence J. Vale. Cornell University Press, April 2015, 296 pages, $70 (hardcover), $23 (paper).*

Reviewed by Jayne Merkel

NOTHING LED to the disillusion with modern architecture during the postmodern era more than the critique of public housing. It was not, after all, Robert Venturi's *Complexity and Contradiction in Architecture* (1966) that really ushered in the new style. That book was too complex and subtle. Charles Jencks's more colorful and bombastic *The Language of Postmodern Architecture* (1977) was much more influential, and it began with a view of the destruction of Pruitt-Igoe. With one facile fell swoop, both modernist form and modernist idealism were imploded.



Oscar Newman's *Defensible Space* (1972) also played a role. "It is the apartment tower itself which is the real and final villain," Newman wrote.

But, as several studies in the new book *Public Housing Myths* show, the problem was not the high-rise so much as well-intentioned social policy. Projects, particularly in Chicago, gave priority to large families that had trouble finding market-rate housing. Reformers assumed that children, in particular, would benefit from modern housing. But buildings with a higher percentage of children than adults—an imbalance the authors call "youth density"—ended up having much higher crime rates, even though, initially at least, the tenants were stable two-parent families. Eventually, these complexes became unmanageable. Another seemingly logical policy—setting rents at a percentage of income—ended up driving out the working poor. When they were replaced by the nonworking poor, housing authorities ended up with less money for maintenance.

The editors of this book—and the authors of most of its essays—are professors who study and teach architecture, planning, or history, though one piece is by Yonah Freemark, a project manager at Chicago's Metropolitan Planning Council. The book shows—in careful study after careful study—that the critique of public housing was inaccurate, misfocused, and often even fabricated. Most public housing thrived, but the projects that failed got much more publicity.

Among the authors' findings are that the serious problems attributed to modern housing projects throughout the nation were, in fact, in a very few places. The largest concentration of high-rise public housing in the nation—in New York—has been surprisingly successful, because of good management and the fact that, in New York, high-rise housing is the norm.

Also, although modernist tower blocks are synonymous with public housing in the American imagination, only a third of public-housing units are actually in high-rises. And the most troubled complexes have been in cities that were losing population, jobs, and other opportunities: housing was part of a much larger problem.

The myths are debunked in chapters including "Modernist Architecture Failed Public Housing," "Public Housing Breeds Crime," "Public Housing Ended in Failure in the 1970s," "Mixed-Income Redevelopment Is the Only Way to Fix Failed Public Housing," and "Public Housing Is Only for Poor People."

This book appears at a time when many cities have an inadequate supply of affordable housing. There are plenty of problems in need of solutions, and these studies—taken together—should go some distance in finding the right ways to solve them. ■

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CIRCLE 43

Villages in the City: A Guide to South China's Informal Settlements, *edited by Stefan Al. Hong Kong University Press and University of Hawaii Press, October 2014, 216 pages, $28.*

Handmade Urbanism: From Community Initiatives to Participatory Models, *edited by Marcos Rosa and Ute Weiland. Jovis, October 2013, 224 pages, $40.*

Tactical Urbanism: Short-term Action for Long-term Change, *by Mike Lydon and Anthony Garcia. Island Press, March 2015, 256 pages, $25.*

Reviewed by Gordon Douglas

FROM THE slum settlements of burgeoning megacities to the guerrilla gardening and pop-up everything we celebrate in the United States, recent years have seen a growing interest in creative and informal urbanisms of a wide variety. Several new books offer contributions to this discourse on the bottom-up.

One of the best is *Villages in the City* edited by Stefan Al. This "guide to South China's informal settlements" looks at villages enveloped by the rapid growth of nearby "western style" cities. The formerly rural residents have profited from the development of agricultural lands as they densified their dwellings and rented them to recent migrants. Despite the adaptive nature of this process in places that long predate the surrounding development, the resulting areas are viewed as messy, crime-ridden "tumors" in the otherwise rational city, and are now being destroyed.

Al and his contributors aim to document, theorize, and defend these curious places, and do so to great effect through an artful assemblage of photographs, illustrations, maps, and essays. Indeed, while *Villages in the City* is a fabulous piece of architecture and design graphica, written contributions from Marco Cenzatti, Margaret Crawford, Jiong Wu, and others offer vital considerations of the histories and contexts of the phenomenon. The book succeeds by investigating and advocating for the informal without fetishizing it.

Marcos Rosa and Ute Weiland's *Handmade Urbanism* is a fun tour of community-based initiatives in Mumbai, São Paulo, Istanbul, Mexico City, and Cape Town that received the Deutsche Bank Urban Age Award for public-private collaborations that improve urban places and lives. The book is organized by city and presents photos, statistics, illustrated summaries, and interviews for each. In Mexico City, for instance, once-warring street gangs worked to reduce violence through graffiti contests and sports; in Cape Town, a community organization built an agricultural-education complex. Many initiatives converted neglected land into thriving public spaces.

Handmade Urbanism has the feel of a clever, even cartoony textbook: the aesthetic is accessible, texts are short, facts are simple. It even includes a DVD documentary. This approachableness is a strength, as are some powerful photos and thoughtful contributions from noted urbanists including Richard Sennett and Ricky Burdett. But other pieces are clumsy and hyperbolic at times, celebrating these local efforts without really assessing them.

Tactical Urbanism, by Mike Lydon and Anthony Garcia, is about creative placemaking in the global north. The book takes as its subject simple but bold streetscape interventions that lead to powerful changes. Think of the rapid pedestrianization of Times Square or San Francisco's popular "parklets." Lydon and Garcia have popularized the term tactical urbanism in recent years and work here to define it, explore its history and successes, and proselytize for its continuing application.

The book focuses on citizen-planning initiatives that have found support and success, such as Build a Better Block, a streetscaping effort that started in a single Dallas neighborhood and is now an international model. Lydon and Garcia make an array of interesting connections in a section on tactical urbanism's precursors, including mail-order bungalows and the first late-night diner. The "how-to" guide that constitutes the fifth chapter presents advice from the authors, who combine professional training with experience in creating their own tactical interventions.

Ironically, what these three books on informal urbanism all demonstrate is the inescapability of formal processes. China's urbanized villages were enabled by policy and are now threatened by it; the Urban Age Awards projects explicitly integrate the grassroots with the public and private sectors; tactical urbanism is a way for citizens and planners to leverage informal approaches for official results by demonstrating the impacts of innovations without (or at least before) the encumbrances of regulatory hand-wringing.

It could also be said that the three books, all unwavering proponents of their subjects, lack sufficient cautions and critiques. There are simple issues of safety and responsibility for projects that walk a line between unsanctioned and sanctioned. But there are also questions to ask about rewarding these efforts when many people want for basic shelter and services. This critical perspective is still missing from the conversation. ■

Gordon Douglas is a postdoctoral fellow at NYU's Institute for Public Knowledge.

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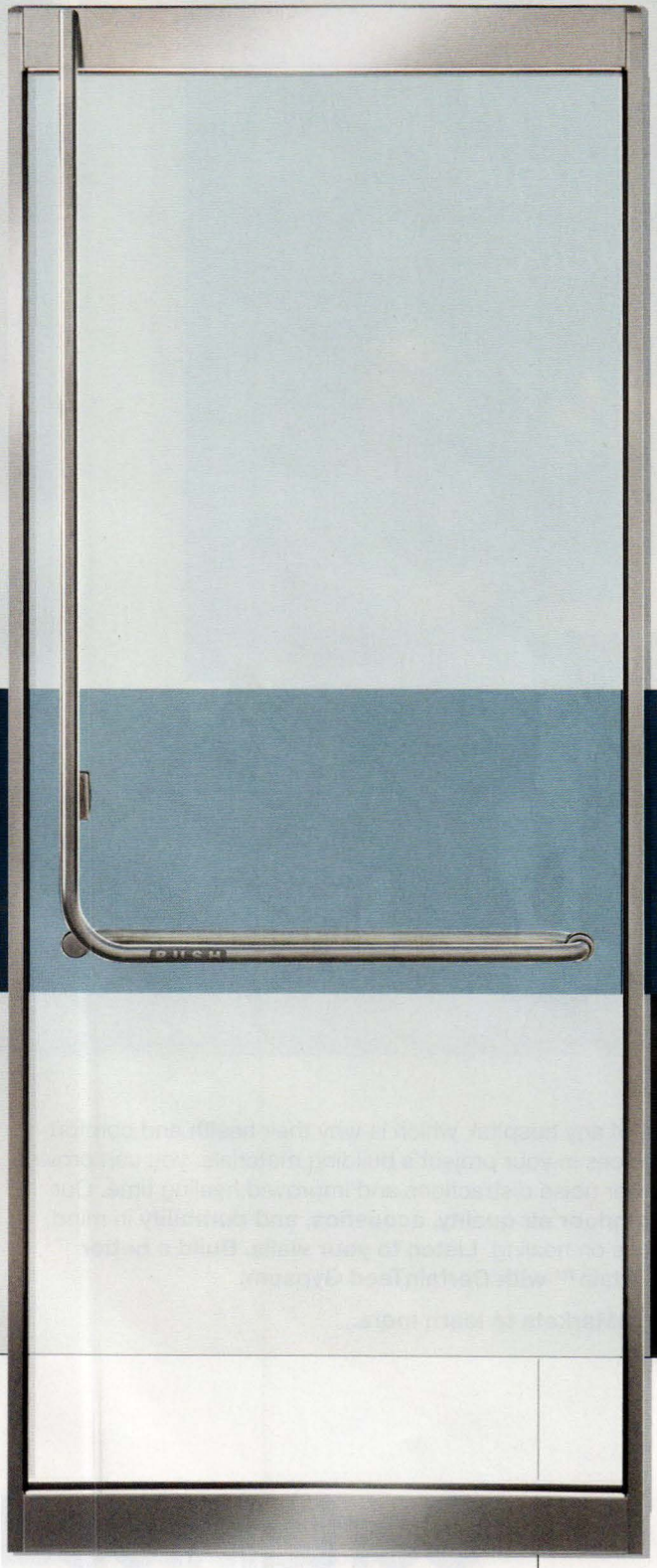

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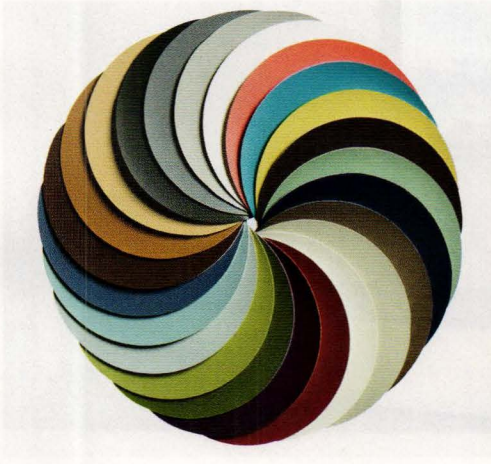

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Crypton crypton.com

The high-performance-textile manufacturer has introduced a new vinyl product aimed at health care, senior living, and various other contract markets. The polyester/cotton jersey–backed vinyl withstands cracking; stubborn stains from ink and food to blood; and repeated cleanings using harsh solutions. Additionally, Revyl resists bacterial or fungal growth and is Greenguard certified for low VOCs. CIRCLE 205

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Nemschoff nemschoff.com

Simple geometric pieces conceived for health-care settings, these Parsons tables are equally suitable for hospitality, education, or office projects. The models—which are customizable for patient, guest, or staff use—include six square end tables, three consoles, and a square dining table, covered with hard-wearing laminate or wood veneer. Solid-surface tops and integrated power ports are options. CIRCLE 201

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Adams Rite ritedoor.com

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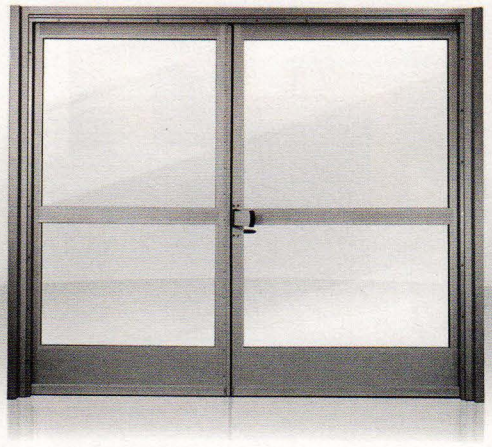

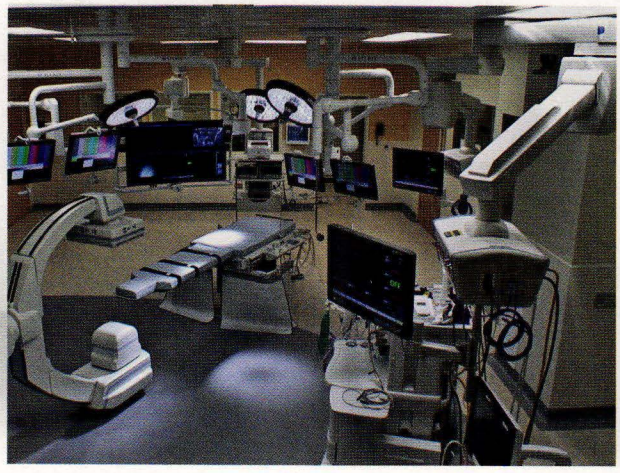

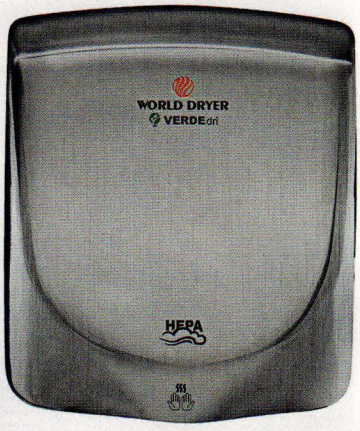

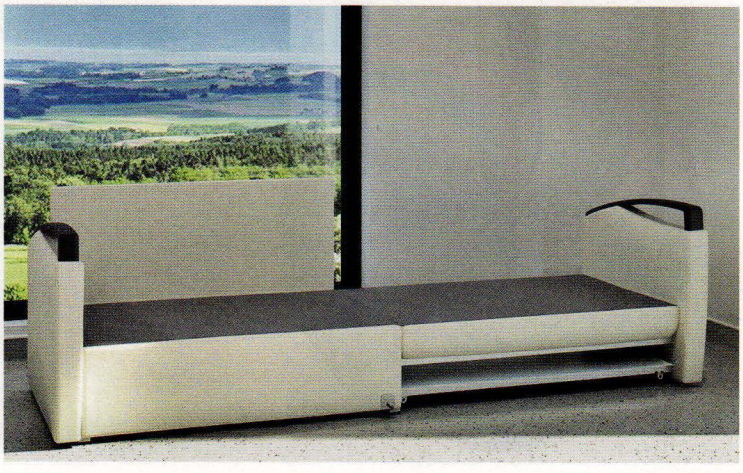

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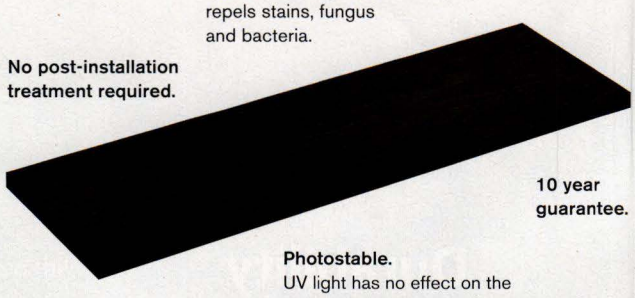

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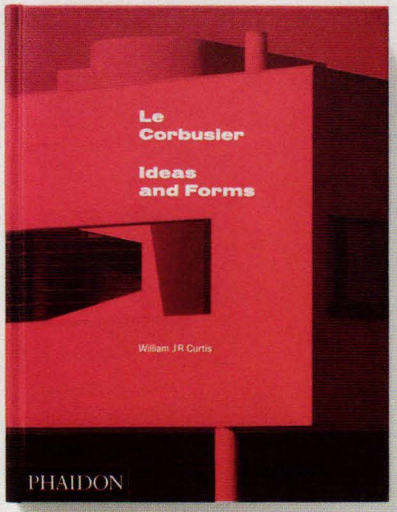

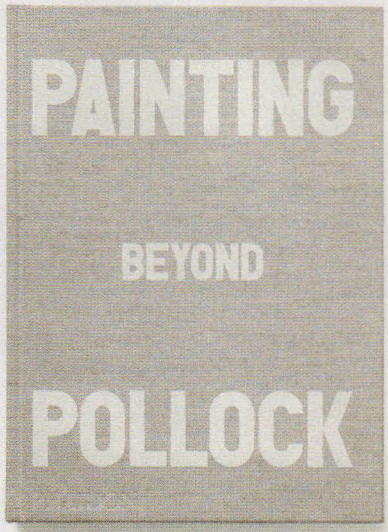

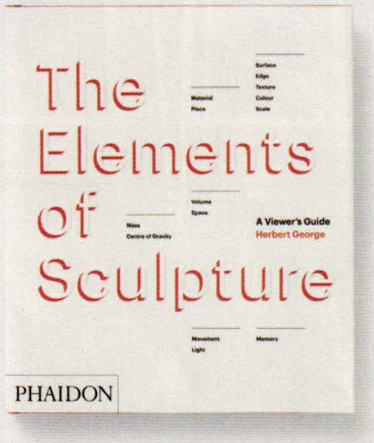

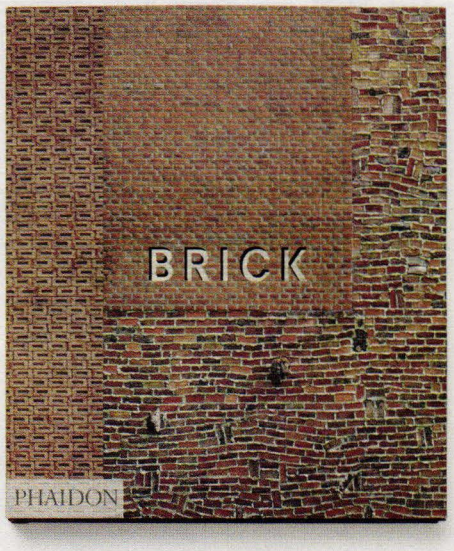

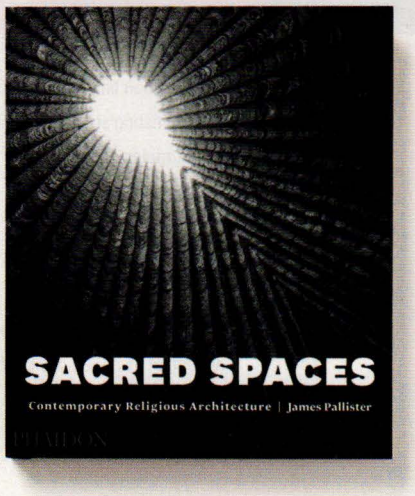

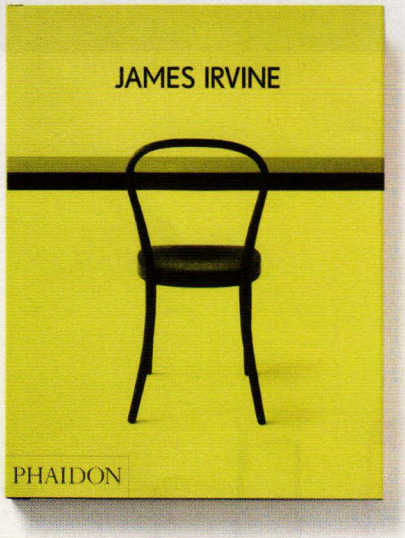

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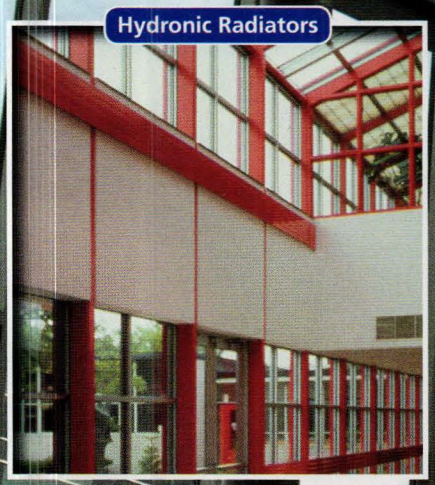

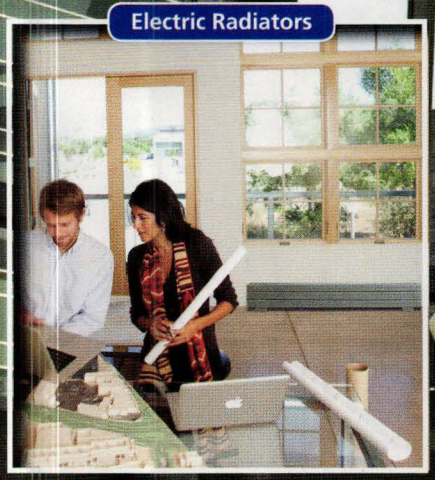

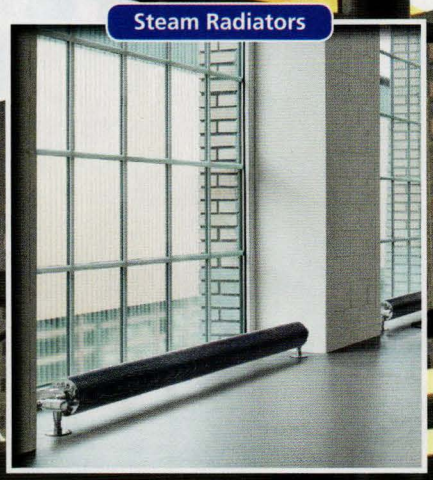

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CIRCLE 44

DESIGN FOR SOCIAL ENGAGEMENT

PHOTOGRAPHY: © IWAN BAAN

The six projects in this section show architects reaching out to a diverse range of communities, from urban neighborhoods in Port-au-Prince, Haiti, and Los Angeles to rural villages in Zambia, Kenya, Senegal, and China. Engaging with the people who live in these places, the architects must deal with the particularities of culture, climate, and convention. If they do their jobs well, they create buildings that resonate with the users—turning the experience of going to school or getting medical treatment, for instance, into something more meaningful than just taking a class or getting vaccinated: they provide spaces for celebrations and social gatherings as well as the more mundane activities that are ostensibly the project's purpose. They combine traditional and modern strategies to produce buildings (as in the artists residence center pictured on this page) that speak to the spirit of the people using them.

THREAD: Artists' Residence & Cultural Center
Sinthian, Senegal | Toshiko Mori Architect

COMMON THREAD

A light-filled artists' residence in a remote Senegalese village encourages dialogue while serving its community.

BY ANNA FIXSEN

PHOTOGRAPHY BY IWAN BAAN

A favorite dictum of artist Josef Albers—known for his meditative, color-saturated paintings of overlapping squares—was "minimal means, maximum effect." Forty years after his death, this idea is at the heart of a new initiative of the Connecticut-based Josef and Anni Albers Foundation: an artists' residency program and cultural center in rural Senegal. THREAD, as the center is called, is a sensitive work, designed pro bono by New York architect Toshiko Mori, that aims to weave together art, education, and cultural exchange under one roof.

The road to Sinthian, a village of 705 people in Senegal's Tambacounda Region near the border of Mali, is dotted with stately baobabs and hulking termite mounds. In this sun-scorched part of sub-Saharan Africa, temperatures can climb well above 115 degrees, and once-plentiful aquifers have disappeared due to overuse and desertification.

Nicholas Fox Weber, executive director of the Albers Foundation, had been volunteering on and off for more than two decades with a local clinic here to combat high rates of infant and maternal mortality. He also dreamed of taking the Albers Foundation's mission—to educate the public about art—to Africa. After Mori designed an exhibition for the Cooper-Hewitt museum of the Alberses' work—Anni's textiles alongside Josef's Bauhaus-influenced furniture—the two became friends. Weber convinced Mori to bring her studio

PLAYING THE PART
The 11,300-square-foot building, commissioned by the Josef and Anni Albers Foundation, accommodates visiting artists as well as pickup games of soccer.

View additional images at architecturalrecord.com.

at Harvard's Graduate School of Design (GSD) to Senegal.

"I had been to different places, but not to Africa with students," Mori says. "But Nicholas knew the local people and the context. We had the necessary connections and relationships."

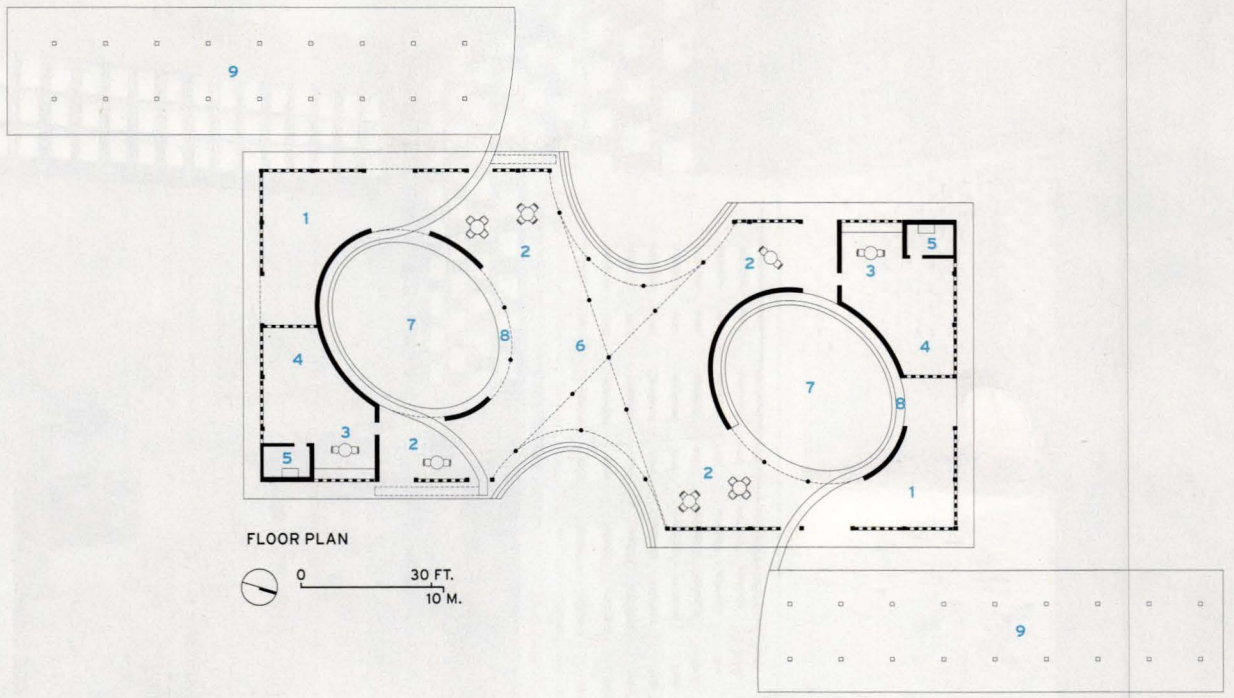
Through trips to two different towns in 2010 and 2012, the students identified a need for cultural venues to accommodate the rich Senegalese traditions of music and dancing. "The villagers loved our ideas and wanted to build everything we proposed," says Mori. "It was like a dream for them."

Fox Weber asked Mori's office to design an Albers Foundation artists' residence in Sinthian, where he had been working with the clinic, to foster cultural and artistic exchange between local and international artists. Mori, along with former student Jordan MacTavish (now a designer in her office), modified a scheme that emerged from the 2010 GSD studio—a low-slung brick building with a dramatic undulating bamboo roof that is as graceful as it is functional.

On a one-acre site near the local clinic, the designers oriented the structure to catch breezes and light, as well as to collect rainwater to compensate for the depleted aquifers. The building's figure-eight-shaped plan divides the interiors into flexible spaces. The designers located visiting artists' residency rooms on the northwest and southeast corners, while two circular central courtyards were meant as venues for performances and meetings. Brick was laid for walls perforated in a geometric pattern, inspired by Josef Albers's work, to provide ventilation and light while keeping out dust.

The building's most striking feature, its parametrically designed roof, minimizes the need for interior columns by resting on the brick walls. Composed of three lashed-together layers of bamboo topped with thatch, the sloped roof directs rainwater into canals, which drain into covered cisterns that can hold up to 73,860 gallons—one third of the annual domestic water usage in Sinthian. The roof will be put to the test for the first time this month, with the advent of the rainy season.

Most important, the architects were careful not to force a vision on the community, instead working within existing techniques, using local materials and construction methods, and giving local workers employment. Says Mori, "It's pro



FLOOR PLAN

0 30 FT.
10 M.

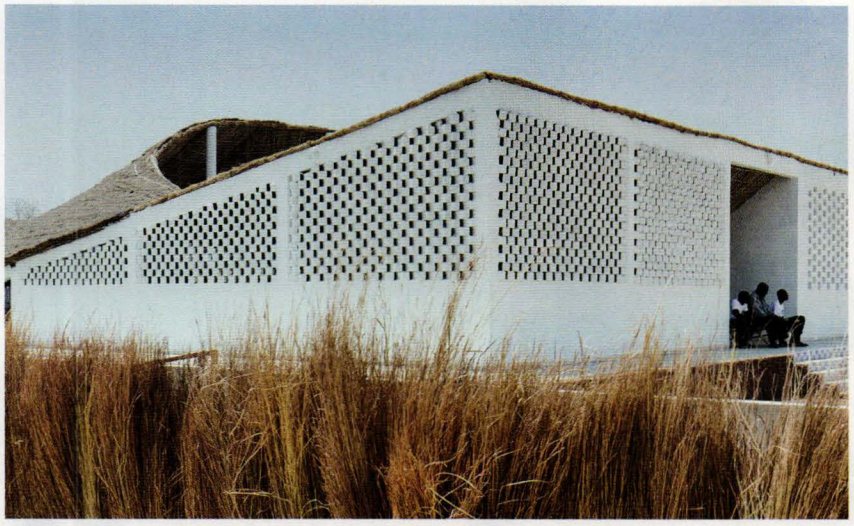
1 WORKSHOP
2 FLEXIBLE SPACE
3 KITCHEN
4 BEDROOM
5 BATH
6 MEETING/ PERFORMANCE SPACE
7 COURTYARD
8 WATER CANAL
9 WATER CISTERN

VIEW FROM THE TOP
THREAD is crowned with a roof designed by German engineers Schlaich Bergermann und Partner in collaboration with Toshiko Mori, and constructed by local workers with native bamboo and thatch (opposite and right). Its sloped surface enables rainwater to drain into canals and storage cisterns for village consumption. Sinthian residents, inspired by Josef Albers's glass assemblages, laid the tile floors (opposite). Community members contribute to the center's maintenance (right).

bono work, but not for pro bono's sake—it made sense in terms of economics." The sale of one Albers painting at Christie's more than covered the construction cost, at $440,000. The remaining funds have gone to the first-year operating budget.

On opening day this past March, more than 1,000 people from Sinthian and surrounding villages flocked to the center. In one of the light-filled courtyards, community members delivered hours of speeches, dances, rap music, and skits. When not used for performances, dozens of children fill up the space, improvising soccer matches in the courtyards to escape the searing heat, and working on their schoolwork at dusk, when the center glows like a beacon.

"It is one thing to build a building," says Mori, "but the most important thing is how you run it, how you program it, and how it becomes a truly sustainable program useful to the community." ■



credits

ARCHITECT: Toshiko Mori Architect – Toshiko Mori, Jordan MacTavish

ENGINEERS: Michael Stein, Schlaich Bergermann und Partner (structural)

CONTRACTOR: Dr. Magueye Ba

CLIENT: Josef and Anni Albers Foundation

SIZE: 11,300 square feet

COST: $227,715

COMPLETION DATE: February 2015

SOURCES

MASONRY: Clay brick and masonry blocks formed on-site

ROOFING: Local bamboo and thatch

WHITE-HOT One of two artist residences flanks the cultural center (opposite, top). The white perforated walls (opposite, bottom), assembled from locally made bricks, are inspired by Josef Albers's work and support the bamboo roof structure (above and below).


Maple
ONE WAY

BUILDING SANDWICH Four stories of prefabricated housing modules hover above a ground-floor health clinic with a recreation terrace set between them.

Star Apartments | Los Angeles
Michael Maltzan Architecture

STACKING THE DECK

An architect and a nonprofit client work together for the third time to create housing for the formerly homeless, this time using prefabricated modules.

BY SARAH AMELAR

PHOTOGRAPHY BY IWAN BAAN

Star Apartments, in downtown Los Angeles, is striking not just for its angular, almost levitating sculptural form, but also for the ways it differs from Michael Maltzan Architecture (MMA)'s prior work for the nonprofit Skid Row Housing Trust (SRHT). "Rather than create a prototype and make it over and over, our collaboration with the Trust as our client is very much in the laboratory phase, still exploring what's possible," says principal Michael Maltzan. Each successive commission—Star is the third—"has expanded the ambitions," he says, "allowing us to reconsider how a building can be lived in, can support its residents, fit into the evolving city, and even be made."

Enlisting top-notch architecture to help overcome homelessness is fundamental to SRHT, which started in 1989, turning derelict SRO hotels in Skid Row into safe, affordable, attractive, hotel-style quarters for the chronically homeless. By the mid-'90s, SRHT began creating permanent, instead of transitional, supportive housing, and eventually entire new buildings, with efficiency apartments and on-site social services. And "a miraculous thing happened," says the organization's literature: "long-term homeless people . . . often considered 'beyond help,' got better, a lot better."

Yet housing this population often elicits neighborhood wariness—even along downtown Los Angeles's raw, but gentrifying fringes. SRHT responds with architecture that's "not just acceptable but outstanding—beautiful, high-performing design that serves formerly homeless residents, while genuinely enhancing the city," says Theresa Hwang, SRHT's director of community design and planning. "One of our goals is to break down stigma and NIMBY-ism."

SRHT, which owns and operates 1,600 units in 24 buildings, first engaged MMA to design Rainbow Apartments (2006), a model for permanent supportive housing. Then came the New Carver Apartments (2009), which took SRHT

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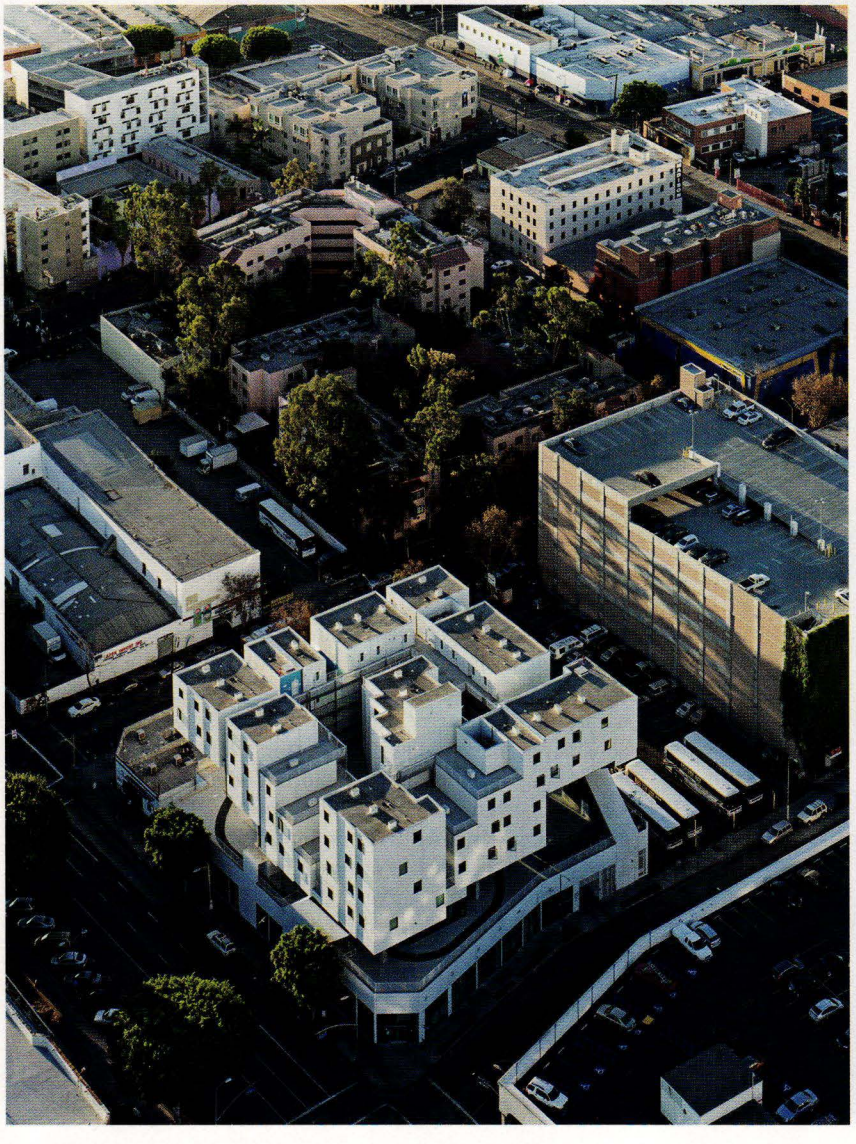
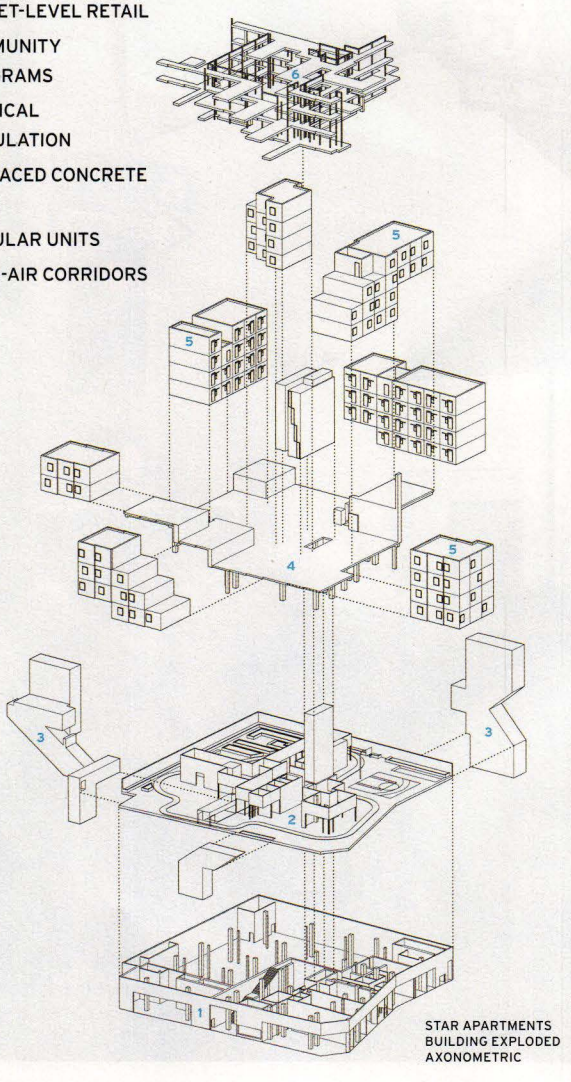
beyond Skid Row and gave a difficult site along the I-10 freeway a landmark. Completed in 2014, Star Apartments broke new ground, except not literally—as its base is an existing structure.

To integrate housing within a larger community, SRHT sought opportunities for a mixed-use project. A low-rise concrete building at Maple Avenue and 6th Street offered just that: a typical Skid Row hodgepodge of mom-and-pop street-level retail beneath roof-deck parking. Razing this five-year-old structure would have violated SRHT's commitment to sustainability—and also forfeited its chance to include retail, since its funding stipulations permit only pre-existing mixed-use.

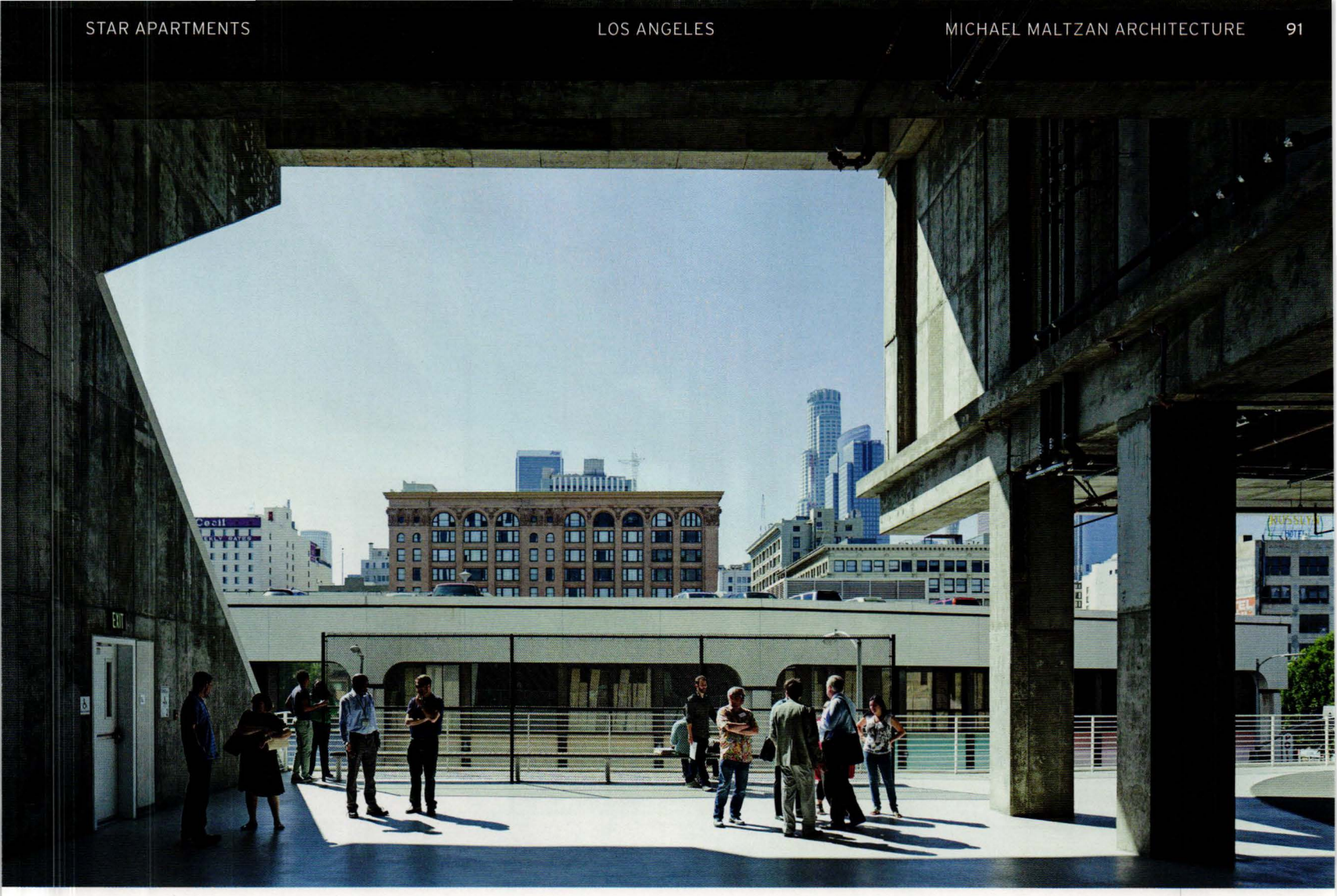
The decision to piggyback on an existing structure led MMA to an approach not explored in Los Angeles



1 STREET-LEVEL RETAIL
2 COMMUNITY PROGRAMS
3 VERTICAL CIRCULATION
4 TERRACED CONCRETE SLAB
5 MODULAR UNITS
6 OPEN-AIR CORRIDORS



STAR APARTMENTS BUILDING EXPLODED AXONOMETRIC



CITY VIEWS
The recreation terrace (above) offers open and covered spaces, as well as indoor rooms for art, dining, reading, and exercise. The apartments cluster around a courtyard and are connected by outdoor walkways (right). The prefab units were delivered by truck from Idaho and lifted onto a concrete deck (opposite, top). The 95,000-square-foot building occupies a corner site on Skid Row (opposite, bottom).

in decades: multifamily modular prefab. When traditional configurations, including double-loaded corridors and central courtyards, failed to fit enough units, plus generous outdoor areas, within a six-story limit, Maltzan recalls, "we needed to devise a model for another kind of urban space."

MMA's solution was to repurpose the parking deck as a podium, a 15,220-square-foot terrace with gardens and a jogging track, alongside a communal kitchen, lounge, and rooms for art and exercise. Above that level, a new concrete tray could accommodate 102 units, stacked non-hierarchically and interwoven with patios and outdoor catwalks—a configuration reminiscent of a hill town's scale, density, and meandering routes. "Craning in the units seemed like a natural fit," says Maltzan. "Prefab emerged as the most direct and efficient approach, addressing issues from technical and financial to social and urban."

SRHT hired Guerdon Enterprises in Idaho to prefabricate the wood-frame modules—each a 300-square-foot studio with full kitchen, bath, and interior finishes factory-installed—while the existing building in downtown Los Angeles was retrofitted with extra concrete columns to help support the new sections. Two concrete interior stairways were also added, laterally bracing the second-floor deck. From the exterior, these muscular diagonals express the structural brawn of holding the modules high above the podium.

The units were fabricated in seven weeks and assembled in only six. On-site, they plugged into the web of steel catwalks, which double as armatures for electric, water, and gas lines.

Though the apartments are virtually identical, their massing creates a microcosm of localized conditions or "neighborhoods" with views out to the city. Input from residents, many with mental or physical disabilities, played a role in strengthening visual connections to street life and creating communal spaces more extroverted than the sheltered courts in MMA's earlier projects.

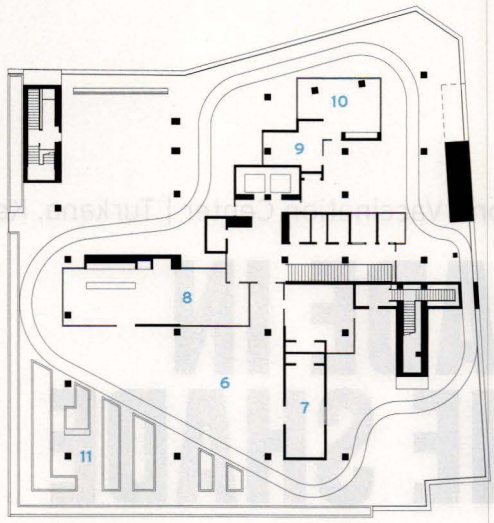
Star's program, more complex than its predecessors, changed in midconstruction when the Los Angeles County Department of Health Services chose an unprecedented role, making a 15-year commitment to be the sole ground-floor tenant, with a large community clinic and offices for its Housing for Health program. Though not the retail and clientele mix originally envisioned, this storefront clinic serves Star residents and a broader public.

The $40 million project has attained LEED for Homes Platinum and a high tenant-retention rate. As MMA's fourth Trust building, Crest, heads into construction, Star's community gardens burgeon with mint, tomatoes, and fruit trees. The high-ceilinged lobby, with its original concrete floors glowing, marks the gracious, modern entry to a place of pride. "People seem to be over the moon," observes Hwang. "Every time I go by, I see someone strumming a guitar or making sure the gardens get weeded." ■

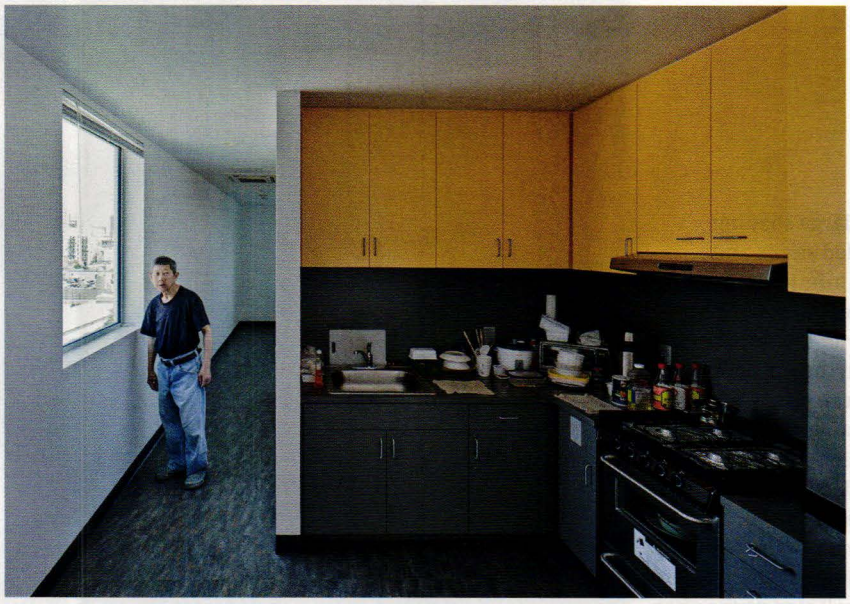
HOUSE PROUD
A double-height lobby (above) sits within an existing building converted into space for a health clinic, offices for the city's Housing for Health agency, and parking. Each 300-square-foot apartment (opposite, top and bottom) has a full kitchen and bathroom.

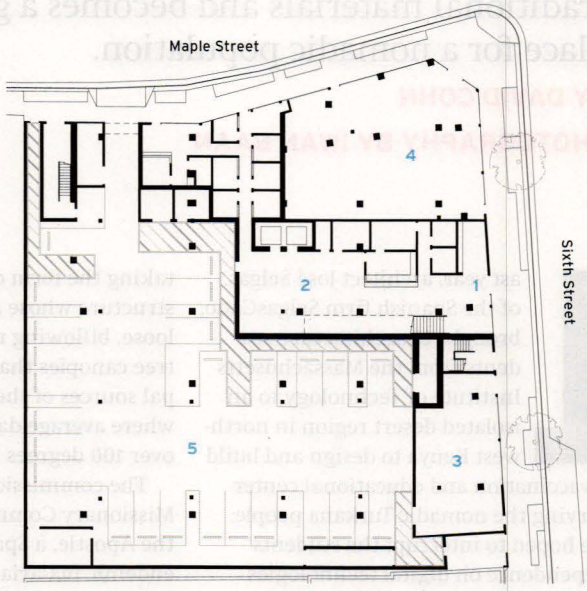
1 MAIN ENTRANCE
2 LOBBY
3 HEALTH CLINIC
4 HOUSING FOR HEALTH OFFICES
5 PARKING
6 PATIO
7 EXERCISE
8 DINING/KITCHEN
9 LIBRARY
10 ART
11 GARDEN
12 APARTMENT

FOURTH LEVEL

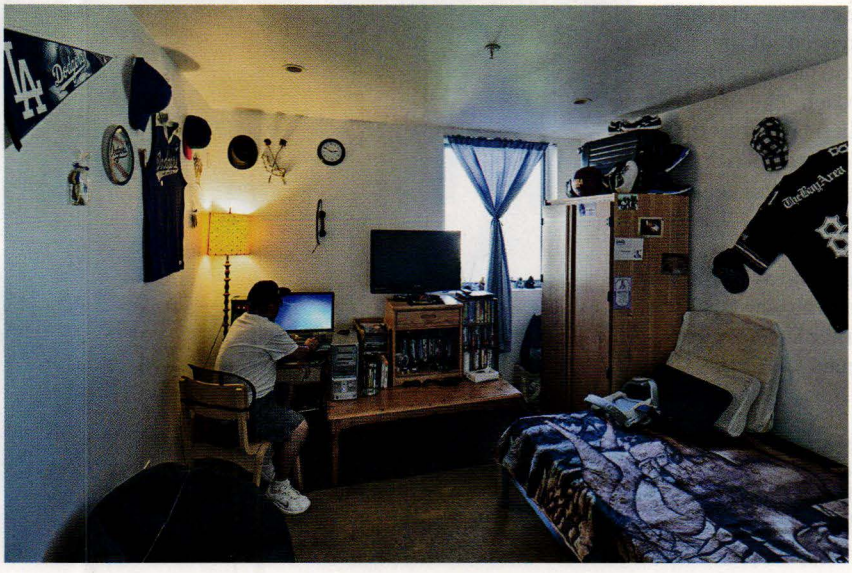


PODIUM LEVEL





GROUND FLOOR



credits

ARCHITECT: Michael Maltzan Architecture – Michael Maltzan, design principal; Tim Williams, principal in charge; Wil Carson, Edward Tung, Jessica Tracy, Sahaja Aram, Hiroshi Tokumaru, Michael Striegel, Theresa Hwang, David Rodriguez, Hoey Yip, Joseph Saccomanno, Mike Wang, Jessica Varner, Lisa Madonna, project team

ENGINEERS: B.W. Smith Structural Engineers, Nova Structures (structural); Green Engineering Consulting Group (m/e/p); Curtis Fletcher (prefabrication)

GENERAL CONTRACTOR: Westport Construction

CLIENT: Skid Row Housing Trust

PREFAB CONTRACTOR: Guerdon Enterprises

SIZE: 95,000 square feet

COST: $19.3 million

SOURCES

CURTAIN WALL: Arcadia

WINDOWS: Western Window Systems

Konokono Vaccination Center | Turkana, Kenya | SelgasCano

MADE IN THE SHADE

A desert clinic shifts notions about traditional materials and becomes a gathering place for a nomadic population.

BY DAVID COHN

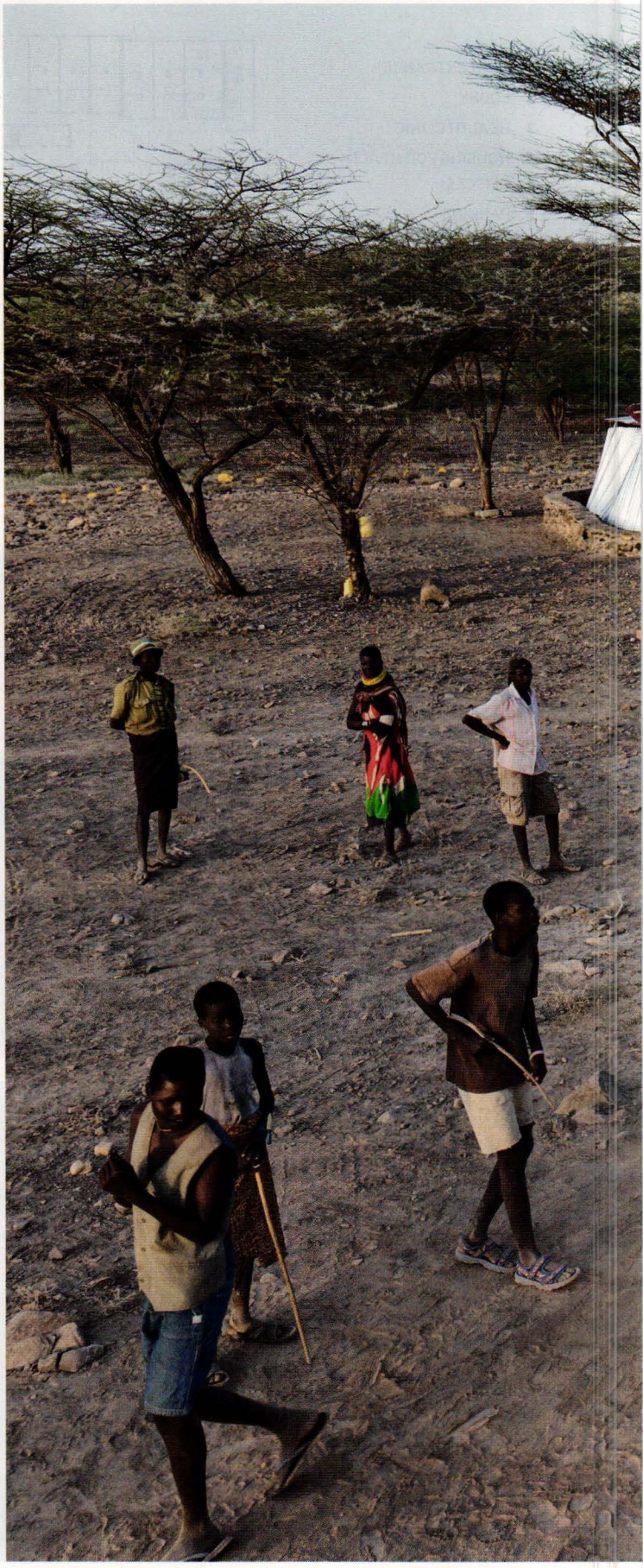
PHOTOGRAPHY BY IWAN BAAN

Last year, architect José Selgas, of the Spanish firm SelgasCano, brought 10 architecture students from the Massachusetts Institute of Technology to an isolated desert region in northwest Kenya to design and build a vaccination and educational center serving the nomadic Turkana people. He hoped to interrupt the students' dependence on digital technologies and confront them with more basic questions of habitat and design. In the process, he also managed to upset romantic notions about the use of indigenous, ecologically sustainable materials such as thatch or adobe, which were ruled out by the client as too expensive to install and maintain. "They're for the luxury hotels, the tourists," Selgas observes. "So you realize that it's a lot of our own prejudices that make us want to use these supposedly natural and honest materials. It was difficult for the students to understand this."

Instead, the group used the corrugated metal roofing common in modest constructions and shantytowns all across Africa, and an ingenious structural system adapted from scaffolding parts. The design also departs from conventional notions of a building, taking the form of a large shading structure whose angled struts and loose, billowing roof mimic the fragile tree canopies that are one of the principal sources of shelter in the region, where average daily temperatures rise over 100 degrees Fahrenheit.

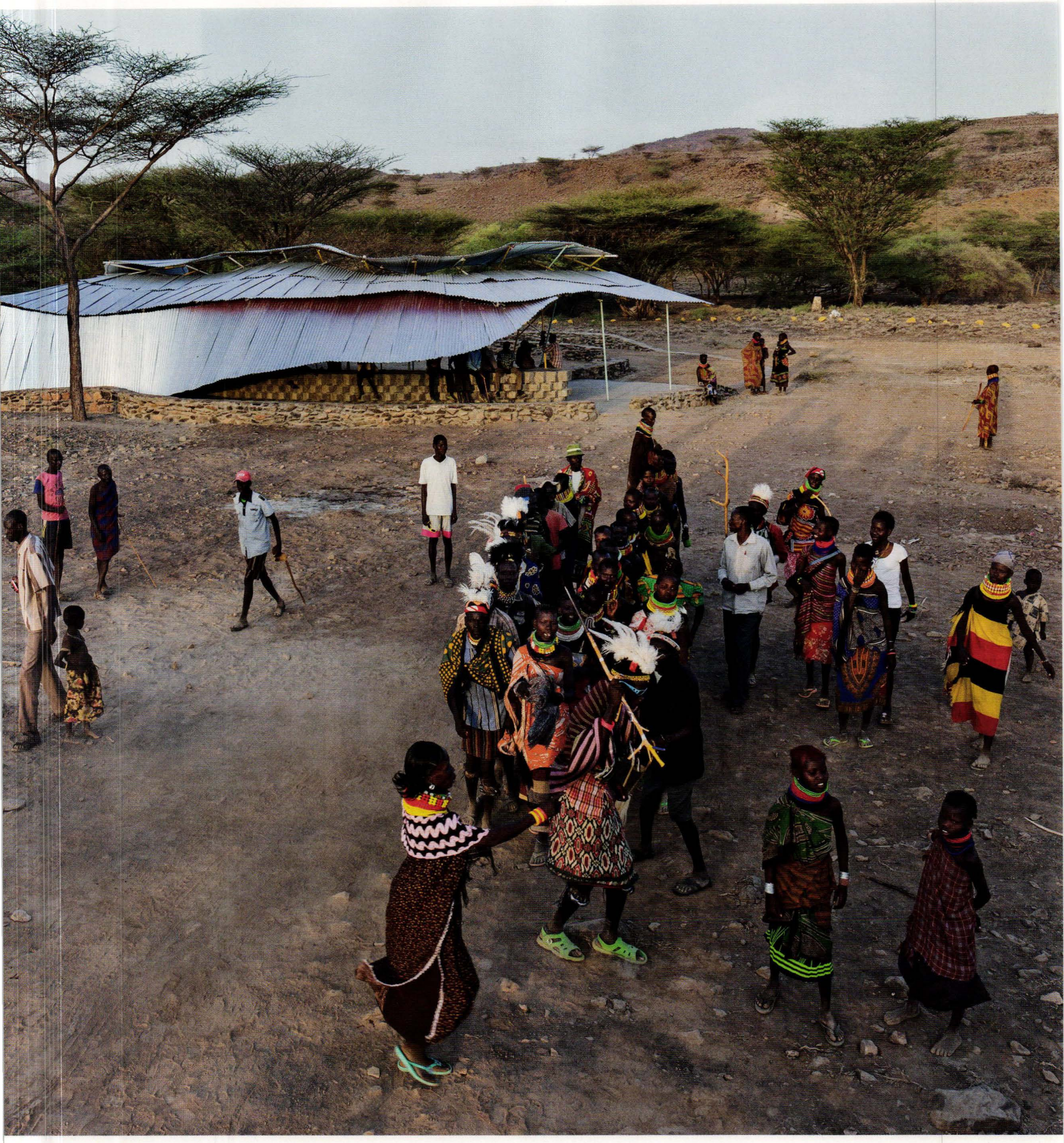
The commission came from the Missionary Community of Saint Paul the Apostle, a Spanish NGO that fights endemic malaria, malnutrition, and other ills. After 20 years in the region, the missionaries found that their rudimentary concrete-block structures were poorly adapted to the extreme climate or to the customs and needs of the Turkana people, and turned to SelgasCano for a fresh approach. The firm is best known for cladding buildings in translucent, brightly colored plastics, as in its Congress Center in Cartagena, Spain (RECORD, July 2012, page 52), and for a design philosophy based on "rethinking everything and avoiding the already known," in the words of Selgas's wife and partner Lucia Cano.

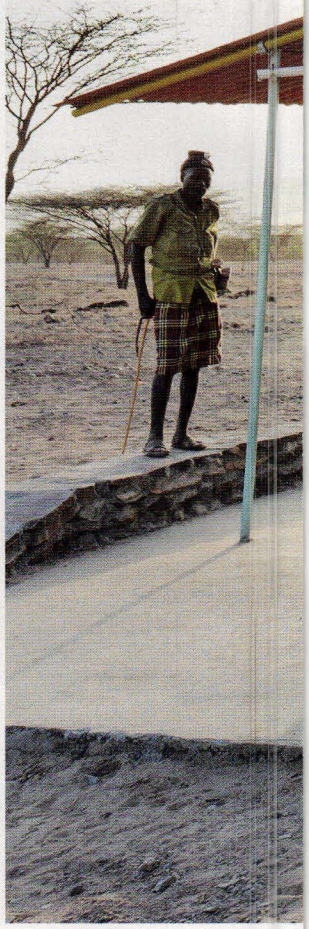
The students designed the project



SOCIAL SCENE Corrugated metal supported by a structure of scaffolding elements provides shelter against the desert sun, converting the facility into a popular meeting place for the Turkana people.

View additional images at architecturalrecord.com.



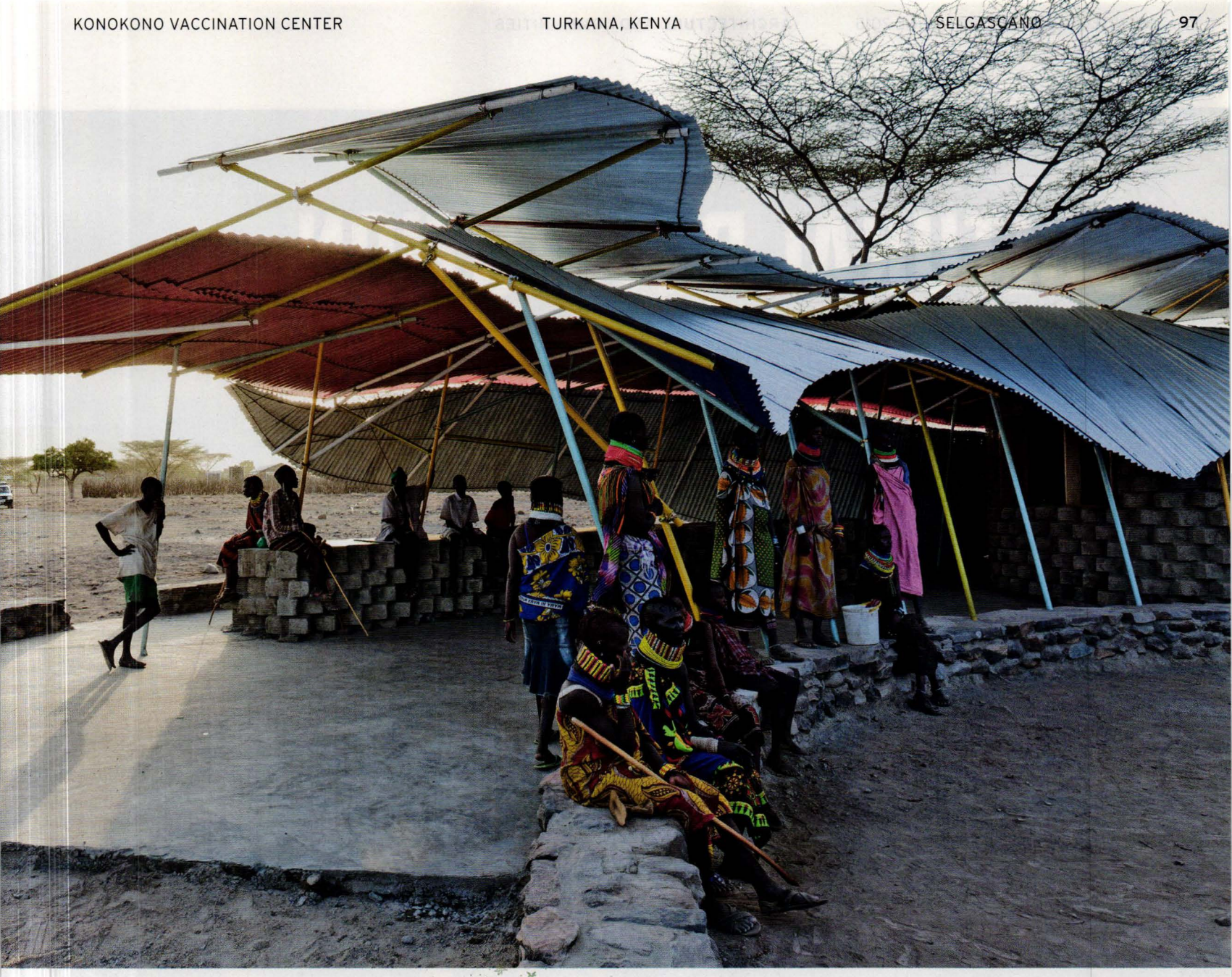


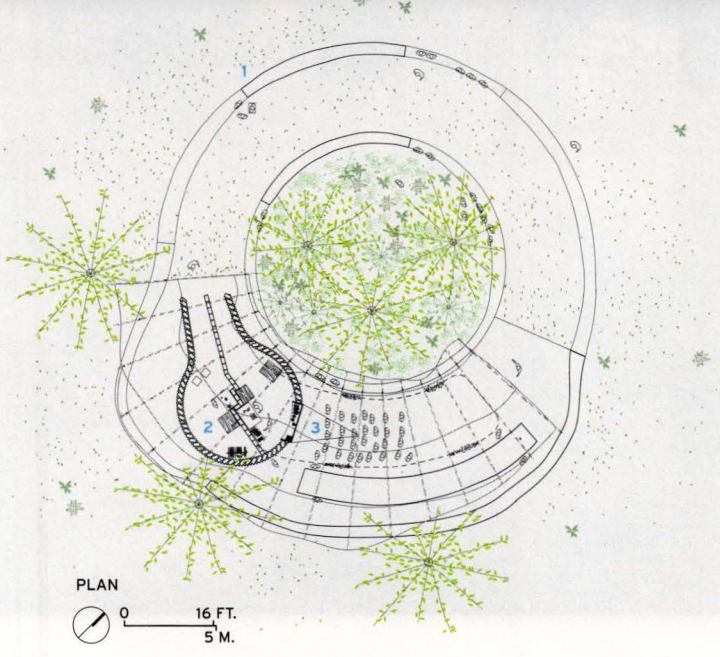
IMPROV ACT
After laying stone, used for seating rings (above and right), proved too time-consuming, the team made concrete blocks on-site for walls (left). Shadows cast by the blocks' projecting corners cut heat loads. Overlapping roof planes (opposite) promote ventilation, and adjustable fasteners permit movement in any direction for struts.

during an initial visit to Turkana in the spring, and four of them returned with Selgas in the summer to build the pavilion in a single month, training local people and using a few semi-skilled workers. With the approval of tribal elders, they sited the building between four acacia trees and developed a design that follows a segment of a circle, allowing for future growth. The canopy shelters a rounded office enclosed in concrete blocks they produced on-site. Rings of low stone walls for sitting complete the circle. The shaded area around the office is used for classes, as a waiting area for vaccinations, and for social events.

The structural system of metal tubes fixed in place by adjustable clamps allowed for quick assembly. The clamps permit movement in any direction, accommodating the off-kilter angles of the structural bays as well as the imperfect construction process. The team anchored the tubes against low walls and tied the roofing sheets to them with wire. Gaps between overlapping planes of tin at the top of the roof promote air circulation. An extra layer of vertical sheeting shields the southern and western exposures from the sun, while the structure opens up to the north.

The greatest satisfaction for Selgas and Cano has been the project's acceptance by the native population. Selgas reports, "Everyone gathers there in the afternoon. It's become a social center." For Cano, one key to this success is that, as in the huts the Turkana build for themselves, there are no right angles. "Westerners insist that everything has to be straight in their buildings, but the Turkanas don't understand why. It's actually quite hard to make a straight line—you need a whole series of special tools. And curving spaces are very cozy and welcoming." ■





PLAN

0 16 FT.
5 M.

1 EXTERNAL CIRCULAR WALL
2 CONSULTATION ROOM
3 SHELTERED COMMUNITY SPACE

credits

ARCHITECT: SelgasCano – José Selgas, Lucia Cano, principals

STUDENTS OF UN-MATERIAL STUDIO MIT: Anastasia Hiller, Beomki Lee, Karen Kitayama, Suk Lee, Sayjel Patel, Tyler Stevermer, Tyler Crain, Julian Ocampo, Austin Smith, Sixto Cordero

CLIENT: Missionary Community of Saint Paul the Apostle

SIZE: 1,600 square feet

COST: $32,000

COMPLETION DATE: August 2014

Xihe Cereals and Oils Museum and Villagers' Activity Center | Henan Province, China | He Wei Architect

CULTURAL REVOLUTION

A rural village finds new purpose by converting an old granary into a museum and community center.

BY ARIC CHEN

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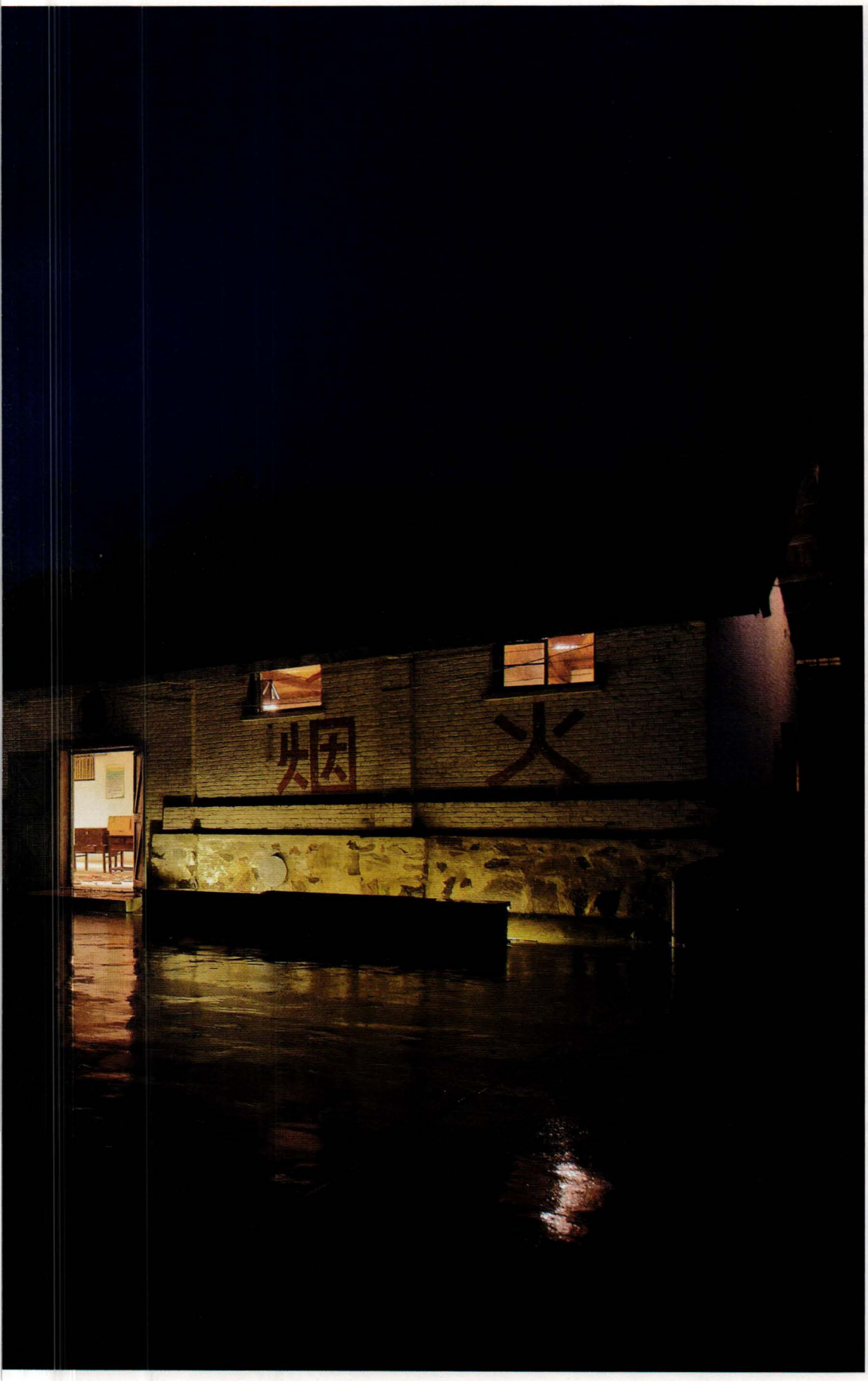


PHOTOGRAPHY: © QI HONGHAI

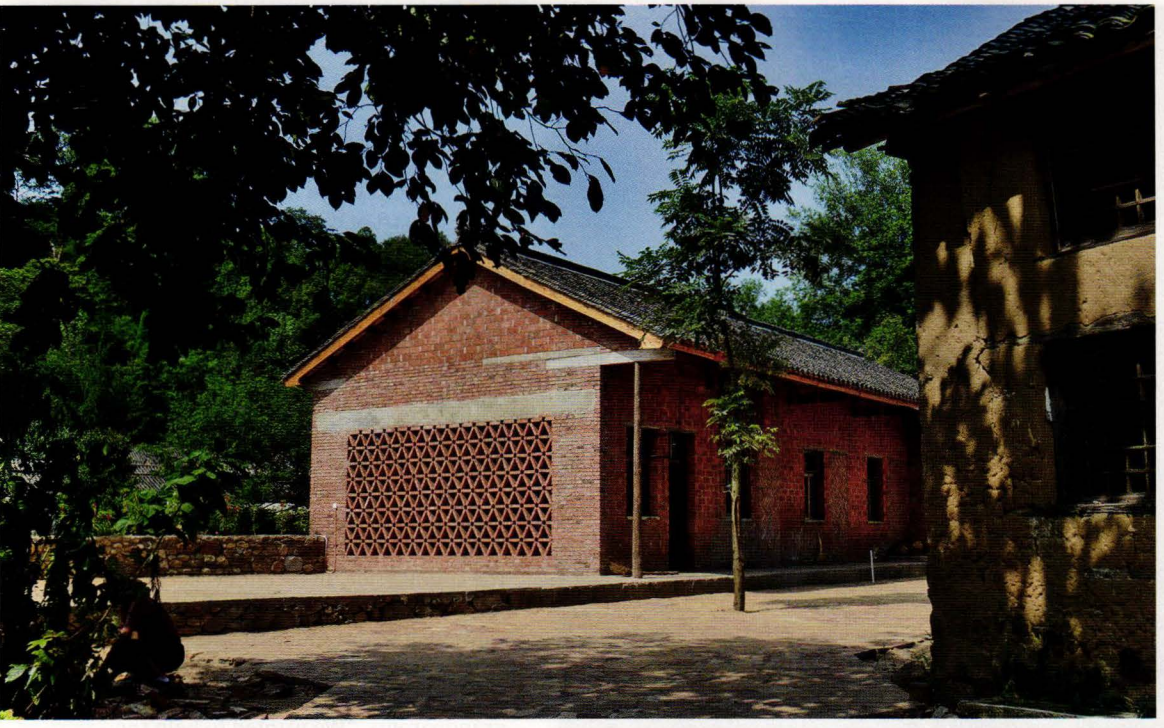
Located in a mountainous part of central China's Henan Province, Xihe was always a small, quiet village that subsisted on growing corn, grains, and tea seeds for oil. But by the time architect He Wei first visited in 2013, it was on life support, having dwindled to just 150 residents—almost all children and elderly farmers.

Xihe represents one of the effects of China's massive urbanization and the corresponding depopulation of the countryside. In recent decades, hundreds of millions of working-age Chinese have migrated to cities in search of higher incomes—often leaving their children in the care of grandparents. "We wanted to help the remaining local people have a better life," says He. "But buildings are only part of what's needed. An architect also has to address the economic issues."

Invited through a government rural-poverty-alleviation program, He, an architecture professor at Beijing's Central Academy of Fine Arts, examined Xihe's prospects. Though dotted with historic structures amid a pleasant landscape, it didn't quite have the picturesque charm that has turned many once-sleepy Chinese villages into tourist attractions. In a country with well over a billion registered mobile phone users, it didn't even have cellular coverage. What it did have, however, was a 1950s granary complex on the south end of town that He, working with local residents, has retooled as the Xihe Cereals and Oils Museum and Villagers' Activity Center.

Set beside a stream, the compound consists of five pitched-roof masonry buildings clustered around a courtyard. The small complex now serves a range of community needs while luring newly minted urbanites with the attraction of fast-disappearing rural life—an example of how quickly China has come full circle.

HISTORICAL ECHOES The courtyard of the old granary is still a key element in the new complex. Chinese characters from the Cultural Revolution remain too.



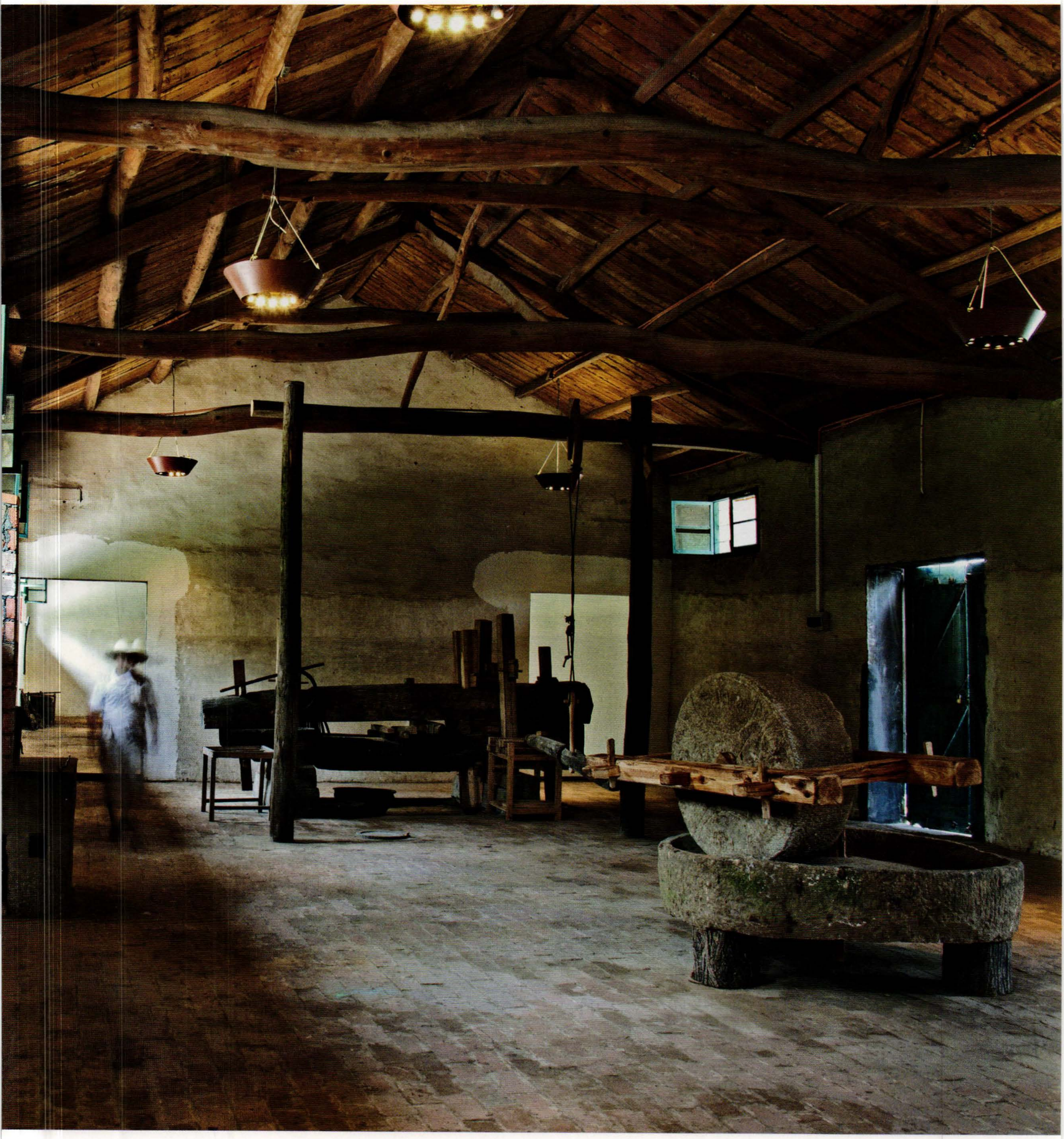
UPDATING THE PAST A new restaurant building (left and below) uses traditional materials such as brick and timber, but in new ways. The museum (opposite) occupies an old building that has been opened up to create one large space.

He began by converting a 4,500-square-foot warehouse into a museum that shows the use of traditional millstones, oil presses, and other implements. Across the courtyard, the architect turned a 7,300-square-foot building into an activity center for village meetings, weddings, and other events, and outfitted one end of it as a shop selling locally made tea-seed oil and organic foods that appeal to a Chinese citizenry wary from the country's food-safety scandals. A smaller building was attached to form a restaurant, while the remaining two buildings function as a kitchen and an office.

Throughout, He wanted to maintain as much of the original structures as possible—"to keep the history," he explains. So he left interior brick floors, timber framing, and plastered walls intact. Painted Chinese characters dating to the Cultural Revolution were retained, as was the concrete paving of the courtyard (now doubling as a playground), despite an early government request to "upgrade" it to brick.

The architect's interventions are subtle, but make a big difference. He opened up the north side of the activity center to create expansive views across a terrace reconstructed with repurposed roof tiles. Bamboo screens shield floor-to-ceiling glazing here and are repeated on the museum's south eleva-

PHOTOGRAPHY: © HE WEI (THIS SPREAD)



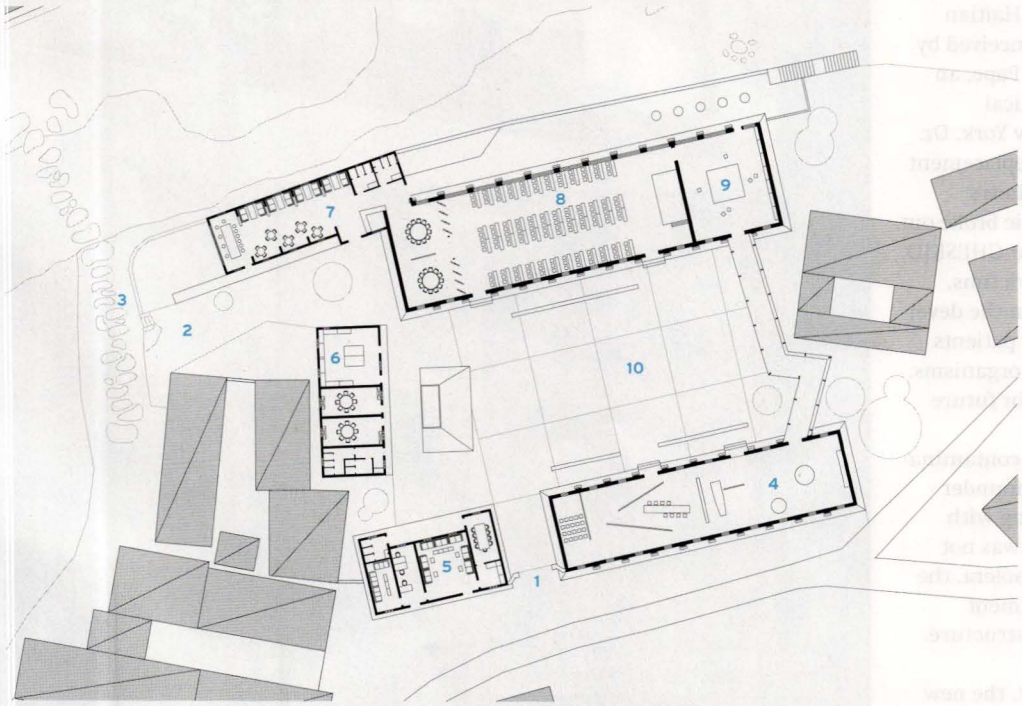
LIGHT TOUCH Bamboo screens protect a new glazed facade on the activity center (above). Instead of "upgrading" the main courtyard with bricks, as some villagers had suggested, the architect merely restored the old concrete to maintain the industrial spirit of the place (below).

tion. Connecting both buildings, a zigzagging outdoor corridor (also of bamboo) helps define the courtyard, where a fire protection pond was turned into a water feature. Inside the activity center, pivoting bamboo partitions separate the main hall from spaces for the restaurant.

For He, this was not a parachute job, but resulted from lengthy discussions with the initially skeptical villagers. "We listened to them and gained their trust," says the architect, and eventually they contributed both funding and labor. Income from the restaurant, space rentals, and sales of food products, including a new Xihe Oil branded by He, go to the village cooperative. The result appears to be a success. With the aid of publicity campaigns, 20,000 visitors came to Xihe over China's National Day holiday in 2014—"more than even we expected," He says. ■

Aric Chen is the design and architecture curator at the M+ museum in Hong Kong.

PHOTOGRAPHY: © CHEN LONG (TOP); QI HONGHAI (BOTTOM)



SITE PLAN

credits

ARCHITECT: He Wei, School of Architecture, China Central Academy of Fine Arts – He Wei, Chen Long, project team

LIGHTING DESIGNERS: Qi Honghai (Z Design & Planning), Han Xiaowei (Geston)

CONSULTANTS: Zhao Zhuoran (exhibitions); Xia Boyang (graphics)

GENERAL CONTRACTOR: Village Cooperative of Xihe

CLIENT: Village Cooperative of Xihe

SIZE: 16,500 square feet

COST: $240,000

COMPLETION DATE: July 2014

1 MAIN ENTRANCE
2 WEST ENTRANCE
3 FERRY LANDING
4 CEREALS AND OILS MUSEUM
5 OFFICE
6 KITCHEN
7 RESTAURANT
8 VILLAGERS' ACTIVITY CENTER
9 SOUVENIR SHOP
10 GRAIN-DRYING COURTYARD

GHESKIO Cholera Treatment Center
Port-au-Prince, Haiti | MASS Design Group

THE WATER CURE

A small project with a big program sets a holistic design standard for health care in Haiti.

BY LINDA C. LENTZ

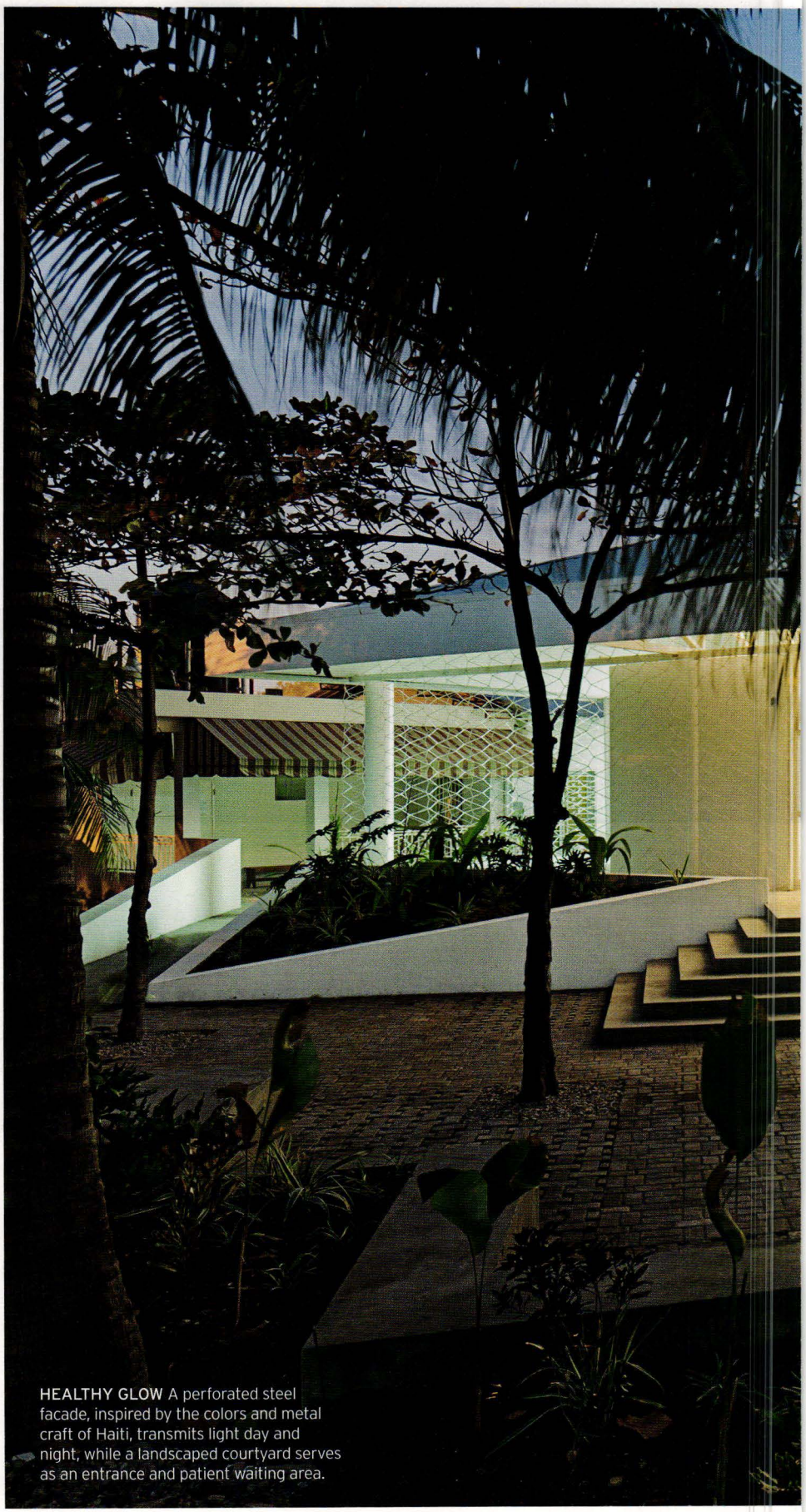
PHOTOGRAPHY BY IWAN BAAN

There is no doubt that architecture can help support the overall health of a populace—at least as far as MASS Design Group (MASS) is concerned: the five-year-old Boston-based practice has a growing body of humanitarian work. Most recently, the firm completed the Cholera Treatment Center (CTC) in Port-au-Prince, Haiti—an airy, welcoming medical pavilion designed to be a benchmark for the treatment of waterborne diarrheal diseases.

Located on the campus of GHESKIO, a leading Haitian health-care and research facility, the CTC was conceived by the organization's founder and director, Dr. Jean Pape, an infectious-disease specialist and professor of clinical medicine at Weill Cornell Medical College in New York. Dr. Pape had been collaborating with MASS on the replacement of a tuberculosis hospital that collapsed during Haiti's January 2010 earthquake. Then a cholera epidemic broke out. While emergency medical crews, including one at GHESKIO, established tent stations to immediately aid the victims, Dr. Pape asked the architects to work with him on the development of a permanent clinic to provide care for patients with cholera or with acute diarrhea due to other organisms. In addition, it would serve as a training ground for future generations of health-care workers.

"There were no piped toilets or wastewater decontamination in the tents," says Michael Murphy, MASS cofounder and executive director, "and the method of dealing with the crisis (i.e., privatized collection and removal) was not happening appropriately." For the CTC to quell cholera, the design team needed to devise off-grid water-treatment systems, independent of the city's unstable infrastructure. This would be their first priority.

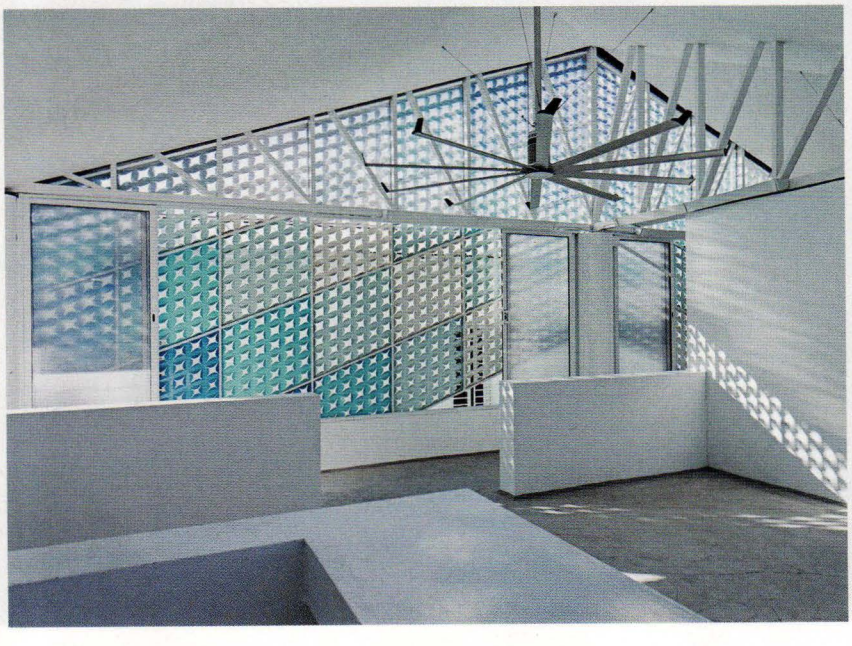
Bordering a landfill settlement along the coast, the new 7,500-square-foot reinforced-concrete and steel structure is earthquake- and hurricane-resistant and sits on a slab raised more than 3 feet above grade. This not only thwarts poten-

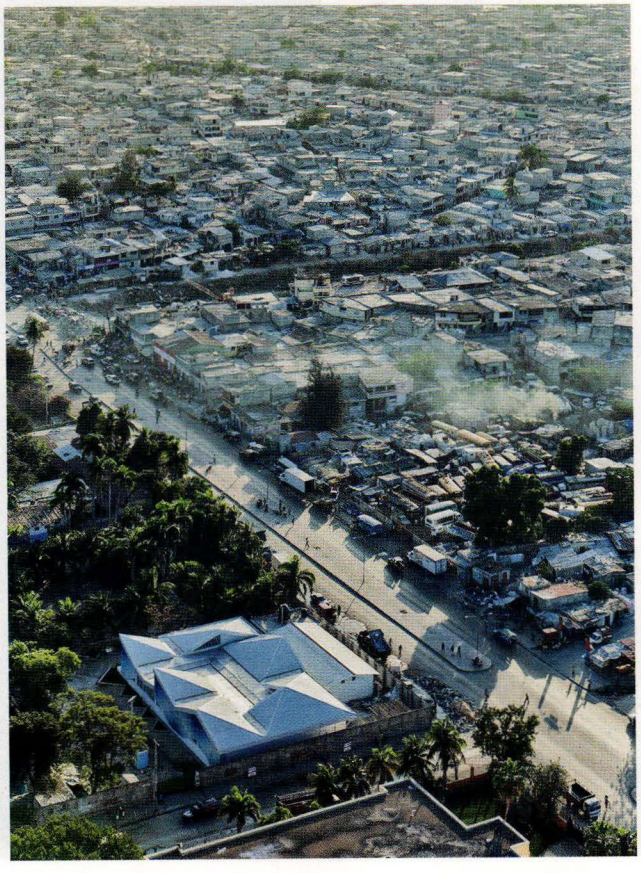


HEALTHY GLOW A perforated steel facade, inspired by the colors and metal craft of Haiti, transmits light day and night, while a landscaped courtyard serves as an entrance and patient waiting area.

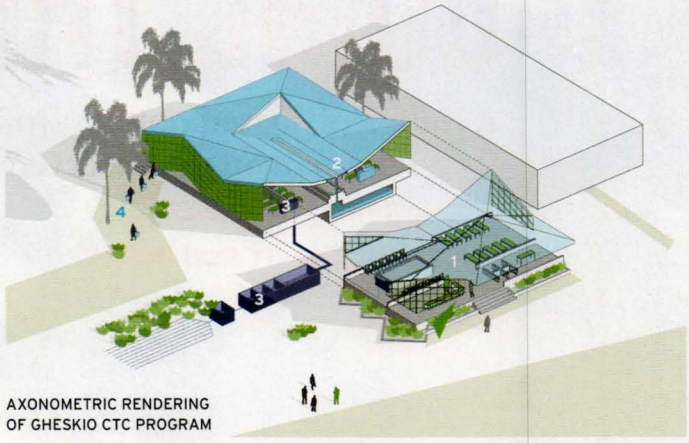
View additional images at architecturalrecord.com.

A PLACE TO HEAL The CTC borders a landfill settlement inhabited by about 60,000 people (right and opposite). Ceiling fans, donated by Big Ass Solutions, bolster airflow, as do the colorful pierced facade and polycarbonate sliding doors and windows, which can be closed during windy rainstorms (below). Clerestory windows and large planters add a sense of well-being (above).

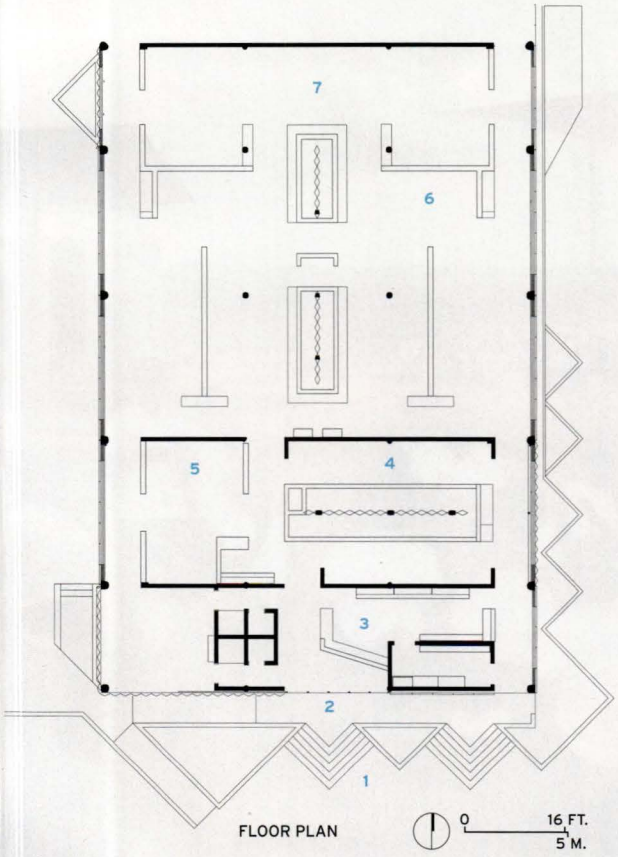




1 ADMITTING/DIAGNOSTICS/TREATMENT
2 RAINWATER CATCHMENT SYSTEM
3 WASTEWATER TREATMENT SYSTEM
4 CHLORINE PRODUCTION AND COMMUNITY DISTRIBUTION



AXONOMETRIC RENDERING OF GHESKIO CTC PROGRAM



FLOOR PLAN 0 16 FT. 5 M.

1 OUTDOOR WAITING AREA
2 ENTRANCE
3 ADMINISTRATION/CHECK-IN
4 MILD CASES OBSERVATION
5 SEVERE WARD
6 GENERAL WARD
7 PATIENT ATTENDANT SEATING

tial flooding but also provides room for a cistern under the building that captures rainwater from a gutter on the steel roof. The rainwater is treated and purified for nursing and cleaning. To prevent contamination of the groundwater (only about 6 inches below grade), the architects worked with San Francisco–based Fall Creek Engineering to develop a wastewater decontamination system. This efficient anaerobic biodigester with four chambers (instead of the more typical three) introduces chlorine at the third stage.

MASS engaged local craftspeople and construction crews to build a comfortable, distinguished environment to aid the healing process. In designing the elevated pavilion, the architects created a large rectangular platform on which they placed a series of concrete columns with concrete shear walls, lateral steel bracing, and customized steel roof trusses. A vented, folded steel roof with clerestories optimizes daylight and airflow—as does the perforated steel facade, digitally plotted with smaller apertures along the bottom to give the patients privacy.

Indoors, large overhead fans boost cross breezes within an open room plan divided by low walls made of locally produced compressed stabilized earth blocks. Patient chairs and beds, specially designed by MASS with Herman Miller, are arranged for views of the outdoors or flora-filled central planters.

The $700,000 project was funded with money raised by both GHESKIO and MASS, 30 percent of which was MASS-donated time. Open since May, the CTC may be the first facility of its kind to incorporate waste treatment into the building. "It is a unique situation," notes Dr. Pape, referring to his collaboration with MASS. "They were not afraid to deal with issues. In fact," he adds, "they were happy to tackle them and provide solutions." ■

credits

ARCHITECT: MASS Design Group – Michael Murphy, Alan Ricks, design principals; Christopher Scovel, project architect; Adam Saltzman, project manager

ENGINEERS: YCF Group (structural); Mazzetti (m/e/p); Fall Creek Engineering (civil)

GENERAL CONTRACTOR: TECINA

CLIENT: Les Centres GHESKIO

SIZE: 7,500 square feet

CONSTRUCTION COST: $630,000

PROJECT COST: $700,000

COMPLETION DATE: March 2015

SOURCES

ROOFING: MFM Peel & Seal; ACRA

WINDOWS: Atlantic Door & Windows

FINISHES: Rust-Oleum (floor)

VENTILATION: Big Ass Solutions (ceiling fans)

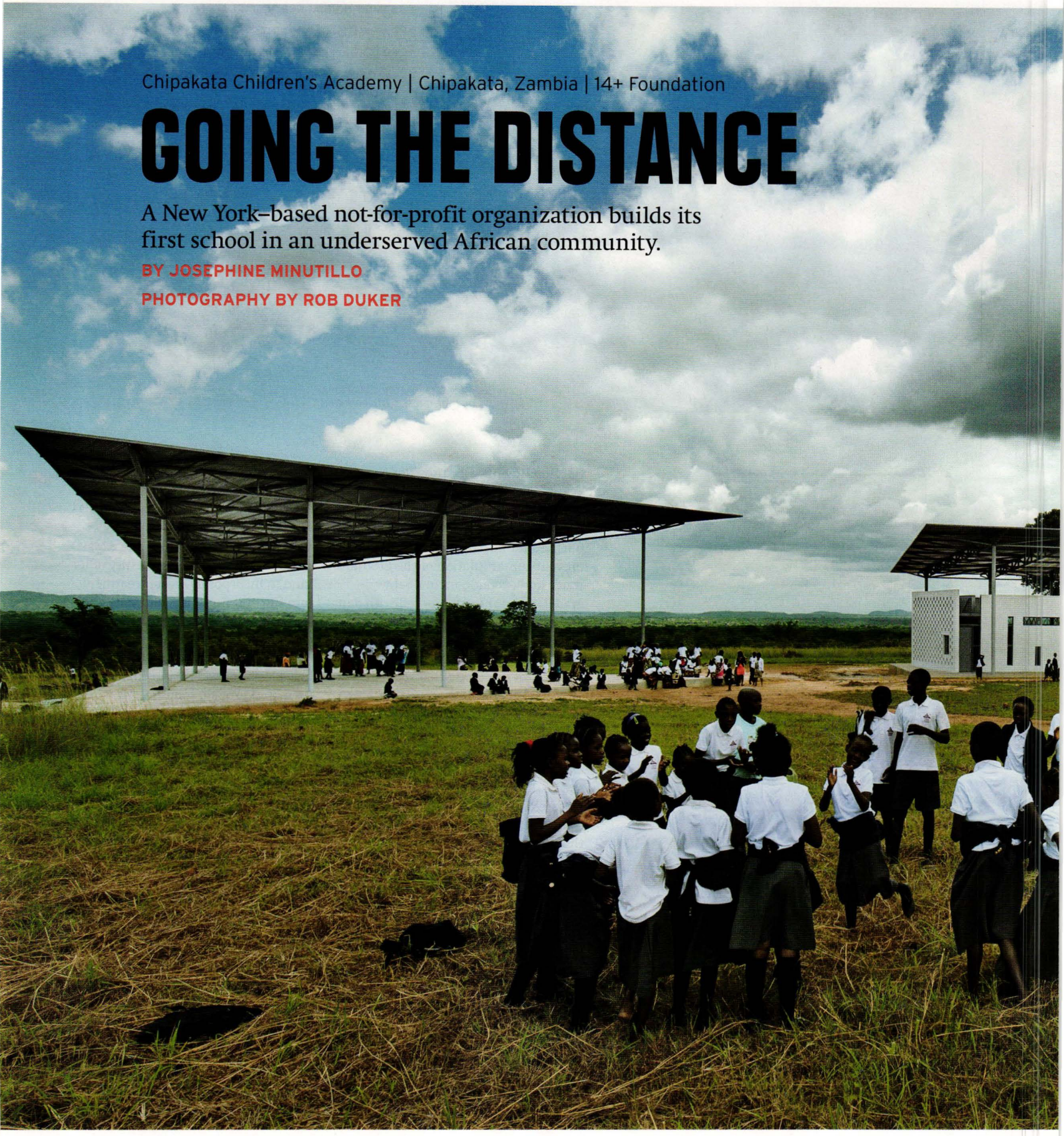
Chipakata Children's Academy | Chipakata, Zambia | 14+ Foundation

GOING THE DISTANCE

A New York–based not-for-profit organization builds its first school in an underserved African community.

BY JOSEPHINE MINUTILLO

PHOTOGRAPHY BY ROB DUKER



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ON CAMPUS Before Chipakata Children's Academy was built, some of its students were traveling almost 5 miles on foot to school. The new facility features a classroom building, an open-air pavilion, and teachers' housing units alongside fields for soccer and volleyball.

In 2011, Joseph Mizzi found himself in Zambia, the landlocked nation in southern Africa. As a volunteer for World Bicycle Relief, he was part of a mission to provide schoolchildren with wheels to alleviate their sometimes hours-long commute on foot. But the builder in Mizzi—he is president of New York-based Sciame Construction—had other ideas. "I thought, rather than give them bikes to travel the long distances to school," he recalls, "why not build more schools?"

Upon his return to the States, a chance meeting with Zambian-born Nchimunya Wulf, and a later introduction to her family's village, strengthened Mizzi's resolve and helped solidify plans for locating the first school. Together, he and Wulf cofounded the 14+ Foundation to build schools in rural African communities and to improve the education of children over 14—the age when local kids often drop out. The not-for-profit's Chipakata Children's Academy, with its atypical white walls and floating roof, opened in Zambia in January.

The three years between founding 14+ and completing Chipakata were spent assessing the community's needs (14+ donated a large grinding mill for the corn harvest, for instance) and providing the infrastructure required to make a high-quality building possible, including constructing 5 miles of roads and a small bridge. Mizzi himself made more than 10 trips to Zambia during this time. Back in New York, he and a team of volunteers organized multiple fundraising events, including auctions with the support of such friends and clients as artists Julian Schnabel and Rashid Johnson and musician Solange Knowles.

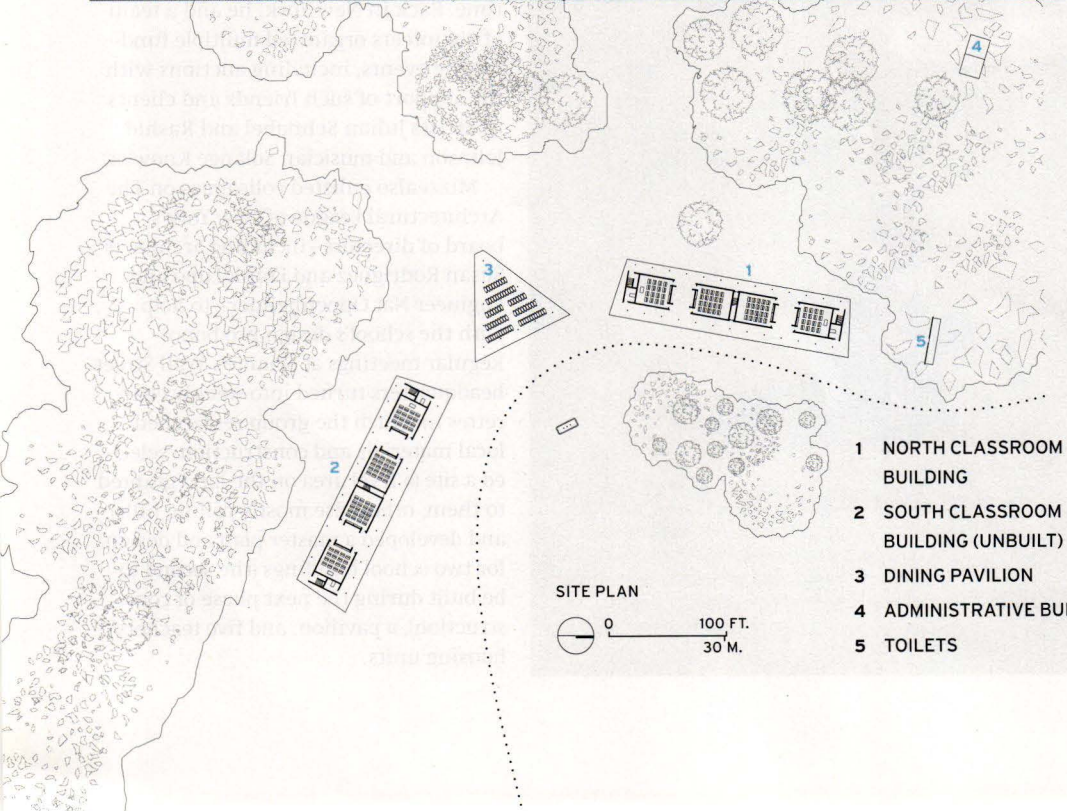
Mizzi also enlisted colleagues on The Architectural League of New York's board of directors—including architects Susan Rodriguez and Frank Lupo and engineer Nat Oppenheimer—to help with the school's design pro bono. Regular meetings at Sciame's Wall Street headquarters turned into weekly charrettes in which the group researched local materials and construction, selected a site (a level area on the land granted to them, otherwise mostly rolling hills), and developed a master plan and design for two school buildings (the second to be built during the next phase of construction), a pavilion, and five teachers' housing units.

The new primary school, which serves seven villages, mimics the local language of bar-shaped buildings (typically earth-colored), but pulls the bar apart and raises the roof to create indoor/outdoor spaces and a second story with covered open-air classrooms. "These were two simple things to accomplish to get so much more from the building," explains Rodriguez, a principal at Ennead, which also provided design support through Ennead Lab. "These are people who live at ground level—most had never been on a stair before."

Independent architect Fabian Bedolla moved to Zambia to manage the construction process, in which villagers were employed to build the mostly masonry structure. For the steel columns and roof trusses, Oppenheimer tweaked the structural design to base it on steel components available in Lusaka, the capital city 60 miles to the west.

While the initial intent was to forgo electric lighting completely, with daylight for the classrooms coming from clerestory and slit windows or the open sides, the design team quickly realized that the building would become a community hub, used by adults for meetings and classes in the evening. A rooftop photovoltaic array provides power for supplemental lighting, computers, and for charging cellphones.

With over 180 students enrolled and the first semester complete, the school has already begun transforming the lives of local residents, who were at first "polite, shy, and a tad suspicious," says Mizzi, who also provided the schoolchildren's uniforms and recently attended the academy's first student awards ceremony. "When we started 14+, we established our model as a nonprofit not just to design and build schools, but to operate them," he says. "I welcome that responsibility." ■



credits

ARCHITECTS: Design principals: Susan Rodriguez (Ennead Architects), Frank Lupo; Design team: Randy Antonia Lott (MDEAS Architects), Fabian Bedolla (on-site project architect), Hiroko Nakatani (Ennead Lab), Mehonaz Kazi

ENGINEER: Nat Oppenheimer (Robert Silman Associates)

SIZE: 20,000 square feet

COST: $1 million (including infrastructure)

COMPLETION DATE: January 2015

CLASS ACT
Steel columns and trusses, along with the metal doors and windows, were purchased in the capital city of Lusaka and transported to the site over new roads built by the 14+ Foundation. The concrete (opposite) was mixed on-site using local labor. The arts-based curriculum is taught in daylit classrooms on two floors: at ground level (above) and an upper one (right) with a roof for shade and no walls.

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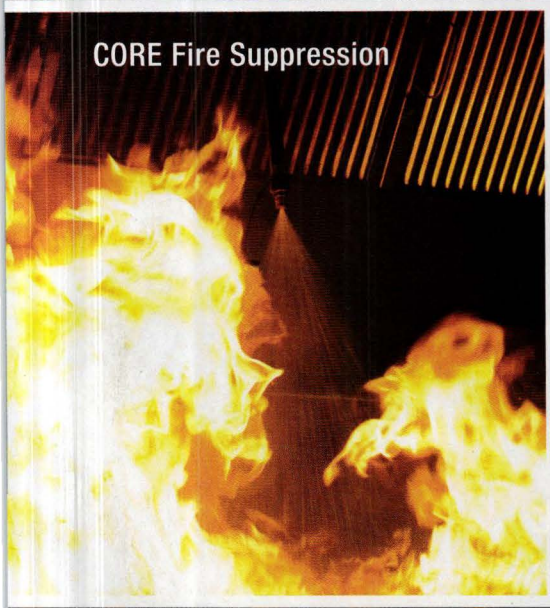

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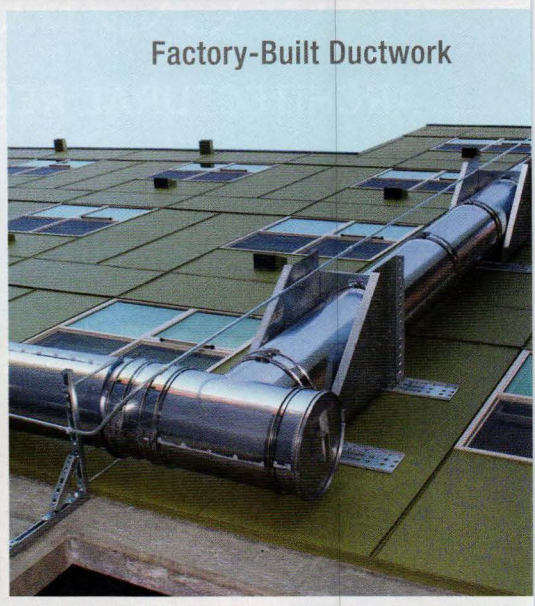

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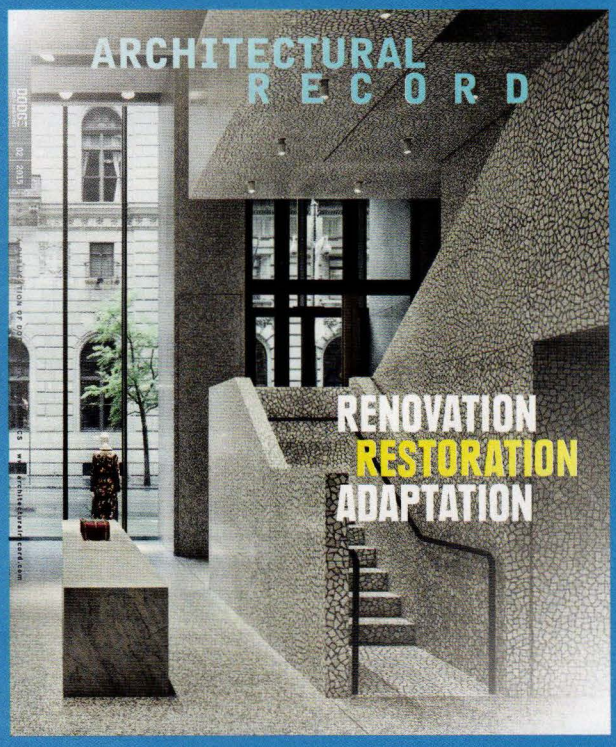

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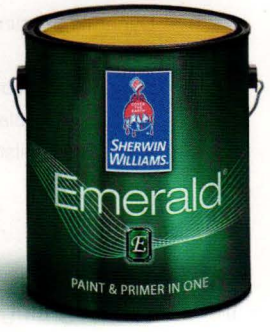

CIRCLE 46

Health Care

Until recently, the idea that patients could get better faster in settings with daylight, views, greenery, and physical and acoustical privacy was considered revolutionary, and strategies addressing wellness in that way were implemented in only the most cutting-edge hospitals. Today, the wide embrace of these ideals has indelibly altered the course of health-care design, touching facilities at all scales and in all corners of the country. In the following pages, ARCHITECTURAL RECORD looks at some of the best new medical buildings—from the enormous Parkland hospital in Dallas to the small-scale renovation of a neighborhood health center in New York to the exemplary new spaces for a research campus in California. While these projects directly aid the healing process, they also go a long way to enhance the overall environment for staff and visitors.

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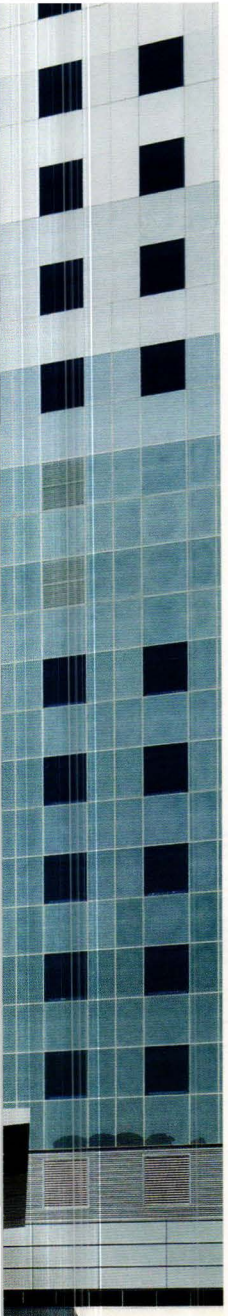
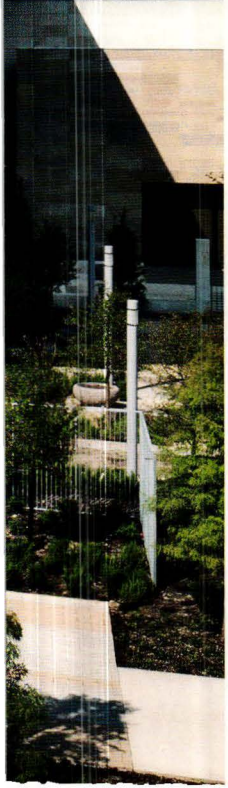
NEW PARKLAND HOSPITAL IN DALLAS, DESIGNED BY HDR + CORGAN.


HOSPITAL ENTRANCE





PHOTOGRAPHY: © ASSASSI PRODUCTIONS

Raising the Bar

New Parkland Hospital | Dallas | HDR + Corgan

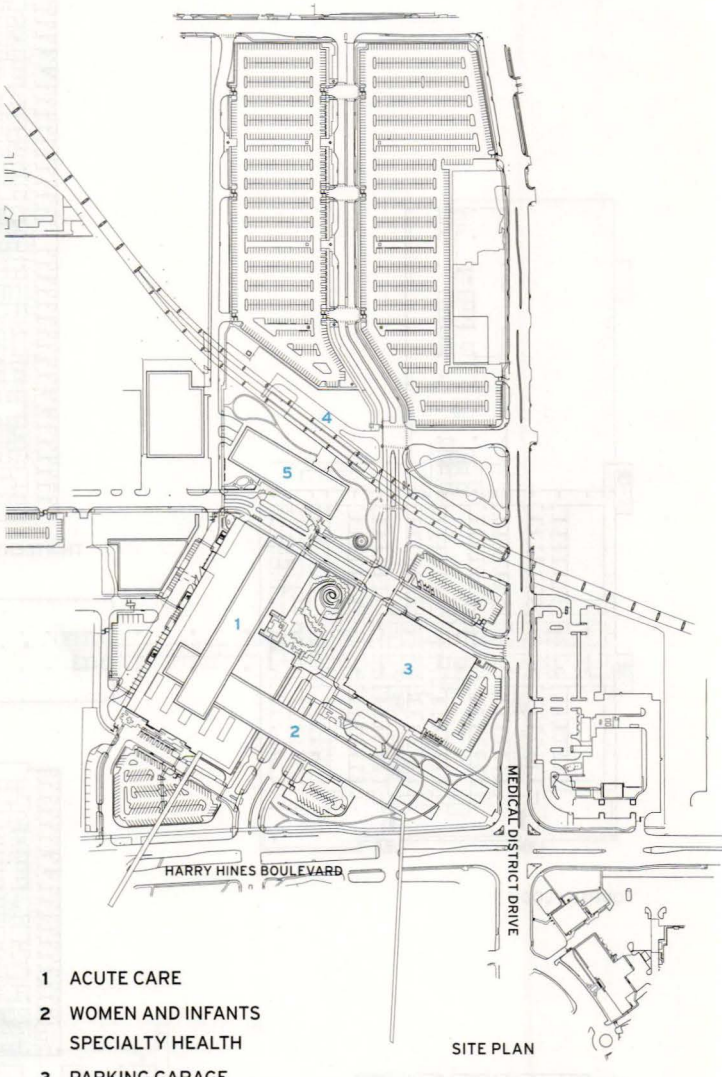
An interplay of volumes that seem to float animates a hospital's immense scale.

By Suzanne Stephens

IN DESIGNING a new, 2 million-square-foot facility for Parkland Memorial Hospital in Dallas, the architect HDR + Corgan confronted significant functional and formal challenges. How do you create a monolithic facility where people don't get lost in a labyrinth of linoleum floors and fluorescent lights? How do you give a hospital a warmer, hotel-like ambience? How do you bring in plenty of daylight, and views out to an abundance of greenery? While meeting these goals is known to aid in healing, they can be hard to accomplish in a huge and complex building type.

The old Parkland Memorial Hospital, built in 1954, is best known as the place where President Kennedy was taken when he was fatally shot on November 22, 1963. Since then, Parkland has grown—it now admits 1 million patients a year—and the new structure is almost twice the size of the jumble of buildings (whose future is still being determined) that made up the old hospital. Across Harry Hines Boulevard from the original complex, the new facility sits amid 26 acres of a former brownfield site, which now also includes a rapid-transit station and a parking garage for the medical complex.

In breaking down the scale of the 18-story, 862-bed hospital—the size of a horizontal skyscraper—the architects looked to other schemes dealing with such bulk. "We were inspired by the way Steven Holl elevated the horizontal bars at the Vanke Center in Shenzhen" (China, 2009), explains Thomas Trenolone, creative director for Parkland from HDR's Omaha office. Allusions to Holl's series of rectangular volumes floating above the ground plane are echoed in the way the new Parkland's stalwart hulk rises above a scrum of service buildings and parking lots. Perpendicular to the main mass is the elongated bar-like wing for Women & Infant's Specialty Health (WISH), raised on columns, which dynamically penetrates a five-story-high square opening in the poured-in-place concrete structure.

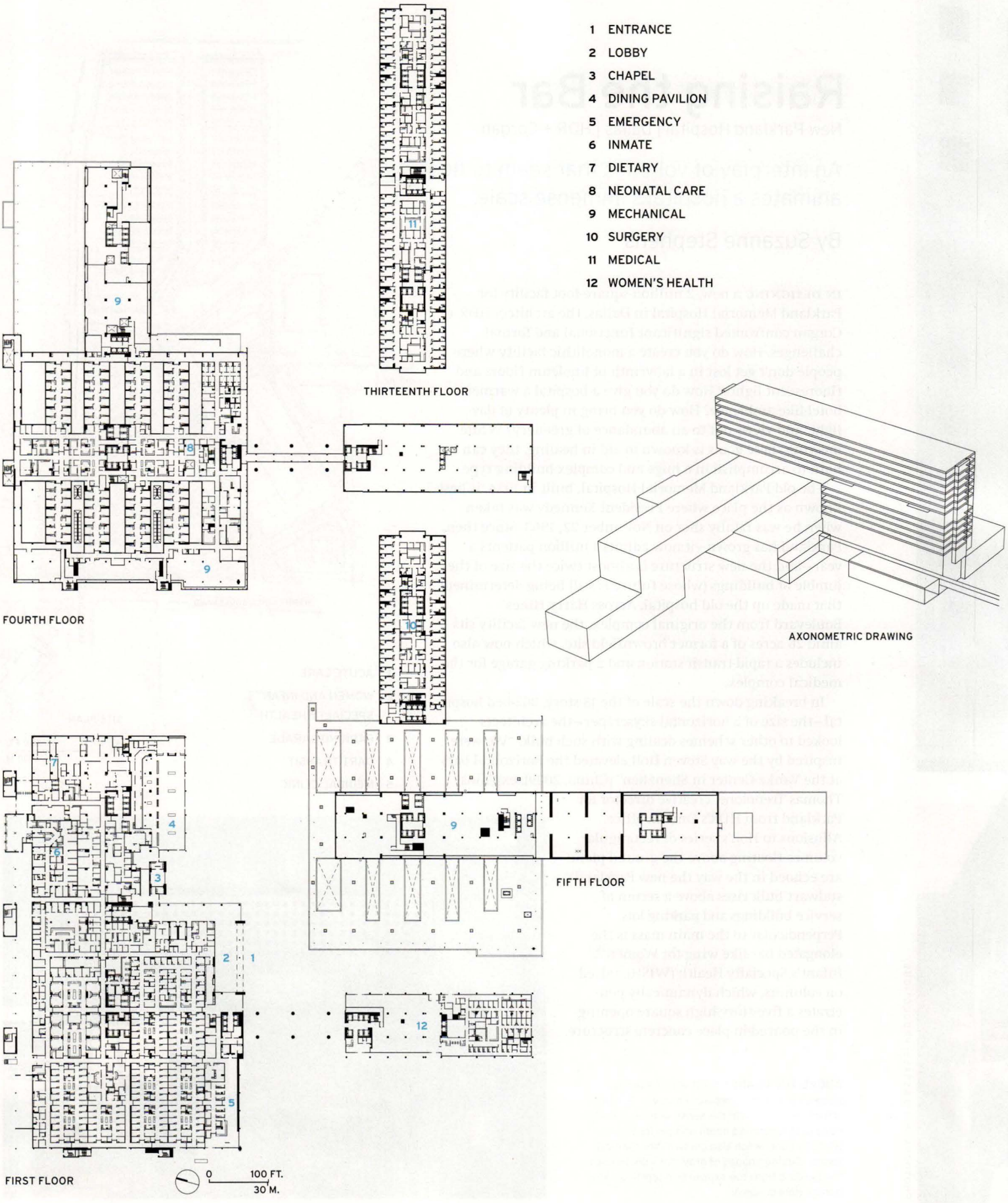


1 ACUTE CARE
2 WOMEN AND INFANTS SPECIALTY HEALTH
3 PARKING GARAGE
4 DART TRANSIT
5 MEDICAL CLINIC

SITE PLAN
0 300 FT.
100 M.

ABOVE THE PLAIN A giant void is punched through the poured-in-place concrete 18-story structure to alleviate the sense of bulk. A 4-foot-deep post-tensioned beam bridges its top, on the 10th floor, which also contains mechanical space. Varying shades of gray glass distinguish the building from the exposed-concrete parking garage (foreground).

View additional images at architecturalrecord.com.

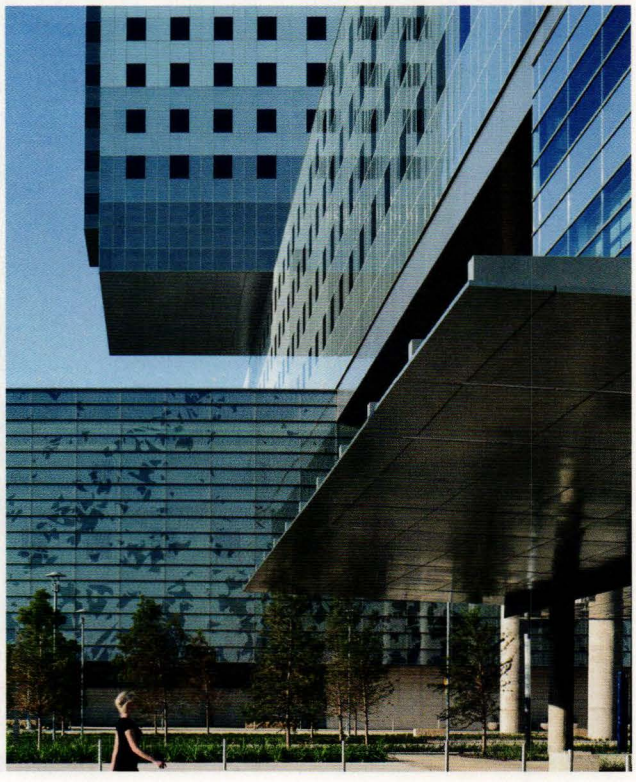

1 ENTRANCE
2 LOBBY
3 CHAPEL
4 DINING PAVILION
5 EMERGENCY
6 INMATE
7 DIETARY
8 NEONATAL CARE
9 MECHANICAL
10 SURGERY
11 MEDICAL
12 WOMEN'S HEALTH
THIRTEENTH FLOOR
FOURTH FLOOR
AXONOMETRIC DRAWING
FIFTH FLOOR
FIRST FLOOR
0
100 FT.
30 M.

Visitors arriving at the hospital find a three-story glass-walled lobby, with the drop-off area framed by the WISH wing bridging the entry drive. In addition, the architects have carved out a garden in front of a ground-floor chapel and dining pavilion on the southeast, where contoured benches of Texas limestone spiral around drought-resistant planting. Elsewhere, slices of nature accent the campus, since, as Jim Henry, HDR's health-care designer in its Dallas office, says, "We wanted to put the park back into Parkland."

The sleek glass facade, with square flush windows, pays another homage to Holl—this time to Simmons Hall at MIT (RECORD, May 2003, page 204). "Our team tried to be architecturally literate and look at other campuses and urban solutions—not just hospitals," says Trenolone. (Who knew that Holl's controversial Simmons scheme could be tamed in Texas?)

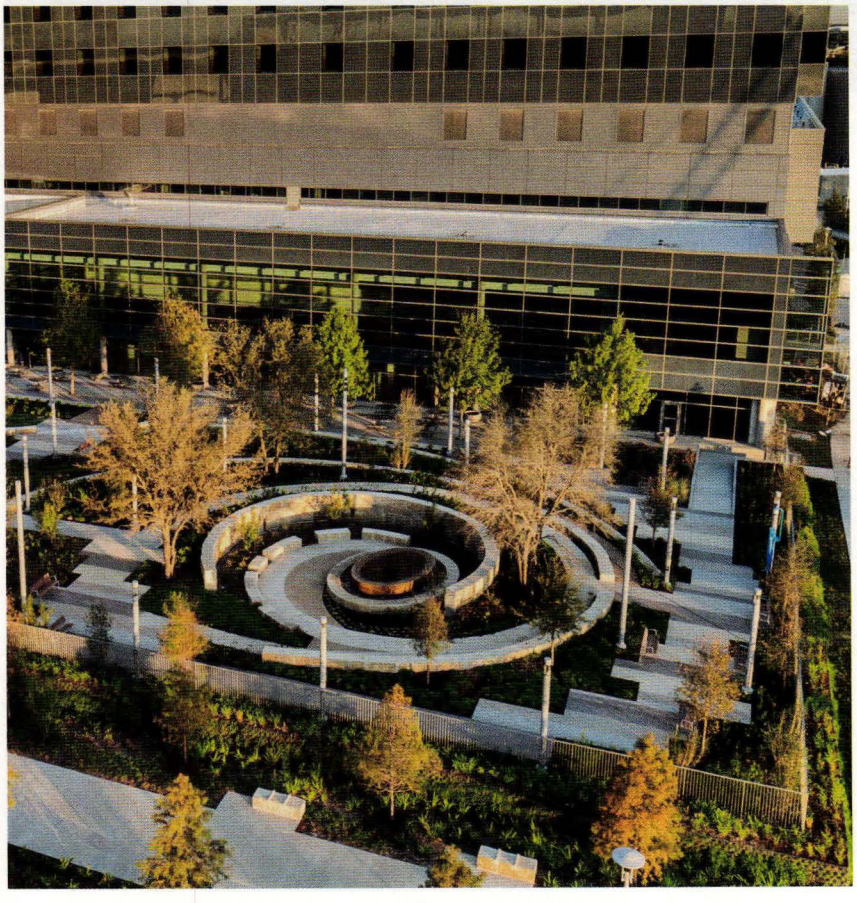
To cut down on solar gain, HDR + Corgan sheathed the walls in low-iron glass of varying gray tints, covered with a white digitally printed pattern. The wraithlike outlines of trees and attenuated lines of donors' names (anyone who gave $10 or more to the hospital) provide a striking decorative motif. Chuck Armstrong, lead designer of Corgan, claims this is "the largest digitally printed glass building in the world."

The monumental glazed lobby brings light and views into the entrance area, where blues and yellows on the elevators guide visitors to the various medical floors, including burn,



SLEEK SURFACES On the southeast end of the entrance facade, the base is carved out so the lobby, chapel, and dining area look on to a park (above). Toward the west, the Women & Infants Specialty Health wing intersects the main horizontal slab. On the southwest end, the walk-in entrance to the emergency wing (right) allows a glimpse of the top floors cantilevering 60 feet toward Harry Hines Boulevard.

DON'T FENCE ME IN The hospital's in-patient rooms (below) are all single-occupancy, with private bathrooms and large windows, along with extra accommodations for visitors. A park with spiraling benches of Texas limestone and drought-resistant plantings (bottom) is located next to the glass-walled dining room; the large glazed lobby runs along the south and east to create expansive areas for sitting, with ample natural light and views of the outdoors.



trauma, neonatal, and medical-surgery units. A key part of planning the circulation was to separate the "backstage" functions from the "on-stage" ones: a racetrack corridor loops around the elongated floors for patients and visitors, while an inner core of elevators and shorter halls accommodates staff and equipment. In addition, glassed-in seating alcoves for families and friends are abundant, supplemented by sofas and chairs in the patient rooms (all are single-bed rooms with private baths). To keep the corridors from stretching onward monotonously, the architects angled the walls of the patient rooms where they open into the halls and, by partially glazing them, were able to allow more daylight to penetrate from the exterior windows to the interior.

The bold architectural features—the digitally printed glass, the huge punched-through void, and flush-jointed square windows—definitely make the $1.3 billion building ($690 million for construction) look much more expensive. But as Louis Saksen, senior vice president of new construction for the hospital, explains, the architects and the builders worked closely together to keep the prices down, and stayed assiduously on budget. Collaboration in any hospital project is a given, but here the design teams from HDR and Corgan worked extremely well with each other, the contractors, and the hospital. "We practically lived on-site," says Trenolone, pointing to a group of rental retail space at the edge of the campus where the offices are temporarily located. "And we brought different things to the scheme: I had experience in urban planning, Jim in hospital design, and Chuck in airport design. There was a good alchemy among us."

While Parkland is arguably more sedate than its architectural inspirations, it is definitely adventurous for a hospital in the United States. The new Parkland doesn't open until August, but even in its untested state, it seems worlds away from so many overwhelming and depressing health-care complexes. ■

credits

ARCHITECT: HDR + Corgan (joint venture): HDR – Hank Adams, design manager; Mike Moran, operational management; Thomas Trenolone, creative director; Jim Henry, health-care designer; Corgan – Robert Morris, David Lind, Executive Council; Matt Mooney, senior project manager; Chuck Armstrong, lead designer

ASSOCIATE ARCHITECTS: VAI Architects, Stephens Marks Architects

ENGINEERS: AG&E Associates (prime structural design); Datum Gojer (structural); M.E.P. Consulting Engineers (m/e/p); Pacheco-Koch Consulting Engineers, APM & Associates (civil); IDA Engineers (medical glass and plumbing)

CONSULTANTS: Ten Eyck Landscape Architects, Studio Outside (landscape)

GENERAL CONTRACTOR: BARA

CLIENT: Parkland Health and Hospital System

CONSTRUCTION COST: $690 million

PROJECT COST: $1.3 billion

COMPLETION DATE: November 2014

SOURCES

GLASS CURTAIN WALL AND SKYLIGHTS: Oldcastle BuildingEnvelope

CABLE-SUSPENDED GLASS FACADE: Pilkington

WINDOW SHADING: MechoSystems

METAL PANELS: Morin

PHOTOGRAPHY: © ANDREW POGUE (THIS PAGE AND OPPOSITE, BOTTOM)

Natural Remedy

St. Charles Bend Cancer Center | Bend, Oregon | ZGF

A cancer center with panoramic mountain views encourages patients and staff to connect to nature.

By Laura Mirviss
Photography by Pete Eckert

BUILT WITH natural materials and a no-frills design, the new St. Charles Bend Cancer Center in central Oregon reflects the earthy flavor of this pioneer town, where adventure and outdoor sports such as rock climbing, mountain biking, and skiing are a way of life.

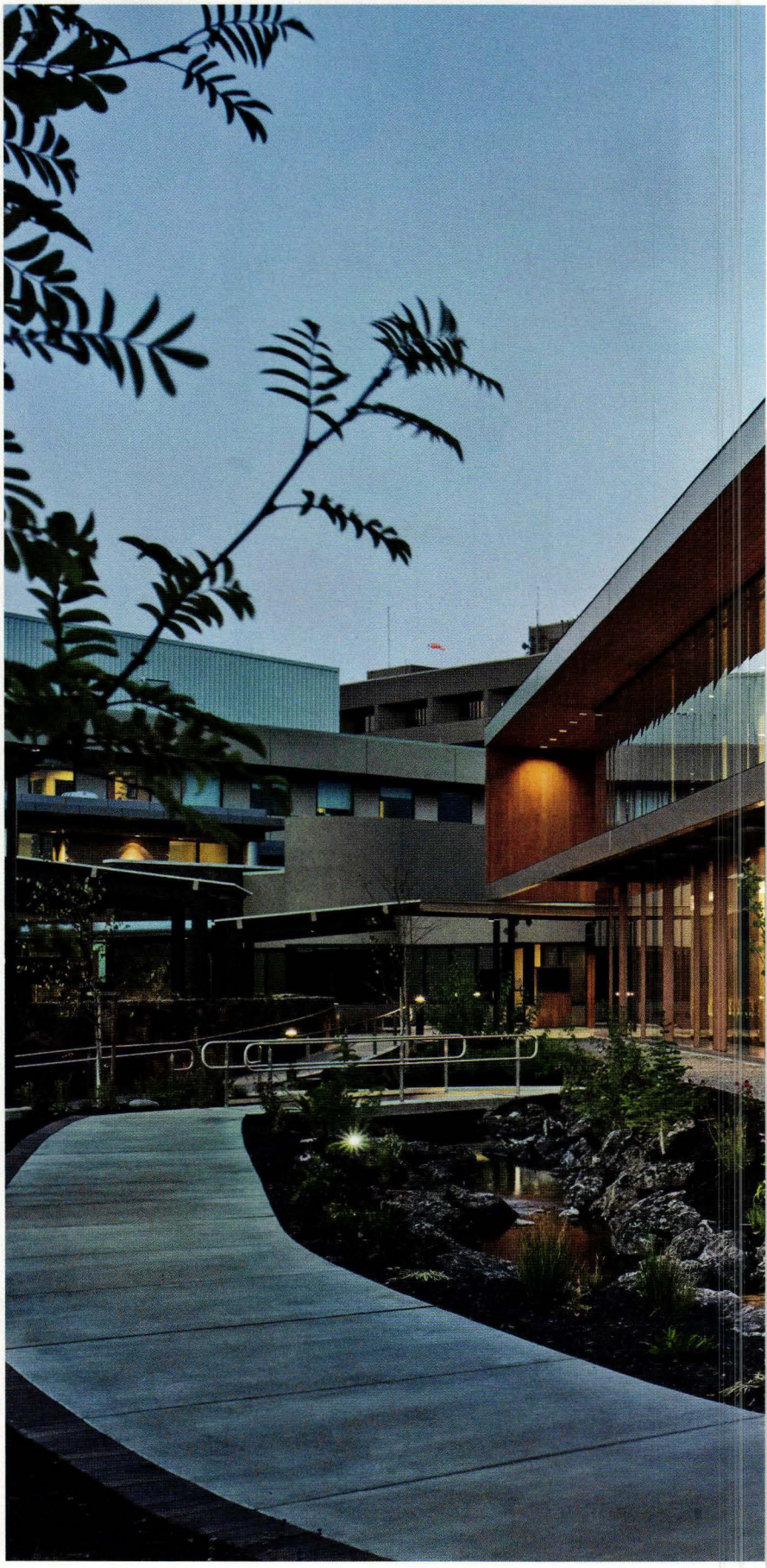
Designed by Portland, Oregon–based ZGF Architects, the 16,000-square-foot two-story building is the latest addition to the St. Charles Medical Center, a series of wings off a large original structure, designed by SOM, that dates back to 1974.

St. Charles is the only comprehensive cancer center in the region, and patients travel up to 300 miles to receive treatment in Bend, where they might stay for up to six weeks. The new wing brings the medical oncology and radiation oncology treatment teams and services under the same roof for the first time. (Previously, medical oncology was located at a satellite campus a mile down the road, a logistical nightmare for patients who had to shuttle back and forth for their chemotherapy and radiation treatments.)

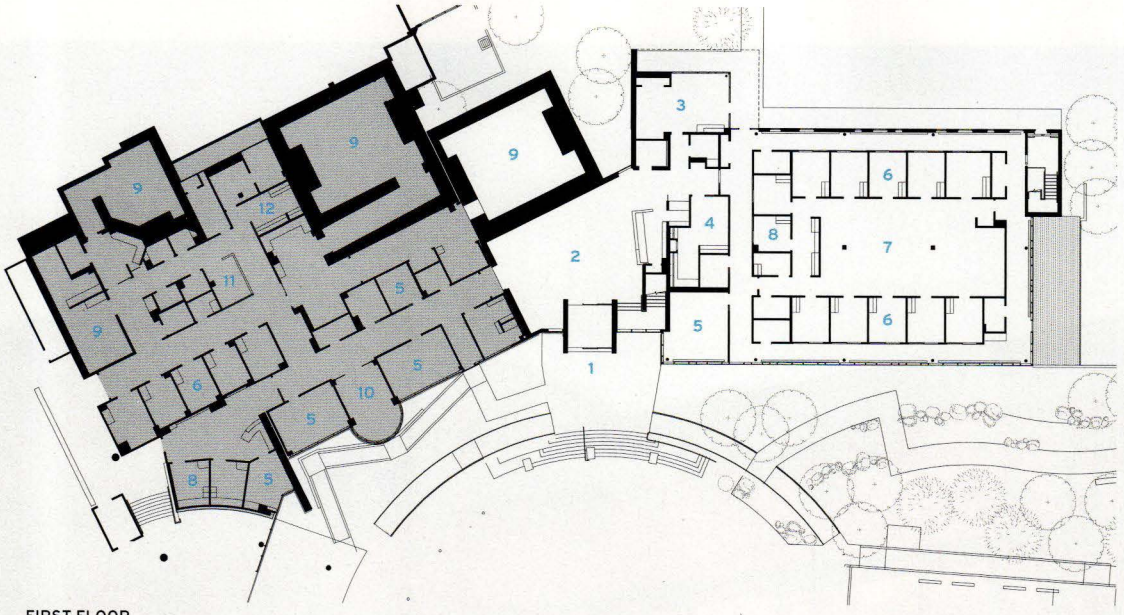
Oriented toward the southwest, the steel-frame orthogonal structure is perfectly positioned to capitalize on breathtaking views of Pilot Butte to the south and the snow-capped Cascades to the west. To blend in with the surrounding landscape, the architects clad the building with a sustainable and durable skin made of wood-like hybrid panels comprised of rice husks and mineral oil, and lightweight cement fiberboard in subtle shades of gray.

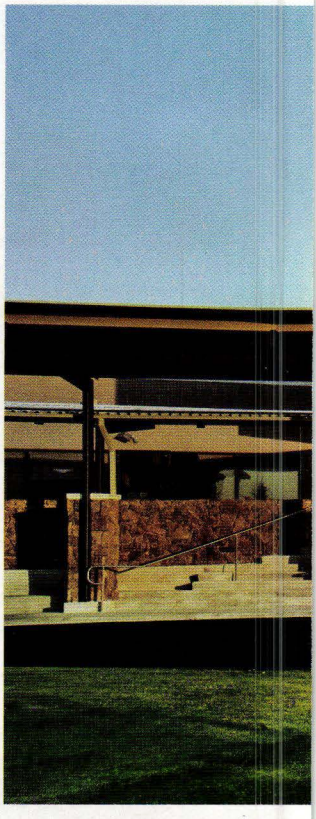
The warm natural materials continue inside, where light pours into a glazed double-height lobby with wood-paneled walls adorned by works of local artists, including a painted-tile triptych depicting Pilot Butte and the Cascades by Kathy Deggendorfer spanning the back wall. "We tried to continue that indoor-to-outdoor connectivity, with pieces that are uplifting and reflect the local scenery," says ZGF interior designer Paul Evans.

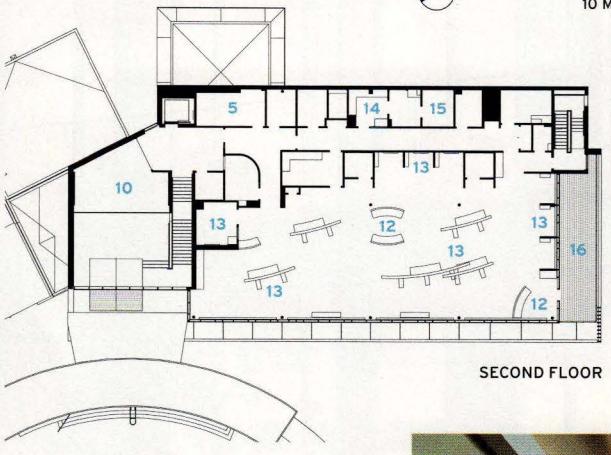
The architects organized the first-floor examination area in layers to maximize patient comfort. An inner core, housing an open-plan staff work area, is surrounded by patient exam rooms lined by corridors with floor-to-ceiling windows on the perimeter. The actual examination rooms are enclosed by frosted-glass sliding doors with a "rice paper–like quality" that provide both privacy and indirect daylight. If patients or



FRESH APPROACH The two-story cancer center encourages patients to spend time outside, either in a healing garden adjacent to the building or on a deck connected to the infusion center at the second level.







1 ENTRY
2 LOBBY
3 STAFF LOUNGE
4 BLOOD DRAW
5 OFFICE
6 EXAM
7 TEAM SPACE
8 TREATMENT
9 RADIATION TREATMENT
10 CONFERENCE ROOM
11 WAITING
12 NURSE STATION
13 INFUSION
14 PHARMACY
15 CHEMOTHERAPY PREP
16 DECK

credits

ARCHITECT: ZGF Architects – Karl Sonnenberg, partner in charge; Gene Sandoval, design partner; Malcolm Brown, project manager; Douglas Morris, Paul Evans, David Grant, Trevor Lewis, Mark Elliott, Kelvin Ono, Barbara Anderson, Aaron Schalon, project team

ENGINEERS: Froelich (structural); Hickman, Williams & Associates (civil); PAE (mechanical); Sparling (electrical)

GENERAL CONTRACTOR: Howard S. Wright

CLIENT: St. Charles Health System

SIZE: 16,000 square feet (addition), 8,000 square feet (renovation)

CONSTRUCTION COST: $10 million

PROJECT COST: withheld

COMPLETION DATE: August 2014

SOURCES

CURTAIN WALL: Kawneer, Oldcastle BuildingEnvelope, Guardian

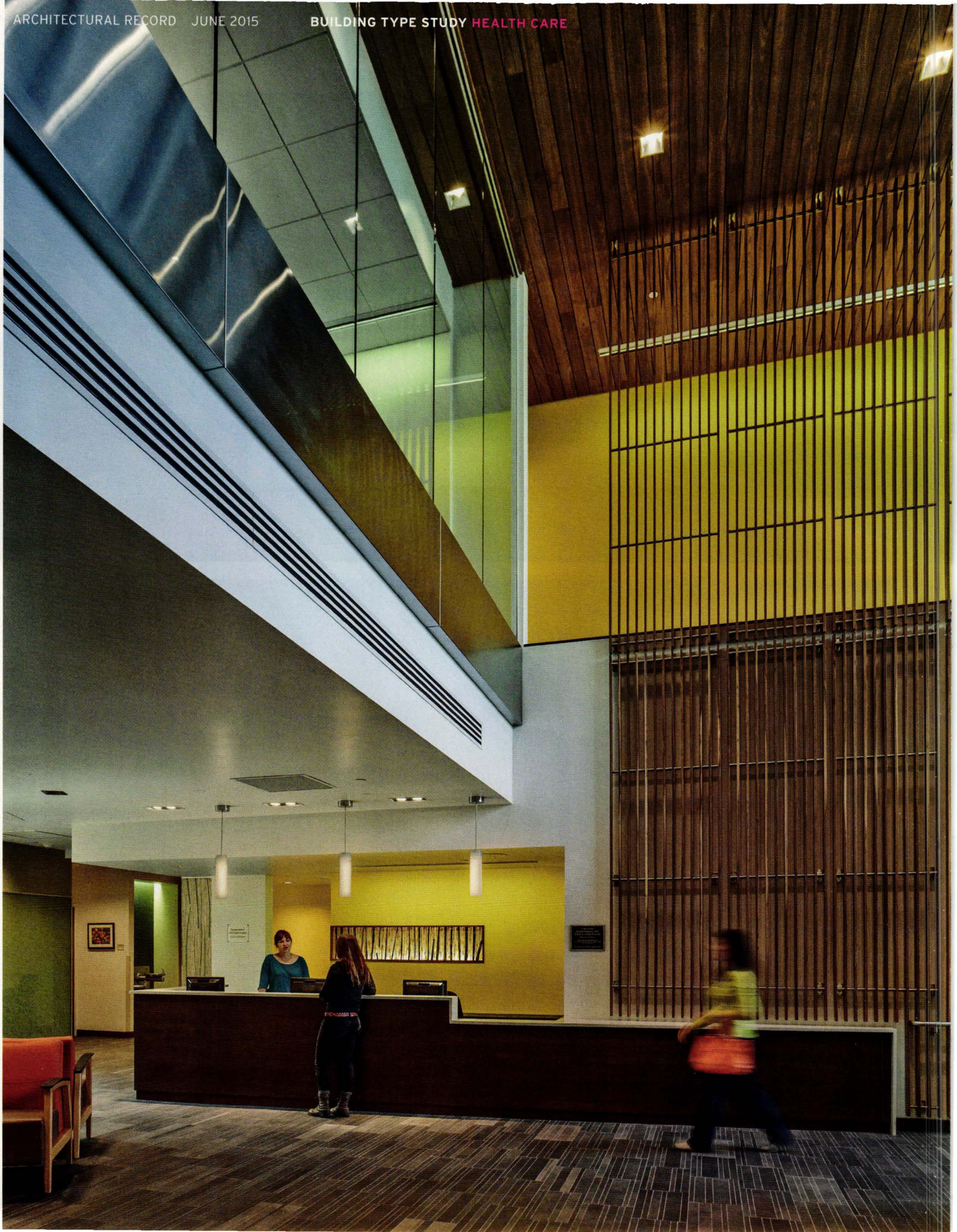
ROOFING: Carlisle

CEILINGS: USG

LIGHTING: Lithonia, Gammalux, Waldman, Lumenpulse, Philips, Eureka, Bega, Hydrel, RAB

ELEVATOR: ThyssenKrupp

CLEAR PERSPECTIVE Generous glazing fills the Center with sunlight (top). The building is clad in sustainable materials that blend with the natural setting (above). Daylit corridors line examination rooms, which have translucent panels to allow indirect light (opposite).



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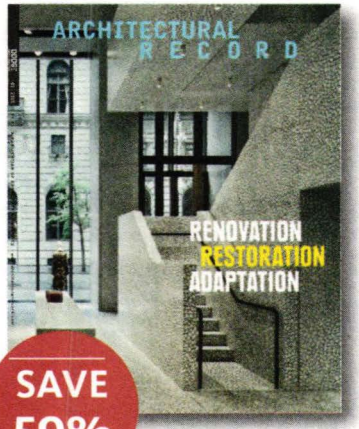

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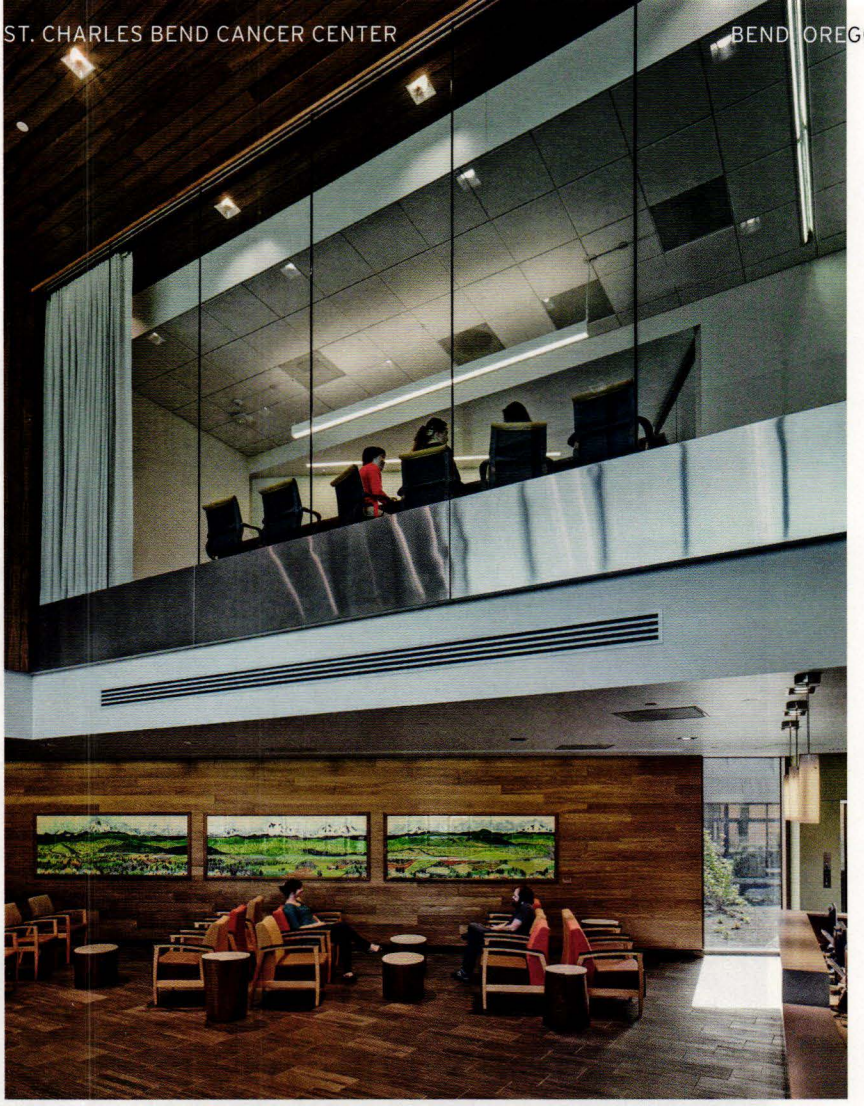
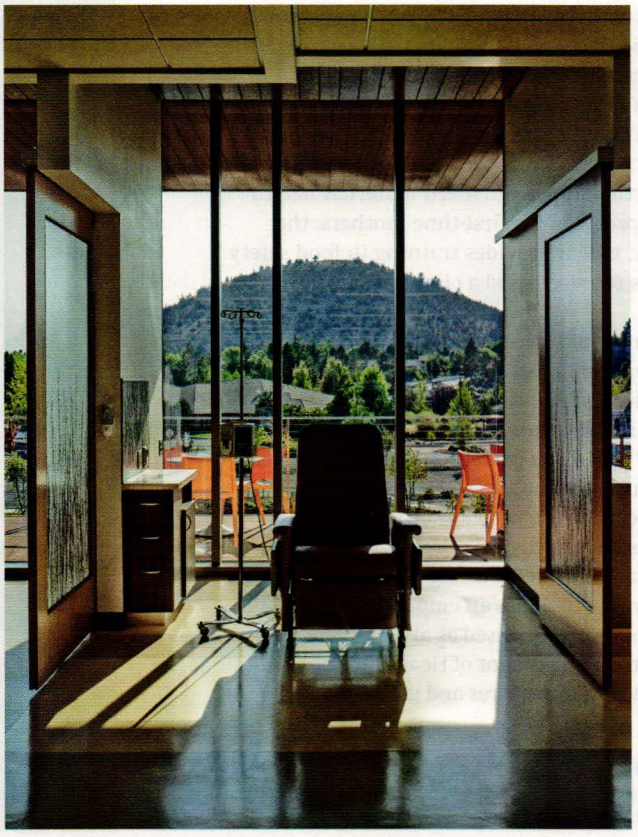


their family members need to take a breather, they can stroll outside around the healing garden and walk across a reflecting pool on "floating" pavers or sit on a bench and watch nesting ducks. There's also a lawn for yoga, Tai Chi, and other restorative activities. (Those services also are offered indoors in new integrative-therapy rooms, where patients can have massages, acupuncture, or Reiki.)

On the second floor, the infusion clinic—a spacious open-plan room with high ceilings and arresting views of the mountains—feels more like a spa than a hospital. Patients can sit for their infusions in groups of three or four, in a private room, or bays screened by resin sliding doors that incorporate dried grasses. "It's so open—it's not clinical—and that's what makes it comfortable," says ZGF partner Karl Sonnenberg. If they're feeling up to it, patients can sit on a deck that overlooks the healing garden and get their treatment outdoors. "There's always a connection to nature," says ZGF partner Gene Sandoval.

During the design process, the architects built, at a nearby dude ranch owned by the project's general contractor, full-scale mock-ups of the lobby and infusion center. Doctors, nurses, and patients reviewed and critiqued the mock-ups, with the architects making changes on the fly. "When we were talking to patients, one of the things that was really important was having options—opportunities to have conversations and interactions with their families and more of a group dynamic—and alternatives for privacy if they were feeling more withdrawn or sick," says Evans.

The result is both functional and striking. "We didn't want to make a big statement—we wanted to complement the other buildings and be sensitive to the campus," says Sandoval. For the patients, it provides a sense of well-being. ■



HEALTHY SETTING
A multipurpose conference room is suspended over the double-height lobby, where the walls are adorned with Western-themed art by local artists (opposite and top). On the second floor, the infusion clinic, with an outdoor deck, treats patients and staff to panoramic views of Pilot Butte, a popular hiking spot, to the south (left and far left).

On the Mend

Riverside Health Center | New York | 1100 Architect

A community health center's deteriorating building is resuscitated with a hardy dose of design.

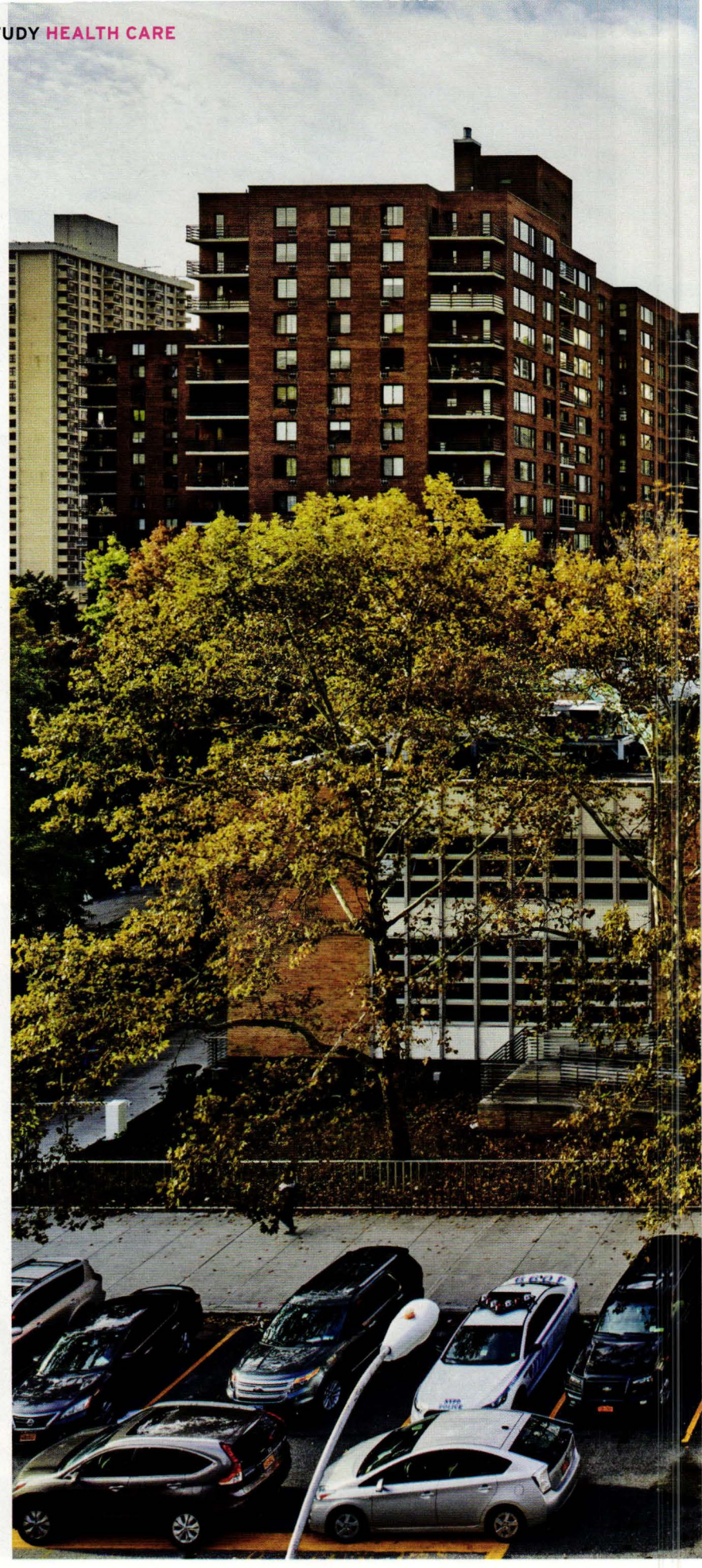
By Josephine Minutillo
Photography by Nikolas Koenig

RIVERSIDE HEALTH CENTER'S next-door neighbor is a 106-year-old Lutheran church, the only building within 32 acres to survive the wrecking ball of notorious New York planner Robert Moses as part of a huge slum-clearance project in the 1950s. The health center, on the other hand, sprang up in the early 1960s in the demolished Upper West Side neighborhood once known as Manhattantown. It was a low beacon among the new high-rise housing developments. Designed by Harry M. Prince, Architect, the H-shaped, three-story brick and terra-cotta structure, which comprises a library within its east wing, was one of many public amenities designated for the revitalized neighborhood; just across the street, a similarly set-back '60s-era building contains a police precinct headquarters and firehouse.

Riverside dutifully served the community—which remained mainly low-income—for over 40 years, but by the start of the new century was in need of a revitalization of its own. The New York City Department of Health and Mental Hygiene selected 1100 Architect through the Department of Design and Construction's Design Excellence program to modernize the deteriorating 36,000-square-foot facility.

While the New York– and Frankfurt-based firm had completed numerous renovation projects, this was its first health-care facility. The program here was unique as well, taking into account the needs of various entities including the Nurse Family Partnership, a nurse-led maternal health and home visitation program for first-time mothers; the NYC Health Academy, which provides training in food safety where certification is required; and a clinic for sexually transmitted diseases.

1100 did away with the old layouts to accommodate the new and returning tenants' expanding needs and to simplify circulation. While a second elevator was installed, so was a second stairway, and its use is encouraged through signs bearing aphorisms—"When you go up, your blood pressure goes down," for instance. A handsome windowed area in the rear portion of the second level, with low office furniture, permits views of trees and the historic church. The enlarged cellar—crawl space was excavated with light wells for additional offices and storage—includes an employee fitness room, and a community room variously used as an emergency command center for the Department of Health, or for breast-feeding seminars and similar lectures and gatherings.



NEIGHBORHOOD WATCH Built in the 1960s on a New York City block that had been razed as part of a slum clearance, the deeply set-back three-story Riverside Health Center is surrounded by high-rise apartment buildings.

View additional images at architecturalrecord.com.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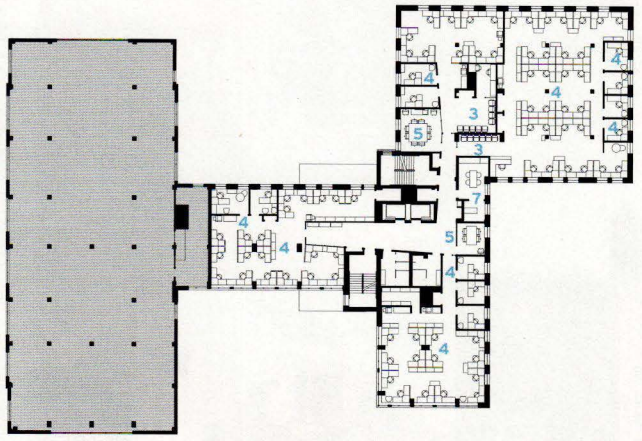
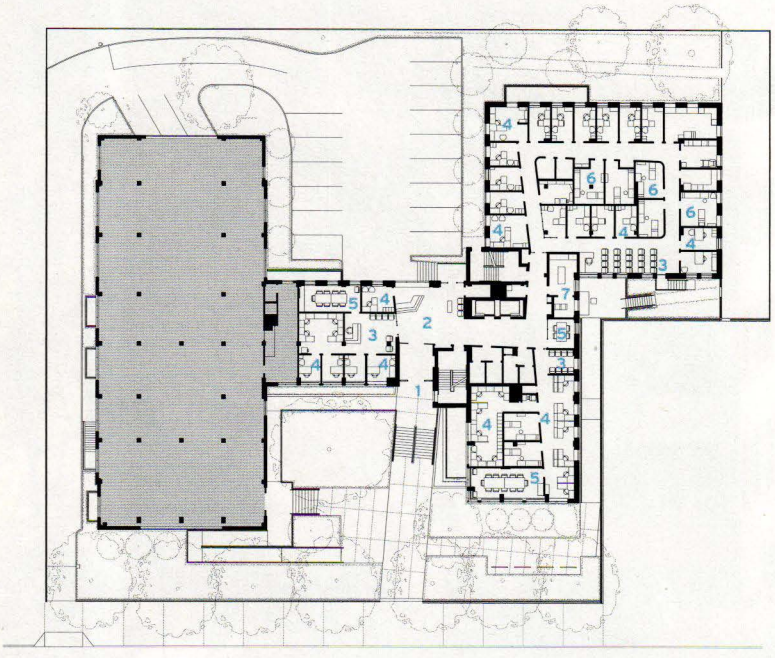
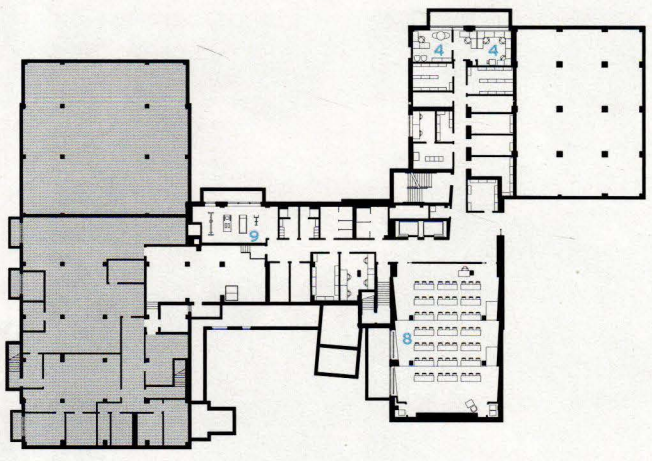


SECOND FLOOR



FIRST FLOOR



CELLAR

0 30 FT. 10 M.

1 ENTRY
2 LOBBY
3 WAITING ROOM
4 OFFICE
5 CONFERENCE ROOM
6 EXAM ROOM
7 KITCHENETTE
8 AUDITORIUM
9 EXERCISE ROOM

BACK IN SHAPE Color plays a big role in Riverside's transformation. Cheery, daylight-filled spaces are painted in bright hues (right). Interior ceramic tiles complement Richard Artschwager's orange terra-cotta cladding on the exterior tower (opposite, bottom). On the third floor, food-safety-certification classes use a functioning kitchen and refrigeration room to teach (opposite, top).

The reception area and hallways feature resurfaced terrazzo, while floors in offices, exam areas, and classrooms are covered in end-grain wood tiles. Finishes are bright and cheery. "We selected durable but playful materials," says 1100 principal in charge Juergen Riehm. In particular, colorful tiles in staircases and along select walls complement the bright orange exterior terra-cotta on the stair tower near the entrance. (The late artist Richard Artschwager, who was engaged through New York's Department of Cultural Affairs' Percent for Art Program before 1100 began, selected the cladding.) "We were happy to design around the new terra-cotta," says Riehm. The rest of the facade was also spruced up—brick was replaced and repointed as needed, and exterior lighting and stainless-steel railings installed.

Sustainable design strategies were incorporated to meet the city's requirement that the new facility be certified LEED Silver, at minimum. It is on track to exceed that. Double-hung windows were replaced with tilt-turn ones. Daylighting and efficient LED and fluorescent fixtures, some controlled by occupancy sensors, provide illumination. An upper-level addition includes a green roof and brise-soleil to control solar gain inside the new space's classrooms.

For New York, a revamped Riverside represents a continued commitment to communities in need. For 1100 Architect, which recently began working with the NYC Parks Department on recreation centers in Brooklyn and the Bronx, the facility represents a turning point in the firm's focus. Says Riehm, "It is part of our longer-term vision to do more projects that affect larger groups of people." ■

credits

ARCHITECT: 1100 Architect – Juergen Riehm, partner in charge; Texer Nam, project manager; Ellen Martin, project architect; Dominic Griffin, senior designer

ENGINEERS: Silman (structural); Buro Happold (m/e/p); Matrix New World Engineering (civil)

CONSULTANTS: Quennell Rothschild & Partners (landscape); Atelier Ten (lighting); KDS Consulting & Design (kitchen); Perkins Eastman (health care)

CLIENT: New York City Department of Design and Construction and New York City Department of Health and Mental Hygiene

OWNER: New York City Department of Health and Mental Hygiene

SIZE: 36,000 square feet

CONSTRUCTION COST: $28 million

PROJECT COST: withheld

COMPLETION DATE: December 2014

SOURCES

METAL WINDOWS: Northern Building Products

MASONRY: Boston Valley Terra Cotta; Belden Brick

CERAMIC TILE: Wizard Enterprise

OFFICE FURNITURE: Herman Miller

FIRE-RATED GLASS DOORS: SAFTI FIRST Fire Rated Glazing Solutions

Tree of Hope

City of Hope, Kaplan Research Pavilion
Duarte, California | Belzberg Architects

A historic medical institution celebrates its centennial with new exhibition and event spaces that wrap sinuously around a camphor tree.

By Sarah Amelar
Photography by Bruce Damonte

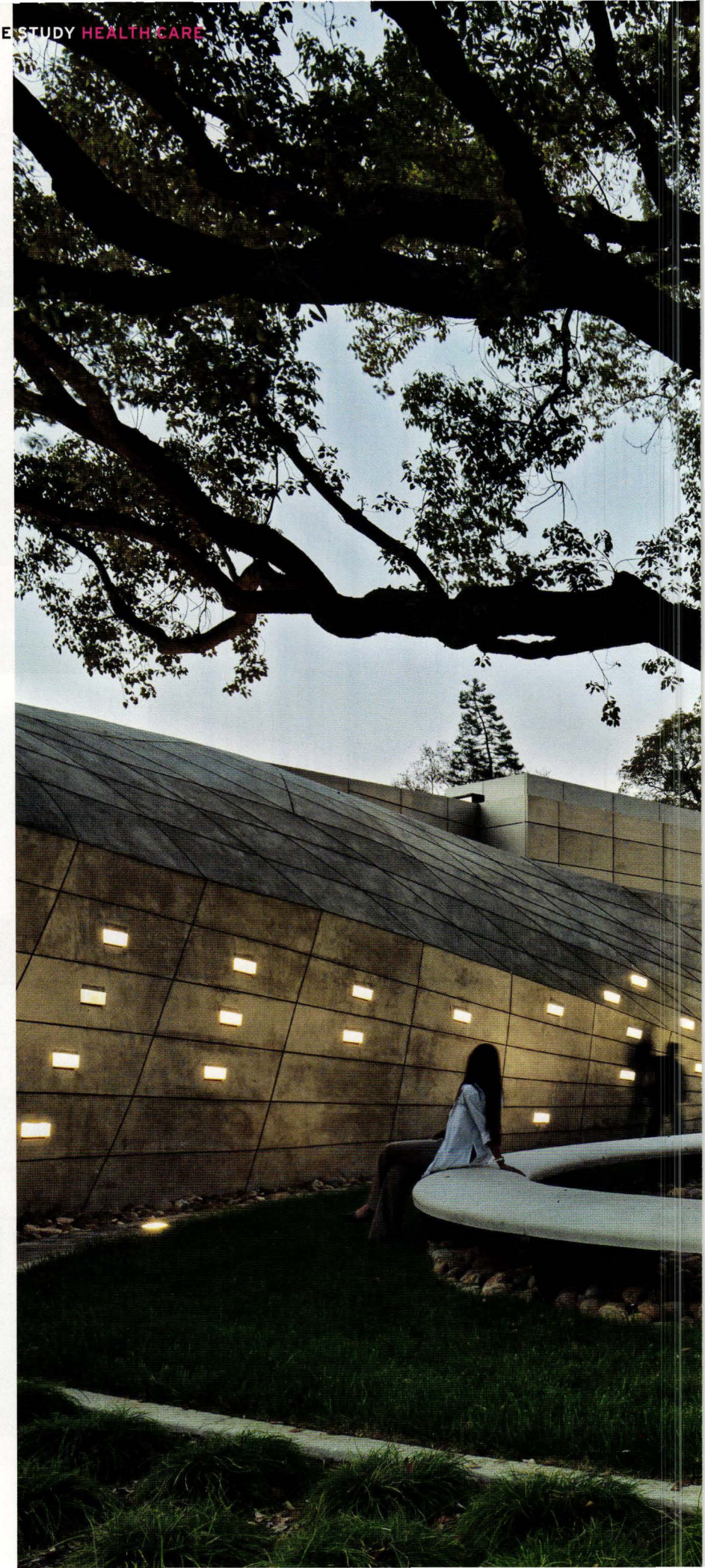
THE FIRST time architect Hagy Belzberg visited City of Hope (CoH), a biomedical research and treatment center for cancer and other life-threatening diseases, he was drawn to four young "Wishing Trees," fluttering with colorful paper rectangles. Each of those tags, strung from the branches like tiny prayer flags, carried a thought, a hope, a message from a patient, a family member, or a friend. "It moved me profoundly," recalls Belzberg of the borrowed Japanese tradition that began here three years ago and quickly blossomed.

Belzberg was visiting the 120-acre campus, in Duarte, California, near the San Gabriel Mountains, northeast of Los Angeles, to interview for a project honoring CoH's 100th anniversary. The institution formed here in 1913 as a free tuberculosis sanitarium, originally in tents. "To honor our centennial and our various intertwined missions," says Michael Friedman, M.D., CoH's president-CEO until 2014, "we wanted a work of architecture, a place for museum exhibitions, lectures, meetings, and graduation" for the Ph.D. program here. The hope was to convert an existing bungalow near the research laboratories.

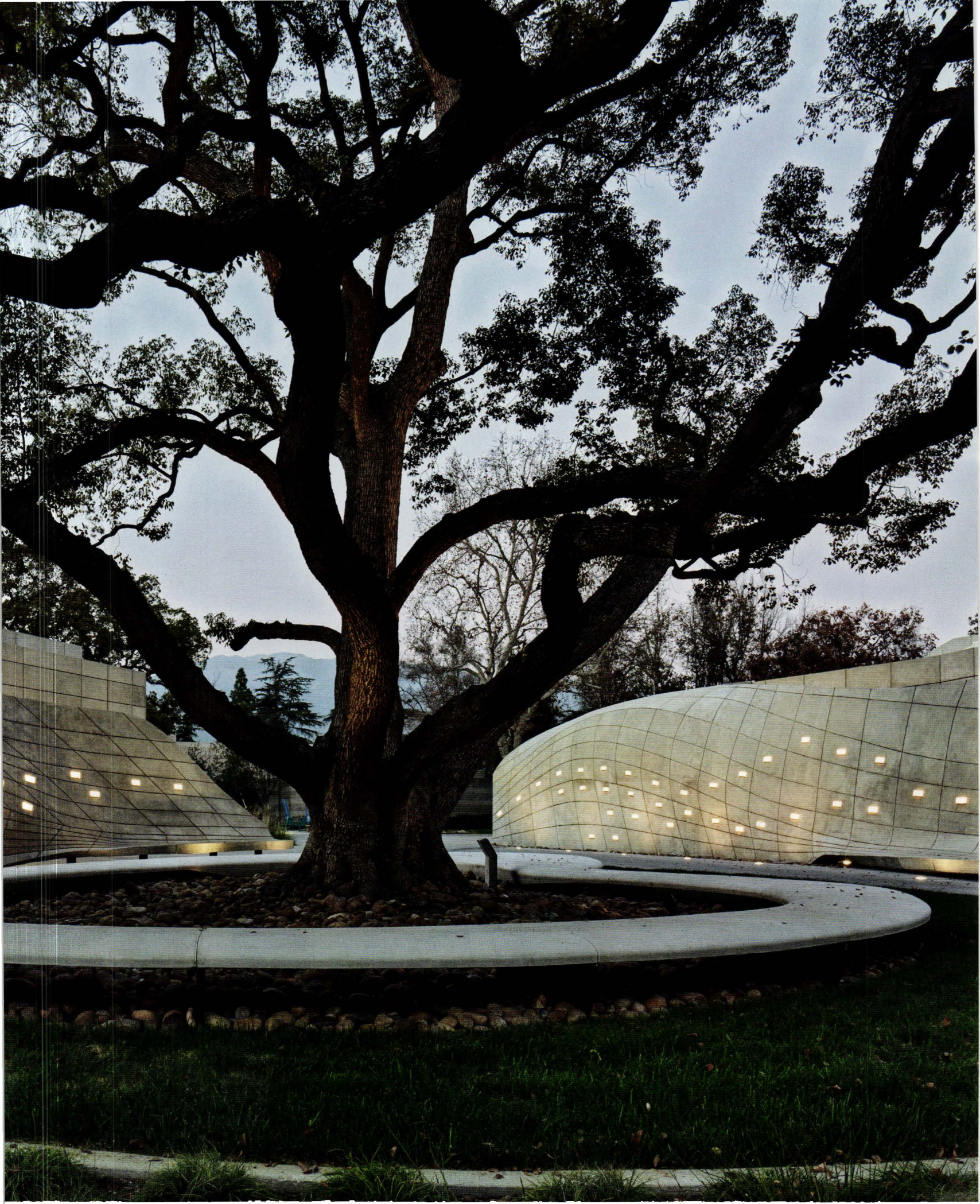
But later, when Belzberg strolled the campus, he came upon a majestic tree with a tremendous canopy. "It connected back to the Wishing Tree narrative," he recalls. "And I thought, 'Why not make the site right here, under and around this amazing tree?" Intuitively he could imagine drawing researchers out of their labs, beyond institutional and hermetic confines, to exchange ideas in a natural gathering place.

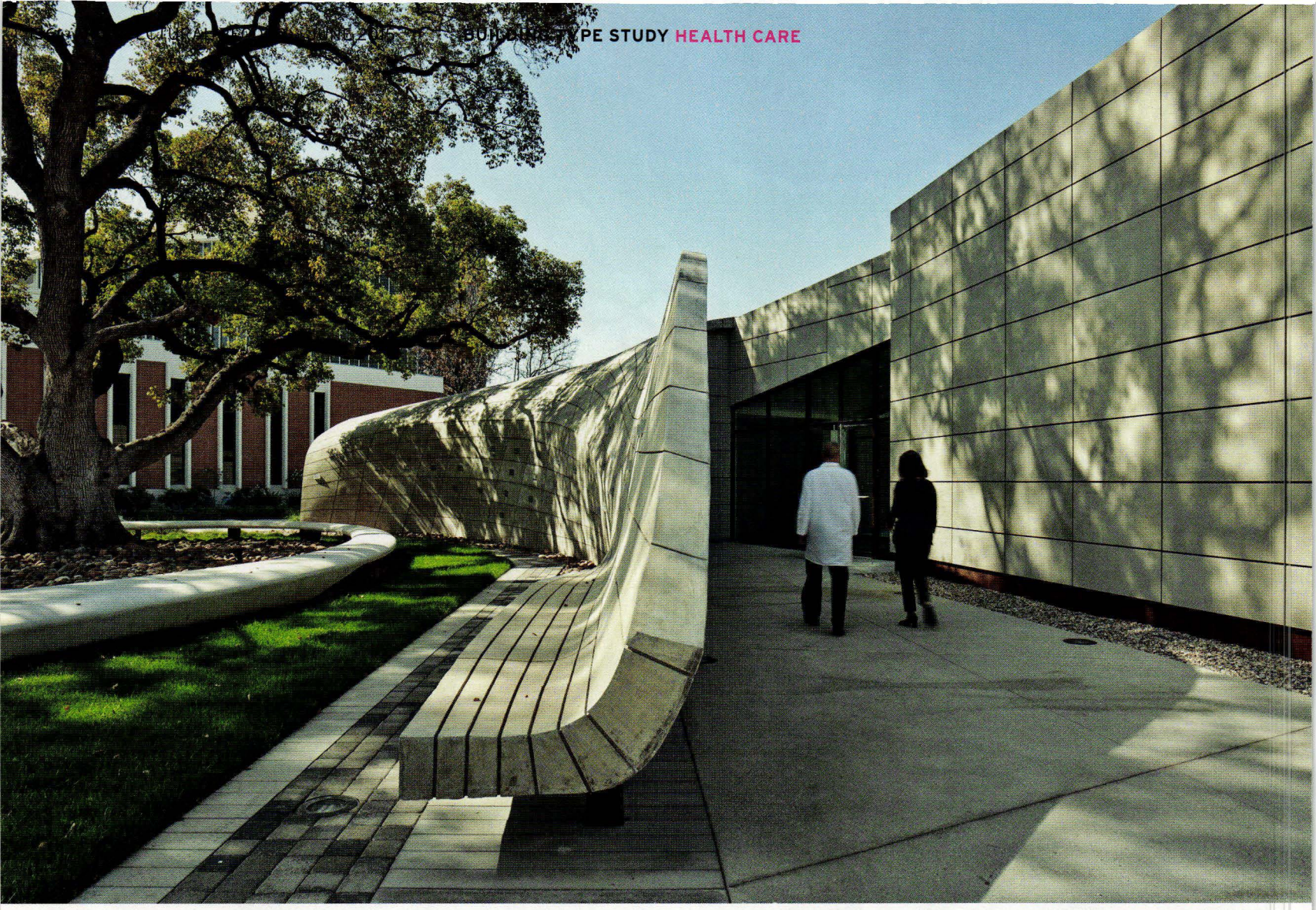
As he later learned, that tree was a particularly apt symbol for CoH's century of growth: it was 100 years old and probably planted when the organization first put down roots; also it was a camphor, an Asian tree known for its medicinal uses, longevity, and recovery. (Famously, in Japan, one specimen has an estimated age exceeding 1,000 years and, after the atomic bombing in Hiroshima, others sprang back with remarkable speed and health.)

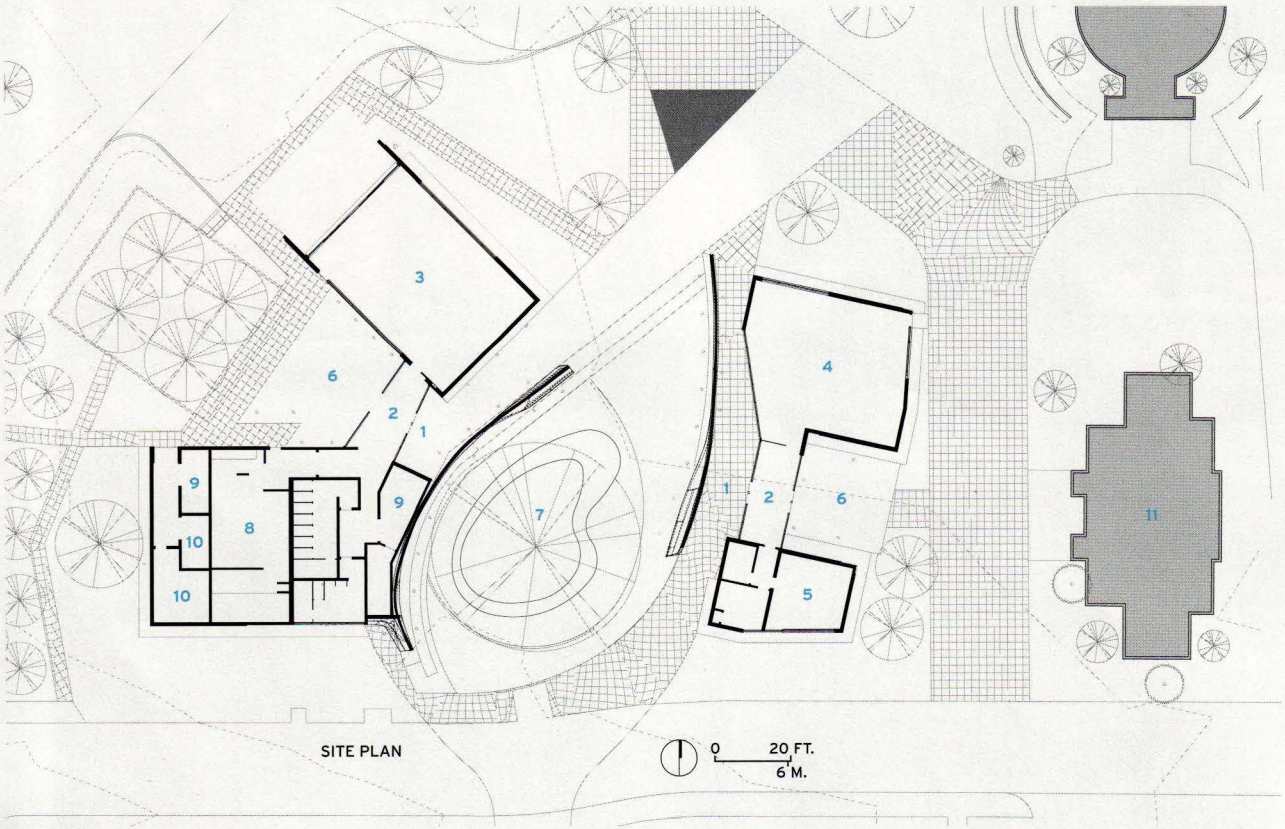
Belzberg soon convinced his client to build alongside the great camphor. Beyond its evocative power—as a tree of knowledge, tree of life, tree of hope—it represents the nexus



DEEP ROOTS The planting of this aromatic camphor tree, estimated to be 100 years old, probably coincides with the institution's founding. The paired pavilions flanking it have almost topographic facades, as if they, too, are landscape elements. For the City of Hope's centennial, backlit acrylic plaques on the buildings' concrete skin cite milestones from its first 10 years.



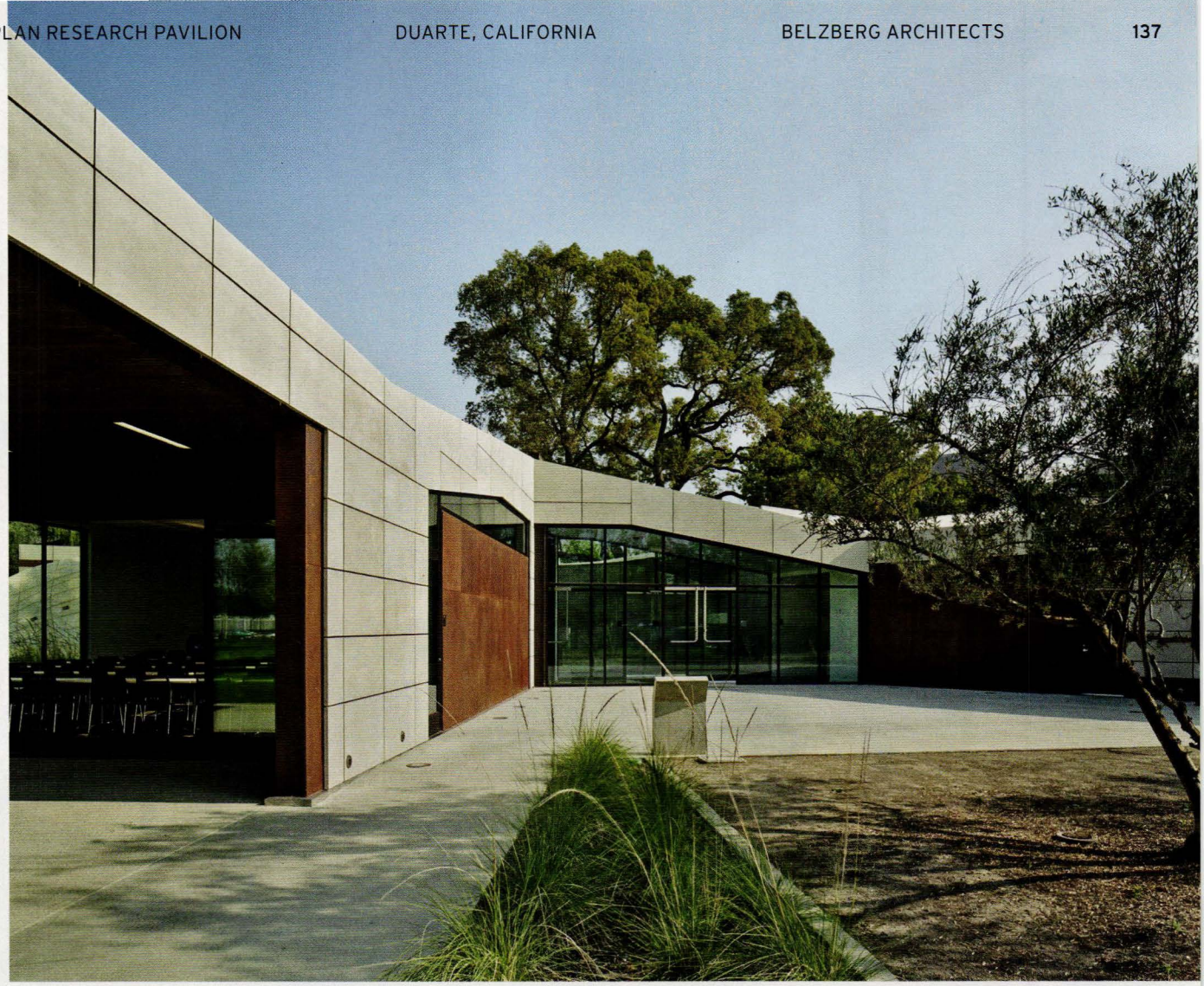


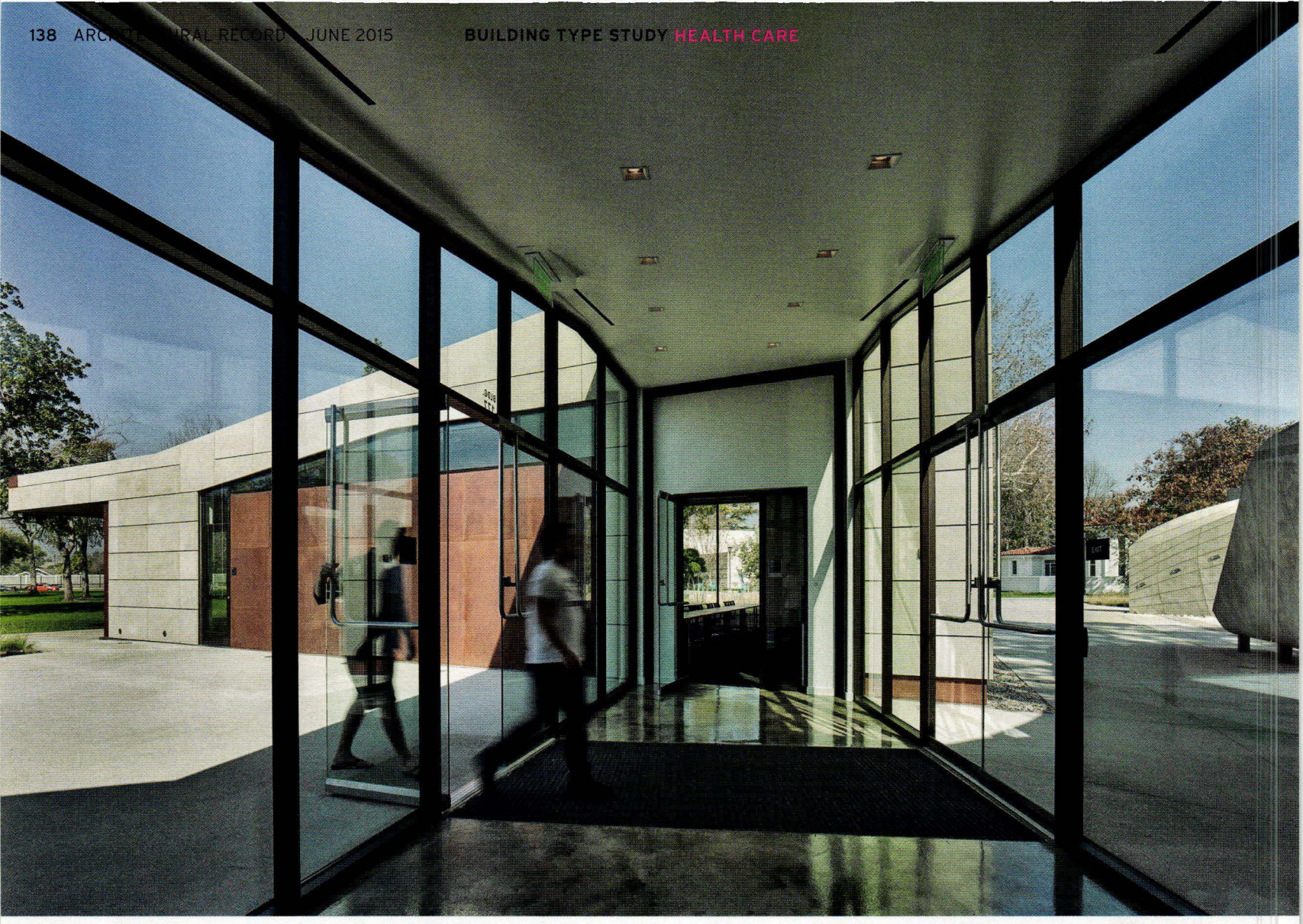


SITE PLAN

1 ENTRY
2 LOBBY
3 ASSEMBLY
4 EXHIBITION
5 ADMINISTRATION
6 COURTYARD
7 CAMPHOR TREE
8 KITCHEN
9 STORAGE
10 M/E/P
11 EXISTING VISITORS CENTER

OPEN-DOOR POLICY
The facades' concrete skin, or rainscreen, morphs into seating, and the bench that rings the tree barely touches the ground, protecting the roots (opposite). The rear of the assembly building, sheathed in concrete and weathering steel, opens to a patio and lawn, where a deep overhang shades outdoor audience members or cocktail reception guests (right and below). AHBE Landscape Architects surrounded the buildings with native grasses and permeable paving.





credits

ARCHITECT: Belzberg Architects – Hagy Belzberg, founding principal; Daniel Rentsch, project manager; Andrew Kim, Ashley Coon, David Cheung, Cory Taylor, Susan Nwankpa, Micah Belzberg, Chris Sanford, project team

ENGINEERS: Nous Engineering (structural); VCA Engineers (civil); California Energy Designs (m/e/p)

CONSULTANTS: AHBE Landscape Architects

GENERAL CONTRACTOR: Winters-Schram Associates

CLIENT: City of Hope

SIZE: 7,000 square feet

CONSTRUCTION COST: $6 million

PROJECT COST: $8 million

COMPLETION DATE: February 2015

SOURCES

CLADDING: Dissimilar Metal Design (weathering steel); Meridian Precast (concrete panels)

ROOFING: FiberTite

CEILINGS: Armstrong; Newmat (stretch ceiling)

WINDOW FRAMES: Arcadia

GLAZING: PPG

DOORS: Herculite (entrances)

PAINTS AND STAINS: Dunn-Edwards

CARPET: Shaw Contract Group

of CoH's historic grounds and later expansion. It was also, as Dr. Friedman points out, "at the emotional center of campus, surrounded by buildings with the highest traffic and greatest concentration of treatment and research facilities." And constructing the project here from scratch opened up potential for an intimately scaled indoor-outdoor venue, an antidote to the institution's larger, more formal enclosed conference settings.

To embrace the open space beneath the tree's canopy, Belzberg Architects (BA) designed a single-story structure on either side of it, together comprising the 7,000-square-foot Kaplan Family Pavilion. In each, a glassy vestibule, like a hinge, joins two programmatic elements: a flexible 1,745-square-foot assembly room and a large catering kitchen in one and, in the other, a 1,545-square-foot exhibition space with its own administrative offices. And where the pavilions face the shady camphor, their rectangular volumes melt into curvy organic form, as if responding to energy fields of the tree, an impression accentuated by the convergence and divergence of grid lines on the structures' concrete skins.

"The tree is the emphasis and the threshold," says Belzberg. From beneath its leafy canopy, you enter each building by slipping between two walls. There, a concrete rainscreen pulls away, like a billowing drape, from the underlying concrete or

CLEAR CONNECTION Glazed vestibules (above) link each building's key programmatic elements: the assembly room and catering kitchen in one; and an exhibition space with its administrative offices in the other. The flexible assembly room (opposite) allows for multiple configurations. Sliding glass panels open it to the outdoors. Its ceiling, a stretched membrane with a custom-printed pattern, has an optical effect that recalls the buildings' sculptural exterior skins.

weathering steel cladding. The rainscreen morphs into seating against each facade, and a concrete bench—like a dynamically stretched torus—rings the big tree.

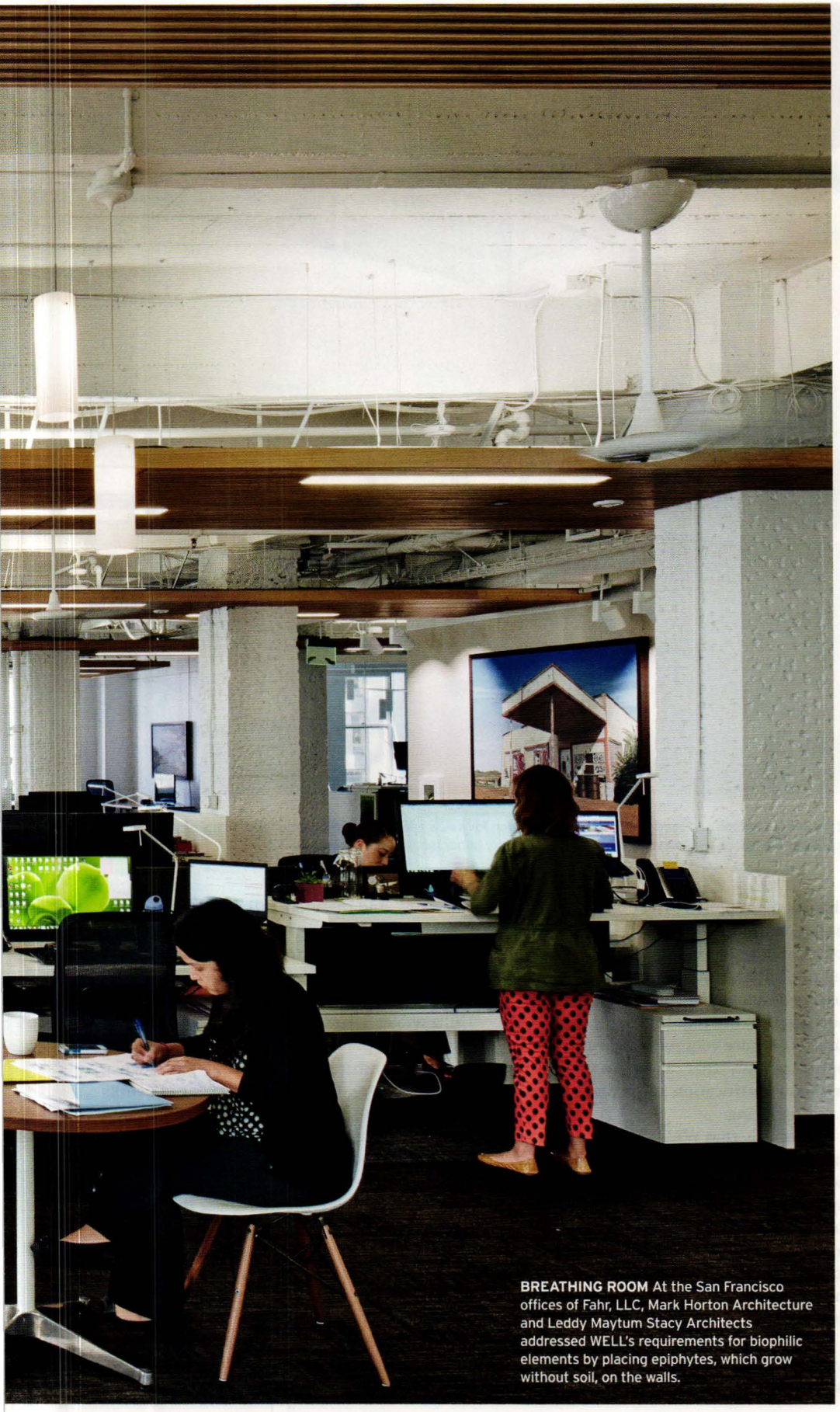
The bench, however, does not touch the trunk and barely meets the ground. The entire project's design and construction took great care to protect the tree, as BA sited the pavilions as close to the camphor as possible without encroaching on roots or branches. (The resulting challenges in accommodating foundations and seismic bracing were resolved with Nous Engineering.)

Ahbe Landscape Architects, which had worked with CoH on many earlier projects, designed the Kaplan's grounds. "Here we kept it very simple and serene, using native grasses instead of ornamental plants or flowers, to set off Hagy's sculptural forms and their refined but simple materials."

The $8 million project opened in February and is on track for LEED Platinum certification. The gallery's rotating exhibits—to correlate with symposia in the pavilion—await installation, but 100 backlit acrylic plaques already glow across the concrete skin of both buildings. Half of these insets commemorate CoH's historic moments and breakthroughs, including the synthesis of human insulin in 1978. The remaining 50 are blank, ready for future milestones.

Already conferences here have spilled productively outdoors as the assembly room—with a sliding-glass rear wall—opens to lawn and patio, and attendees informally extend their dialogue beneath the tree. These areas, near the catering kitchen, will host future graduations, open-air receptions, and dinners.

Although meditative and healing gardens weave through CoH's campus, an unexpected consequence of the Kaplan Pavilion has been its draw not just for faculty and staff but also for patients and their families, often seen gathering under the great camphor. In its gentle, nourishing, and contemplative connection to nature, the spirit of this new center seems to resonate with CoH's underlying credo: "There is no profit in curing the body if, in the process, we destroy the soul." ■



BREATHING ROOM At the San Francisco offices of Fahr, LLC, Mark Horton Architecture and Leddy Maytum Stacy Architects addressed WELL's requirements for biophilic elements by placing epiphytes, which grow without soil, on the walls.

PHOTOGRAPHY: © BRUCE DAMONTE

The Picture of Health

A new certification system for buildings places the occupant at the center of sustainable design. By Joann Gonchar, AIA

A BUILDING can promote the well-being of its occupants in a variety of ways—just ask any architect. Some will say it should be free of toxic chemicals. Others might argue that the design should discourage occupants from being too sedentary. Still others will maintain that a building must foster ways for its users to be productive and happy. Now a new certification program called WELL is available. This set of health-centered guidelines could help architects and other professionals define more precisely the relationship between wellness and the built environment.

No doubt there are design teams and clients who question the need for another rating system or an additional plaque to hang on the wall. But advocates maintain that even though LEED provides credits for attributes like daylighting and good indoor air quality, WELL is a complementary system that responds to a distinct set of problems. "It deals with issues that LEED tackles only obliquely," says Bill Browning, founding partner of research and consulting firm Terrapin Bright Green. "LEED is about the building," he elaborates, "while WELL is about the experience of the occupants in the building."

The tool for measuring, certifying, and monitoring the features of the built environment that further human health is the brainchild of Paul Scialla, a former Goldman Sachs partner. In 2007, he founded Delos—a research, consulting, and development company that he describes as a "wellness real-estate" business. He saw opportunity in combining real estate, "the world's largest asset class," with health and wellness, "its fastest-growing industry," he explains.

Delos first developed WELL as a proprietary system in collaboration with medical and health professionals. But to further advance its goals, Scialla decided to offer it as a publicly available standard. And, to administer it, he established the International Well Building Institute (IWBI) as a public benefit company, or B-Corp, a type of for-profit entity recognized

LEG UP The leadership of Pittsburgh's Phipps Conservatory and Botanical Gardens decided to seek WELL certification for a new administration building after completion of construction. Because the structure already had features like a centrally placed, daylit, and visually appealing stair, only minor modifications were needed.

in many states that includes having a positive impact on society in its mission. Last October, after a multistage peer-review process, the institute released version 1.0 of WELL, which is tailored specifically to offices. Standards for other building types are in the works.

According to IWBI, three pilot projects have so far been certified, and projects totaling more than 10 million square feet, in buildings located throughout the world, are on the path to certification. Although this figure is dwarfed by the number of LEED buildings—almost 60 million square feet were certified in the month of April alone—the WELL tally is impressive, considering that it is still so new.

ROAD TO WELLNESS

In its 216 pages, WELL 1.0 outlines recommended practices, organizing them into seven categories: air, water, nourishment, light, fitness, comfort, and mind. Within each of these are strategies, or in WELL lingo, "features," which can be applied to a building project or space to promote the health of the human body, including its cardiovascular, immune, and respiratory systems. Some of these strategies are designated as "preconditions," meaning they are required for certification, while others are voluntary measures, or "optimizations," that can help a project surpass basic certification and achieve a Gold or Platinum rating.

Sources say that WELL 1.0 catalogues what goes into the making of a healthy environment. The document "teases apart the various aspects of wellness," rendering its concepts both "accessible and actionable," says Beth Heider, chief sustainability officer at construction and development company Skanska USA. She served as a peer reviewer, as did Terrapin's Browning.

Many of the 102 features outlined by the standard depend on the space's configuration, its finishes and furnishings, and mechanical systems, and therefore fall directly under the purview of the design and construction team. For example, there are requirements for walls and ceilings to have minimum light reflectance values in order to promote alertness, ultraviolet lamps incorporated into cooling systems to prevent mold growth, and ergonomic furniture. But other strategies, such as those limiting the amount of sugar in drinks available on the premises, housekeeping protocols relying on nontoxic and hypoallergenic products, and policies intended to encourage physical activity, like reimbursement for gym membership, clearly come under the purview of the client or tenant.

Some of the features are ahead of available technology. Aliza Skolnik, a senior associate with consulting engineering firm ESD, cites an optimization that calls for sensors continuously monitoring and displaying noise levels. There is no sensor suited for that purpose yet on the market, explains Skolnik, who is

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among the first group of provisional WELL APs, or accredited professionals (she will be eligible for full AP status after passing an exam to be offered for the first time this fall).

Designers from Mark Horton Architecture and Leddy Maytum Stacy Architects (LMS) encountered a similar problem when they renovated a floor in a 1920s office building in San Francisco's financial district. The client was Fahr LLC, which oversees several organizations owned and managed by environmentalists Tom Steyer and Kat Taylor. In addition to WELL, the architects for the recently completed project are seeking certification under the Living Building Challenge (LBC)—a standard whose stringent requirements include a prohibition against using materials that contain any one of 22 chemicals on a so-called "red list." The dual certification goal complicated furniture selection for the offices, especially since a compressed schedule, with less than two months for design, allowed little time for the vetting of materials. "If 12 chairs met the red list, WELL's ergonomic requirements eliminated 11 of them," says Adam Franch, project architect from LMS. Horton believes that programs like WELL and LBC will provide manufacturers with an incentive to broaden the range of compliant products. "All of this momentum will eventually change the market," he predicts.

THE PRICE OF HEALTH

The certification process, which includes an on-site assessment for the testing of air, water, and lighting quality, will be managed by the Green Business Certification Institute (GBCI)—the organization (formerly the Green *Building* Certification Institute) that is also responsible for LEED certification. Fees for registration and commissioning vary depending on a project's size and type, but for a tenant improvement project smaller than 50,000 square feet, the total would be $8,300. IWBI charges additional fees for the audit, which begin at $4,000.

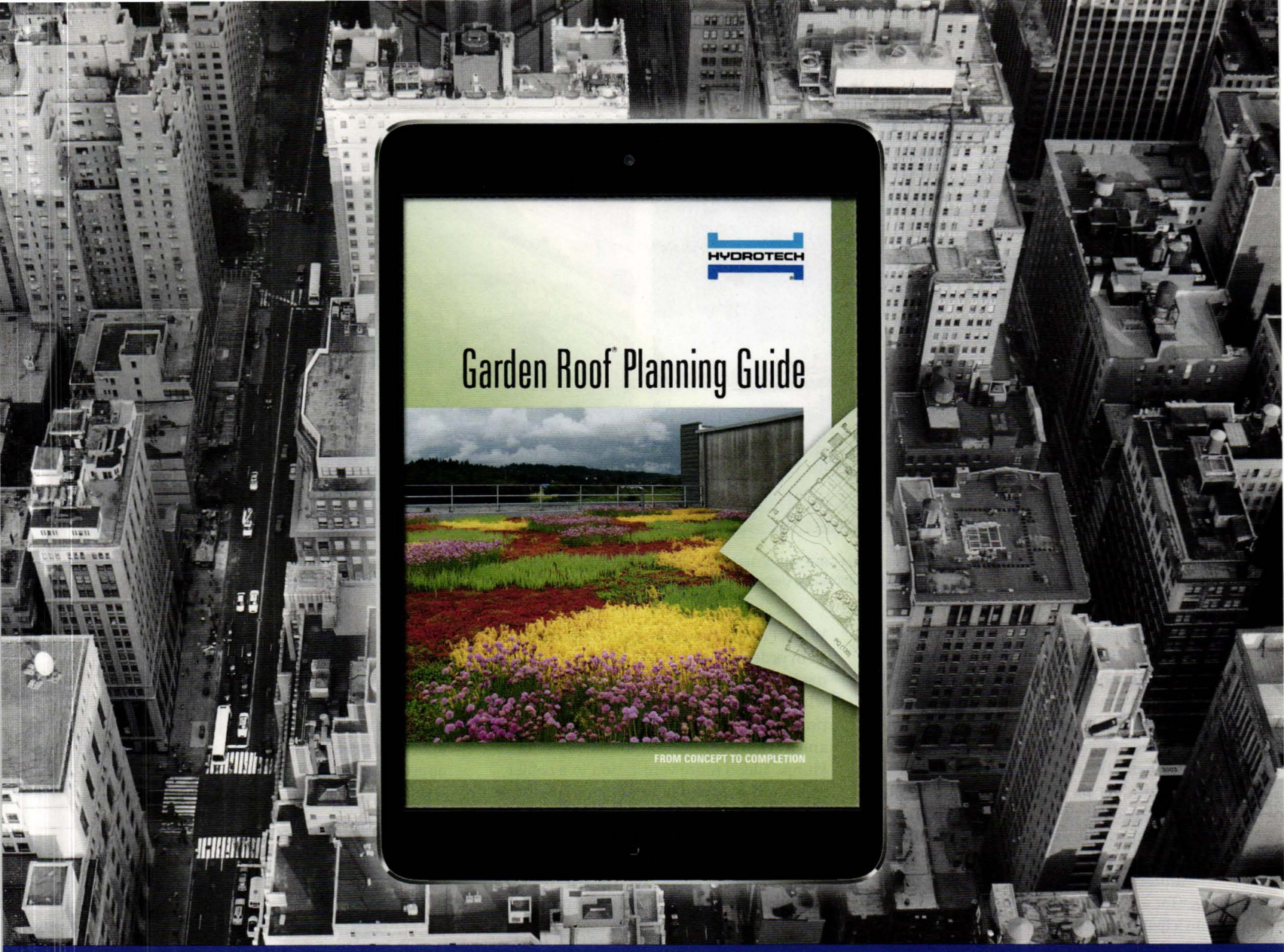
The cost of actual compliance is a bit less clear-cut. Michelle Moore, an IWBI strategic adviser, points out that with only three certified projects so far there isn't enough data for a comprehensive analysis. However, she expects low incremental construction costs, especially for those projects also targeting LEED. "Project teams that have figured out integrated design know that sustainability is about different decisions, not necessarily about more expensive ones." She recommends putting the two rating systems' checklists side by side to identify areas of overlap and pinpoint which credits or features entail additional investment. To aid this process, WELL 1.0 includes appendices that compare it with both LEED and the Living Building Challenge.

Onno Zwaneveld, an executive at real-estate services and investment company CBRE, says

"LEED is about the building, while WELL is about the experience of the occupants in the building," says Terrapin Bright Green's Browning.

RENDERING: COURTESY HOK

HEALTH FOR ALL The U.S. Green Building Council and HOK are partners on the William Jefferson Clinton Children's Center project in Haiti, which is now in design development. The team has committed to achieving LEED Platinum and WELL certification for the facility, which will deploy passive and renewable strategies.



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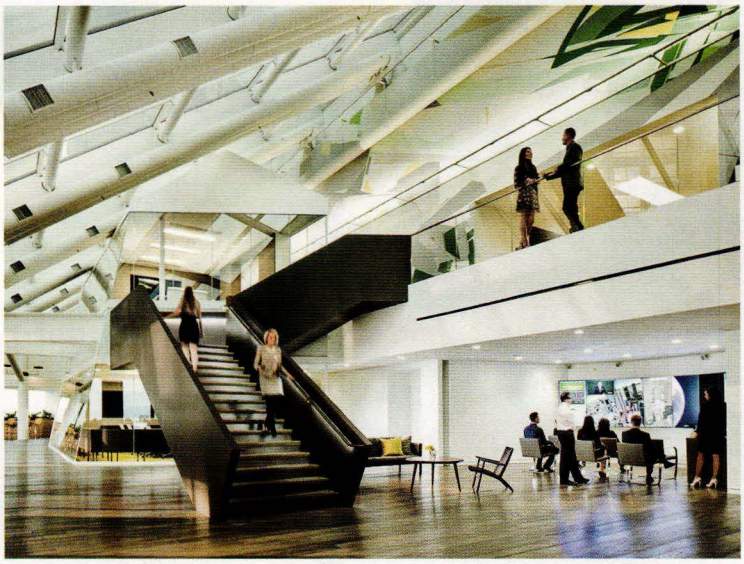

HIGH MARKS More than 90 percent of employees based in CBRE's new Gensler-designed WELL-certified offices in Los Angeles (above, right) say their new home contributes to their health and well-being. Architects from RNL say WELL features at a Denver condo complex (above, left) slated for completion in 2017 will increase the pool of potential buyers.

WELL features for his company's new Gensler-designed office on two floors of a 26-story building in downtown Los Angeles added 1.7 percent to the construction budget over the cost of its LEED Gold certification. The space, which received its WELL certification in November 2013, includes advanced air filtration and water purification, lighting intended to minimize the disruption of the body's circadian system, and ergonomic furniture such as stand-up desks.

Similarly, Josh Gould, CEO of RNL, the architect for a 229-unit condo complex in Denver, anticipates its premium for WELL compliance to be "just a few percentage points" when compared to a more conventional apartment building. Slated for completion in the fall of 2017, the structure will have a number of features intended to encourage physical activity, including a 12-story tower with a glass-enclosed stair. The architects hope that the views the stair will provide of the surroundings will entice residents to use them rather than the elevator. Gould expects WELL certification to enlarge the pool of prospective buyers.

It goes without saying that it is easier to incorporate WELL if the goal is set early in the planning and design process. But it is possible to achieve certification even if that decision is made after the completion of construction. That's what the Phipps Conservatory and Botanical Gardens in Pittsburgh did with its Center for Sustainable Landscapes (CSL), a 24,000-square-foot administrative building executed by local architecture firm The Design Alliance. Completed in late 2012, the structure is LEED Platinum and Living Building Challenge–certified. It received its WELL Platinum certification in October.

In order to meet WELL standards, Phipps made only minimal changes to the building, which had been designed with many health-promoting aspects including ample daylight and a strong connection to the outdoors. Phipps added more ventilation to a copier room and swapped in ergonomic furniture. It also implemented a few changes to operating procedures and policies. These involved enhancing its already green cleaning practices, supplying break rooms with fresh fruit, and making Fitbits available to employees.

GREATER GOOD

Fans of the new standard hope it will advance the discussion of health and architecture into the public realm. However, some worry that, for the moment at least, an environment that promotes wellness is perceived as a luxury. "We need to make sure we divorce healthy buildings from a level of amenity," says Claire Maxfield, director of the San Francisco office of Atelier Ten, an environmental design consultancy that was a peer reviewer of WELL's lighting sections. "I'm sure even IWBI would say so," she adds.

And in fact, Scialla maintains that he is absolutely dedicated to a standard that can be broadly employed. He says this goal will be furthered by IWBI's B-Corp status, which includes a commitment to contribute 51 percent of net profits from certification fees to philanthropic entities and investment that focuses on health and wellness. Among the rating system's many current pilot projects is the William Jefferson Clinton Children's Center—an orphanage in Port-au-Prince, Haiti, which is a collaboration between the U.S. Green Building Council and HOK. Details regarding another pilot project—an affordable-housing complex in New York—are expected to be announced soon. WELL isn't just for luxury apartments or class-A offices, says Scialla: "It is appropriate for any project type at every cost level." ■

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To earn one AIA learning unit (LU), including one hour of health, safety, and welfare (HSW) credit, read "The Picture of Health," review supplemental material at architecturalrecord.com, and complete the online test. Upon passing the test, you will receive a certificate of completion, and your credit will be automatically reported to the AIA. Additional information regarding credit-reporting and continuing-education requirements can be found online at ce.construction.com.

Learning Objectives

1 Explain the goals of WELL.

2 Outline the structure of WELL 1.0 and explain how it helps define the relationship between human health and the built environment.

3 Discuss how WELL differs from more established green building-rating systems such as LEED.

4 Discuss the challenges that the certification process poses for design teams.

AIA/CES Course #1506

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Invitation

In response to the rapid growth in passenger volume of Taiwan Taoyuan International Airport and economic activities in the Asia-Pacific region, the Host Entity is actively promoting the construction of Terminal 3, so as to boost service capacity and enhance quality of service. Terminal 3 is located between Terminal 2 and the CAL Park (China Airlines Headquarters). The project area is approximately 640,000 m^2. The Million Annual Passengers Processor (2042) of Terminal 3 area is estimated to reach 45 MAP. Buildings to be constructed under the project will comprise Terminal 3 processor and concourses, Multi Function Buildings (MFB), while the infrastructure will comprise Service Roads System, Apron and related Taxiway System, Automatic People Mover (APM), Terminal Access Roads, and related facilities.

The objectives of Taiwan Taoyuan International Airport are to become a large-scale hub airport, serving the aviation market in East Asia. The Multi Function Buildings will link Terminal 3 and existing Terminal 2 to form a Mega-Terminal. The main design concepts for this project are "Smart, Green and Culture". With high efficient operating system to provide high quality passenger services and transportation function, the project will be developed as a sustainable and intelligent airport, with comprehensive facilities encompassing functions in tourism, shopping, culture and arts to create new traveling experiences.

This project will be conducted as an international competition. Outstanding design proposals and professional services teams from all over the world are solicited to develop the project. This project intends not only to satisfy the rapidly growing demand in passenger/cargo volume, but also to absorb advanced technologies such as self check-in counter, bag-drop system, Building Information Modeling (BIM) and Energy Management System (EMS) to create a magnificent Terminal in all respects.

You are cordially invited to participate in this competition. Taiwan Taoyuan International Airport is looking forward to cooperating with you.

Total Construction Budget

About NT$48.8 billion (Approximately US$ 1.626 billion.)

Service Fee

The service fee for this project is about NT$3.548 billion (about US$118 million.)

Tendering Method

Individual tendering or joint tendering by national suppliers
Individual tendering or joint tendering by foreign suppliers
Individual tendering or joint tendering by foreign and national suppliers

Qualifications for Participation

Over the last 15 years, the tenderer has had an awarded and signed design contract for a terminal building of an international airport, with terminal design capacity of at least 18 Million Annual Passengers.

Timetable

Stage One Tender Submission Deadline	2015/08/21
Stage One Jury Session	2015/08/25 ~ 2015/08/28
Stage Two Tender Submission Deadline	2015/10/26
Stage Two Jury Session	2015/10/28 ~ 2015/10/30

Tender Documentation Download
(Will be available from June 16th, 2015)

Government e-Procurement System: http://web.pcc.gov.tw/
Competition Website: http://www.T3.com.tw

(Information is for reference only. Subject to the announced tender documentation.)

Host Entity Taoyuan International Airport Corporation Ltd.

Project Contact Person

International Competition Coordinator: Architect Barry Cheng
Address:
No. 9, Hangzhan S. Rd., Dayuan Dist., Taoyuan City 33758, Taiwan R.O.C.
Phone: 886-3-273-3226 Mobile: 886-937-213454
Fax: 886-3-273-3298
Email: T3@mail.taoyuan-airport.com

CIRCLE 28

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Photo courtesy of Unilock

Designing for High-Traffic Outdoor Spaces

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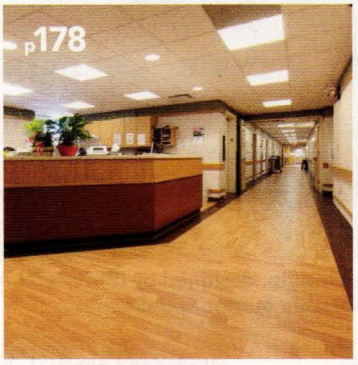

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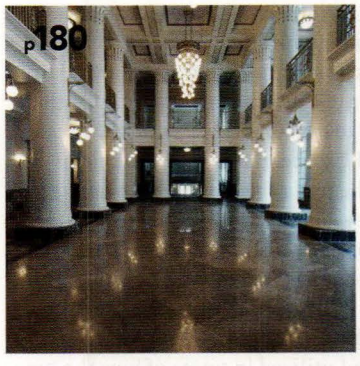

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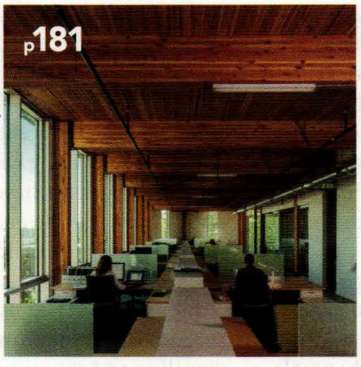

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Concrete Waterproofing with Crystalline Technology

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LS | PM | SI

CREDIT: 1 HSW

CATEGORIES

AC	ACOUSTICS
ACC	ACCESSIBILITY
BE	BUILDING ENVELOPE DESIGN
IN	INTERIORS
LS	LIFE SAFETY AND CODES
PM	PRODUCTS AND MATERIALS
PMD	PRACTICE, MANAGEMENT, DIGITAL TECHNOLOGY
RE	RESIDENTIAL
SI	SITE INFRASTRUCTURE DESIGN
ST	STRUCTURAL
SU	SUSTAINABILITY

Photo courtesy of Unilock

Designing for High-Traffic Outdoor Spaces

A variety of products provide design options for high-traffic outdoor spaces

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By Elena M. Pascarella, PLA, ASLA, Principal – Landscape Elements LLC

Public Plaza at the CN Tower, Toronto, Ontario, designed by IBI Group LA / Graham Infrastructure LP, provides an accessible, comfortable, sociable outdoor public space.

Landscape architects and designers consider a number of factors when designing for outdoor spaces. These factors include both the social and physical criteria that can influence the use and function of the space. The Project for Public Spaces (PPS) has been studying and evaluating public spaces since its founding in 1975. The PPS has found that there are four key qualities that make successful public spaces.

"They are accessible; people are engaged in activities there; the space is comfortable and has a good image; and finally, it is a sociable place: one where people meet each other and take people when they come to visit."[1]

In designing high-traffic outdoor spaces that are successful, architects, landscape architects, and designers should consider these four key qualities as outlined by the PPS: accessibility, aesthetic image, comfort, and sociability. Factors of safety, durability, and sustainability should also be considered.

Accessibility is achieved not only through location, visibility, and connectivity to and from other destinations but also through the selection of pavement surfaces that are safe for people of all ages and physical abilities. Compliance with the latest ADA (Americans with Disabilities Act) guidelines[2] is essential to providing outdoor spaces that are safe and accessible by all users.

An outdoor space with an appealing aesthetic image will naturally entice more users into the space. Appealing outdoor spaces appear comfortable, clean, have adequate lighting and seating, and provide quality design through material selection. In addition, outdoor spaces that are designed for flexibility and are able to accommodate varied user groups as well as serve a variety of outdoor functions are thus more appealing and experience heavier use.

Materials that are modular can provide opportunities for changing the structure and function of an outdoor space. Varied pavement materials or pavement patterns provide tools for differentiating sub areas within a larger outdoor space. The broad range of pavement choices provides options for both design aesthetics and function.

An outdoor space that is comfortable has adequate site amenities such as benches and site lighting. Site lighting provides security and comfort during night-time use and it can help to identify a public space, defining and highlighting various activity areas, entrances, and important features.

PPS states: "In many situations, particularly when people are concerned about security, there is a tendency to over-light a park, plaza, street, or other public space. But in fact, too much lighting can be just as bad as too little lighting. The key to developing a good plan is to relate lighting to the evening functions of a particular space, because in the larger view, street lighting is more than just a technical requirement, a security need, or a design element. It can be thought of and utilized in terms of how the type, placement, and wattage affect how a street is perceived and used."[3]

Benches provide comfort for users needing a place to stop and rest, enjoy lunch, take in a conversation or just to relax. Benches should be placed based on how the space will be used, not just in regularly spaced intervals along a walkway or within the space. Providing the correct type of bench or seating is also important. Benches should provide seating in a variety of sunlight situations, accommodate wheelchair users on either side of the bench,

Photo courtesy of Tournesol Siteworks

Thermally modified wood benches provide comfortable seating in high-use areas.

CONTINUING EDUCATION

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Learning Objectives

After reading this article, you should be able to:

1. Develop sustainable strategies for designing highly trafficked outdoor spaces.
2. Understand the various approaches for providing energy-efficient outdoor lighting utilizing the latest LED technologies.
3. Determine the most appropriate pavement surface application or applications for outdoor space, based on projected design use.
4. List the key qualities inherent in successful public spaces.

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AIA/CES #K1506D

and be ergonomically designed for user comfort. Ergonomic design standards indicate comfortable seat height of 18 inches, seat width of 12 to 18 inches for benches with backs, and 30 inches for benches without backs and a 95- to 105-degree angle for the seat back.

Social outdoor spaces attract people and "what attracts people most, it would appear, is other people" *(William H. Whyte: The Social Life of Small Urban Spaces)*.[4] William H. Whyte observed this pattern of attraction in public outdoor spaces throughout the world. People were attracted to outdoor spaces that had social gatherings of other people. And an outdoor space that presents an image of safety will be more likely to attract people. Such spaces are easily accessible, have adequate lighting for safe night-time use, have adequate visibility and adequate seating, and provide safe walking surfaces.

Durability of materials is an important design criteria for high-traffic spaces. Non-durable materials will wear more rapidly and will create unsafe and unsightly elements in the space. Non-durable materials will also increase client costs as they will require increased maintenance and/or more frequent replacement.

PAVEMENTS FOR ACCESSIBILITY AND SUSTAINABILITY IN HIGH-TRAFFIC AREAS

Of the many products available for pavement surfaces in high-traffic outdoor areas, modular pavers have seen increased popularity as they provide a wealth of design options with respect to color, size, and surface finish while being easy to install. Modular pavers provide flexibility for the design composition as well as ease of maintenance as individual units are easily removed and replaced should any unit become damaged through excessive abuse or severe impacts.

Studies have been done by the International Concrete Paving Institute (ICPI) regarding interlocking concrete pavers and ADA compliance.

Concrete Pavers

Interlocking precast concrete pavers provide many options with respect to size, shape, color, and surface texture. These pavers have been available to designers for many years and used in pedestrian, vehicular, and heavy-duty settings where durability is a requirement. The latest technologies and manufacturing processes take this durability to the next level in order to ensure the product maintains its texture and color without degradation in high-traffic areas. New processes have also given us products with surface textures and colors that look like natural stone as well as products that are unique and contemporary in styling and surface texture.

Pavers were originally manufactured with a mix of large and small aggregate throughout the entire unit that allowed for the large aggregate to become exposed at the surface over time.

Today, select manufacturers combine large and small aggregates in layers through the entire precast concrete paver mix with the larger aggregates in the base to provide strength and the smaller aggregates towards the top. A blended layer of the highest level performing minerals that are fade-resistant is embedded into the surface of each stone during the manufacturing process. This not only provides variable options for color and texture aesthetic but ensures that the surface will not fade, crack, peel, or delaminate, and offers a durable surface that maintains its color and character through years of high-traffic use.

When specifying precast concrete pavers, designers should consider the application and use—pedestrian, vehicular, or both. Other factors to consider in specifying interlocking precast concrete pavers include how the paver is made, the paver size or sizes, color, subsurface preparation, and the desired paver pattern. In addition, designers should determine whether the project must meet LEED®, SITES™, or IGCC (International Green Construction Code) criteria and if so, consider the selection of a color with a high solar reflectance index (SRI) value to reduce urban heat island effects and/or a permeable paver.

A number of interlocking precast concrete pavers are permeable and are available in a wide variety of styles and colors with ADA-compliant joint spacing thus helping to meet LEED®, SITES™, and IGCC criteria and assist in meeting local demands for sustainability. The Interlocking Concrete Paver Institute provides

information relating to the permeability of interlocking precast concrete pavers.

ADA Design Guidelines require that surfaces be firm, stable, and slip resistant. The ADA Design Guidelines recommend that the static coefficient of friction for flat surfaces along accessible routes be 0.6 and 0.8 for ramps. ADA advisory material recommends various test methods to assess surface slip resistance. The Interlocking Concrete Pavement Institute's technical Specification Section 13 provides information on the slip and skid resistance of interlocking concrete pavements.[5] When specifying precast concrete pavers, designers should note their capacity for slip resistance, resistance to salt erosion, and tolerance to resist oil and gas spills. These characteristics, along with their colorfast pigments and durable aggregate composition, can provide a surface material that is able to withstand high traffic as well as severe weather conditions.

To meet durability criteria, pavers are manufactured to comply with both ASTM C936 and CSA (Canadian) A 231.2 industry quality standards for strength and absorption as well as dimensional tolerances. During the manufacturing process, pavers are carefully tested, and hourly product density tests are performed. The high strength of concrete pavers, combined with low water absorption, provides a hardscape material that won't crack, peel, or delaminate. Interlocking precast concrete pavers can offer up to four times the strength of poured concrete.

High-quality pavers are manufactured with the highest-quality minerals and pigments that are color stable and do not fade. Interlocking precast concrete pavers can be made in custom colors and textures as well as with custom recycled content. At the United Nations Center in New York, the old window pane glass was ground and made into a pozzolan that was added to the concrete pavers during the manufacturing process as part of the recycled content of the paving stones.

Case studies have been done on the durability and quality of interlocking precast concrete pavers involving applications at high-traffic areas in Cleveland, Ohio. The Uptown Alleyway project was designed by James Corner Field Operation. The project covers approximately 65,000 square feet of both vehicular and pedestrian areas. Of the total area, approximately 35,000 square feet is permeable. This is the City of Cleveland's first permeable public roadway project. The alleyway uses long plank pavers in a variety of grey color tones. Due to the heavy pedestrian and vehicular traffic, it was essential that the paver surface be durable, color-fast, highly abrasion resistant, and strong to withstand the harsh winter climate.

The aesthetic appeal of interlocking precast concrete pavers lies in the variety of available colors and textures. While some options mimic natural stone, bricks, or cobbles, others offer contemporary surfaces, shapes, and sizing. It is this variety that allows the landscape architect or designer to execute their creative vision for the project, or to follow industry trends such as long, linear plank designs or large-format slab paving. From roof decks to streetscapes, permeable to heavy-duty, there is a paver for every application.

While color is always evolving, other trends include mixing different paver shapes within the paver pattern and varying textures for aesthetic appeal.

Photo courtesy of Unilock

The Grand Traverse Fire Station, Grand Traverse, Michigan, designed by Gourdie-Fraser, Inc., shows color options for permeable interlocking concrete pavers.

Flexible Concrete Mats

Flexible concrete mats can provide vehicular parking for high-traffic outdoor areas. The flexible concrete mats provide designers with the option to green up an outdoor space by adding vegetation to the interior openings in the mat. The mats are made of wet-cast, low-moisture-absorption concrete, which is cast with holes to allow for infiltration and root penetration of the infill vegetation material. Cast inside the concrete is an engineered polymer grid that provides flexibility to the concrete mat. This flexibility provides added tensile strength to complement the compressive strength of the concrete. The flexibility also allows these mats to conform to irregular ground surfaces along pre-defined linear grooves while providing structural support for high-traffic use. The flexible concrete mat maintains its load-supporting characteristics even when saturated. The design also eliminates sharp edges and won't crack and break like rigid concrete or pop up like plastic. The small openings in the concrete grid provide spaces for infill planting of turf grass or groundcovers as well as infill with gravel, sand, or crushed stone.

The mat is designed so that the grass or groundcover that is planted in the holes can develop a continuous root system below the mat surface, thus promoting a healthy turf while minimizing moisture evaporation. Because the flexible concrete mat has porous openings and a shallow depth, it allows water to flow through laterally and to penetrate the root system of the grass. In addition, the geometry of the mat limits infill and root compaction by concentrating the load on the concrete pads instead of void spaces. The large bearing connections of the concrete coupled with the size of the holes or void spaces provide the optimal situation for sustaining and maintaining grass or other groundcover materials.

Many urban sites with large paved surfaces are challenged in trying to obtain LEED® and SITES credits. LEED® NC Criteria SSc6.2 provides credits for Stormwater Design – Quality Control. Credits are given to projects that address polluted runoff. The credit measures the Total Suspended Solids (TSS) as the indicator of level of pollution and the design must be able to show that the stormwater

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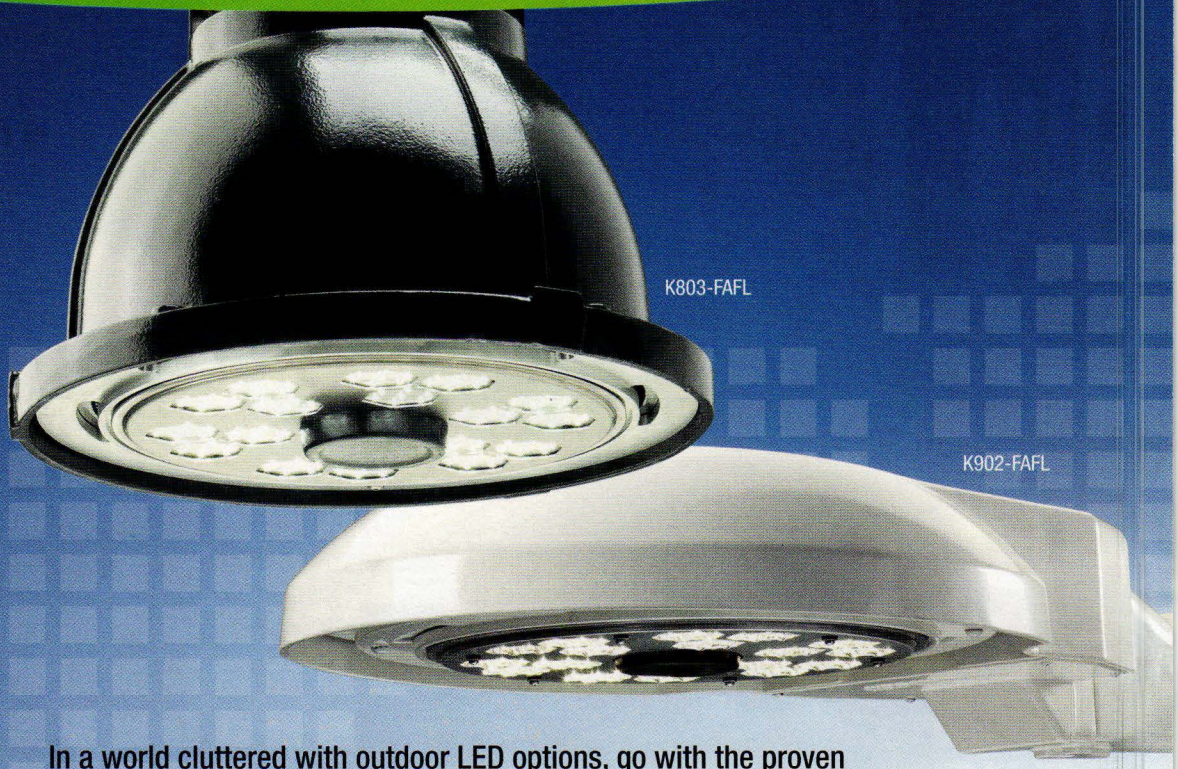

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treatment system is effective at treating all rainstorms for any year up to 90 percent of the average annual rainfall. The American Society of Landscape Architects in conjunction with the National Arboretum and the Lady Bird Johnson Wildflower Center has issued their Sustainable SITES Initiative rating system. Section 3 – Site Design Water provides a possible 23 credits for designs that manage and reduce stormwater at the site.

For high-traffic areas that must meet the requirements of LEED®, SITES™, or International Green Construction Code (IGCC) criteria, the flexible concrete mat can assist in stormwater management, reduce heat island effect, lower run-off coefficients, assist in on-site water storage and biofiltration, and contribute to groundwater recharge.

The mats can be used in place of concrete or asphalt pavement, thus providing alternative solutions to stormwater management by providing surface areas for biofiltration, infiltration, and water storage below the parking/driving surface without requiring the loss of valuable site area to surface bioswales or detention basins. An example of this type of use is the fire lane at a Kaiser Permanente Hospital. The total surface area of flexible concrete mats can contribute towards required green space allowances and also meet criteria for reducing Heat Island Effect.

A project in Hastings on Hudson, New York, features three different residences on a shared lot just across from a walking trail. An area was needed for off-street parking for up to seven vehicles. The Planning Board wanted to be assured that whatever was used to create the unique, diagonally shaped parking space would blend well with the natural surroundings and not distract from the nearby Aqueduct Trailway. Ned Baldwin, senior partner with the firm of Baldwin & Franklin Architects, proposed the use of flexible concrete mats to create an area of drivable grass. "By using drivable grass instead of asphalt paving, we easily gained the approval of the Planning Board," says Baldwin. "The grass we planted over it turned green in less than three weeks, which was very encouraging, but the winter was the most severe we've had in 15 years with as much as 30 inches of snowfall at one time. Despite that terrible winter so soon after its installation, it continues to thrive."

Flexible concrete mats are manufactured to meet ASTM precast concrete standards for compressive strength, standard proctor, particle size analysis, concrete aggregates, mixed concrete, Portland cement, blended hydraulic cement, slump flow and pigments for integrally colored concrete. The manufacture process for the flexible concrete mats also follows the American Concrete Institute (ACI) standard practice for selecting proportions for normal, heavy weight, and mass concrete, and for durability.

Flexible concrete mats can be used in all climate areas, but specific recommendations are provided for cold weather applications. Specifications recommend that sites requiring the use of snowplow machinery install mow curb strips prior to installation of the paving mats and that the mats should be depressed ½ inch below the top of the mow curb/strip to protect the mat from the snowplow blade. In addition, it is recommended that snowplow equipment operators be educated about the underlying surface prior to snow removal and that the snowplow equipment be fitted with Teflon runners to prevent damage to the mat.

people rather than cars. The parklet, which takes up space formally occupied by two parked vehicles, provides several hundred square feet of benches, tables, planters, and bike racks. The pilot program in San Francisco was a huge success and increased sales at a local café by 20 percent. As a result, additional employees were hired. The success of this program led the way for dozens of similar projects across the city, making livable streets possible all over the United States.

Studies have been done to evaluate the function and durability of pop-up parks using modular wood tiles. The studies show an emerging trend among communities throughout the country with a desire to make use of small

Photo courtesy of Soil Retention

The use of flexible concrete mats creates a drivable grass area in Hastings on Hudson, New York.

Durable Wood Walking Surfaces

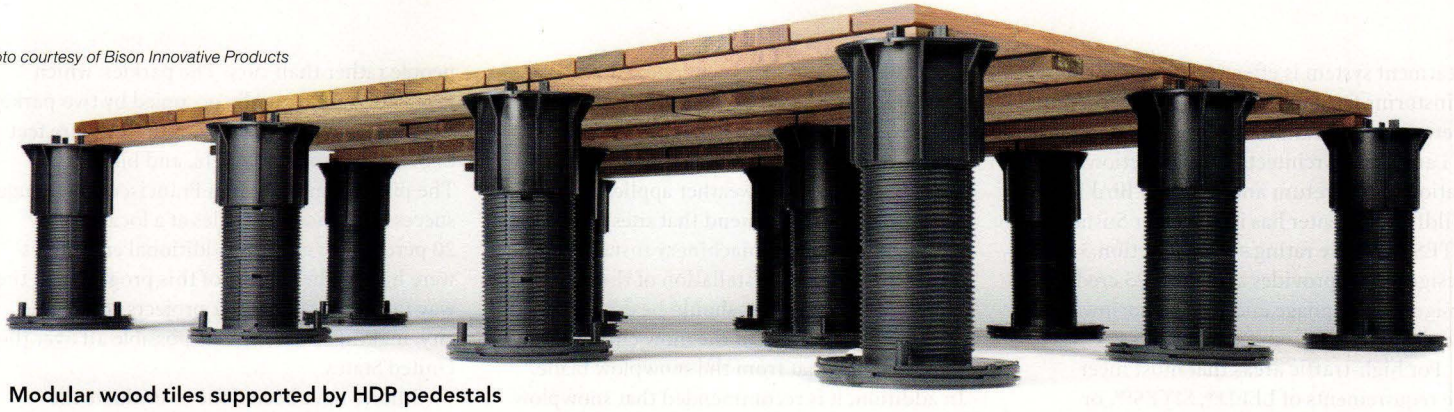
Modular wood tiles can provide another option for high-traffic areas which require durable and sustainable walking surfaces. Because of their modular characteristic and design flexibility, modular wood tiles can be installed over a variety of surfaces and are adaptable to a variety of sites. Modular wood tiles can be used to create large wood deck surfaces either on building rooftops or at ground-level surfaces. At the ground level, these modular decks have served as outdoor dining areas for high-traffic restaurants and as pop-up parks.

Pop-up parks or parklets have been designed and built throughout the United States in areas of varying climate such as New York, California, Minnesota, and Colorado. Modular wood tiles were used in the first-ever pop-up park in the country at the Mojo Café in San Francisco, California. The pop-up park has been in use since 2010 and repurposed street space for urban spaces that are traditionally unbuildable. Modular wood tiles enable greater design creativity in small urban spaces.

Modular wood deck tiles are FSC® certified (FSC-C13454) so Ipe and Massarunduba wood tiles could contribute LEED points under Materials and Resources Credit 7 (MR Credit 6 for CS). The wood tiles are supported by pedestals, which contain 20 percent post-industrial recycled material, thus potentially contributing to multiple points within Materials and Resources Credits 4 as a single product contributing to multiple LEED points. The tiles are made from wood remnants. These remnants are premium-grade shorts purchased from the flooring and furniture industries that comply with strict regulations regarding extraction, milling, and transport.

Modular wood tiles come in 2 foot by 2 foot (2 x 2) and 2 foot by 4 foot (2 x 4) sized units. Each modular tile has seven to eight

Photo courtesy of Bison Innovative Products



Modular wood tiles supported by HDP pedestals

top slats and three bottom slats that are held together with 48 stainless steel screws that are inserted from the bottom so that the fasteners are not visible on the surface. The wood tiles are integrated with a pedestal system with tabs which hold the wood tile units in place. A fastening kit adds further stability with the system. The pedestal system has a levelling capacity that compensates for slope and changes in grade. Through this levelling system, elevations can be adjusted from heights as little as 1/8 of an inch up to 36 inches with pedestal attachments.

The wood tiles are ADA compliant as the surface texture and spacing between the units meet ADA criteria. The wood tiles meet industry standards and certifications for wind uplift, fire rating, slip resistance, weight-bearing capacity, and seismic. To ensure adequate weight bearing in support of heavier loads, it is recommended that more pedestals be used above the standard 1.2 ratio of pedestals to wood tiles. With respect to seismic and uplift requirements, the pedestal systems can include stabilizing bracing in addition to fasteners which deter wind uplift.

Photo courtesy of Bison Innovative Products

A pop-up park in Chicago using modular wood tiles

SITE AMENITIES FOR HIGH-TRAFFIC OUTDOOR SPACES

Site amenities that enhance comfort and safety will make an outdoor space much more inviting. In high-traffic areas, site amenities such as benches, planters, and site lighting should be durable to minimize maintenance and energy efficient to lower operation costs. Sustainability criteria and certifications are a way of ensuring a successful, cost-effective project.

Lighting plays a major role in visual comfort and security. Architectural flood lighting, pedestrian-scale decorative lighting, and in-grade luminaires for targeted up-lighting enhance and accent the beauty of the architecture and site features.

Benches provide comfort and enhance the image of outdoor spaces. According to the Project for Public Spaces, users are drawn to outdoor areas that present a positive image and provide comfortable elements such as benches. Benches can be fabricated from a variety of materials including cast iron, aluminum, composite wood, recycled plastic, concrete, and natural wood. Each material has benefits and can be used appropriately in high-traffic outdoor spaces.

Lighting for Parking and Larger Outdoor Areas

The International Dark Sky Association (www.darksky.org) has completed research on LED lighting. LED lighting is much more efficient than conventional incandescent lighting at converting electrical energy to light. In conjunction with newer luminaire designs, LED lamps provide reduced energy use without compromising safety. Through this reduced energy demand/use, LEDs lower carbon emissions and also lower costs to the user/consumer. Use of LED technology for lighting can contribute qualification points to LEED® and SITES™ rating systems. A possible 16 total credits can be earned toward LEED certification in the use of LED lighting.

For larger outdoor spaces and parking areas, architectural LED flood lights with targeted optics provide safe levels of lighting for high-traffic areas while allowing the designer control over excessive or trespass lighting outside of the application areas through the use of targeted optics.

For targeted optics, LED modules are recessed into the fixture housing to provide a glare-free zone with zero upright. The independent LED modules function as multiple points of an omni-directional optical system arranged to create the most optimum light distribution. Each luminaire has adjustable emitter modules to provide maximum spacing with uniform horizontal and vertical illumination. These modules are capable of a 70-degree vertical tilt and 350-degree rotation without ever moving the luminaire housing.

The International Dark Sky Association evaluates the zonal distributions and blue light content of LED luminaires and has established a Fixture Seal of Approval Program.[6] Obtaining their seal of approval is dependent on the luminaire meeting one of many criteria including:

project: Hillshire Brands, Chicago IL
architect: Perkins + Will
landscape architect: Wolff Landscape Architecture, Inc

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PROJECT: Sanford Consortium

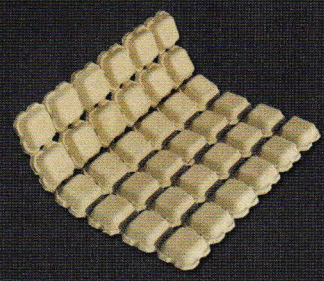
ARCHITECT: Fentress Architects

ASSOCIATE ARCHITECTS: Davis Davis Architects

LANDSCAPE ARCHITECT: Civitas, Inc.

GENERAL CONTRACTOR: Hensel Phelps Construction Co.

INSTALLER: Valley Crest Landscape Development



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- Fixture must emit no light above 90 degrees (with the exclusion of incidental light reflecting from fixture housing, mounts, and pole).
- Fixture must have a listed correlated color temperature (CCT) configuration of 3,000K or below.

The luminaires comply with Dark Sky requirements for light trespass and light pollution and the structural LED optical system and flat lenses produce zero light above 90 degrees.

Incandescent and high-intensity discharge lamps can produce unnecessary light concentrations beneath the luminaire. The LED modules significantly reduce point source glare and smooth hot spots of other LED luminaires. Users experience the appropriate illuminance levels for uniform and quality lighting throughout the various needs of the application. Improving the light levels in the dark zones reduces shadowing and potential hazard areas, providing for a more secure design.

The LED modules in architectural LED flood lighting are designed with two distinct but complementary methods to manage the life-limiting heat produced by the LED diodes. Both conduction and convection are used and the optical system is monitored by circuitry tying back to the driver controls. Heat is drawn away from the housing chamber and dispersed into the air around the luminaire to maintain diode performance output and ensure longer life.

Dark Sky compliance through the International Dark Sky Association can be met through the use of cut-off fixtures, and the LED luminaires can also meet Illuminating Engineering Society (IES) TM15 requirements or "BUG" criteria. BUG stands for Backlight, Uplight, and Glare. The IES established the BUG criteria in 2005 as a result of increased demand for reduction in glare and light trespass. LEED SS 8.8 for exterior lighting credits are given if the site lighting used provides optimum down lighting (Dark Sky Friendly™) fixtures. Fixtures must be full cut-off for park/rural settings and for residential/commercial settings, have less than 2 percent uplight above 90 degrees.

LED light conversions were made in Boston, Massachusetts, when the city embarked on a major conversion of their light fixtures to more energy-efficient LED fixtures. Starting in 2012, Boston converted thousands of their existing 175W and 250W Mercury Vapour Acorn lights with replacement 60W and 75W LED lights. The City plans to change all existing Acorn lights with LED lights by the end of 2016. Boston's city-wide LED conversion has cut their energy consumption by 50 percent and payback is expected in 1.5 years.

The City of Austin, Texas holds a "south by southwest" (SXSW) event every year. This event sees high-traffic use, and LED lighting provided the necessary light levels to enhance the safety of the event. The poles supporting the LED lights also provided an aesthetic image appeal as the City hung 55 decorative pendants from them. This is a City of Austin pilot program which includes 12 new streetlights and the conversion of 48 streetlights on Sixth Street between Interstate 35 and Brazos Street. The lights will brighten after the bars close for the night to enhance nighttime safety and return to normal once crowds disperse. The light levels are controlled remotely.

Photo courtesy of Kim Lighting

In-grade flood lighting at Long Beach Convention Center, California

In-Grade Flood Lighting Provides Safety and Ambiance

Architectural LED flood lights are also available as in-grade or in-ground fixtures. In-grade fixtures or luminaires can provide both safety and ambiance lighting in areas where pole-mounted flood lighting would not be appropriate. In-grade luminaires can be placed to provide uplighting of trees, flagpoles, and buildings, and the ambient light provides both aesthetic visual safety illumination.

Aiming can be controlled in LED in-grade luminaires with a Bluetooth-enabled mobile device. The end user, designer, or property manager can select either an iOS or Android mobile device to change the optical orientation and dim or brighten the amount of light from the luminaire. To contribute to the sustainability of a project, the housings for LED in-grade luminaires can use durable brass castings and use lenses of thick tempered glass to protect against breakage, chipping, and scratches. IP68 type connections protect the interior of the light and prevent dues, moisture, and water intrusion.

The IP rating system is the Ingress Protection rating (IP = Ingress Protection). These ratings are part of the International Electrical Code standards. The rating system classifies the degrees of protection provided again the

intrusion of various elements. The first digit provides the intrusion rating against solids and the second digit provides the rating for intrusion against liquids. In-grade flood lights have been used by the communities of Long Beach, California and Fort Myers, Florida.

Pedestrian-Scale Decorative Lighting

Pedestrian-scale decorative lighting presents another option for lighting in high-traffic outdoor areas. These luminaires are available in a range of pole heights and luminaire sizes to provide options for various outdoor lighting applications.

Pedestrian-scale decorative lights can provide energy-efficient LED point source lights while providing reduced glare lighting through diffused lenses. A die-cast back housing with segmented, high-reflectance, aluminum mirrors provides a precision optical system to put light where it is needed, minimizing light trespass, sky glow, and other forms of light pollution. These optical systems are engineered for highly controlled and more effective light distribution. Because of their glare reduction and minimal light pollution, these lights are International Dark Sky compliant and meet the standards of the Design Light Consortium (DSL) of the U.S. Department of Energy.

Pedestrian-scale decorative luminaires are produced with sustainable technologies that have as small an impact on the environment as possible. Renewable materials such as aluminum and glass are used.

Light poles do not need to be fabricated of metal or fiberglass. Spun concrete poles can provide durable, cost-effective lighting for outdoor areas. Concrete poles are fabricated of 8,000 psi concrete so they are four times the strength of a sidewalk and will last over 75 years. Concrete light poles are durable, maintenance free, do not rust, and can take considerable impact. Concrete poles also retain their color, and the color is not applied to the surface but is embedded through the entire depth of the pole as part of the fabrication process.

Photo courtesy of Architectural Area Lighting

Decorative pedestrian-scale lighting, Skinker Boulevard, St. Louis, Missouri

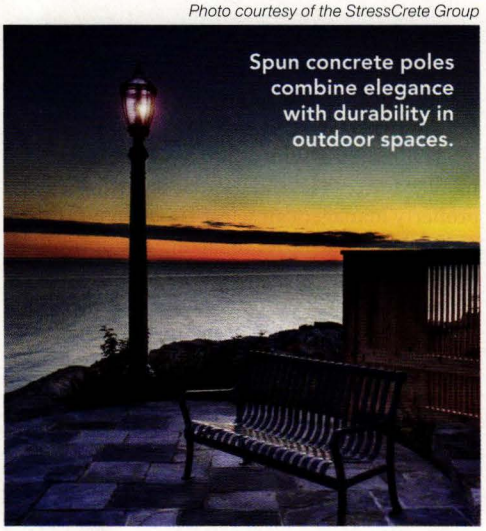
Spun concrete poles are a centrifugally cast reinforced concrete. They are commonly referred to as a "spun concrete pole" as they have the compressive strength of concrete but contain strand cables around which the concrete is spun. This cabling provides the tensile strength to the pole. The poles meet ASTM and CSA standards for spun concrete poles. The spinning process introduces qualities into the concrete which cannot be obtained by more conventional casting methods. Through the spinning process, the concrete attains a higher density and strength. The spinning process allows a hollow raceway to form inside the pole, thereby providing a smooth conduit for electrical cables.

Poles of spun concrete have a long service life, require minimal maintenance, have minimal vibration and deflection qualities, and are easily installed because they can be directly embedded to the site via a baseplate mounting system. This direct embedment eliminates the need for a footing and makes the spun concrete poles cost effective. The concrete poles also meet ASTM and AASHTO wind loading requirements and have a lifetime warranty.

Spun concrete poles also provide some safety advantages. Electrical fires cause power failures because of salt corrosion on poles. Concrete poles do not require any further fire protection because concrete is a non-combustible material. With Concrete poles, the structural integrity remains intact safeguarding people from power failures.

Spun concrete poles can also contribute to LEED® certification points as concrete is comprised of naturally sourced materials of water, sand and aggregated. Concrete poles are 100 percent reusable at both the existing site and for new site applications. The extremely long life span (75+ years) means that they can be reused to mount new upgraded lighting fixtures for future site upgrades and expansions. This minimizes energy and materials costs. Therefore, concrete poles can potentially offer up to 2 credits to LEED MR 1.3. Spun concrete poles contain Portland cement, which has a very good reflectance ratio (approx .35) and they can be made of a light colored concrete. This leads to a reduction in Heat Island affect for the site and can contribute to LEED Site Credit 7 Heat Island reduction. Other possible LEED credits may be obtained for MR 4.1, 4.2 for the recycled content of the poles and MR 5.0 for use of locally sourced materials.

Photo courtesy of the StressCrete Group



Spun concrete poles combine elegance with durability in outdoor spaces.

BENCHES FOR COMFORT AND IMAGE APPEAL

The best outdoor spaces have site amenities that make them both comfortable and appealing to users. Appropriately placed benches provide rest stops for users and can affect how people use a space based on their location. Design and material selection are other factors to consider in the selection of benches. There are a wealth of available materials for bench fabrication which include stone, concrete, wood, metal, recycled plastic. Material selection should be based on site location and projected use as well as availability of bench materials. Benches fabricated from recycled or locally sourced materials will assist in gaining LEED credits for a project.

See endnotes in the online version of this article.

Continues at ce.architecturalrecord.com

***Elena M. Pascarella, PLA, ASLA,** is the principal of Landscape Elements LLC, an award-winning landscape architectural firm based in Warwick, Rhode Island.*

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Main) Brisbane Bench; 1) Flight Deck Trash and Recycle Bins, BART Stations, San Francisco, CA; 2) Boulevard Wood Tiles and Pebble Stools; 3) Children's Healing Garden, Fowler Cancer Center, Cleveland, OH.

CIRCLE 84

PRODUCT REVIEW

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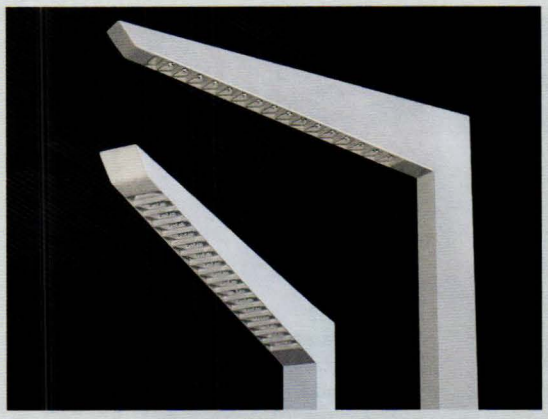

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Innovative Deck Systems

For over 20 years, Bison Innovative Products has been the leader in building level decks by integrating deck pedestals, modular wood deck tiles and planters to create distinctive rooftop environments. Bison systems offer exclusive features, simplifying installation and maintenance, including integrated slope compensation, low-height solutions, and a bracing system for heights over 24 inches.

www.bisonip.com *Circle 15*

Kim Lighting

Flood and Wall Luminaires

The luminaires' LEAR (Light Engine Adjustable Ready) modules expand upon Kim Lighting's past innovation with targeted optics allowing 0-70° tilt and 355° of independent module rotation, precisely aiming the beam pattern to create any standard IES or custom Type "X" distribution using the Design Isolines feature in AGi32 Version 16.

www.kimlighting.com *Circle 16*

Soil Retention

Permeable Pavement System

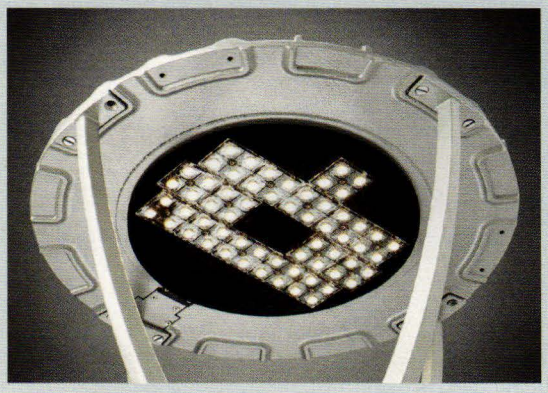
Drivable Grass® is a permeable, flexible, and plantable concrete pavement system that is environmentally friendly and a beautiful alternative to poured concrete and asphalt. Drivable Grass® offers strength, permeability, flexibility, and infill options, such as grass, artificial turf, gravel, sod, ground cover, and other infill choices.

www.soilretention.com/drivable-grass *Circle 17*

PRODUCT REVIEW

Designing for High-Traffic Outdoor Spaces

The StressCrete Group



LED Optical System

The P4 "4th generation flat array" was designed to increase roadway performance while providing superior spacing. Utilizing a refractor optic, the P4 is perfect for roadway applications and features a uniform footprint. The light quality is evident with low glare and excellent chromaticity.

www.StressCreteGroup.com *Circle 18*

Unilock

MBTA (Massachusetts Bay Transportation Authority) Wonderland Station. Designer: Arrowstreet.

Photo courtesy of Pedestrian Bridge, Revere, Massachusetts

Paving Stone for High-Traffic Areas

Random dispersion of color and granite particles creates the beauty of Umbriano's unique mottled surface, resembling natural granite in this dramatic, large-scale paving stone. Its EasyClean™ feature makes it ideal for high-traffic areas, such as commercial plazas, parks, offices, and retail complexes.

commercial.unilock.com *Circle 19*

Tournesol Siteworks

Modular Seating System

TWIG is a highly configurable, modular seating system, which promotes social interaction and a casual lifestyle. TWIG is currently available in lightweight GFRC concrete and lightable LLDPE plastic.

tournesolsiteworks.com/product-twig-bench.html *Circle 20*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CIRCLE 85

All photos courtesy of ICYNENE, Inc.

Spray foam insulation can achieve truly continuous insulation in commercial buildings as required by energy codes, particularly in curved or irregular shaped walls.

Continuous Insulation: Spray Foam Compared to Rigid Boards

Medium-density spray foam insulation can provide better results at less cost

Sponsored by ICYNENE, Inc. | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

The design of exterior wall assemblies has become increasingly focused on performance for greater energy efficiency and resistance to air and water penetration. The 2015 International Energy Conservation Code and ASHRAE 90.1 now require insulation that is continuous in wall assemblies (i.e. not interrupted by studs, framing, etc.) in all eight climate zones within the United States. This push for continuous insulation in exterior wall assemblies is also reflected in green building standards and the desires of building owners to reduce energy costs. The response by many architects has often been to use rigid foam board insulation located over the exterior structural face and behind exterior cladding. While this may be a common choice, it is not the only one. In fact, closer review suggests that using field-applied spray foam insulation, of a medium density, may be a better choice for many situations. This has been found to be true when looked at in terms of design flexibility, performance, construction efficiency, and cost.

COMPARISON OF FOAM INSULATION TYPES

Plastic foam insulation has been in use for decades on a range of applications from coffee

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Learning Objectives

After reading this article, you should be able to:

1. Identify the characteristics of high-performance continuously insulated exterior wall assemblies.
2. Compare the characteristics of rigid board insulation with those of medium-density spray foam insulation for use in exterior wall assemblies.
3. Investigate the use of spray foam insulation to achieve multiple performance traits in one product including thermal, air, and water resistance.
4. Assess the ability of spray foam insulation to be installed with fewer steps and at a lesser cost than assemblies using rigid foam insulation.

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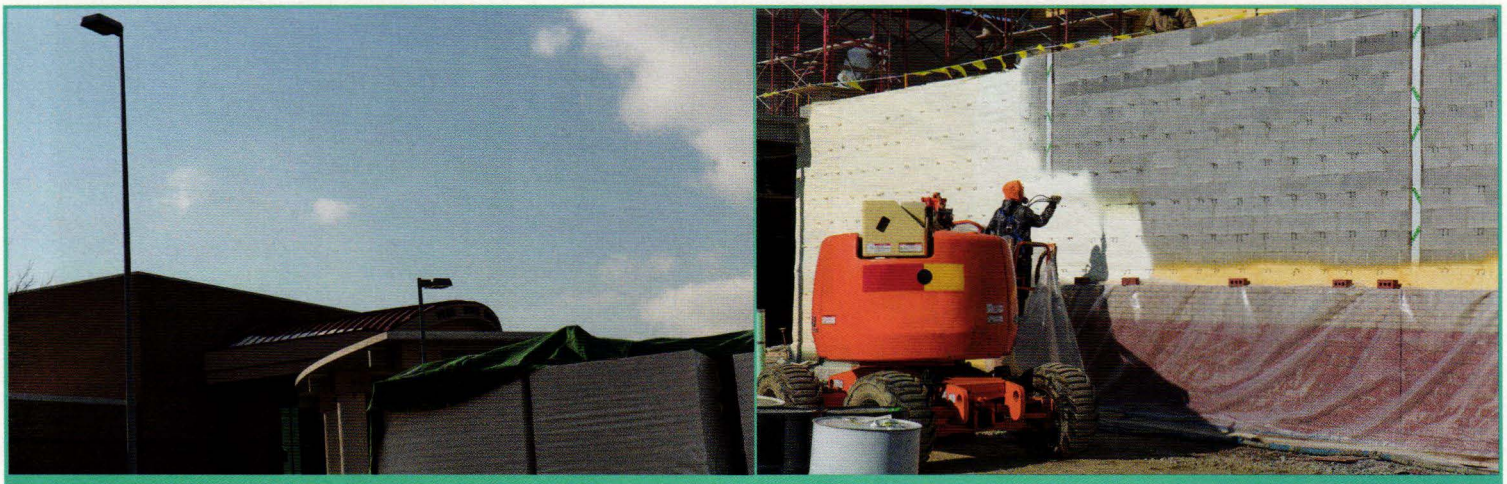


Rigid foam boards (left) come in standard sizes and need to be cut and fit into wall assemblies. Spray foam insulation (right) is directly applied to the appropriate surface of the wall assembly in the quantity needed.

cups to the Space Shuttle. In buildings, it has been used in the building envelope for insulating walls, roofs, and floors and some specialty applications as well. In many cases, it carries a higher resistance to heat transfer (i.e. R-value) per inch of thickness than other insulating materials such fibrous materials that are blown or installed in blankets/batts. While similar in many ways, there are notable differences across the common types of plastic foam insulation used in buildings, some of which are discussed as follows.

Rigid Foam Board Insulation

These factory-produced, flat sheets of insulation come in a range of standard sizes with common widths of 2 or 4 feet and common lengths of 8, 10, or 12 feet. The most common, un-faced products are manufactured from polystyrene, which is a petroleum-based plastic made from the styrene monomer. Generically, polystyrene is a light-weight material with about 95 percent air trapped in the foam to produce its insulation properties. In practice, there are two types of rigid polystyrene foam plastic insulation boards available—expanded (EPS foam) and extruded (XPS foam). Although both types of insulation are comprised of polystyrene, the two types of manufacturing processes produce finished products with very different performance properties.

Expanded foam (EPS) characteristics. EPS foam insulating sheathing has become a fairly well-known standard product. As an exterior insulating sheathing material, it is non-structural and has been used both above and below grade in addition to roof, floor, and ceiling installations. Different densities are available that can provide the R-value required to meet energy codes.

Extruded foam (XPS) characteristics. XPS is manufactured in a continuous extrusion process that produces a homogeneous closed cell cross section, whereas EPS is manufactured by expanding spherical beads in a mold, using heat and pressure to fuse the beads together. The documented results of this difference in manufacturing process indicate that XPS is more moisture resistant than EPS and holds its R-value better at lower mean temperatures when water is present.

There is a third common type of rigid insulation board used in buildings, namely polyisocyanurate or "polyiso" insulation. Polyiso is a closed-cell, rigid foam board insulation made from a plastic that is similar to, but still different from, polyurethane. It is commonly manufactured into rigid insulation boards consisting of a foam core sandwiched between two face sheets. These face sheets can be composed of organic or inorganic materials with foil or paper and fiberglass being the most common. It is widely used in residential and commercial markets most typically for flat roofing applications.

Spray Foam Insulation

In contrast to rigid, pre-manufactured boards, spray foam is field-applied insulation used in a range of settings, including industrial operations, heating plants, and buildings. Typically, this sprayed insulation is polyurethane based which can be formulated in different densities with different characteristics. Low-density foam weighs about 0.5 pound per cubic foot when installed. It is typically an open cell product which remains somewhat flexible in place and achieves R-values comparable to fibrous insulation. Medium-density foam, as the name implies, is heavier than low-density spray foam, coming in at about 2 pounds per cubic foot, or roughly four times heavier than low-density material. Its other defining characteristic is the closed cell nature of the insulation when mixed. Since it becomes a series of small bubbles (cells) of trapped insulating gas (a blowing agent), the thermal performance is directly enhanced, resulting in an over 70 percent increase in R-value compared to traditional insulation. R-values are possible up to R-7.1 per inch for closed cell spray foam compared to 3.7 per inch for open cell.

The make-up of medium-density insulation also allows it to serve as a full air barrier, eliminating the need for a separate product to perform that function. In fact, according to the Air Barrier Association of America (ABAA), many medium-density spray foam insulations are classified as air barrier materials and are the key component in tested air barrier assemblies. Further, in terms of water vapor permeance, it tests as a class II vapor retarder, meaning it has low water vapor permeance. Hence, it has been used in wall assemblies, including stud cavities, to meet the code requirements for a vapor retarder. Additionally, the material serves as a full water resistant barrier as defined in building codes. Collectively, this means that medium-density, closed cell, spray foam insulation provides the performance of four products in one—insulation, air barrier, vapor retarder, and water-resistive barrier. This combination of traits means it not only has the potential to save time and money during construction, it also significantly reduces air leakage, minimizes water and moisture transfer, and optimizes energy efficiency.

DESIGN AND PERFORMANCE CONSIDERATIONS

With an understanding of the basic types of foam insulation products available and their characteristics, our focus can now turn to the selection of those products for use in buildings, specifically in exterior wall assemblies. There are some general design considerations that should be addressed as follows.

Spray foam insulation can be applied to curved and irregular surfaces while also readily sealing around other wall features such as windows.

Continuity Along Wall Shape

Not all buildings are designed to be rectilinear, and even those that are often have some unique or irregular conditions along the walls. Rigid insulation boards are necessarily rectilinear and don't bend or adapt easily to irregular conditions in a wall assembly. Therefore, they may not be a practical or realistic choice for certain buildings where continuity of the insulation is a key design criteria. By contrast, spray foam insulation conforms directly to the surface it is being applied to regardless of shape, geometry, or irregularities. That means that it fully covers and seals over the underlying construction to provide a truly continuous, uninterrupted insulation layer and protective barrier. It also means that buildings designed with intentional curves, domes, arches, angles, or other non-rectilinear shapes no longer need to suffer from lower performance because of limitations from other insulation types. A curved surface for example would be very difficult if not impossible to cover properly with rigid foam board insulation. Mineral fiber batts or blankets do curve and may be used in wall cavities including curved surfaces. However, they do not provide the same performance in terms of insulation level per inch, water resistance, or air resistance. Spray foam insulation would provide excellent performance in all of those areas since its characteristics are not limited or influenced by the shape of the building.

Dimensional Stability

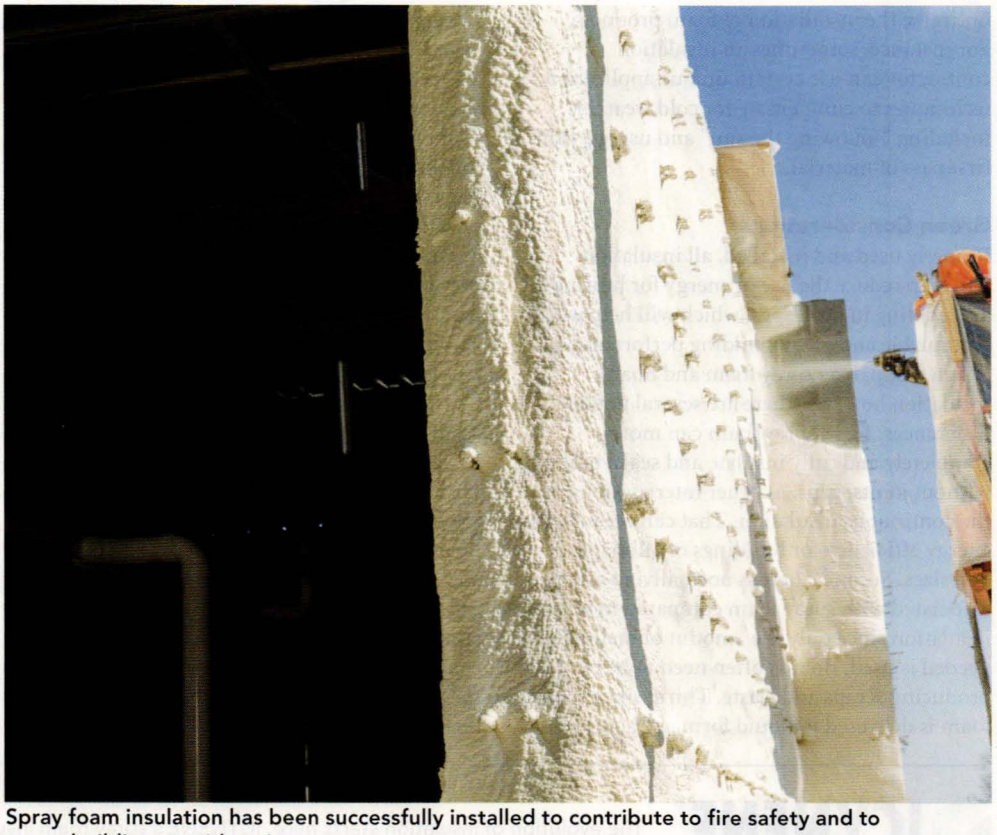
Once in place, all building materials are subject to movement from expansion and contraction due to thermal changes. The less a material moves, the more dimensionally stable it is. Similarly, materials that are formed such as concrete and foam insulation are subject to internal shrinkage as the material cures or ages. Picking an appropriate insulation product that does not suffer from movement in either of these cases is important for sustained, continued performance. Some rigid insulation board product manufacturers are keenly aware of the movement of their products and have issued guidelines for leaving gaps or spaces to accommodate that movement, particularly over large expanses. Of course, doing so does compromise the continuity of the insulation. Similarly, some foam board products may shrink or warp over time which also creates spaces or gaps between the boards.

Polyurethane spray foam insulation by comparison is known for exhibiting minimal, or at worst, acceptable levels of expansion and contraction, even in conditions of extreme relative humidity. That means it has been shown to be very dimensionally stable within wall assemblies in different conditions. Closed cell spray foam insulation is also not prone to cell structure change, which means that shrinkage is rare. This is significant since it is important that the insulation stays in place and does not shrink away from the surfaces it is sprayed onto. Note that buildings can creep or settle, which can impact the performance of foam. In cases where this is a concern, the use of termination bars can be employed to help create a long-term mechanical bond between the spray foam and substrates or membranes.

Fire Resistance

Both spray foam insulation and rigid foam insulation board products are considered combustible, just like many other building materials are. Nonetheless, their installation is allowed in non-combustible assemblies provided that the thermal barrier requirements in the Building Code are met. That means that the insulation needs to be protected and isolated with an appropriate barrier such as gypsum board, masonry, etc. and/or meet specific fire safety code requirements. The standards for determining fire safety are found in several well-known standards.

ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Materials is intended to evaluate the duration of time that building elements contain a fire, retain their structural integrity, or exhibit both properties during a predetermined test exposure. A wall assembly that incorporates spray foam insulation with a proper thermal barrier can meet the requirements of this testing for fire resistance. In terms of flame propagation, NFPA 285 has become the referenced code standard for exterior wall assemblies. The notable point about NFPA 285 compliance is that it is based on testing the whole wall system, not just the product. Therefore, manufacturers typically prepare, and have independent laboratories test, common wall assemblies using their insulation products and have the results made available for designers to reference. Non-typical assemblies and NFPA 285-compliant walls can be determined on a case-by-case basis relying on engineering evaluations if not actual testing.



Spray foam insulation has been successfully installed to contribute to fire safety and to green building considerations.

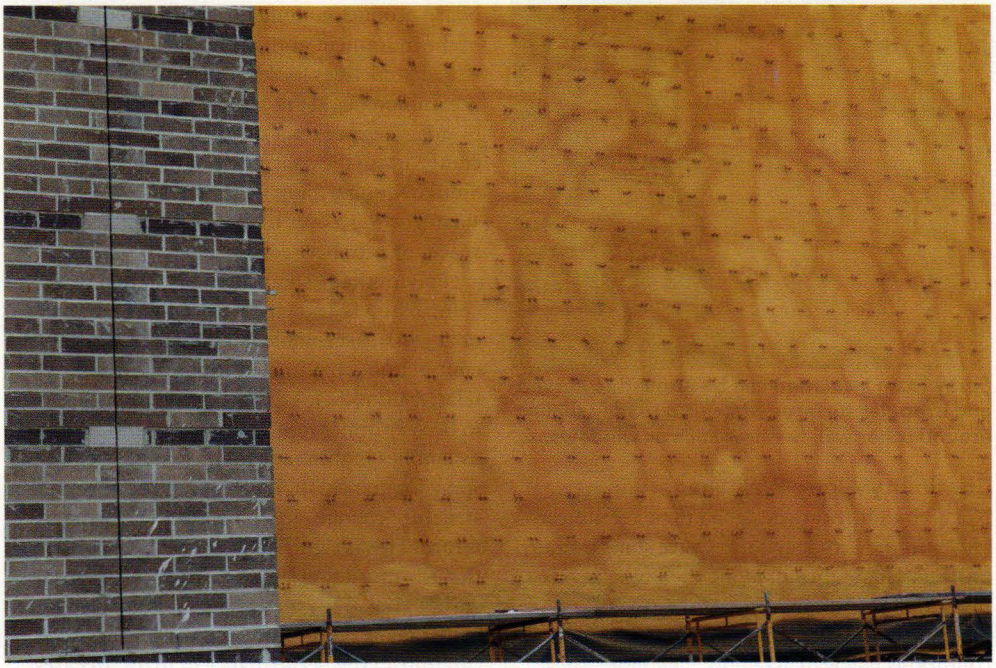
Hence it may be necessary to consult with manufacturer's technical staff or consultants to determine the suitability of a custom or non-standard wall assembly.

It is worth noting when comparing foam insulation products that medium-density spray foam's fire performance characteristics are different than extruded polystyrene foam boards in that the spray foam does not melt at high temperatures. Furthermore, although medium-density spray foam products are considered combustible according to the code, they will not sustain a fire once the fire source is removed.

Cold Temperature Applications. Rigid insulation board can generally be applied in all temperature ranges subject to the limitations of the expansion and contraction of the material and the temperature tolerance of fastening materials (i.e. adhesives). Similarly medium-density spray foam products can be applied in cold conditions and to cold substrate materials in accordance with installation guidelines. Some are particularly useful for cold weather work since they can be successfully applied to substrates as cold as 5°F (-15°C). This capability makes it an industry leader for winter time use as exterior continuous insulation. Other spray foams have cold temperature capabilities with substrates allowed to be a minimum of 22°F (-5.5°C) for an application. Some contractors are trained to take steps to optimize the installation of foam products. For instance, sometimes an insulation contractor can use certain unique application techniques to compensate for cold weather including "following the sun" and using a thin first pass of material.

Green Considerations

Properly used and installed, all insulation will help reduce the use of energy for heating and cooling in buildings, which will help with sustainable and green building performance. When comparing spray foam and board insulation however, there are several notable differences. First, spray foam can more completely and fully insulate and seal a building without joints, gaps, or other interruptions in the continuous insulation. That can mean better energy efficiency for buildings of all shapes and sizes. Second, there is normally no waste associated with spray foam compared to board insulation since only the amount of material needed is used. Boards often need to be cut to fit producing scraps and waste. Third, since spray foam is delivered in liquid form, a tractor trailer load of it can hold a significantly greater amount of board feet of insulation than a truck load of rigid foam insulation boards.



As a continuous air and water-resistive barrier, spray foam insulation seals completely around attachments such as these brick ties.

Finally, the process for producing spray foam insulation compared to board insulation is different not only in the base material used but also in the type of blowing agents used. Those blowing agents have been independently rated and range widely in terms of Global Warming Potential (GWP). Spray foam with 100 percent water blown technology offers the lowest rated GWP of 1. By contrast, XPS chemical blowing agents carry a dramatically higher GWP of over 1,000. It is easy to see which one is more environmentally sustainable based on those numbers.

To elaborate more on the performance issues of rigid and spray foam insulation, we can look further at the three main considerations—thermal resistance, air sealing, and water-resistive barrier properties.

THERMAL RESISTANCE

Integrating continuous insulation in exterior wall assemblies has received considerable attention in recent years for many good reasons. Energy codes and standards recognize that this construction approach dramatically increases the effective thermal performance of a wall by eliminating heat flows through non-insulated components such as framing and structural members. This "thermal bridging" as it is referred to, is thus eliminated, resulting in increased wall energy efficiency and greater comfort for occupants. For example, the proper use of an exterior continuous insulation system can result in the elimination of some of the most common thermal bridges that often plague a building, such as direct thermal conductivity through metal or wood wall stud framing, perimeter concrete floor edges, and exposed concrete and steel structural columns and beams. The test of a truly effective continuous insulation system is, therefore, the degree that it fully covers all areas of a building assembly and eliminates thermal bridges.

Outside of the structure, the method of securing and attaching the insulation and the cladding material can become an issue. Rigid insulation that requires mechanical fasteners obviously can compromise the continuity and integrity of the insulation. Using adhesive or other means to secure the insulation in place without penetrating it with fasteners is clearly preferred. With spray foam insulation, this is not an issue since the material has its own adhesive properties to keep it securely attached in place once applied.

Continues at ce.architecturalrecord.com

Peter J. Arsenault, FAIA, NCARB, LEED AP, *is an architect and green building consultant who has authored over 100 continuing education and technical publications as part of a nationwide practice. www.linkedin.com/in/pjaarch*

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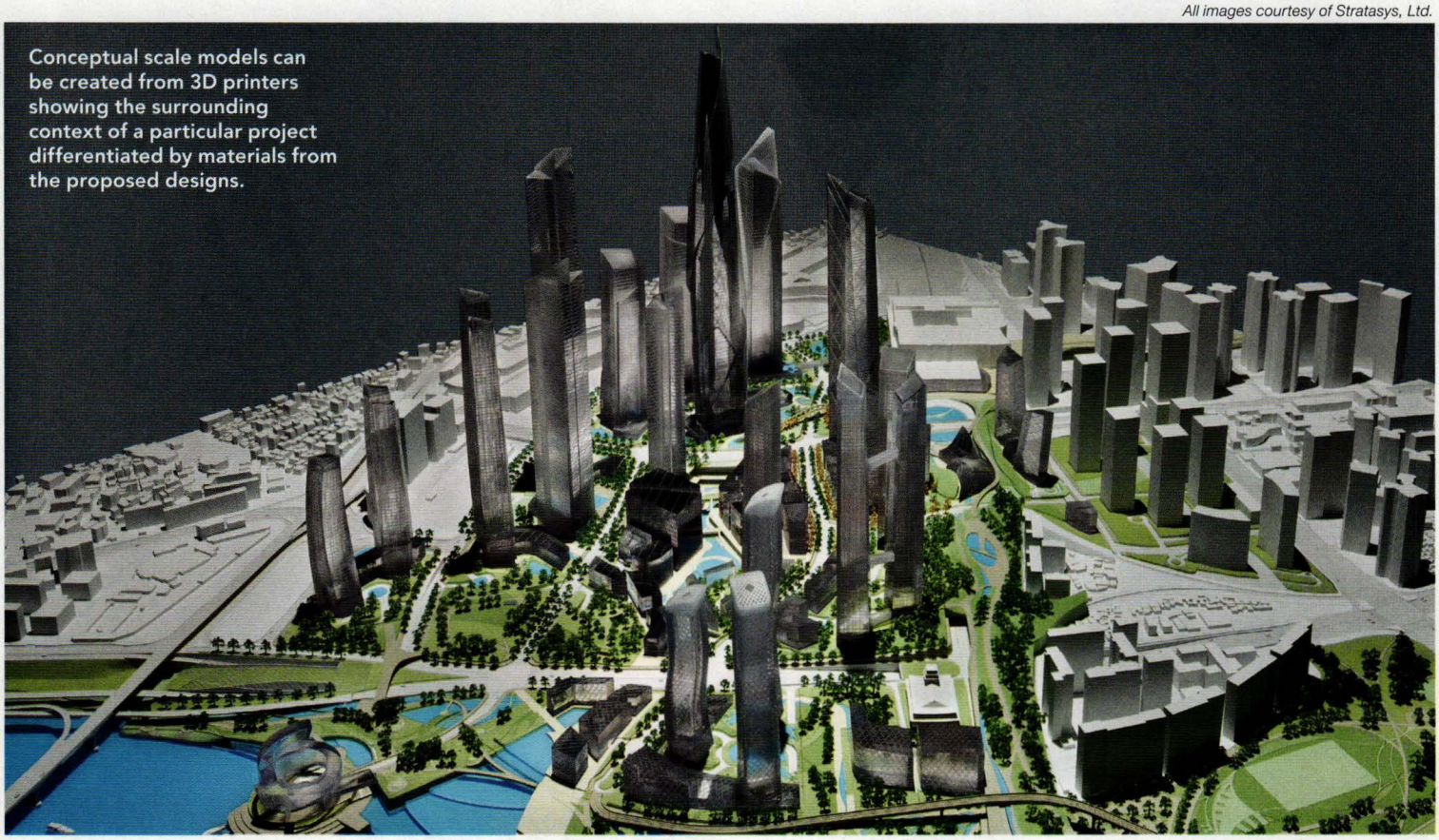


Conceptual scale models can be created from 3D printers showing the surrounding context of a particular project differentiated by materials from the proposed designs.

Using 3D Printers to Create Architectural Models

Detailed design exploration is faster and less costly than traditional model making

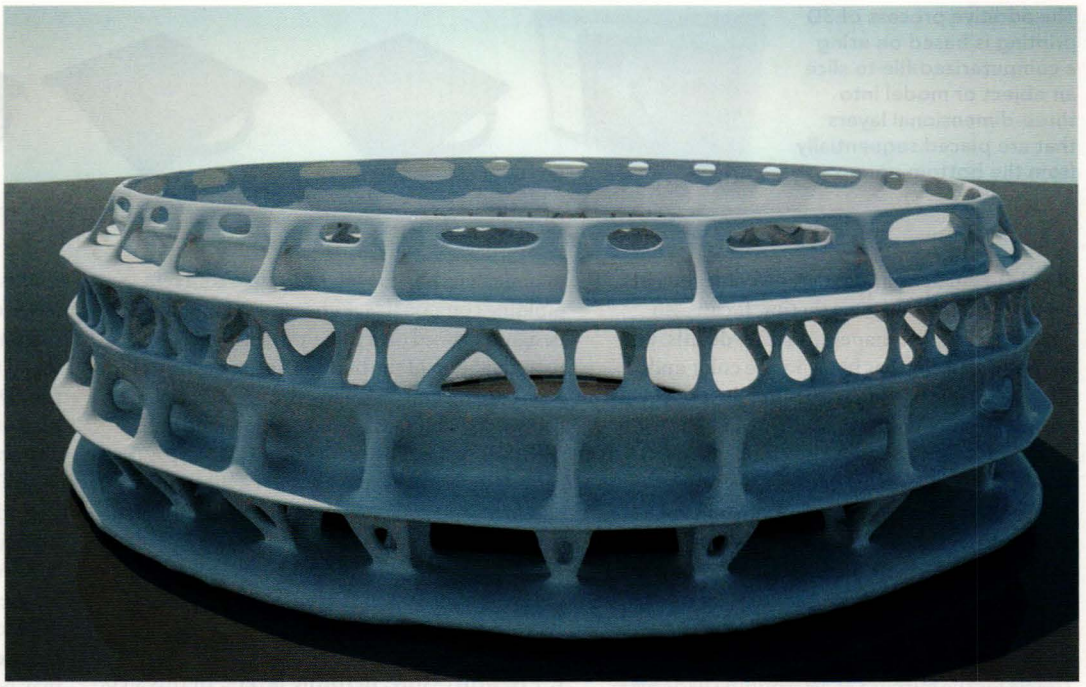
Sponsored by Stratasys, Ltd. | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

Architects have routinely created scale models of building designs to serve multiple purposes. In some cases, they have been simple conceptual models to study the relative sizing or massing of a particular design in a given context. In others, they have been detailed explorations into the relationship of spaces, shapes, and materials. In all cases they help with three-dimensional visualization of the proposed designs whether by the design team, the client, the public, or all of these. The process of creating such architectural models has varied based on need and capabilities. Historically, simple in-house model building has been based on cardboard or wooden representations cut with hand tools. More advanced models have been prepared by companies specializing in creating detailed creations based on architects' designs that use machine-cut wood, plastic, or other materials supplemented with features to represent natural features such as trees, terrain, etc. Now, there is also a new option available to any design team—the use of 3D printers to create architectural models of all types and detail. This conceptually simple but revolutionary technology allows new freedom in the design process to explore building designs in three dimensions and in a manner that can be quicker and less expensive than traditional architectural models. Further, 3D printing combines the precision of computerized design simulations with the tangibility of physical scale models.

3D printing equipment is available in a variety of sizes for a variety of needs using different types of materials that can make architectural models.

3D PRINTING TECHNOLOGY

Over the past 25 years or so, printing technology in general has developed side by side with advances in computer technology. Anyone who has printed drawings or documents on paper during this time has experienced the transformation of ammonia-based "blueprints" and black line prints to computer-generated drawing outputs using pen plotters, inkjet plotters, and laser printers. At the same time, while architects have been immersed in using computer-aided drafting (CAD), those in the industrial design world have experienced computer-aided manufacturing (CAM). This



A completed 3D printed model can show the form and mass of a building or focus on a portion with as much detail as needed for design review.

technology has been based on creating 3D objects for prototyping or testing typically by using a subtractive approach. This means that a solid piece or block of material (wood, metal, etc.) is placed in a machine that follows the computerized design instructions to remove or subtract all of the material that is not needed, leaving the final product at the end. It is essentially 3D sculpting via a computerized machining process.

With all of the CAD, CAM, and printing advances that have taken place, it is not surprising to see that 3D printing technology has grown up in this time too. The term 3D printer was originally a trademarked name but in 1999, it was allowed to enter the public domain and become a generic industry term. Just as a 2D inkjet printer places ink on paper using the X and Y axes based on a computer file, 3D printers place solid material on a base using computerized information for the X, Y, and Z axes. However, instead of the subtractive process used in CAM, a 3D printer creates objects using an additive manufacturing process which deposits material in a succession of layers from the bottom up. This means that there is no waste—only the material needed to create the object is used. That material is not ink as in a 2D printer, but typically some type of plastic that is heated slightly so it flows through printer heads or sprays through jets and then re-solidifies as it cools or is exposed to ultraviolet light.

3D Printing Equipment Options

3D printers are available to produce a variety of sizes of printed output, just like ink on paper printers, from small to large format. Small 3D printers are reasonably priced and can be readily incorporated into most design offices on a table or desktop. As a time-saving approach, they can be set up and programmed to run overnight unattended. Larger 3D printers or multiple units may be warranted if a lot of models are created. Alternatively, businesses are available that will do 3D printing (just like paper printing) from CAD files.

Two different technologies are commonly used in 3D printing of architectural models:

► **Fused deposition material (FDM).** This production process occurs as layers of plastic material are placed on top of each other. FDM printers build three-dimensional objects by melting and advancing one or more fine ribbons of plastic through a computer-controlled extrusion head into layers. The plastic cools and is ready for the next layer. FDM printers are useful for building concept models, functional prototypes, and end-use parts in standard, engineering-grade and high-performance thermoplastics. It's the only professional 3D printing technology that uses production-grade thermoplastics, so parts can be very high in mechanical, thermal and chemical strength and remain environmentally stable. That means complex geometries and cavities that would otherwise be problematic become practical with FDM technology. Other benefits include a technology that is clean, simple-to-use, and office-friendly.

► **PolyJet technology.** PolyJet 3D printing is similar to inkjet printing, but instead of jetting drops of ink onto paper, PolyJet 3D printers spray precise layers of curable liquid photopolymer onto a build tray. As such, PolyJet technology is a powerful additive manufacturing method that produces smooth, accurate prototypes, parts, and tooling. With 16-micron layer resolution and accuracy as high as 0.1 mm, it can produce thin walls and complex geometries using the widest range of materials. Its characteristics may be better suited to prototyping manufactured parts, but it can also be useful when precise, detailed models are needed in architectural settings. It

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Learning Objectives

After reading this article, you should be able to:

1. Identify and recognize the capabilities and characteristics of three-dimensional printing technology.
2. Investigate the ways that 3D printing of architectural models can be used to enhance the building design process.
3. Assess the materials and process options for creating models of different sizes and inherent structural strength.
4. Incorporate 3D printing as part of a typical building design process as a stand-alone technique or as a supplement to other digital design processes.

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The additive process of 3D printing is based on using a computerized file to slice an object or model into three-dimensional layers that are placed sequentially from the bottom up.

is able to create smooth, detailed objects that convey final-product aesthetics. It can also produce complex shapes, intricate details, and smooth surfaces that incorporate color and diverse material properties into one model with the greatest material versatility available.

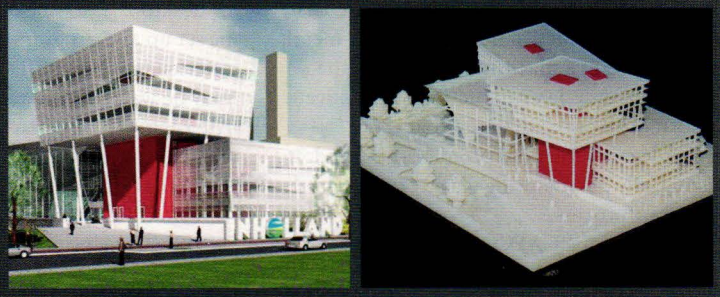
Basic 3D Printing Process

While there are a number of variables in the equipment, material, and output sizes in 3D printing, the basic process is the same in most cases. The beginning point, just as in any architectural modeling process, is the development of a design. That design can be simple for the purpose of determining basic form or massing, or it can be detailed for the purpose of understanding the interactions of different building components. Either way, a computerized design file based on a three-dimensional representation of the building is the starting point. Many architectural designs already start that way using CAD or building information modeling (BIM) software. The beauty of 3D printing is that early designs can be quickly and readily tested, observed, and compared by printing out different concepts or variations.

With a computerized design in place, there are essentially three steps that occur in the 3D printing process for an architectural model:

1. **Pre-processing: defining layers.** In this step, the design is "sliced" or sectioned into layers. This is accomplished by creating a "build file" based on importing a 3D CAD file into a printing software program installed on the computer. Note that if the finished model is larger than the size of the 3D printing chamber, then it will need to be prepared in parts or sections that can be assembled afterwards. Those sections will need to be identified and treated as separate printed outputs. Regardless of size, some options related to specific material, color, and slice thickness may need to be selected if the 3D printer has multiple choices for these. In some cases, it may also be necessary to pick a "build and support" style to match the requirements of the object being created. Supports may be needed to temporarily hold in place parts of the object that overhang or cantilever out or

3D PRINTING TECHNOLOGY ENABLES INTERNATIONAL ARCHITECTURE FIRM TO SHAVE MONTHS OFF OF MODEL-BUILDING TIME



FIRM CASE STUDY #1 Rietveld Architects, New York, NY

Established in New York City in 1994, Rietveld Architects LLP is known throughout the United States and Europe for its creative commercial and residential spaces. Its international team of architects embraces the latest technologies in such areas as energy savings and individual environmental controls. The firm's partners, Margaret and Rijk Rietveld, learned about 3D printing from a contact at the National Aeronautics and Space Administration (NASA). They saw in this technology the potential to increase productivity and produce more innovative designs.

CHALLENGES – TIME-CONSUMING MODEL BUILDING

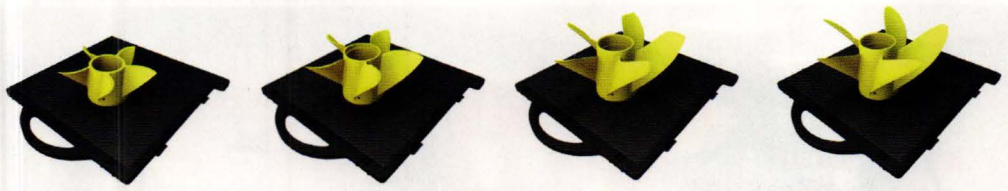
During the course of a typical project, Rietveld builds numerous models of increasing detail and scale that help its clients to visualize designs. Like other firms, they traditionally built these models by hand. This task usually required two employees to spend upwards of two months cutting, assembling, and finishing components made of cardboard, foam board, and Plexiglass. The time and expense to hand craft these complex elements limited the amount of detail in these models, which sometimes made it difficult to demonstrate the merits of the design. Several years ago, Rietveld decided to explore how to significantly reduce the time and expense required to produce detailed architectural models. They were also interested in how to produce better representations of designs and quickly respond to client feedback to facilitate the decision-making process. "We saw that big changes were coming to the architectural industry and believed that firms that could do more with less and deliver superior models would be more competitive in the new environment," says Rijk Rietveld.

SOLUTION – 3D PRINTING

Rietveld's leadership became familiar with the available 3D printing technologies and, after in-depth research on eight different systems, selected the one that fit their needs the best. "We were particularly impressed by the ability of this system to quickly produce highly detailed, accurate models with minimal office clean-up," says Rijk Rietveld. "Some of the other technologies produced brittle models and didn't have the fine detail we sought." According to Piet Meijs, an associate with the firm, "our 3D printer is helping us do more with less, spurring innovation in our company and industry."

RESULTS – BETTER MODELS IN LESS TIME

The prototyping capabilities offered by the 3D printing has literally shaved months off of the firm's architectural model-building process. It has reduced model creation time from two months of two employees' time to just a few hours of a single employee's time. The firm now produces more detailed models, which help clients better visualize final projects. The end result is that the firm is winning more projects and more successfully executing them. "Frequently during a project, clients request design changes or wonder how particular changes may impact the overall aesthetic," says Meijs. Clients have been impressed by the firm's ability to create and finish models in a matter of hours. "Hand-made models often can display all of the important details in a project. The name of the game is innovation," Meijs says. "We are constantly striving to better ourselves and better our industry. Our 3D printer is helping us do just that."



Large, detailed models can be created to scale for display purposes. Mitekgruppen (Mitekgroup), a Swedish design firm hired to create a 3D model of the city of Stockholm, Sweden, completed the project in a fraction of the normal time by using a 3D printer and Google Earth.

otherwise need scaffolding style stiffening until the material solidifies. Some of this may depend on the orientation of the model being printed so selecting that orientation may need to be done as well (i.e. printing on its side or even upside down if that is more practical).

Once the choices are made, the preprocessing software calculates sections and slices the design into many layers, ranging from 0.005 inch (0.127 mm) to 0.013 inch (0.3302 mm) in height. Using the sectioning data, the software then generates "tool paths" or building instructions, which will drive the printer or extrusion head. This step may be automatic when using certain software. Once complete, the printing job is ready to be sent to the 3D printer.

2. Production: the layering process. The 3D printer needs to be prepared and ready just like any other printing machine. Most have fully enclosed chambers where the 3D object is created on a base or platen that moves vertically along the Z axis. They also have a place for the plastic material to be loaded, just like loading ink cartridges in a paper printer. The platform on the bottom of the chamber is usually not the place to have the model built, rather, a base made of wood or plastic should be positioned so the finished result can be easily lifted out. Once ready, it can be as simple as pressing "print" or start to allow the chamber and the plastic material to heat up to the appropriate temperatures.

The building process begins with the printing platform, or platen, moving vertically into position. Typically, this platen moves down in measured distances along the Z axis as material is deposited in layers. After each layer is complete, it lowers slightly to make way for the next layer. In the FDM process, the extrusion head, which moves about on an XY platform, lays down a ribbon of material. Two materials may enter the extrusion head—one or more to make the object, and one to support it. Heat is applied to soften the plastics, which are extruded in a ribbon, ranging in size from a human hair to heavy twine. Alternating between model material and support material, the system deposits layers as thin as 0.005 inch (0.13 mm). Each layer of molten plastic is deposited on top of the previous one and flattened slightly by the extrusion head. In most cases, the layers instantly fuse to one another.

The accuracy and precision of the FDM printed object relies on the coupling of material feed rates and extrusion head motion. Both are constantly changing to produce a flat ribbon of material. Drive wheels push the plastic filament into the hot liquefier section of the tip assembly. The pressure forces the plastic through a tiny orifice in the tip, which presses down to flatten the bead. Meanwhile, the head accelerates and decelerates as it travels across the platen. As the head speed changes, the drive wheels adjust the material flow rate. The result is a precise ribbon width that adjusts as required to produce the object. On the highest-performance machines, accuracy or tolerance reaches as high as 0.003 inch (0.08 mm), which rivals the accuracy of injection molding for machinery.

In the PolyJet process, the jet-heads spray a layer of material along the X and Y axes that is essentially tiny droplets of liquid photopolymer instead of the heated ribbons used in FDM. Once in place, this photopolymer layer is immediately cured with ultraviolet (UV) light and becomes solid before the next layer begins. Depending on the size and ability of the printer, as many as three different materials may be mixed at once during the printing process to create different colors, transparencies, or flexibilities. As the PolyJet printing process continues, multiple fine layers accumulate on the build tray to create a precise 3D model or part. Where overhangs or complex shapes require support, the 3D printer builds a removable gel-like support material.

▶ Continues at ce.architecturalrecord.com

Peter J. Arsenault, FAIA, NCARB, LEED AP, *is an architect and green building consultant who has authored over 100 continuing education and technical publications as part of a nationwide practice. www.linkedin.com/in/pjaarch*

Photo courtesy of Ecore Commercial Flooring

New Trends in Resilient Flooring for Healthcare Environments

The right flooring can make a major contribution to a positive healing environment for patients, a productive workplace for staff, and the safety and well-being of both

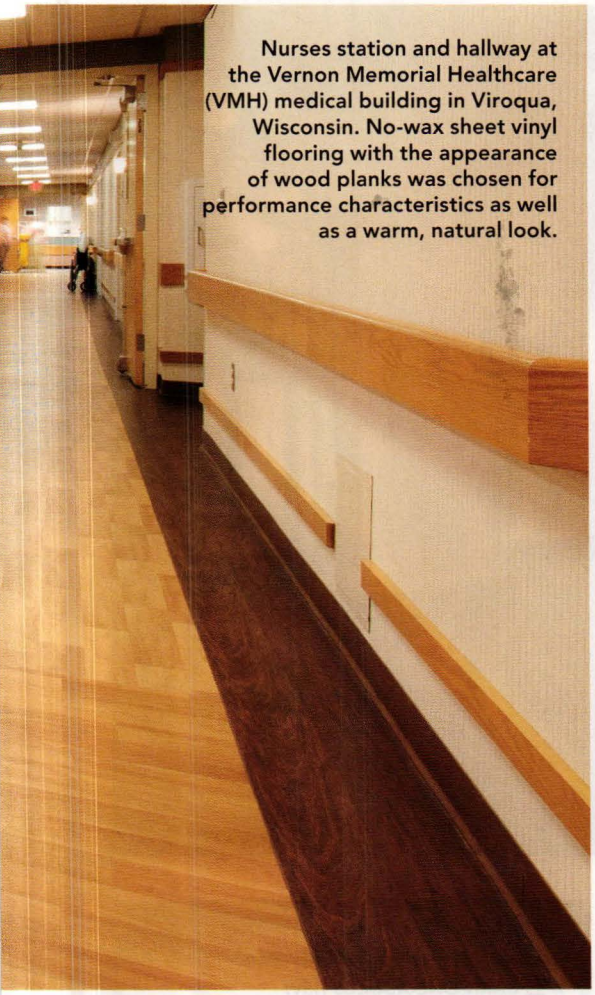
Sponsored by Ecore Commercial Flooring | *By Layne Evans*

A few years ago, a boom in capital construction was predicted to provide an aging population with additional beds. Now, although large new hospitals are still being built, by far the greatest growth is in renovation, modernization, and the construction of new, specialized spaces, such as outpatient clinics and units focusing on specific needs.

Two of the major trends affecting the design of these new spaces sometimes seem to be in direct conflict. A large body of knowledge now exists documenting how the physical environment of a healthcare facility directly affects patient outcomes. Evidence-based design can promote healing, safety, and a positive experience for patients, families, and staff. At the same time, cost constraints are more severe. It seems the more healthcare design, products, and materials can do, the less money there is to pay for them.

But the changing structure of the healthcare industry is also rewarding the use of evidence-based design in many important ways. Healthcare is shifting from a fee-for-services model to a fee-for-performance model. Under the Affordable Care Act (ACA), costs associated with avoidable incidents, such as hospital-acquired infections (HAIs) and slip/fall injuries, are not reimbursable and are borne by the healthcare provider. Medicare payments are linked to factors, such as scores on patient satisfaction surveys, length of hospital stays, and the number of readmissions. Many private insurers are following suit. Reimbursement at risk has created a healthcare dynamic where the emphasis on efficiency must be paired with quality and patient satisfaction.

Part of the answer is more choice in products that can contribute to good outcomes while controlling costs. The selection of flooring will directly affect major components



Nurses station and hallway at the Vernon Memorial Healthcare (VMH) medical building in Viroqua, Wisconsin. No-wax sheet vinyl flooring with the appearance of wood planks was chosen for performance characteristics as well as a warm, natural look.

of safety and satisfaction for both patients and staff, including acoustics, protection from injury, prevention of HAIs, and creating a safe, positive healing environment. The same choices will result in cost saving and efficiency through better patient experiences, improved staff efficiency and retention, reduced liability for infection and injury, and reduced costs for maintenance and energy.

Not long ago every floor in a hospital might be covered with a single material, often the same sterile institutional color. It was probably noisy and hard, with no particular connection to the mission of the facility. Now there are specialized resilient flooring solutions available for every application.

This course will consider three important factors in selecting a resilient floor for a healthcare environment: current construction and design trends, the evidence-based performance requirements of each space, and the different types of resilient flooring that are available, including new technology that is transforming familiar products and creating new options.

FLOORS FOR NEW SPACES

The growth in healthcare construction is centered in new outpatient settings and new specialized spaces within existing hospitals. Medical services are being relocated to the community as part of a population-based approach to medicine. The formation of new Accountable Care Organizations (ACOs), where voluntary groups of primary physicians, specialists, and hospitals work together to provide patients with coordinated, integrated care, often brings new outpatient units into partnership with larger hospital systems.

Buildings originally built for other purposes are being renovated to become neighborhood primary care or urgent care clinics (for example, the Formé Urgent Care and Wellness Center building, featured in a sidebar in the online version of this course, previously housed the White Plains Building Department). Some ambulatory care centers (ACCs) offer all the services available in an acute care hospital with the exception of overnight stay. They are far faster and less expensive to build than new hospital wings, and can be designed for flexibility and expansion if markets grow or change.

Within hospitals, spaces are being reconfigured to improve processes, to meet new purposes, and to make changes that will lead to lower costs in cleaning, maintenance, and energy. The 2015 Hospital Construction Survey[1] indicates that "more than half of hospitals and health systems are repurposing space, or considering the idea, as they transition to value-based payment models and take the reins of population health management in their communities."

Examples of this trend include:

- Stand-alone emergency departments
- Ambulatory surgery centers
- Medical offices for targeted procedures
- Specialized services, e.g., dialysis, infusion
- Community primary and urgent care centers
- Behavioral health units
- Bariatric care
- Acuity-adaptable rooms
- Rehabilitation and physical therapy centers
- Diagnostic and imaging centers

Facilities like ACCs combine areas for different purposes, and require specific flooring for each. Treatment and procedure rooms require the same seamless germ-free flooring as a sterile hospital operating room. Laboratories and imaging facilities may require flooring that controls electrostatic discharge (ESD).

All require ergonomically effective and easy-to-clean patient rooms and staff areas, noise-dampening corridors, cost-efficient utility and pharmacy areas, and waiting and consultation areas that are welcoming and reduce stress. As discussed later in this course, research has shown that "waiting" is an activity that can have a significant impact on family engagement and patient outcomes. In fact, the attractiveness of the lobby has been found to affect a patient's perception of the quality of care, even including the length of the wait.

Renovation within hospitals often concentrates on reconfiguring and equipping space for better workflow and to meet new priorities in care.

See endnote in the online version of this article.

Continues at ce.architecturalrecord.com

CONTINUING EDUCATION

EARN 1.5 AIA/CES HSW LEARNING UNITS (LUs)

Learning Objectives

After reading this article, you should be able to:

1. Discuss major changes in the healthcare industry with a direct impact on design and product selection, including a strong emphasis on patient well-being, satisfaction, and outcome.
2. Analyze unique performance requirements of flooring in healthcare environments and their close relationship to the safety and comfort of patients and staff.
3. Evaluate different types of resilient flooring for specific healthcare applications, including new technologies that are changing familiar products to improve performance, sustainability, and patient experience.
4. Select flooring that contributes to effective, evidence-based environments for healing.

To receive AIA/CES credit, you are required to read the entire article and pass the test. Go to **ce.architecturalrecord.com** for complete text and to take the test for free.

AIA/CES COURSE #K1505T

Photo courtesy of Sherwin-Williams

Technologically advanced high-performance coatings bridge the gap between traditional architectural paint and coatings formulated for heavy industrial applications.

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Every job is unique. Each has specialized requirements, client demands, and environmental compliance issues that must be considered. Of the many challenges facing the design community, one of the most demanding is specifying the right coating for commercial spaces. Just as all jobs are not created equal, all paints are not created equal. Standard latex architectural wall paints typically found in MasterFormat section 099123 for Interior Paint are fine for some light-duty commercial applications but are inadequate for areas that experience higher traffic or frequent cleaning. And heavy-duty industrial coatings such as the epoxies and urethanes typically found in section 099600 for High-Performance Coatings are usually reserved for harsh industrial environments such as manufacturing and processing plants.

Continues at ce.architecturalrecord.com

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

EARN ONE GBCI CE HOUR FOR LEED CREDENTIAL MAINTENANCE

Learning Objectives

After reading this article, you should be able to:

1. Distinguish between the features of a high-performance coating and a traditional architectural coating.
2. Describe why high-performance coatings are well suited for applications with stringent environmental considerations.
3. Recognize the basic differences between the five primary types of high-performance coatings and identify potential applications for each.
4. Explain what factors determine a coating's sustainability.
5. Evaluate the impact of a coating's life cycle on long-term product costs and the environment.

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AIA/CES COURSE #K1406D
GBCI COURSE #910000383

Originally published in the June 2014 issue of *Architectural Record*

Photo by John Stamets

Living Building Certification
The Bullitt Center – Seattle, Washington
Architect: The Miller Hull Partnership
WoodWorks Multi-Story Wood Design Award, 2014

Green Building and Wood Products

Increasing recognition of wood's environmental advantages

Sponsored by reThink Wood

With growing pressure to reduce the carbon footprint of the built environment, building designers are increasingly being called upon to balance functionality and cost objectives with reduced environmental impact. Wood can help to achieve that balance.

The choice to use wood as a green building material is intuitive. It's abundant, renewable and recyclable, and has a lighter carbon footprint than other construction materials.[1] Wood is also the only structural building material with third-party certification systems in place to verify that products have come from a sustainably managed resource.

In addition to its environmental benefits, wood's natural beauty and warmth have a positive effect on building occupants. In two studies conducted at FPInnovations and the University of British Columbia, for example, the use of visual wood was shown to lower sympathetic nervous system (SNS) activation, which is responsible for physiological stress responses in humans.[2] As a result, an increasing number of architects are incorporating wood in their designs as a way to achieve goals such as improved productivity and performance in schools and offices, and better patient outcomes in hospitals.[3]

With all of these attributes, wood is well positioned as a key component of environmentally superior structures. Yet, early efforts to promote green construction resulted in highly variable treatment of wood in green building rating systems—which, at the time, were largely based on long lists of prescriptive standards, typically focused on single attributes such as recycled content. Such variability can still be seen in many of the green building programs in use today. However, these systems are increasingly moving away from prescriptive standards and toward reliance on systematic, multi-attribute assessment of building products, assemblies, and completed structures through life cycle assessment (LCA). The result is greater uniformity between programs and far greater robustness in evaluation, both of which serve to leverage the environmental advantages of wood.

See endnotes in the online version of this article.

Continues at ce.architecturalrecord.com

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

EARN ONE GBCI CE HOUR FOR LEED CREDENTIAL MAINTENANCE

Learning Objectives

After reading this article, you should be able to:

1. Discuss the sustainable aspects of wood products.
2. Describe how wood contributes to credits under various green building rating systems.
3. Articulate the importance of life cycle assessment and how it can be used to evaluate the environmental performance of buildings at the design stage.
4. Describe how green building certification, sustainable forest certification, and Environmental Product Declarations complement each other to provide a more complete picture of a building's environmental performance.

To receive credit, you are required to read the entire article and pass the test. Go to **ce.architecturalrecord.com** for complete text and to take the test for free.

AIA/CES COURSE #K1406C
GBCI COURSE #910000367

Originally published in the June 2014 issue of *Architectural Record*, updated May 2015

CONTINUING EDUCATION

Concrete Waterproofing with Crystalline Technology

Crystalline chemicals improve concrete durability, lower maintenance costs, and extend building life cycles | Sponsored by XYPEX Chemical Corp.

From foundations, floor slabs, and exterior precast panels, to water treatment facilities and underground urban infrastructure, concrete is one of the most commonly used building and construction materials. However, due to its composition, a mixture of rock, sand, cement, and water, concrete is often susceptible to damage and deterioration from water and chemical penetration.

These deleterious effects can be avoided through the use of crystalline waterproofing technology, which effectively improves the durability and lifespan of concrete structures, thereby reducing long-term maintenance costs. This article explores how crystalline technology provides a high level of performance to concrete mixtures, materials, and structures, and what design professionals need to know in order to specify and understand how this chemical technology will enhance building projects.

Continues at ce.architecturalrecord.com

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

Learning Objectives

After reading this article, you should be able to:

1. Understand how crystalline technology works with concrete to provide high-performance waterproofing qualities.
2. Explain the difference between porosity, permeability, and the mechanics by which water is absorbed through concrete structures.
3. Discuss how crystalline waterproofing technology improves the durability of concrete structures and reduces maintenance.
4. Identify appropriate crystalline technology product applications for various types of concrete construction.
5. Analyze how crystalline technology admixtures can impact building life-cycle and project construction costs.

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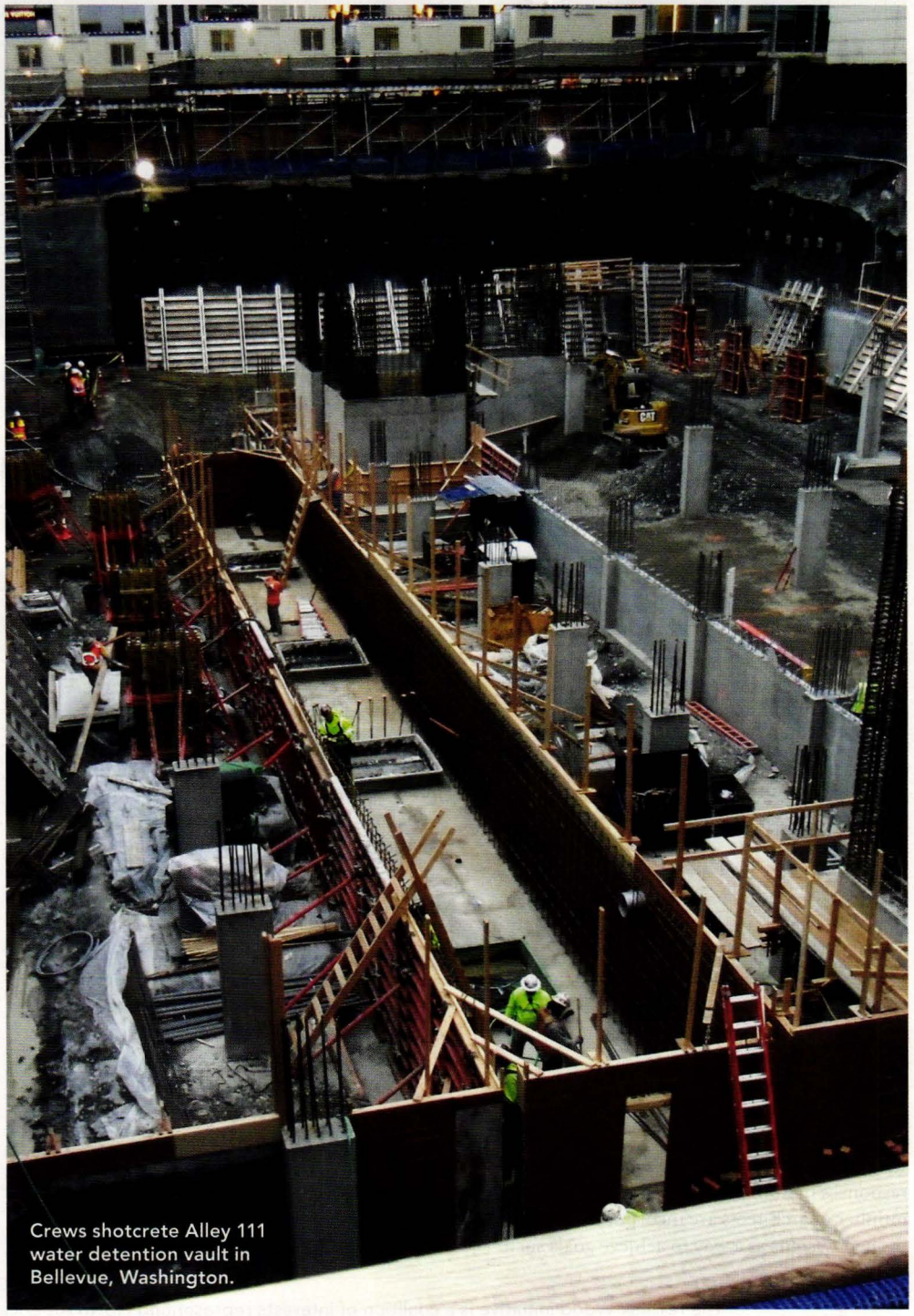

Crews shotcrete Alley 111 water detention vault in Bellevue, Washington.

Originally published in November 2011, updated April 2015

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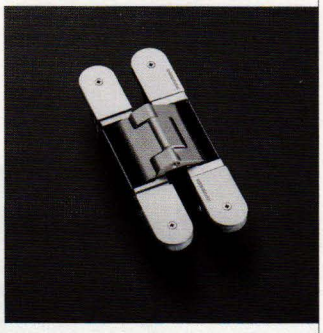

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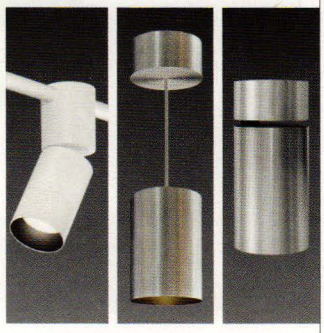

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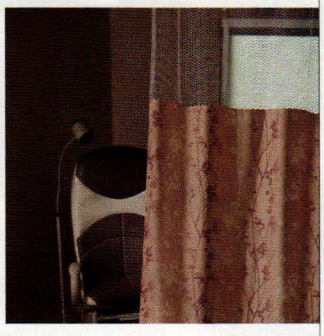

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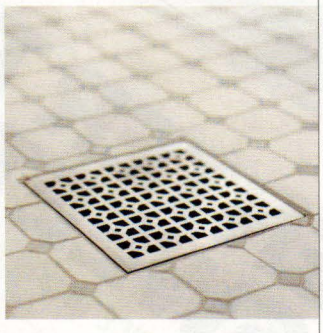

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Timothy J. Regan, President and CEO of the Whiting-Turner Contracting Company, second from right, is presented the 2015 Keystone Award by Ronald E. Bogle, Hon. AIA, President and CEO of the American Architectural Foundation, Diane J. Hoskins, FAIA, LEED AP, Co-CEO of Gensler and AAF Regent, and John M. Syvertsen, FAIA, Chair of the AAF Board of Regents.

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WITH SPECIAL THANKS TO OUR 2015 GALA LEADERSHIP COMMITTEE

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Established in 1943, the American Architectural Foundation is a national nonprofit organization that empowers leaders to use architecture and design to improve lives and transform communities. At the heart of our efforts and supported in part by the proceeds of the Accent on Architecture Gala are the Center for Design & the City, the Center for the Advancement of Architecture, the Center for Design & Cultural Heritage, and Design for Learning. Learn more and get involved at archfoundation.org.

New and Upcoming Exhibitions

Africa
Humlebæk, Denmark
June 25–December 25, 2015
Held at the Louisiana Museum of Modern Art, *Africa* presents a number of striking impressions and living traditions from the African continent taking place at the intersection of architecture, contemporary art, and culture. Louisiana's architecture exhibitions are never simply about building construction and aesthetics but are rather about defining, interpreting, and transforming the type of interventions that architecture contributes to the spaces that constitute society. For more information, visit louisiana.dk.

Endless House: Intersections of Art and Architecture
New York City
June 27, 2015–March 6, 2016
Endless House, at the Museum of Modern Art, considers the single-family home and archetypes of dwellings as themes for the creative endeavors of architects and artists. Through drawings, photographs, video, installations, and architectural models drawn from MoMA's collection, the exhibition highlights how artists have used the house as a means to explore universal topics, and how architects have tackled the design of residences to expand their discipline in new ways. The exhibition also marks the 50th anniversary of the death of Austro-Hungarian-born artist and architect Frederick Kiesler (1890–1965). Taking its name from an unrealized project by Kiesler, *Endless House* celebrates his legacy and the cross-pollination of art and architecture that made Kiesler's 15-year project a reference point for generations to come. For more information, visit moma.org.

Frank Gehry
Los Angeles
September 13, 2015–March 20, 2016
Frank Gehry has revolutionized architecture's aesthetics, social and cultural role, and relationship to the city. His pioneering work in digital technologies set in motion practices adopted by the construction industry today. This exhibition presents a comprehensive examination of his extraordinary body of work, from 1962, when he established his firm in Los Angeles, to the present. The exhibition features more than 200 drawings, many of which have never been seen publicly, and 65 models that illuminate the evolution of Gehry's thinking. At LACMA. For more information, visit lacma.org.

David Adjaye: Architecture for Social Change
Chicago
September 19, 2015–January 3, 2016
With more than 50 built projects across the world, David Adjaye is rapidly emerging as a major international figure in architecture and design. This exhibition—the first devoted to Adjaye—offers an in-depth overview of the architect's distinct approach and visual language through a dynamic installation design conceived by Adjaye Associates. Capturing a significant moment in Adjaye's career, this exhibition spans projects ranging from furniture and housing to public buildings and master plans, and features drawings, sketches, models, and building mock-ups. At the Art Institute of Chicago. For more information, visit artic.edu.

Ongoing Exhibtions

Modeling the Synagogue—from Dura to Touro
New York City
Through July 5, 2015
Yeshiva University Museum's newest major exhibition features a collection of small wonders: remarkably detailed, architecturally accurate models of some of history's most significant synagogues. The 10 synagogue models featured in the exhibition reflect the geographic and cultural breadth of the Jewish world across the centuries, from the ancient Mediterranean Dura-Europos in 3rd-century Syria and Beit Alpha in 6th-century Galilee to Touro in 18th-century Newport, Rhode Island, and Tempio Israelitico in 19th-century Florence. For more information, visit yumuseum.org.

Chatter: Architecture Talks Back
Chicago
Through July 12, 2015
Architecture is a perpetual conversation between the present and the past with the knowledge that the future is listening. So what happens when this dialogue is influenced by contemporary modes of communication such as texting, Twitter, and Instagram? *Chatter* looks at the diverse contemporary methods and approaches wielded by five emerging architects: Bureau Spectacular, Erin Besler, Fake Industries Architectural Agonism, Formlessfinder, and John Szot Studio. For the exhibition, Iker Gil, director of the design publication *MAS Context*, conceived an

installation to explore the multitude of ways in which architecture can be communicated. At the Art Institute of Chicago. For more information, visit artic.edu.

Lina Bo Bardi: Together
Chicago
Through July 25, 2015
The Graham Foundation is pleased to announce the first U.S. presentation of *Lina Bo Bardi: Together*, an exhibition that pays tribute to the work and legacy of 20th-century Italian-Brazilian architect Lina Bo Bardi. Featuring new works by artist Madelon Vriesendorp, filmmaker Tapio Snellman, and photographer Ioana Marinescu, this exhibition endeavors to inspire new conversations around Lina Bo Bardi's work. It brings to life Bo Bardi's buildings and her inclusive approach to design, one that aimed to dispel aesthetic and social hierarchies and embrace the texture and diversity of her adopted Brazil. For more information, visit grahamfoundation.org.

Design for Healthy Living
Atlanta
Through August 9, 2015
This exhibtion explores the impact of the built environment on human health and presents specific design strategies that can promote routine physical activity and healthy living. *Design for Healthy Living* provides real-world examples from Atlanta and beyond that show these design strategies in use and highlight the impact that design is making on health and well-being. Among the projects featured are the Atlanta BeltLine, Lee Street Re-Design, Wheat Street Garden, Serenbe—a New Urban village in Georgia—along with other examples. This highly interactive exhibition—which features an installation by artist and designer Tristan Al-Haddad of Formations Studio—will encourage participation and dialogue as visitors consider how everyday spaces can be used to improve their health. At the Museum of Design Atlanta. For more information, visit museumofdesign.org.

Folly 2015: Torqueing Spheres
Long Island City, New York
Through August 30, 2015
The Architectural League and Socrates Sculpture Park present the winning proposal—now built and on display—for the 2015 Folly Program, an annual juried competition targeted to early-career architects and designers. Cambridge and Philadelphia–based firm IK Studio won this year's competition with their proposal, *Torqueing Spheres*, which transforms a series of intertwining sculpted forms into a meandering curved folly that encourages social interaction. *Torqueing Spheres* combines a simple concept—a straight line—with complex spherical pods that become deep, self-supporting chambers to create experiences for both the collective and the individual. At the Socrates Sculpture Park. For more information, visit archleague.org.

Saving Place: 50 Years of New York City Landmarks
New York City
Through September 13, 2015
The Museum of the City of New York presents this comprehensive exhibition of New York's landmark-preservation movement, one that has transformed the city and driven its success. The movement developed over many years but was galvanized by large historic losses in the early 1960s, most notably the demolition of the world-famous and architecturally significant Pennsylvania Station in 1963. Through original documents, drawings, paintings, photographs, building pieces, and more, the exhibition surveys how New York's landmarking movement developed. For more information, visit mcny.org.

Pathmakers: Women in Art, Craft and Design, Midcentury and Today
New York City
Through September 27, 2015
This exhibition considers the important contributions of women to Modernism in postwar visual culture. In the 1950s and 60s, an era when painting, sculpture, and architecture were dominated by men, women had considerable impact in alternative materials such as textiles, ceramics, and metals. Featuring more than 100 works, *Pathmakers* focuses on a core cadre of women: Ruth Asawa, Edith Heath, Sheila Hicks, Karen Karnes, Dorothy Liebes, Alice Kagawa Parrott, Toshiko Takaezu, Lenore Tawney, and Eva Zeisel. At the Museum of Arts & Design. For more information, visit madmuseum.org.

Lectures, Conferences, & Symposia

Shigeru Ban: Works and Humanitarian Activities
New York City
June 17, 2015
With a portfolio that spans multiple scales—refugee housing, other temporary structures, houses, commercial buildings, and cultural facilities—Shigeru Ban's work is united by structural innovation, the creative use of unconventional building materials, and environmental sensitivity. The 2014 winner

of the Pritzker Prize, Ban was lauded by the jury for "his respect for the people who inhabit his buildings, whether victims of natural disaster or private clients or the public . . . always revealed through his thoughtful approach, functional plans, carefully selected appropriate materials, and the richness of the spaces he creates." At Cooper Union. For more information, visit cooper.edu.

2015: The Inaugural Chicago Architecture Biennial
Chicago
October 3, 2015–January 3, 2016
The Chicago Architecture Biennial provides a platform for groundbreaking architectural projects and spatial experiments that demonstrate how creativity and innovation can radically transform our lived experience. Through its constellation of exhibitions, full-scale installations, and program of events, it will invite the public to engage with and think about architecture in new and unexpected ways, and to take part in a global discussion about the future of the field. At five different locations in Chicago. For more information, visit chicagoarchitecturebiennial.org.

DesignPhiladelphia Festival 2015
Philadelphia
October 8–16, 2015
As the oldest design event of its kind in the country, the DesignPhiladelphia Festival annually showcases the work of more than 400 practicing architects, designers, and creative professionals to demonstrate Philadelphia's reemergence as a 21st-century city shaped by design, technology, and collaborative business practices. Over the course of 11 days, entities such as universities, cultural institutions, civic associations, city agencies, retailers, manufacturers, and startups across the city participate in more than 130 distinct events including talks, panel discussions, exhibitions, tours, workshops, and public happenings. At the Philadelphia Center for Architecture. For more information, visit philadelphiacfa.org.

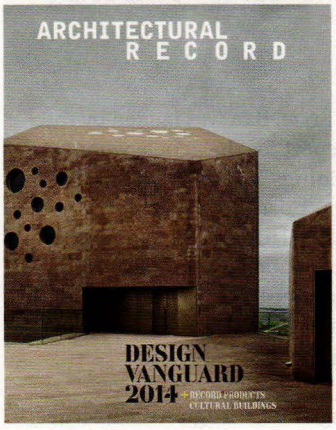
Competitions

ITAD Competition
Registration deadline: June 30, 2015
Designated "Urban Smart Green Office," this year's International Tropical Architecture Design competition seeks innovative and sustainable design that demonstrates the key constituents of smart green office building in a city such as Bangkok, Jakarta, Manila, or Singapore. Such buildings would combine comfort and performance by way of innovative technologies, integrating with active and passive green-building strategies. The energy-efficient buildings would also be designed for the overall health, well-being, and productivity of their tenants and users. For more information, visit itadcompetition.sg.

SEED Competition
Submission deadline: July 31, 2015
SEED calls for the creation of a temporary, environmentally friendly housing unit for one to two inhabitants. Chinese architect and competition creator Qingyun Ma says, "The design should find equilibrium between individual livability and ecological sustainability, celebrating the moment between human intervention and nature." For more information, visit spamall.com.cn/competition.

E-mail information two months in advance to recordevents@construction.com. For more listings, visit architecturalrecord.com/news/events.

2015 CALL FOR ENTRIES Design Vanguard



The editors of ARCHITECTURAL RECORD are looking for the best emerging architecture firms from around the world to feature in our **Design Vanguard** coverage. Although we do not have an age limit, we try to select architects who have had their own practices for no more than 10 years.

To enter the competition, send a low-resolution PDF (no larger than 10 MB) with a portfolio containing five to eight projects (both built and unbuilt), CVs of your firm's partners, a short statement of your firm's design philosophy, and the date your firm was founded.

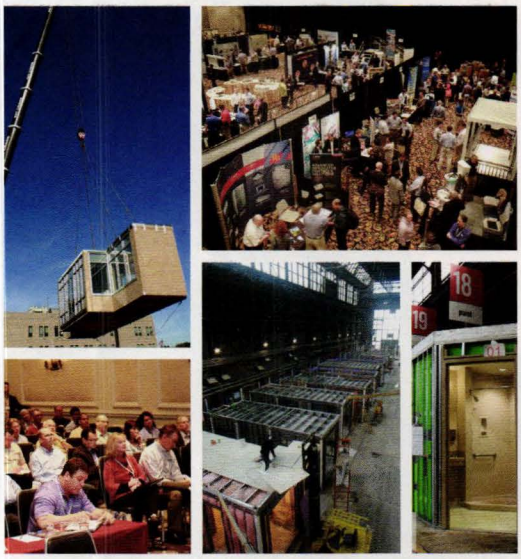
Submit your portfolio by August 10, 2015. Send it to ARCallForEntries@construction.com (put ***Design Vanguard*** in the subject line). There is no fee to enter.

OFFSITE CONSTRUCTION EXPO

DISCOVER OFFSITE

SEPTEMBER 23 & 24

Walter E. Washington Convention Center in Washington, DC.



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EXHIBITS | NETWORKING | EDUCATION

What is Offsite Construction Expo?

The Offsite Construction Expo will feature exhibits from offsite construction contractors, traditional contractors that have integrated offsite methods, offsite factories, transportation companies, architects, engineers, BIM suppliers, materials suppliers, and offsite construction consultants. Educational case studies will be presented each hour on the expo floor.

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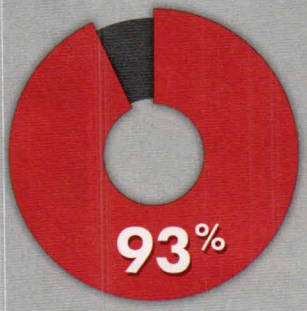
REACH KEY PARTNERS IN THE OFFSITE CONSTRUCTION INDUSTRY



93% of respondents implemented some form of offsite construction in the past 12 months.

Results based on survey conducted by the National Institute of Building Science's Offsite Construction Council.

EXHIBITS FROM:

- Offsite construction contractors
- Traditional contractors that have integrated offsite methods
- Offsite factories
- Transportation companies
- Architects
- Engineers
- BIM suppliers
- Materials suppliers
- Consultants of all types of offsite construction processes

Host Organizations:

National Institute of Building Sciences | The Associated General Contractors of America | Modular Building Institute

Supporting Organizations:

Modular Home Builders Association | VirginiaTech Invent the Future | The Catholic University of America | SIPA Structural Insulated Panel Association

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CIRCLE 90

snapshot

PROJECT RUSSIA'S PAVILION AT EXPO 2015
LOCATION MILAN
DESIGNERS SPEECH

CANTILEVERED ALMOST 100 feet to the main avenue of Expo 2015 Milan, the canopy of the Russian Federation Pavilion dramatically invites visitors into the building's exhibition space. Its mirrored soffit reflects both pedestrians and the wood pathway leading to the rectilinear structure where Russia's contributions to global agriculture are displayed. Designed by Moscow-based architects SPEECH, the pavilion, which fits into a narrow site, is one of 96 at the Expo (page 39) that address the theme of feeding the planet. *Zachary Edelson*

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OPTIMIZE

Your Design Solutions for Light-Framed Multi-Story Construction

Seismic and wind events pose serious threats to the structural integrity and safety of structures. Building structures with a continuous load path can mean the difference between withstanding these types of natural disasters – or not.

All wood-framed buildings need to be designed to resist shearwall overturning and roof-uplift forces. For one- and two-story structures, structural connectors (straps, hurricane ties and holdowns) have been the traditional answer. With the growth in light-frame, multi-story wood structures, however, rod systems have become an increasingly popular load-restraint solution.

Simpson Strong-Tie Strong-Rod™ continuous rod tiedown systems are designed to restrain both lateral and uplift loads, while maintaining reasonable costs on material and labor. Our continuous rod tiedown systems include the Anchor Tiedown System for shearwall overturning restraint (Strong-Rod™ ATS) and the Uplift Restraint System for roofs (Strong-Rod™ URS).

Strong-Rod ATS for Overturning

Strong-Rod ATS solutions address the many design factors that need to be considered to ensure proper performance against shearwall overturning, such as rod elongation, wood shrinkage, construction settling, shrinkage compensating device deflection, incremental loads, cumulative tension loads, and anchorage.

Strong-Rod URS for Uplift

Strong-Rod URS solutions address the many design factors that need to be considered to ensure proper performance against roof uplift, such as rod elongation, wood shrinkage, rod-run spacing, wood top-plate design (connection to roof framing, reinforcement at splices, bending and rotation restraint), and anchorage.

Strong-Rod Systems have been extensively tested by engineers at our state-of-the-art, accredited labs. Our testing and expertise are crucial in providing customers with code-listed solutions. The Strong-Rod URS solution is code-listed in evaluation report ICC-ES ESR-1161 in accordance with AC391, while the take-up devices used in both the ATS and URS solutions are code-listed in evaluation report ICC-ES ESR-2320 in accordance with AC316.

Because no two buildings are alike, Simpson Strong-Tie offers many design methods using code-listed components and systems to help you meet your complex design challenges.

Let us help you optimize your designs. For more information about our Strong-Rod™ systems continuous rod tiedown solutions or traditional connector solutions, call (800) 999-5099 and download our new Strong-Rod™ Systems Design Guide at **strongtie.com/srs**.

SIMPSON Strong-Tie®

CIRCLE 91

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