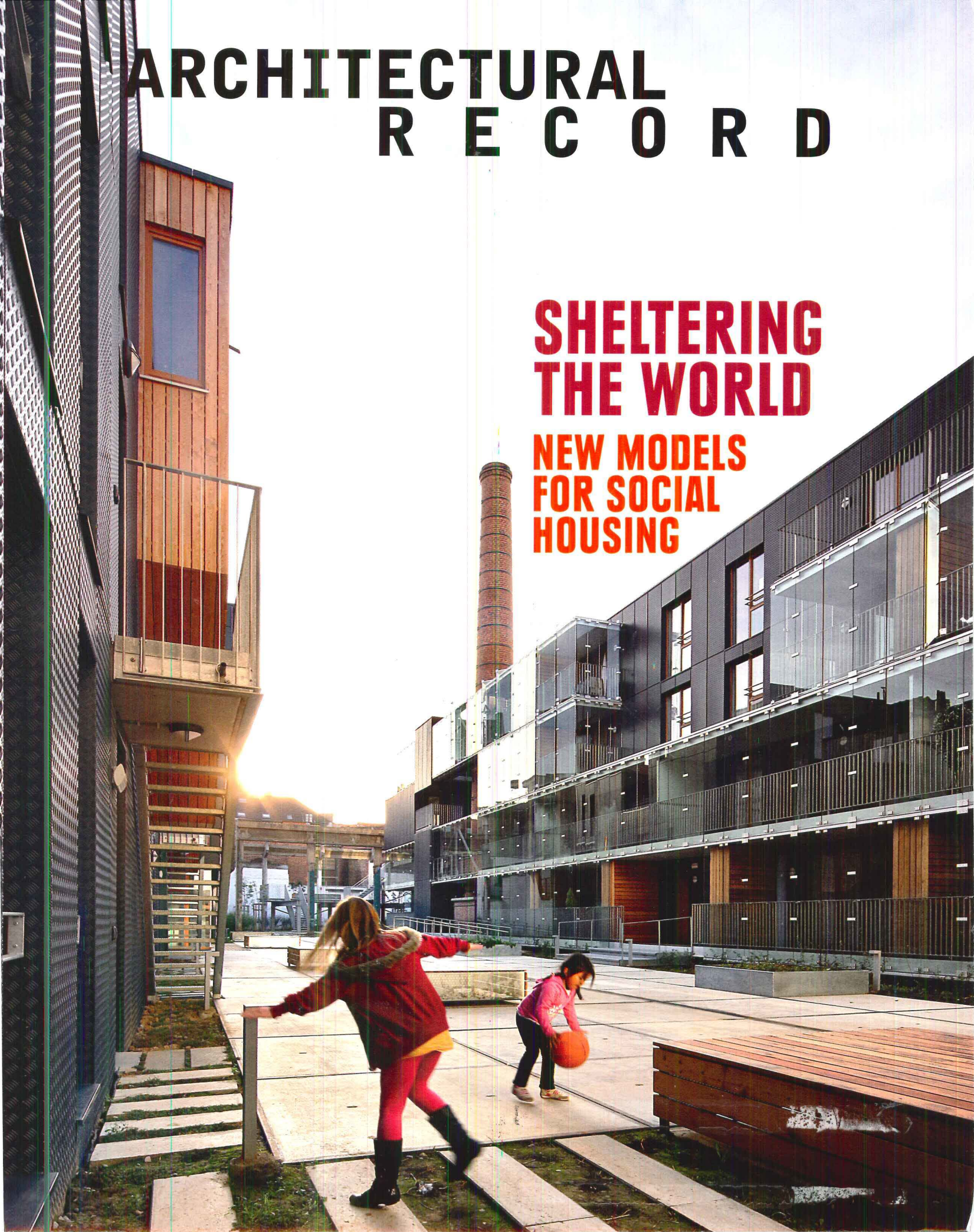



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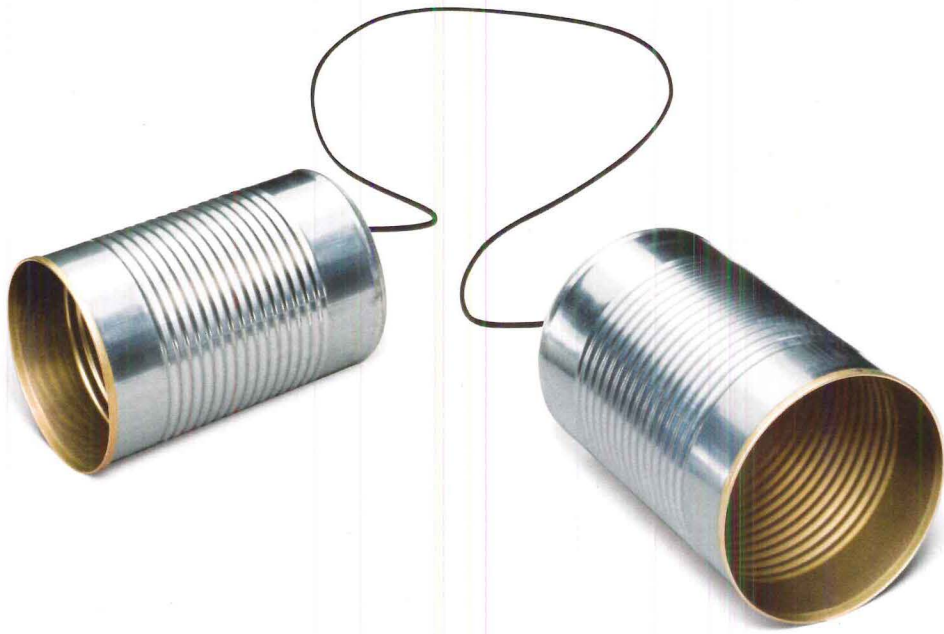
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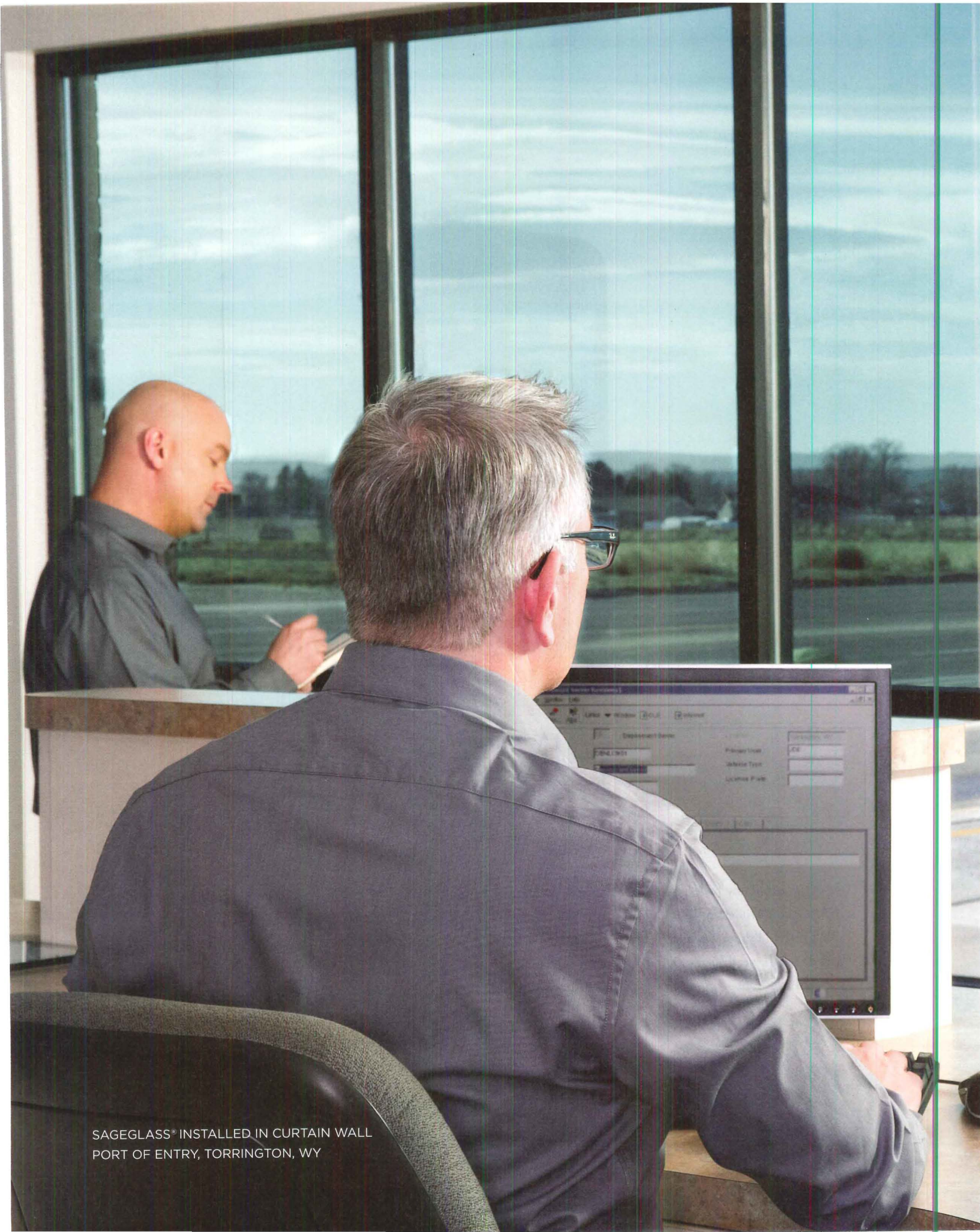
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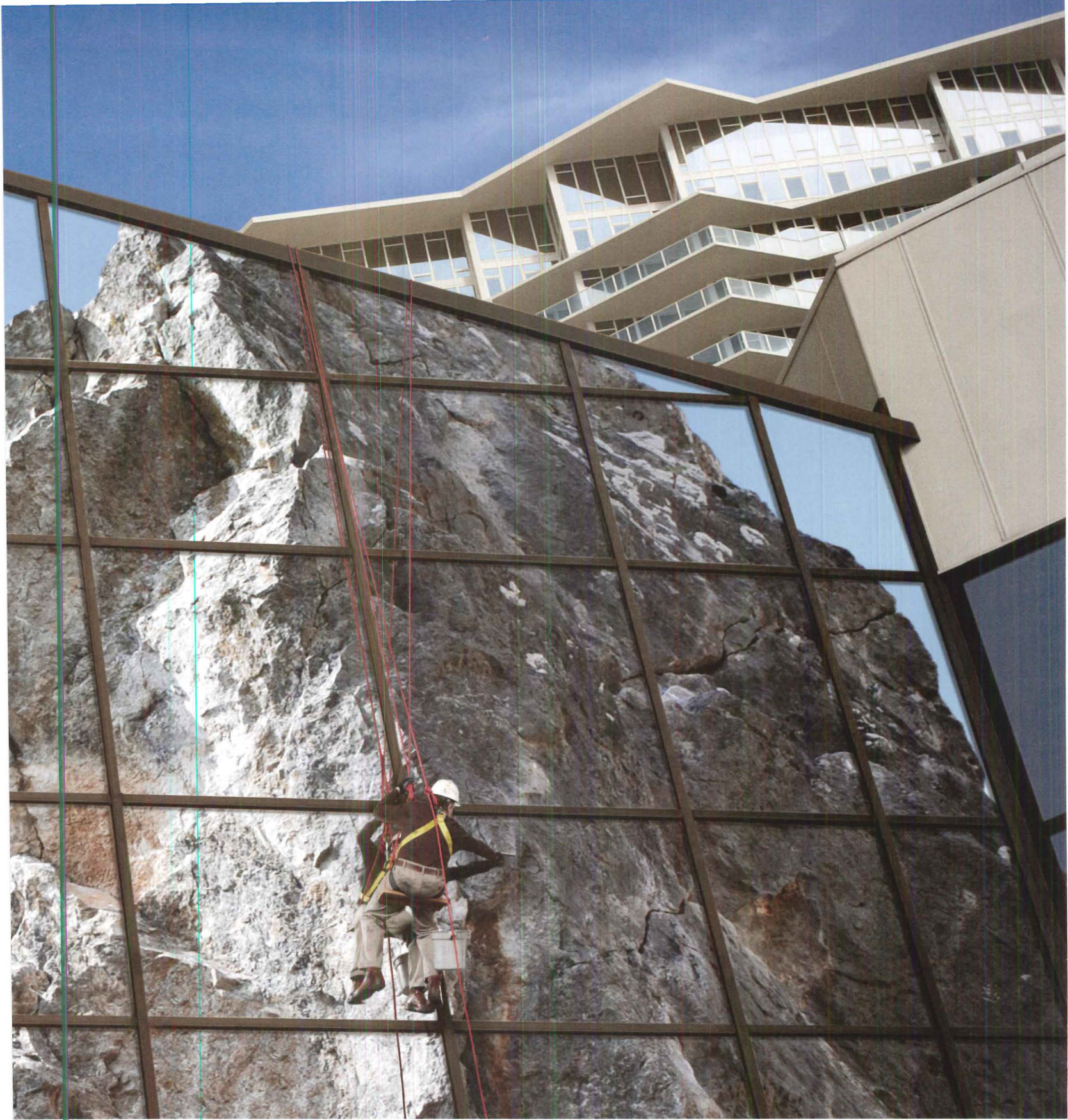


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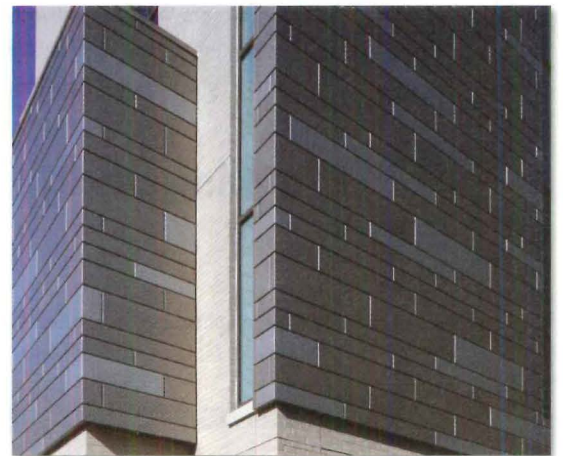
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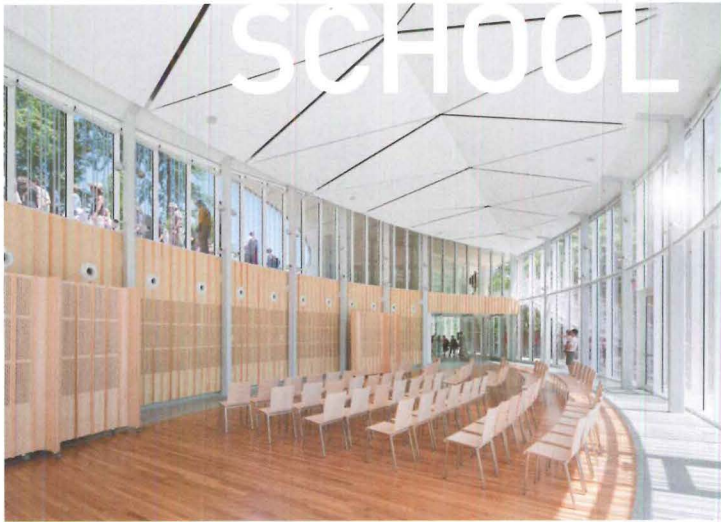


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With 10,000 species of plants, century-old **Brooklyn Botanic Garden** needed a visitor center to teach its more than 1 million visitors each year about horticulture. As green as its mission, the center's undulating glass curtain wall delivers high performance, minimizing heat gain while maximizing natural illumination. Skillfully integrated with park surroundings by architects **Weiss/Manfredi**, its organic transparency offers inviting respite between a busy city and a garden that has a lot of growing—and teaching—left to do.

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Architect: Weiss/Manfredi Architecture/Landscape/Urbanism  
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## WHAT'S UNDER FOOT: Floor trends from Tile of Spain



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Rethink the possibilities of Tile of Spain.



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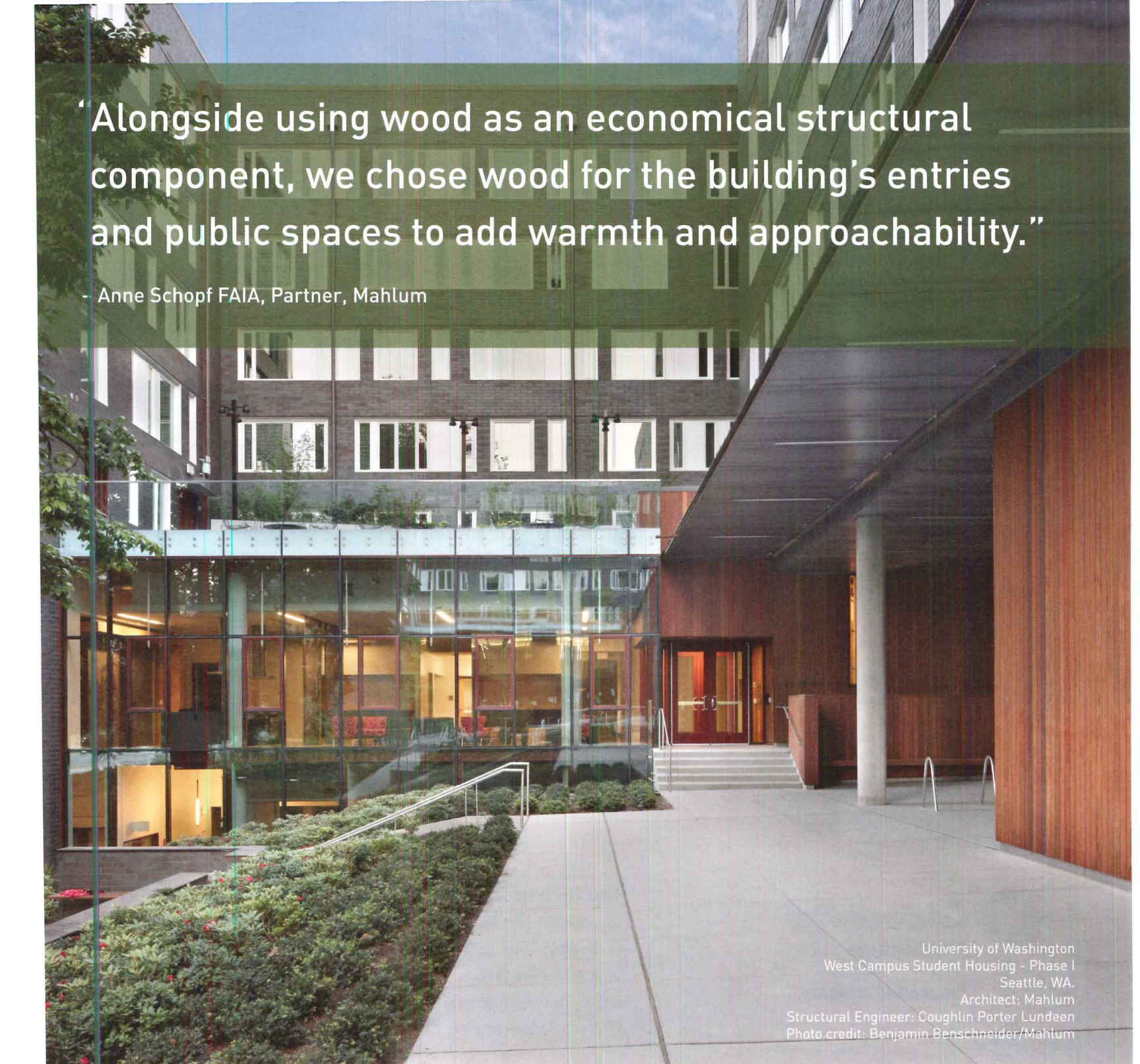
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- Anne Schopf FAIA, Partner, Mahlum

University of Washington  
West Campus Student Housing - Phase I  
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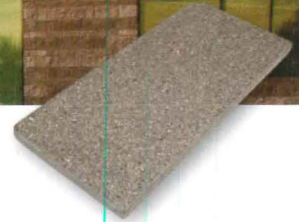
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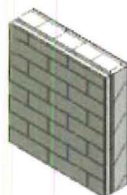


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**Project:** Burlington Central Library

**Location:** Ontario, Canada

**Architect:** Teeple Architects

**Product:** Pilkington Profilit™ translucent channel glass system, horizontal, with Lumira™ aerogel insulation





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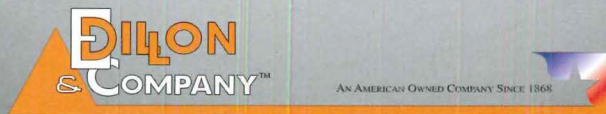
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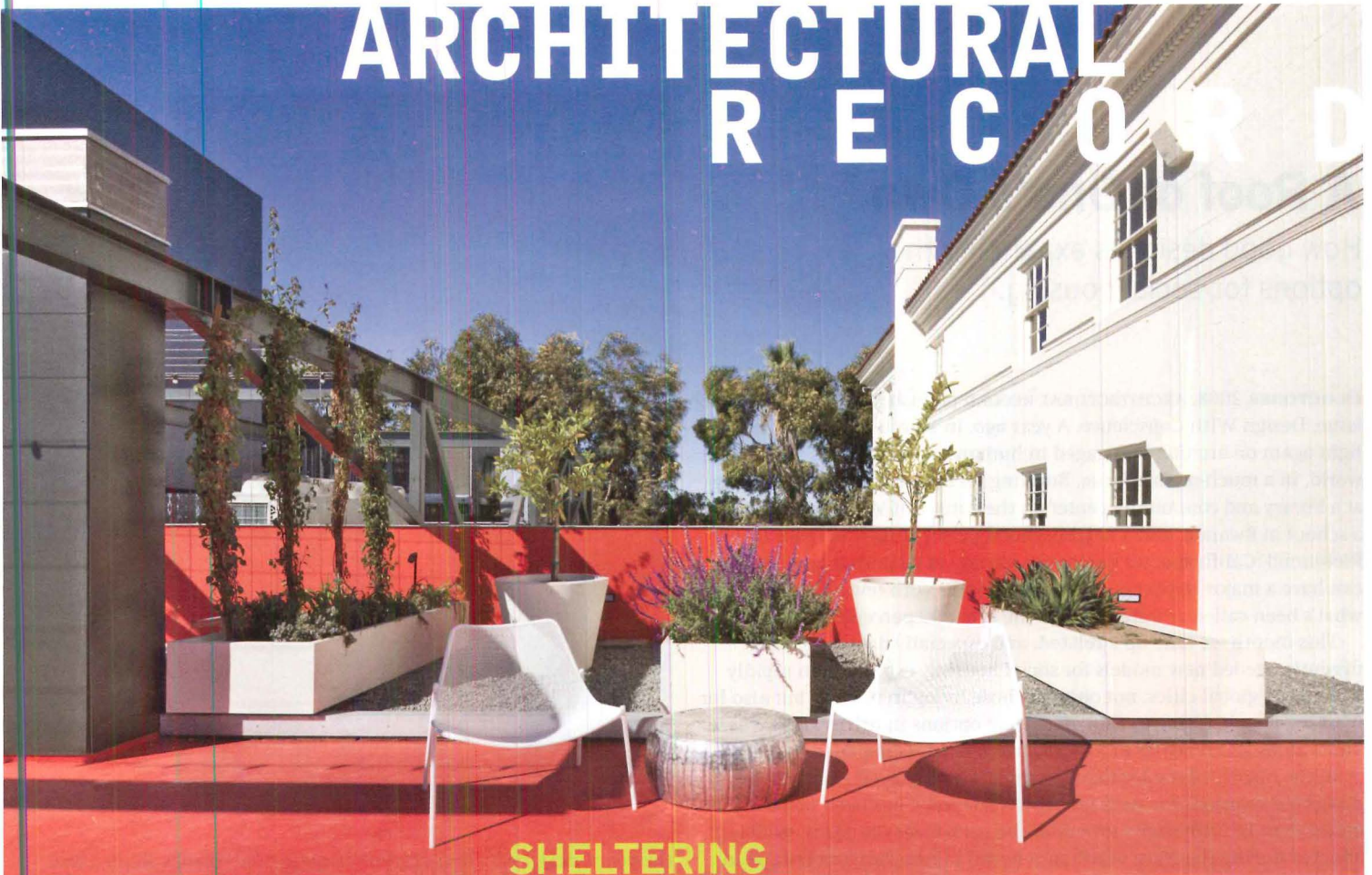
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CIRCLE 95

# ARCHITECTURAL RECORD



## SHELTERING THE WORLD NEW MODELS FOR SOCIAL HOUSING

# 03 2013

### NEWS

- 31 DAVID ADJAYE'S HARLEM HOUSING  
By Ronda Kaysen
- 34 MAKING A HOME IN ANTARCTICA By Chris Foges
- 35 NEWSMAKER: ALEJANDRO ARAVENA  
By Asad Syrkett

### DEPARTMENTS

- 22 EDITOR'S LETTER: A ROOF OF ONE'S OWN
- 44 ARCHITECTURAL ANALYTICS
- 46 BOOKS: HOUSING AROUND THE WORLD  
By Jayne Merkel and Clifford A. Pearson
- 49 HOUSE OF THE MONTH: JOHN LIN'S HOME  
FOR ALL SEASONS By Laura Raskin
- 51 SHELTER: IN SEARCH OF THE \$100 HOUSE  
By Lamar Anderson
- 59 SHELTER: SOCIAL HOUSING U.S.A.  
By Ben Adler
- 67 PRODUCT FOCUS: BUILDING ENVELOPES  
By Rita Catinella Orrell
- 70 PRODUCT BRIEFS: HEALTH CARE  
By Rita Catinella Orrell
- 184 DATES & EVENTS
- 188 READER SERVICE
- 196 SNAPSHOT: HOME-FOR-ALL  
By Laura Mirviss

- 81 INTRODUCTION
- 82 SAVONNERIE HEYMANS, BRUSSELS  
MDW ARCHITECTURE By Tracy Metz
- 86 LA VALENTINA STATION, CALIFORNIA  
DAVID BAKER + PARTNERS By Lydia Lee
- 89 SKYTERRACE @ DAWSON, SINGAPORE  
SCDA ARCHITECTS By Clifford A. Pearson
- 90 SKYVILLE @ DAWSON, SINGAPORE  
WOHA By Clifford A. Pearson
- 92 28TH ST. APARTMENTS, LOS ANGELES  
KONING EIZENBERG ARCHITECTURE  
By Sarah Amelar
- 94 BUTARO DOCTORS' HOUSING, RWANDA  
MASS DESIGN GROUP By Laura Raskin
- 98 2602 BROADWAY, CALIFORNIA  
DALY GENIK ARCHITECTS By Sarah Amelar
- 101 YINZHOU TALENT APARTMENTS, CHINA  
DC ALLIANCE By Clare Jacobson
- 102 THE HEGEMAN, BROOKLYN COOKFOX ARCHITECTS  
By Suzanne Stephens
- 104 JARDIM EDITE SOCIAL HOUSING, SÃO PAULO  
MABB & H+F ARQUITETOS By Tom Hennigan
- 106 FLOORANAUKIO HOUSING, HELSINKI HEIKKINEN-  
KOMONEN ARCHITECTS By Pentti Kareoja
- 109 TLACOLULA SOCIAL HOUSING, MEXICO  
DELLEKAMP ARQUITECTOS By Laura Mirviss
- 110 OWE'NEH BUPINGEH PRESERVATION PROJECT,  
NEW MEXICO ATKIN OLSHIN SCHADE ARCHITECTS  
By Joann Gonchar, AIA

- 114 RENEWED PROMISE  
TWO TEAMS OF ARCHITECTS EMPLOY VERY DIFFERENT  
STRATEGIES TO REINVIGORATE A PAIR OF AMBITIOUS  
1960S APARTMENT PROJECTS, ONE IN THE NORTH OF  
ENGLAND AND THE OTHER IN PARIS. By Chris Foges
- 120 BEYOND ARCHITECTURE By Flavie Halais


### BUILDING TYPES STUDY 932 HEALTH CARE

- 131 REY JUAN CARLOS HOSPITAL, MADRID  
RAFAEL DE LA-HOZ ARQUITECTOS By David Cohn
- 136 ANN & ROBERT H. LURIE CHILDREN'S HOSPITAL,  
CHICAGO ZGF ARCHITECTS, SOLOMON CORDWELL  
BUENZ, ANDERSON MIKOS ARCHITECTS By Lee Bey
- 140 ARIZONA STATE UNIVERSITY HEALTH SERVICES-  
TEMPE BUILDING, ARIZONA  
LAKE|FLATO ARCHITECTS By David M. Brown

ABOVE: 28TH ST. APARTMENTS, BY KONING EIZENBERG ARCHITECTURE. PHOTO BY ERIC STAUDENMAIER.

ON THE COVER: SAVONNERIE HEYMANS, BY MDW ARCHITECTURE. PHOTO BY FILIP DUJARDIN.

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In a February article about the Claire T. Carney Library, we misattributed a source as Catherine Gardner. The source is Catherine Fortier-Barnes, assistant dean for library services.

## A Roof of One's Own

How good design is expanding the options for social housing.

IN OCTOBER 2008, ARCHITECTURAL RECORD published a groundbreaking issue, *Design With Conscience*. A year ago, in March 2012, we cast a light again on architects engaged in humanitarian projects around the world, in a much-praised issue, *Building for Social Change*. By looking at a library and community center on the fringes of Medellín, Colombia, a school in Rwanda, and a neighborhood performing-arts space in Richmond, California, we explored a variety of ways that good design can have a major impact on people and places with few resources—what's been called architecture for the other 99 percent.

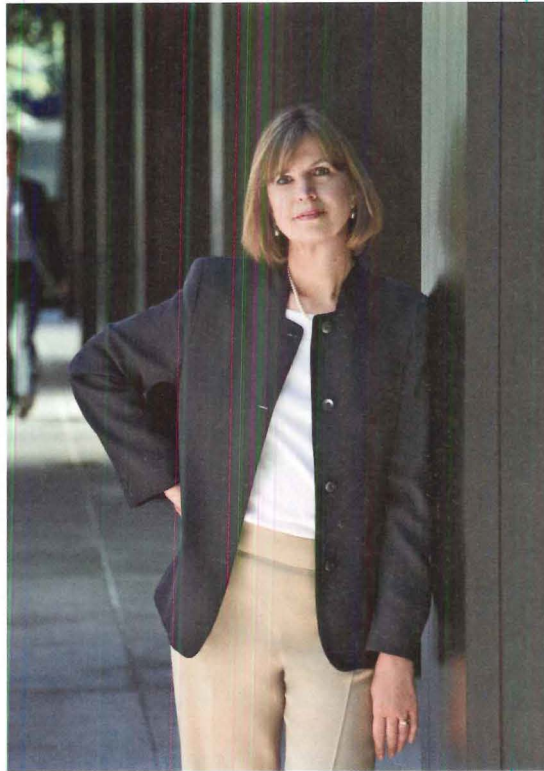
This month we take up a related, and especially daunting, topic: urgently needed new models for social housing, especially in rapidly expanding global cities, not only for those living in poverty but also for working people trying to find affordable options in urban areas where land values and housing shortages have sent rents soaring.

In the history of modernism, architects have played a big role in designing solutions for such problems. No model has been more influential than Le Corbusier's towers-in-the-park from the 1920s. Widely adopted during the wave of urban renewal in America and Europe in the 1950s and '60s—and later attacked as the perfect incubator for crime and other social ills—high-rise public housing has been exported everywhere, particularly to China, where forests of cheaply built residential towers march depressingly from the centers of its mega-cities toward the horizon.

The most damning symbol of the high-rise as housing for the poor is, ironically, a skyscraper never intended for that purpose: Torre David, a mirrored glass office building in Caracas that was left abandoned and unfinished after a banking crisis in 1994. Since 2007 it has been home to a community of 3,000 squatters, with its own elaborate and controversial social structure. RECORD contributing photographer Iwan Baan documented life in this unforgettable makeshift dwelling in *Torre David*, a book that the *Financial Times* named one of the best of 2012 (page 122).

Many experts no longer believe that public-housing towers should necessarily be toppled. Instead, architects are collaborating with professionals in housing and social services to design new residential buildings or renovate existing structures in ways that provide better security and more light, common spaces, recreational amenities, and facilities for support services (page 59).

Today it's clear that no single typology offers a universal solution; rather, social housing must reflect local conditions and cultures. In Singapore, where more than 80 percent of the population lives in government-built housing, urban density dictates towers. But because of the tropical climate, new high-rise public residences designed by the firm WOHA can feature gardens and open community spaces gracing the roofs, the ground, and the lofty levels in between (page 90). In La Valentina Station, in mostly low-rise Sacramento, California, David Baker, an architect who's built dozens of social-housing projects over



the years, designed a four-story subsidized apartment complex that fits neatly into the scale of the cityscape. He also artfully juggled the budget to specify a few luxe materials—such as the water-jet-cut Cor-Ten for the ornate balcony fronts—to create housing that doesn't scream “affordable” but looks market-rate (page 86). Like the project in Singapore, it was planned to be close to mass transit.

Such projects are symbols of hope, but the reality of the global housing crisis is grim. According to the United Nations, 3.5 billion people now live in urban areas, with more than 1 billion of them in slums or informal settlements. (To put real faces against these staggering statistics, read Katherine Boo's gripping account of Annawadi, the “slumbai” next to Mumbai's international airport, in her book *Beyond the Beautiful Forevers*, winner of last year's National Book Award for nonfiction.) The complexity of the issues surrounding these makeshift communities—migration and population growth, public health, economics, corruption and governance—is beyond what architecture and planning alone could ever address (page 120). But architects are expanding their reach, using their creativity and problem-solving skills in broader collaborations with experts from social science, government, finance, and NGOs. Whether bringing good design to large-scale public housing or devising incremental interventions in the world's most challenged settlements, these architects are making a difference every day. ■

Cathleen McGuigan

Cathleen McGuigan, Editor in Chief



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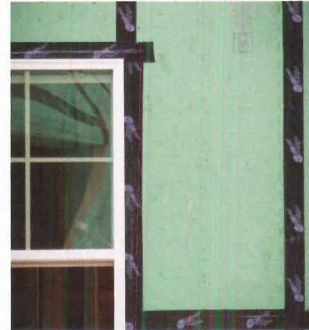
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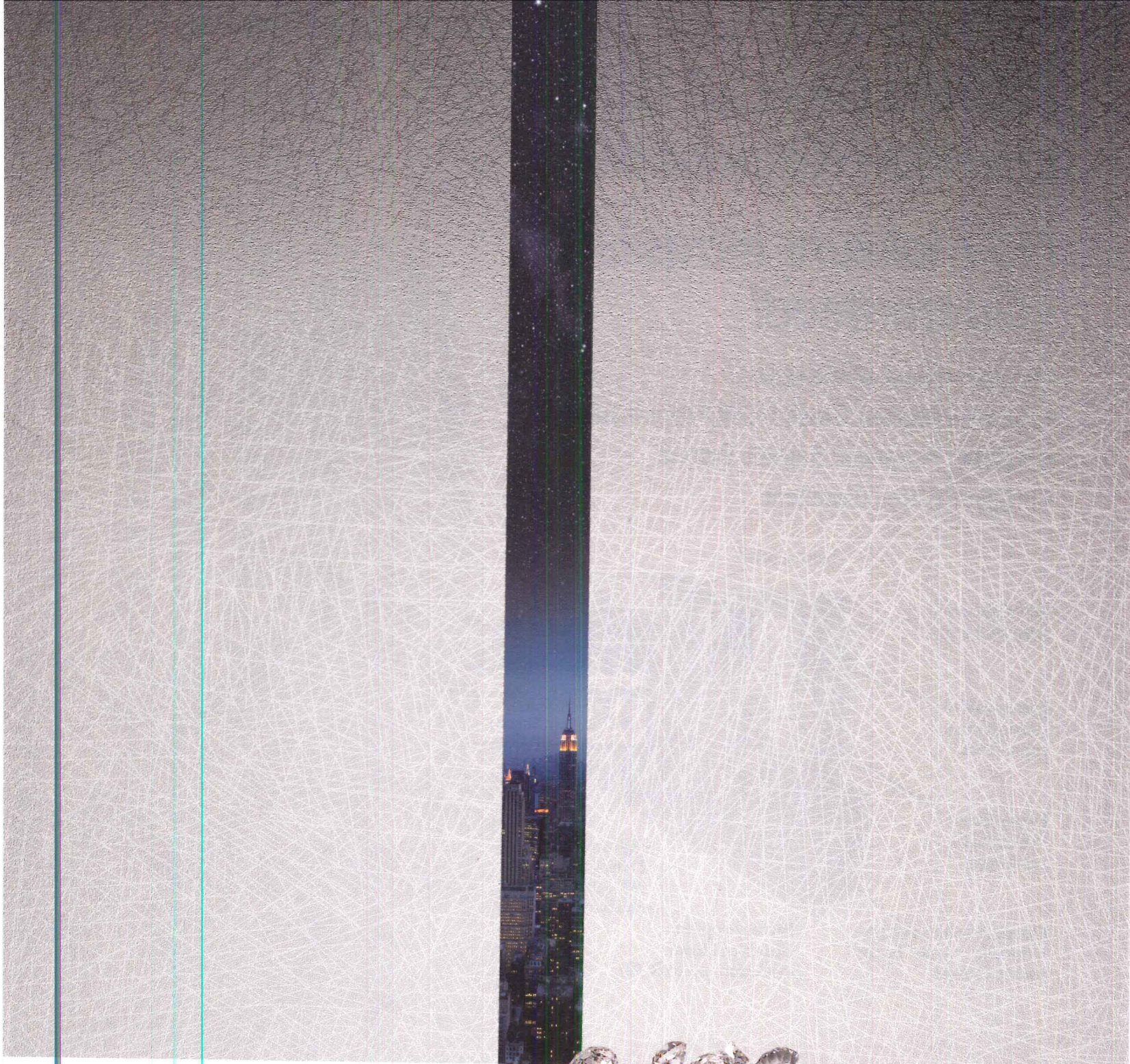
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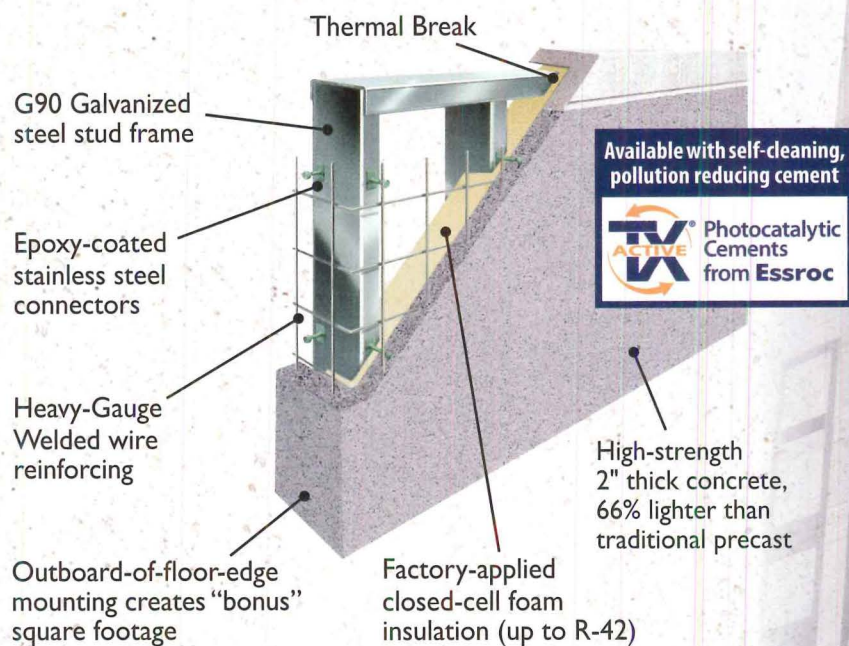
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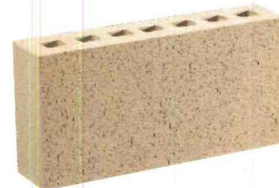
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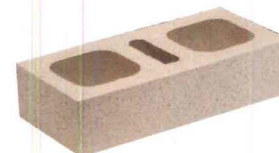
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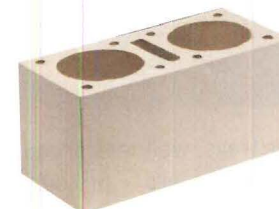
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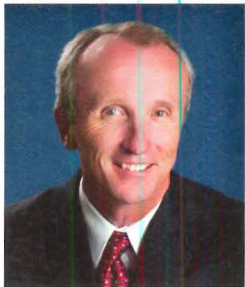
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# perspective

## A Role Model for New York City's Affordable Housing

BY RONDA KAYSEN



Sugar Hill Housing in Harlem will provide 124 units of affordable housing. It will finish construction in December.

**AN URBAN** farm on the rooftop of a David Adjaye-designed affordable-housing project in Harlem will provide fresh produce and income for the building sometime after construction has been completed in December.

An \$80 million development in the historic New York City neighborhood, Sugar Hill Housing will offer 124 units of rental housing for low-income adults and families. Adjaye's stepped-profile design, with a rose-embossed, textured precast-concrete facade, makes it the latest example in a trend to replace bland institutional architecture typical of affordable

housing with creative and striking design.

The rooftop farm, along with plans for a farmers' market in the entrance plaza, provides another example of affordable housing's potential to improve quality of life for neighborhoods. Students at Columbia University are devising a business plan for the 3,500-square-foot farm. Broadway Housing, the nonprofit developer, hopes to model the farm after others like Brooklyn Grange, which operates 2½ acres of farmland on buildings in Queens and the Brooklyn Navy Yard.

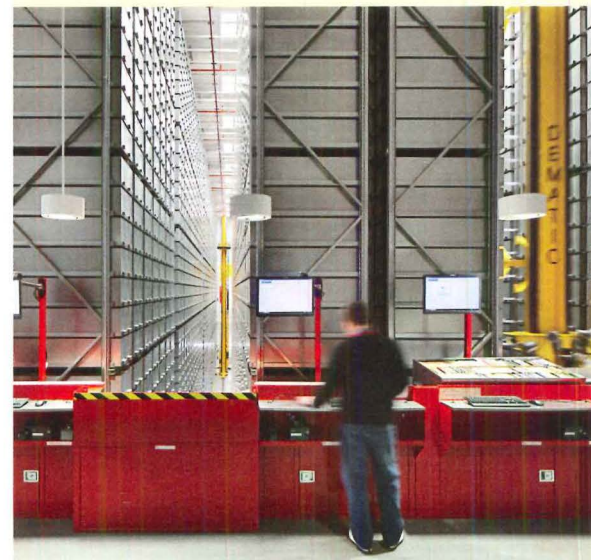
"There's been a lot of attention given to

**We do need a new architecture for this new world: more Frank Gehry than formal Greek. Where once a few strong columns could hold up the weight of the world, today we need a dynamic mix of materials and structures.** —Hillary Rodham Clinton, using a metaphor to describe U.S. foreign policy, January 31, 2013

## Unveiled: Snøhetta's Hunt Library

The Oslo- and New York City-based firm Snøhetta recently completed the James B. Hunt Jr. Library on North Carolina State University's Raleigh campus. The long rectangular volume provides 221,000 square feet of space for up to 1,750 students in traditional and informal study rooms, technology labs, and lounges. An envelope of fritted glass crossed by a zigzag of aluminum sunshades lets in daylight and permits views to a nearby lake. An automated book-delivery system reduces the space needed for stacks and can accommodate a collection of 2 million volumes. In addition to library functions, the facility includes academic offices, an auditorium, and a political think tank.

William Hanley



An automated book-delivery system, supported by browsing software, saved 200,000 square feet of space.

View additional images at [architecturalrecord.com/news](http://architecturalrecord.com/news).

luxury and middle-income housing, but there hasn't been a discussion about affordable housing in New York," says Adjaye. "It was a subject that architects needed to rethink now, so that we can contribute in a meaningful way."

Innovative affordable housing is on the rise in New York City, starting with Via Verde, a complex designed by Dattner Architects and Grimshaw Architects that opened in the Bronx last year. In January, the city tapped nARCHITECTS for a prefabricated tower of micro-unit apartments in Manhattan, 40 percent of which will be for low- and middle-income residents.

"The quality of the design and the quality of the finishes has increased tremendously for a lot of low-income housing these days," says Saky Yakas, a managing partner at SLCE Architects, the architect of record for Sugar Hill Housing. "The expectations of the sponsors and even of the city agencies are far greater than they used to be."

For many years, New York City and affordable-housing groups focused their efforts on renovations. But with few properties left to redevelop, developers have turned to new construction.

The 13-story Sugar Hill development will also house a 15,000-square-foot children's

museum of art and storytelling, an early-childhood learning center, a parking garage, and office space.

Adjaye, who designed the National Museum of African American History and Culture at the Smithsonian Institution in Washington D.C., which opens in 2015, has also designed houses for many artists. His background in gallery design is evident in Sugar Hill. The first floor has a glass facade, so the upper floors appear to float above the base. The glass has another benefit: it brings light into the subterranean children's museum.

Light is a critical component throughout the building. The punched windows are set at different levels. Because of the building's location, perched on a ridge on the corner of St. Nicholas Avenue

and 155th Street, residents will have views down to Battery Park. In an unintentional nod to how far the designs of affordable housing have come, the building also over-

looks the Polo Grounds Towers, a hulking 1968 public-housing project.

For residents, 20 percent of whom will be formerly homeless, the design of the building may come second to simply having quality housing. "The recognition that David Adjaye is a world-class architect will only be understood once residents experience the asymmetrical windows and the light that's cast in their living space," says Ellen Baxter, executive

director of Broadway Housing. "All of us are looking forward to understanding what it's like to be affected by that. I don't even know myself yet." ■



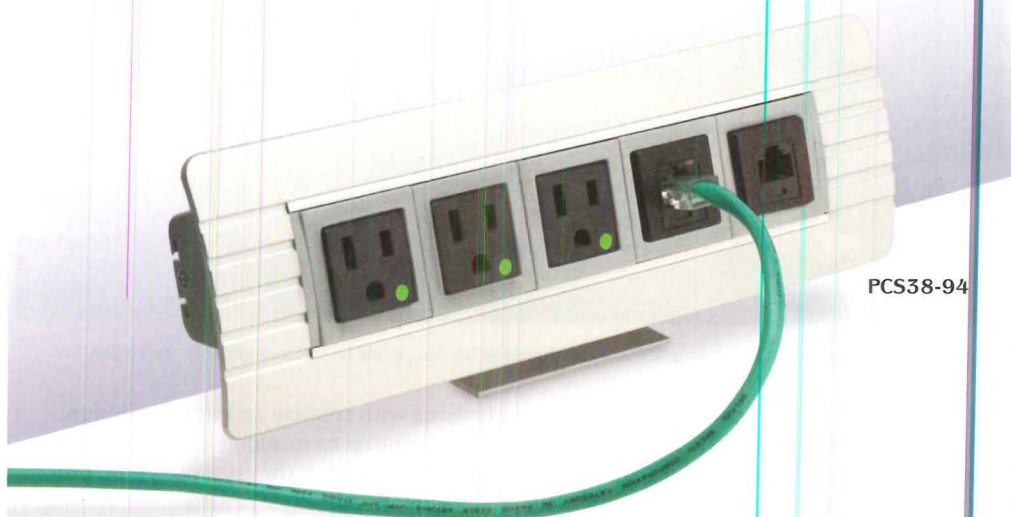
The upper floors appear to float above the base.

IMAGE: COURTESY ADJAYE ASSOCIATES

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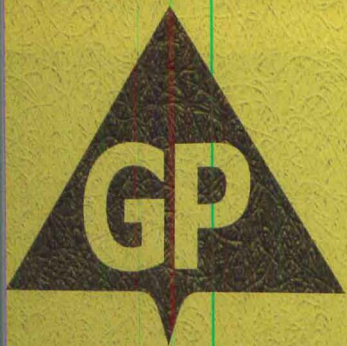
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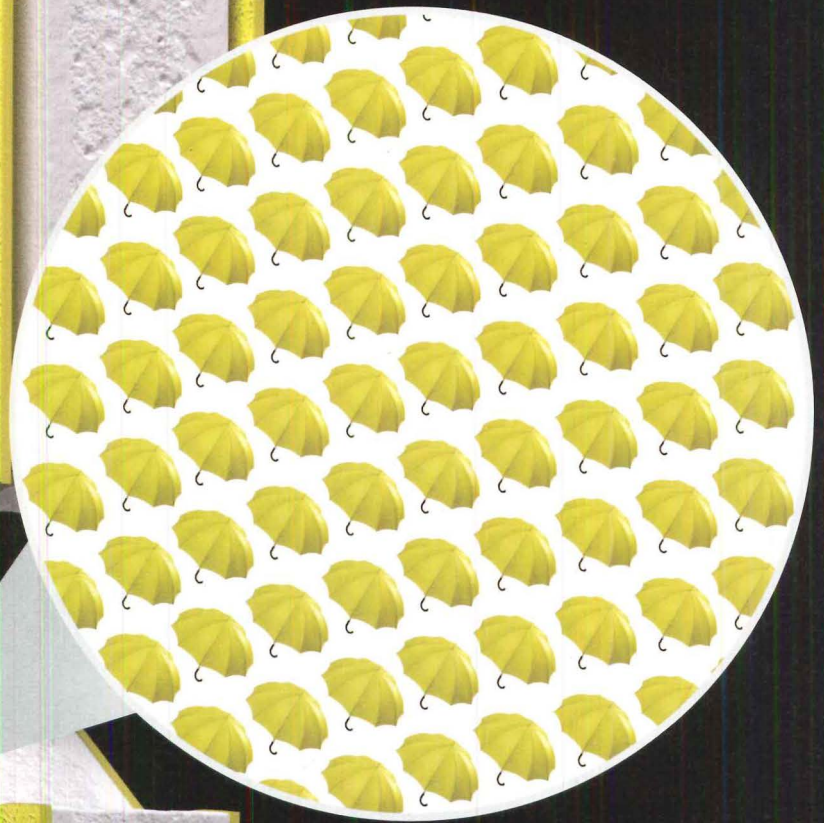
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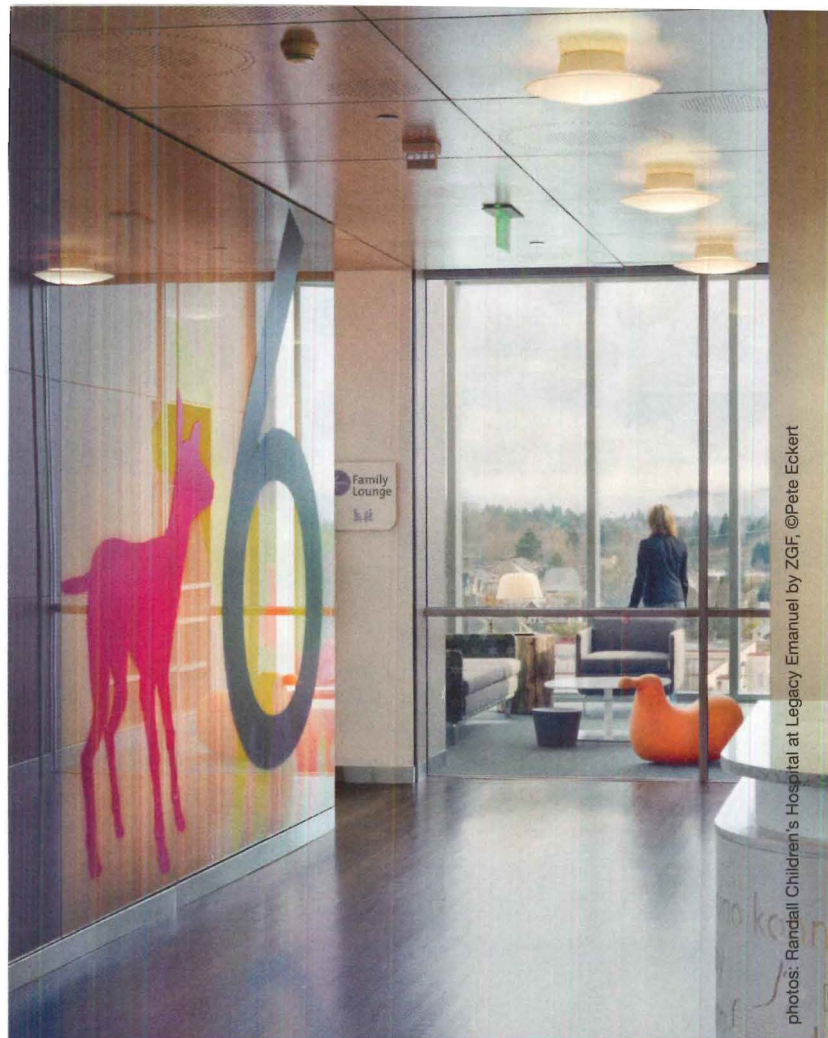
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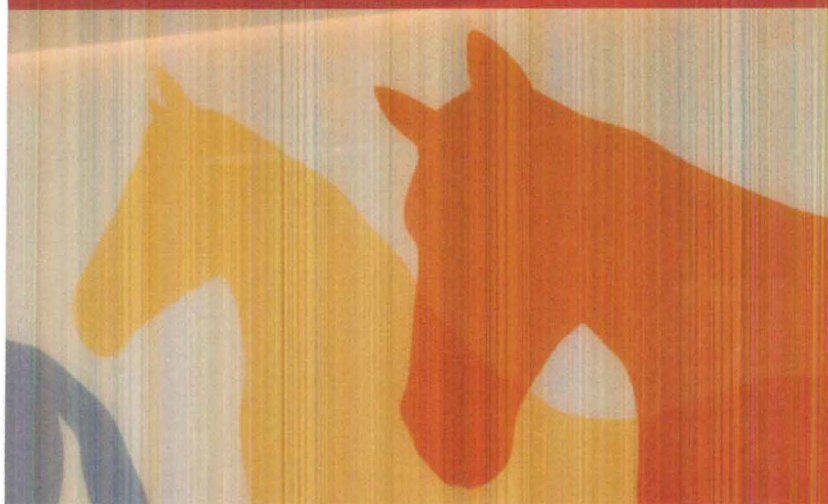
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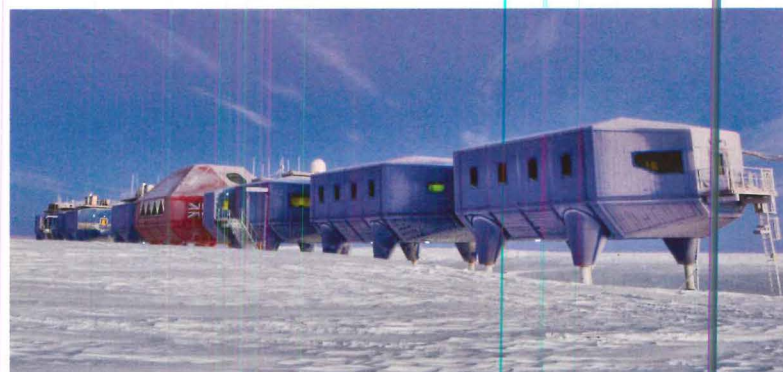
# Making a Home in Antarctica

BY CHRIS FOGES

WHEN HUGH BROUGHTON Architects won a design competition for the Halley VI Antarctic research station, which officially opened February 4, the small London-based office had no experience working in extreme environments. But its proposal, developed with AECOM, impressed the jury both for its technical ingenuity and its understanding that for up to 50 scientists, this inhospitable place is home.

The British Antarctic Survey (BAS) established the Halley research station on the Brunt Ice Shelf in 1956. Its first four bases were lost to the ice, which piles up relentlessly—over 3 feet each year—burying and eventually crushing any building sitting on the ground. A fifth was constructed on steel legs that could be elongated with great effort, but after 20 years of service the legs are encased in 75 feet of ice and break when it moves.

For Halley VI, BAS wanted an easier way to stay clear of the terrain. Broughton's solution was to place eight modules on extendable hydraulic legs. The legs are retracted one by one, and 3 feet of snow is piled underneath each of them. Extending their legs again, the



The Halley VI research station operates on an ice shelf 900 miles from the South Pole.

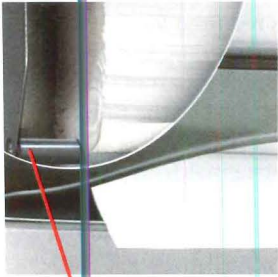
buildings haul themselves clear of the rising ground for another year.

The design of the new station also solves another key problem: the ice shelf itself flows toward the ocean, a quarter-mile each year. Buildings that cannot be moved have a 10-year life span. Halley VI's legs are fitted with giant skis; when the time comes, the modules will be towed inland by bulldozers.

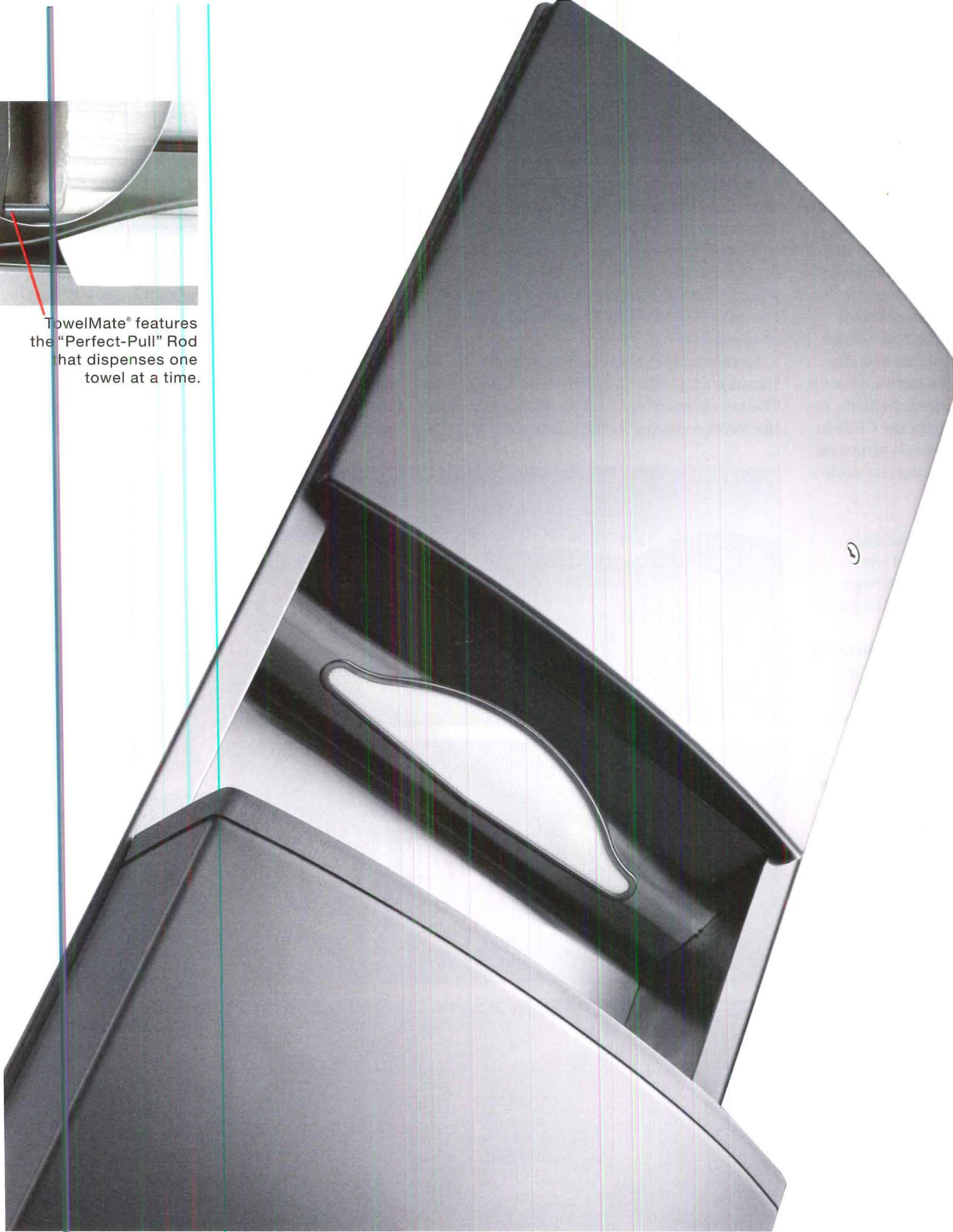
Linked by short, flexible corridors, the modules stand in line like a desert caravan, perpendicular to the direction of the prevailing wind, which blows away snow from underneath. Living accommodations and laboratories, clad in blue glass-reinforced plastic, are positioned on either side of a larger unit clad in red. This red module contains a social space that is crucial to the well-being of the small crew who live at Halley year-round. Brutal winter conditions of 24-hour darkness, temperatures of minus 60 degrees Fahrenheit, and 100-mile-per-hour winds leave them vulnerable to depression and stress—"winter-over syndrome." Home comforts include a hydroponic salad garden within a double-height central space lined with Lebanese cedar, selected for its scent. The architect also worked with a color psychologist to identify "refreshing and stimulating" shades, and developed a bedside lamp with a daylight bulb to simulate sunrise.

"It has been a fascinating project," says Hugh Broughton, "because it combines microscopic examples of many different building types—an operating theater, air-traffic control, a power plant—rolled into 20,000 square feet." ■

View additional images at [architecturalrecord.com/news](http://architecturalrecord.com/news).



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[ NEWSMAKER ]

## Alejandro Aravena

BY ASAD SYRKETT

ELEMENTAL IS at the fore of socially conscious design. Gary Hustwit featured the Chilean design office's subsidized-housing units in Santiago in his well-received 2011 documentary *Urbanized*. And the firm's monograph *Incremental Housing and Participatory Design Manual* appeared in time for the 13th Venice Architecture Biennale last August. RECORD caught up with Elemental's executive director, Alejandro Aravena, to talk about the firm, its soon-to-be-completed housing in the Chilean city of Constitución, and Aravena's stance on the role of architects in sheltering the world's expanding population.

**How did you arrive at your firm's name, Elemental? And why did Elemental use *Incremental Housing and Participatory Design Manual* as the title for the book you released last summer?**

When we work on social housing, Elemental delivers the essential parts of a house and the owners add on to what we deliver. This approach to housing has been around since British architect John F.C. Turner's work in Peru in the late 1950s, so it's not just our philosophical view. This strategy was a consequence of not having enough financing for projects—on average, only about \$7,500 per unit. Most housing costs about \$10,000 to \$12,000 per unit. We tried to provide only what is difficult for families to acquire: the land, the frame of the house, and a connection to utilities. It was far more important to use our limited funds to build a well-located complex of social housing—close to jobs, to education, to transportation. So incremental housing was our answer.

**Was this the approach you took for the Lo Barnechea housing in Santiago [RECORD, March 2012, page 70]?**

Yes. We said, "Let's focus on what families will never be able to achieve on their own and then allow them to complete the house."

**How has that project influenced attitudes toward social housing in that city?**

The quality of public housing was always a big question mark in Chile. Quantity was OK—Chile is the only country in the world that has reduced its housing deficits. But we found that the question "What is quality?" needed to be reframed from just being about making bigger units. For us, a quality unit gains value over time. In developing nations, you get a subsidy from the state and you become an owner of your unit. We sought to harness the housing policy not just to create shelter but to use it as

## perspective news

a tool to allow residents to take out bank loans, to start small businesses, or pay for a better education for their children. So we reframed "quality" as housing being delivered as an investment and not just as a social advancement. Our plan, based on research we'd conducted, was very well received by society, by the families, and by politicians. **What about the forestry workers' housing in Constitución? How did Elemental get this commission?**

Elemental is the result of a partnership with Santiago's Catholic University and COPEC, the Chilean oil company. COPEC also owns Arauco, the forest company in the south of Chile in the

our studies and documents required for a coordinated, efficient reconstruction. So what we're building in the south now is part of the process of reconstruction—they'll be the first things built.

**Not every firm is able to partner with major energy corporations or universities. What role can architects play in addressing the world's growing need for housing?**

If there's any power in architecture or in design, it's the power of synthesis. When you face complex issues, such as reconstruction following an earthquake, you have to think about schools, institutional buildings, housing energy, and sewage. And that requires a level



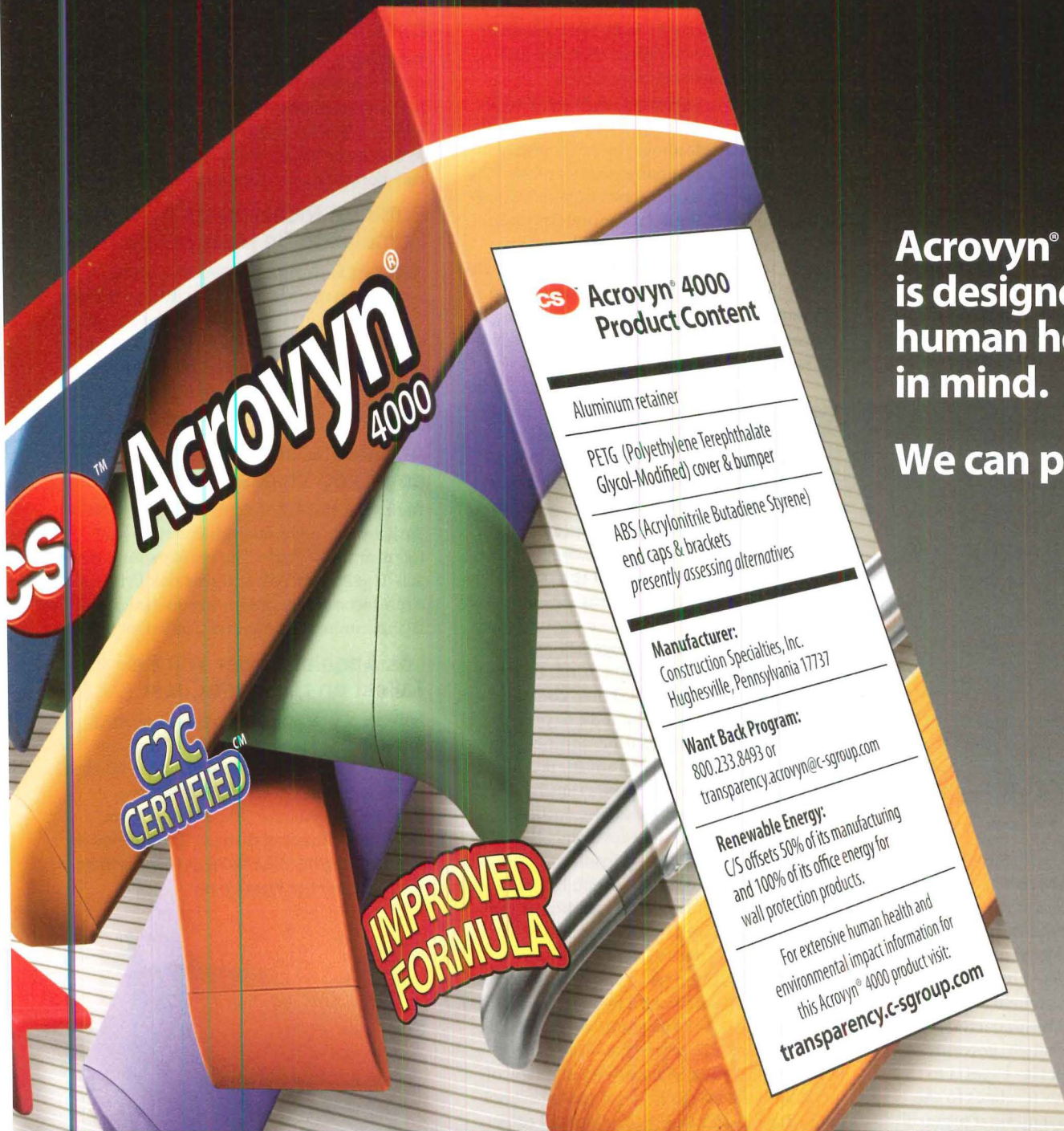
Aravena (above) and Elemental's Lo Barnechea housing in Santiago (left top) garnered attention last year. Today construction is under way on housing for forest-company workers (center) in Constitución, in the south of Chile. A municipal theater (bottom) is also planned for the city, which is rebuilding after an 8.8-magnitude earthquake roiled the region in 2010.

city of Constitución. After the 8.8-magnitude earthquake in 2010, the company asked us to try and create new housing for its workers with the Elemental approach, seeing as they're already applying for state subsidies. And we plan to build about 9,000 units for its workers. We'll also be redesigning the entire city of Constitución, and donating to the government

of coordination that is quite hard to achieve. Architects can offer design as a powerful tool in order to tackle more dimensions of a problem simultaneously, while keeping the problem simple enough to solve.

**So what's next for Elemental? What do you have on your agenda?**

We spend one-third of our time on social housing, a third on this new city, and a third doing private architecture. We're also currently working on projects for Novartis and Catholic University, among others. ■



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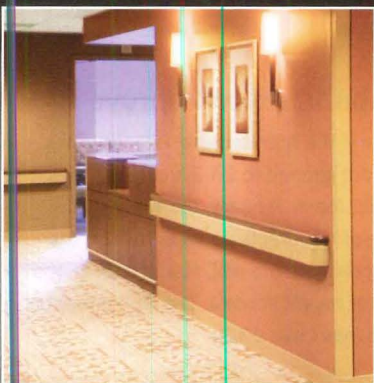
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# Tackling Safety Through Design

BY LAURA FISHER KAISER

IN THE wake of the December massacre at Sandy Hook Elementary School in Newtown, Connecticut, school districts around the country are grappling with “how to marry 20th-century environments with 21st-century technology and make our schools safe,” said architect Irene Nigaglioni, chair of the Council of Educational Facility Planners International



Sandy Hook Elementary School in Newtown, Connecticut.

(CEFPI), at its School Security Summit in Washington, D.C., on February 7.

Echoing many speakers at the meeting, Nigaglioni, a partner at the Dallas-based PBK Architects and the mother of a second grader, said she was deeply affected by the tragedy. She convened the summit, held at the U.S. Green Building Council headquarters, to bring together architects, educators, government agencies, NGOs, and security experts to discuss school security as it relates to the planning, design, and operational protocol of the physical environment.

Franklin Brown, planning director of the Ohio School Facilities Commission, voiced a frustration among architects trying to improve safety through design: “The main thing schools want is a list of retrofits by cost.” No such list exists; costs vary greatly by region.

Locking systems are typically at the top of the security-upgrade menu, specifically “Columbine locks,” which allow teachers to secure classrooms from the inside. Since the 1999 shooting rampage at Columbine High School in Colorado, many school districts have looked into installing them, although they are

## perspective news

costly and controversial. Still, some planners are pushing for mechanisms that shut and lock classroom doors automatically.

Steve Turckes, a principal at Perkins+Will, winced at the idea of locked classrooms. “We need to think more about the perimeter of a site or a building as a point of deterrence,” he said. Creating “concentric circles of protection”—a tenet of Crime Prevention Through Environmental Design (CPTED) theory, in which a series of physical barriers and security systems delay or thwart an attacker—has to be balanced with the need for a welcoming environment. “It’s a constant struggle to create access controls and have a school remain

engaging,” said Scott Layne, an assistant superintendent of Irving Independent School District in Texas. “If we make schools like prisons, we’ve taken away designers’ critical mission.”

For many schools, security starts at the front door with cameras, buzzers, and metal detectors. But before going gadget shopping or redesigning their buildings, schools should conduct a security audit to pinpoint their vulnerabilities, said John Fannin III, president of KCI Protection Technologies. He cautioned against focusing all efforts

on the “active shooter” scenario. After all, the odds of a student dying at school, by homicide or suicide, were only one in a million at the time of a 2004 joint U.S. Department of Education/Secret Service report.

Yet the perception that schools are increasingly dangerous has been a boon to the security industry. The day of the summit, Maryland’s Prince George’s County School District proposed spending \$5.6 million on a slew of security upgrades including a special school police force. Later this year, Ohio will offer grants to schools to purchase a state-of-the-art radio and digital-data network used by first responders. Meanwhile, the Buckeye Firearms Association, an Ohio-based pro-firearms political-action committee, claims that more than 600 people have applied to its Armed Teacher Training Program.

“There’s the old belief that we can do everything possible to make kids safe, but if one crazy person gets inside a school nothing can stop him,” said Layne. “But the debate over school-campus security should not be overshadowed by talk that it’s impossible to make schools safer.” ■

## noted

### Michael Graves Appointed to Federal Agency

President Barack Obama appointed Michael Graves to the U.S. Access Board, an independent federal agency devoted to accessibility for people with disabilities. In 2011, Princeton, New Jersey-based Graves and design firm IDEO collaborated on houses for wounded veterans

### Buffalo’s Richardson Olmsted Complex to Be Redeveloped

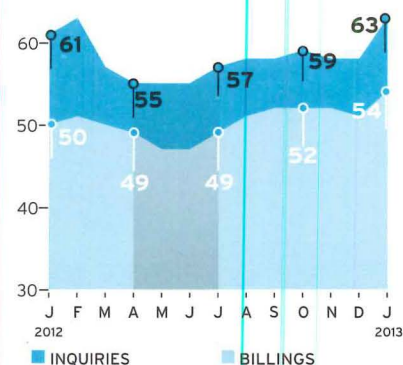
New York Governor Andrew M. Cuomo announced that the 1870 Richardson Olmsted Complex in Buffalo will be developed into a boutique hotel, conference center, and architecture center. Flynn Battaglia Architects, Deborah Berke Partners, and Goody Clancy have been selected for the design.

### Architectural League’s Emerging Voices Announced

Each year, the Architectural League of New York awards eight emerging architecture firms or individuals. The winners for 2013 are SO-IL; PRODUCTORA; Ogrydziak Prillinger Architects; MASS Design Group; Gracia Studio; Dlandstudio; DIGSAU; and Cao|Perrot Studio.

### Los Angeles Tower Will Be Tallest on the West Coast

In February, AC Martin Partners unveiled plans for Los Angeles’s Wilshire Grand, a 73-story high-rise office, hotel, and residential tower to be located on the site of the demolished Wilshire Grand Hotel in the downtown financial district. If completed as planned in 2017, the 1,100-foot tower will be the tallest on the West Coast.



### ABI Continues to Improve

In January, the Architectural Billings Index (ABI) score jumped to 54.2, up from 51.2 in December (each January, the American Institute of Architects updates the factors used to calculate the ABI, resulting in a revision of recent scores). The new-projects-inquiries index was 63.2.



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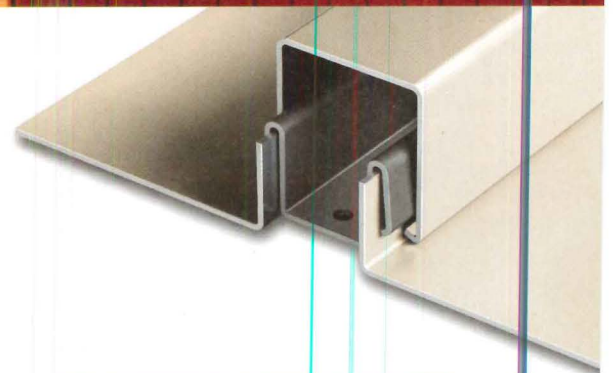
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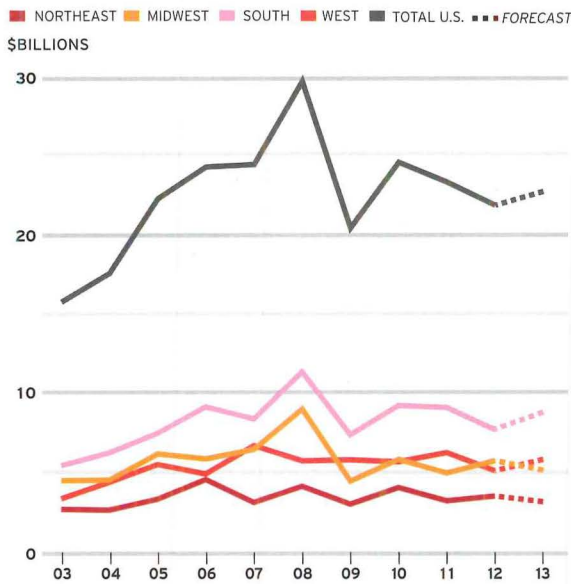
Data from McGraw-Hill Dodge Analytics

# MARKET FOCUS

## HEALTH CARE

### Health-Care Starts by Region

In addition to U.S. total and 2013 forecast figures



The uncertainty surrounding the Affordable Care Act and the future of Medicare and Medicaid has been weighing down health-care construction. Financing constraints have also had a dampening effect.

### Top Metro-Area Markets

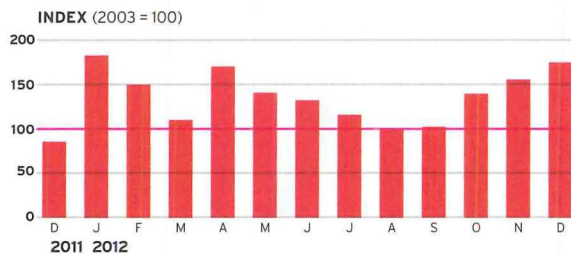
Ranked by 2012 health-care starts

REGION	\$MILLIONS
1 NEW YORK CITY	1,201
2 CHICAGO	808
3 NEW ORLEANS	788
4 DENVER	768
5 SAN JOSE, CA	705



Ann & Robert H. Lurie Children's Hospital of Chicago; ZGF Architects, Solomon Cordwell Buenz, Anderson Mikos Architects (page 136)

### The Dodge Index for Health-Care Construction 12/2011-12/2012



The index is based on seasonally adjusted data for U.S. health-care construction starts. The average dollar value of projects in 2003 serves as the index baseline.

### Top 5 Design Firms

Ranked by health-care construction starts, 1/2011 through 12/2012

- 1 H+L Architecture
- 2 NBBJ
- 3 ZGF Architects
- 4 Perkins + Will
- 5 Cannon Design

### Top 5 Projects

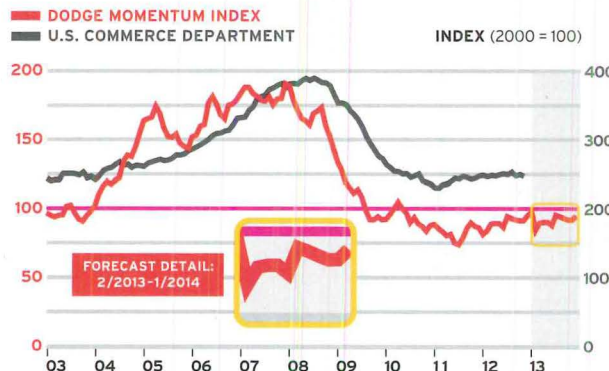
Ranked by 2012 health-care construction starts

- \$651 MILLION**  
PROJECT: Southeast Louisiana Veterans Health Care System Medical Center  
ARCHITECT: Studio NOVA - NBBJ, Eskew+Dumez+Ripple, Rozas Ward Architects  
LOCATION: New Orleans
- \$615 MILLION**  
PROJECT: Lucile Packard Children's Hospital Expansion  
ARCHITECTS: Perkins+Will; HGA  
LOCATION: Palo Alto, CA
- \$583 MILLION**  
PROJECT: Exempla Saint Joseph Hospital  
ARCHITECTS: ZGF Architects; Davis Partnership; H+L Architecture  
LOCATION: Denver
- \$420 MILLION**  
PROJECT: University of California San Diego Jacobs Medical Center  
ARCHITECT: Cannon Design  
LOCATION: La Jolla, CA
- \$335 MILLION**  
PROJECT: Saint John's Mercy Medical Center  
ARCHITECTS: HKS Architects; Archimages  
LOCATION: Joplin, MO

## MOMENTUM INDEX CONTINUES TO CLIMB

In January, the Dodge Momentum Index rose for the second month in a row. The 2.7% gain, which is the result of both institutional and commercial activity, lifted the index to 97.6—the highest reading since mid-2010.

The Dodge Momentum Index is a leading indicator of construction spending. The information is derived from first-issued planning reports in McGraw-Hill Construction's Dodge Reports database. The data leads the U.S. Commerce Department's nonresidential spending by a full year.





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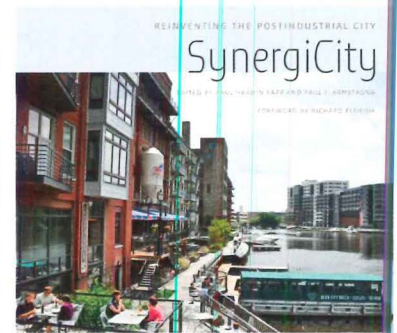
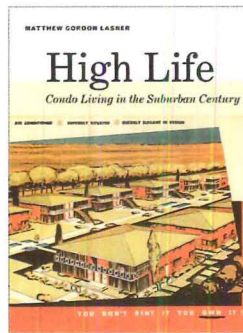
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## Gimme Shelter: Housing Around the World



**High Life: Condo Living in the Suburban Century**, by Matthew Gordon Lasner. Yale University Press, 2012, 336 pages, \$40.

Reviewed by Jayne Merkel

**THIS SUPERB** study of co-owned housing in America—from the first cooperative apartment buildings in 19th-century New York City to condominiums around the country today—is not only an architectural history but also a social, political, urban, economic, and political one. With only 125 black-and-white images, the author manages to provide enough information for the reader to picture those apartment buildings and townhouses, while he explains the socioeconomic circumstances under which they were created.

He notes that the first co-ops appeared particularly to single women (most single men lived in hotels or with their parents) and small families (large ones preferred houses). He describes early multistory luxury co-ops in Manhattan, lower-density ones for the middle class in Queens, and early-20th-century commercially built co-op apartment complexes in mostly East Coast cities and suburbs. He also discusses the first not-for-profit, moderate-income co-op complexes around New York, which were influenced by housing reformers like Clarence Stein and built by progressive groups or unions in the 1920s and after World War II. The idea was to pool resources to create communities of like-minded (mostly left-wing) people, who weren't allowed to rent out

or resell their units at a profit.

In the postwar period, "it was the elderly, primarily in Florida, who made co-ownership a truly mainstream dwelling practice in the US," Lasner explains. "Before World War II older people lived with their grown children, in institutional homes for the aged or infirm, or in residential hotels... Increasing longevity coupled with trade union pensions and Social Security (introduced in 1935) made the postwar era the first in which ordinary Americans could enjoy a comfortable retirement." Unlike earlier co-ops, which resembled rental apartment buildings architecturally, those built largely for the retired assumed new forms—assertively modern, high-rise and low-rise, with balconies to enjoy fresh air, and amenities such as swimming pools and golf courses.

Condominiums became popular in California when land grew scarce around San Francisco and Los Angeles, the latter of which,

says the author, had been the first big city composed mainly of spread-out single-family houses. But by the 1960s, "a majority of new homes...under construction in Southern California's fourteen counties were multifamily...in the city of L.A., three-quarters" were. Most were townhouses or in low-rise buildings with private outdoor space and nearby parking. Like the freestanding subdivision houses before them, they appeared in many styles and colorful palettes, and many had "Spanish" touches.

*High Life* ends up in New York where it began, and where the housing-reform movement had made possible the first large, moderate-income complexes. In the postwar period, another progressive accomplishment, rent control, discouraged the building of new market-rate rental housing. Most new apartment buildings for the middle and upper classes were therefore

condominiums, and many existing apartment buildings were converted to co-ops or condos. In either case, co-ownership became the norm where it began, and demographic trends toward smaller households, later marriage, and greater urbanization suggest that it will become increasingly so throughout the United States.

Already, one-eighth of American homeowners live in co-ops or condos, with higher percentages in cities. Without co-ownership, rates of homeownership would not have grown during the last 50 years. As Lasner reports, "The share of households in owner-occupied, single-family houses in 2007 was precisely the same as it had been in 1960 (49 percent) despite the fact that rates of homeownership had risen from 62 to 68 percent."

For all these reasons, this is an indispensable book for anyone involved with housing—or simply interested in social trends. ■

### [ BRIEFLY NOTED ]

**Urgent Architecture: 40 Sustainable Housing Solutions for a Changing World**, by Bridgette Meinhold. W.W. Norton, 2013, 256 pages, \$50.

The author, who covers architecture for Inhabitat.com, examines the need for new kinds of housing in the wake of disasters, poverty, and climate change, and shows projects from around the globe. She organizes the material into five categories—rapid shelters, transitional shelters, affordable housing, prefab housing, and

adaptable housing—and includes examples from Bangladesh and Haiti to Malibu and Milan. A straightforward format and clear illustrations give the book a no-nonsense immediacy that seems appropriate to the subject.

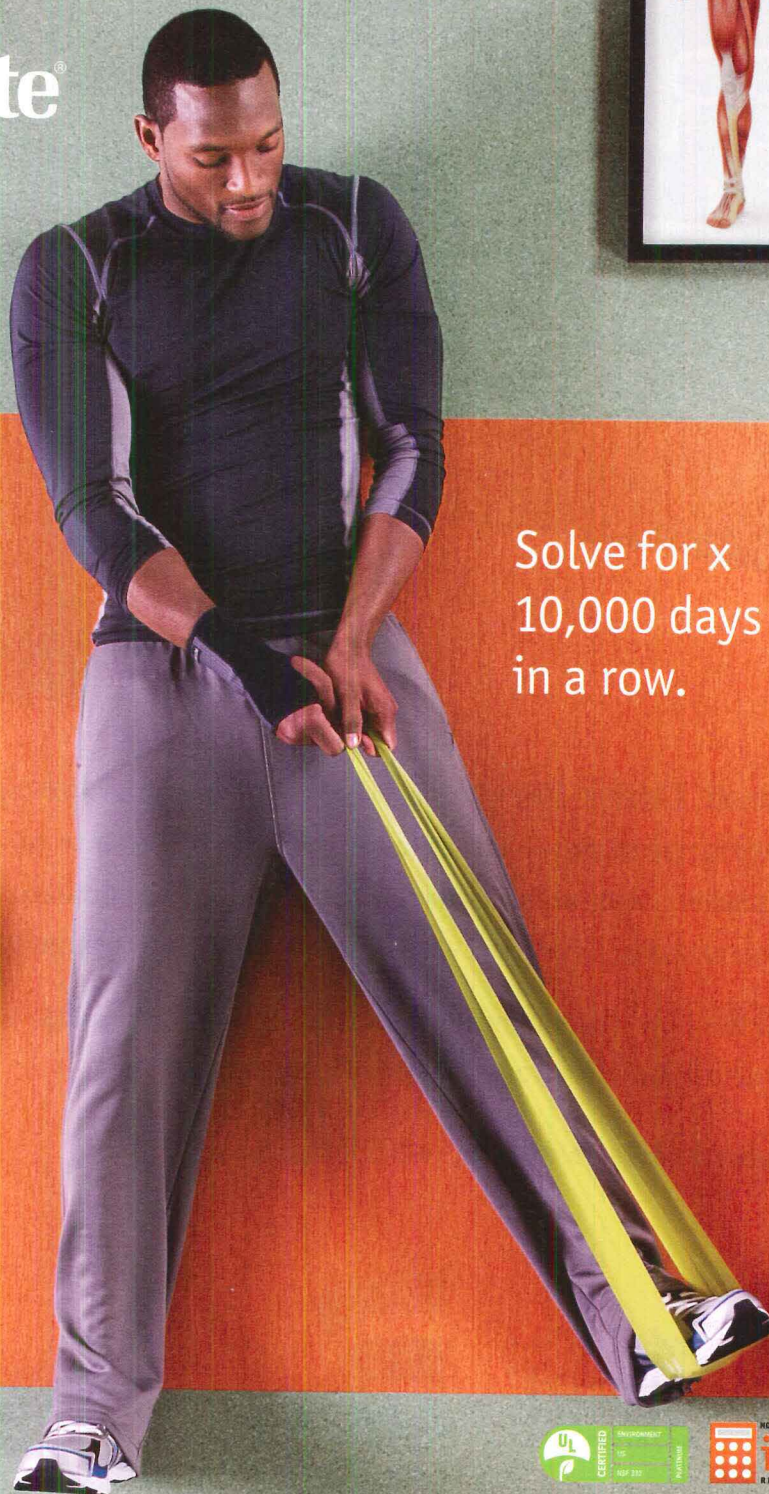
**SynergiCity: Reinventing the Postindustrial City**, edited by Paul Hardin Kapp and Paul J. Armstrong. University of Illinois Press, 2012, 224 pages, \$60.

Focusing mostly on Rust Belt cities in the United States, this book examines urban-revitalization strategies in places such as

Pittsburgh, Milwaukee, St. Louis, Detroit, Baltimore, and Peoria, Illinois. In a lively foreword, urbanist Richard Florida argues that these cities should be wary of megaprojects like "heavily subsidized convention centers and downtown sports stadiums" and should look instead to smaller-scale, grass-roots efforts that have more popular support. The book's earnest attitude emanates from its chapter-long essays by academics, but its message is undercut by a stodgy design and too many poor-quality black-and-white photos. Clifford A. Pearson



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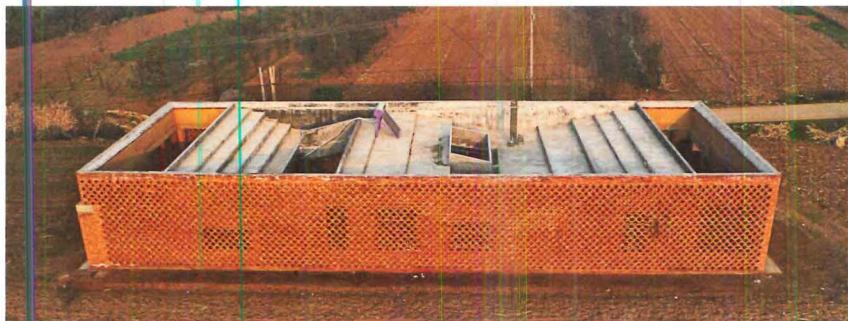
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# perspective house of the month

IN THE CHINESE PROVINCE OF SHAANXI, JOHN LIN'S HOUSE FOR ALL SEASONS REIMAGINES THE VERNACULAR VILLAGE DWELLING, CREATING A MODEL FOR SUSTAINABILITY. BY LAURA RASKIN



The architect was inspired to design the brick screen after a visit to the westernmost areas of China, including Kashgar in Xinjiang province. The screen helps keep the house cool in summer and warm in winter (above). An angled concrete roof collects and stores rainwater and provides a place to dry food (left and below left). Two women live in the house, which is also used for a women's weaving cooperative (below).



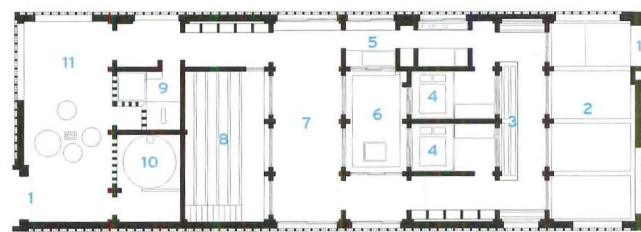
WHEN ARCHITECT John Lin and his students from the University of Hong Kong first visited Shijia village in the province of Shaanxi, China, villagers had a list of requests for projects. But Lin wanted to create something that “empowered them to solve problems on their own,” he wrote in a statement. He and his students observed that rural Chinese villages were changing dramatically as people fled to urban centers. And urban ideas were making their way back to the villages: traditional mud houses were being torn down in favor of less economical and sustainable concrete and brick structures built by outsourced labor.

Lin—who, with Joshua Bolchover, founded the nonprofit research-and-design collaborative Rural Urban Framework at the university—worked with students to design a prototype for

a vernacular village courtyard house, where three generations might live in a dense cluster of ad hoc additions. Lin’s prototype “would be a model or reference,” he wrote, and was not meant to inspire exact replicas. The \$53,400 project, constructed with villagers’ input, serves as a reminder that modernization is possible with the skills and materials available locally.

The 4,100-square-foot, one-story house was completed in March 2012. Its concrete-column structure and mud-brick walls are surrounded by a perforated brick screen for daylight and ventilation.

The kitchen, living room, bedrooms, and bathroom are interspersed with four courtyards for pigs and an underground biogas system that produces energy for cooking. “The house becomes an example of self-reliance,” writes Lin. ■



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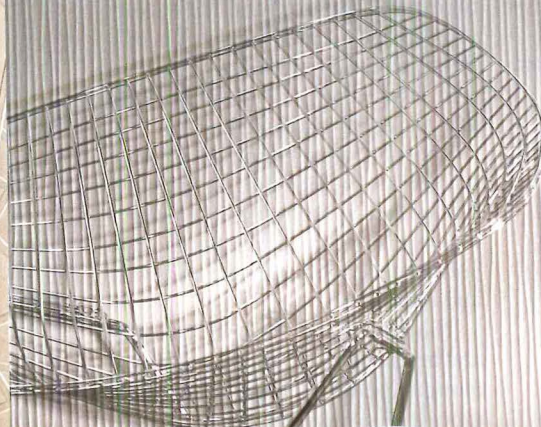
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# In Search of the \$100 House

Designers strive to provide super-low-cost dwellings worthy of being called homes.

BY LAMAR ANDERSON

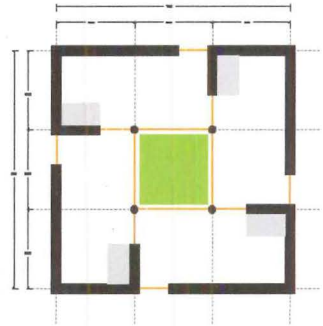
WHEN ROMÁN VIÑOLY, a director at his father's firm Rafael Viñoly Architects, visited Chile in 2010, he toured an affordable-housing project on the outskirts of Santiago that by all measures should have been a success. It provided clean, structurally sound houses for Chileans who had previously lived in self-constructed slums. The problem? The rows of identical, cookie-cutter units felt more like cellblocks than homes, and their one-size-fits-all approach alienated residents who were used to arranging their dwellings to suit their family structures and living habits. "You saw people vandalizing their own homes, writing graffiti on their own houses," says Viñoly, who this spring is building a prototype for a low-cost modular house that residents will be able to configure themselves.

Viñoly's project is part of the latest wave in an effort to design extremely low-cost permanent shelters for people around the globe who lack adequate housing. Inspired by ambitious goals, such as the \$100 house proposed by author and social entrepreneur Paul Polak in his 2008 book *Out of Poverty*, these new designs use different degrees of standardization to push down costs, but they also give homeowners a lead role in determining how their houses will look and function.

Residents of Trapyan Anchang, a village in Cambodia, will get a menu. Commissioned by the country's Habitat for Humanity chapter, the Phnom Penh firm Collective Studio designed a series of six house types for the village. Their plans vary to fit different ways of living, but each model provides waste- and water-management systems, passive cooling, and other improvements over existing housing. Last fall a team that included the residents built prototypes of the first three designs, and three more will be completed this year. The firm kept the average construction cost near \$2,500 by relying on simple building methods and specifying plywood, concrete block, and other locally available materials. Residents will eventually be able to select which of the six designs best suits their households.



4 units + courtyard = 1 house



Ying Chee Chui designed the Pinwheel House (left and above left) based on L-shaped modules. Four components together make four rooms around a central courtyard. Adding modules to the perimeter allows residents to expand or to build neighboring houses with shared walls to lower costs.

Components of the WikiHouse building system by London-based OOZ/ can be downloaded and "printed" using a CNC milling device and then assembled. The firm has built five prototypes so far, but its goal is to refine the construction process and turn it over to users rather than devise a specific blueprint. Residents can customize the system to fit their housing needs and local context.



PHOTO: R. VIÑOLY; COURTESY OF HABITAT FOR HUMANITY; PHOTO: YING CHEE CHUI (2); WIKIHOUSE



But most impoverished communities lack the luxury of a construction project backed by a major nonprofit. To bring them better, inexpensive homes, many designers see potential in do-it-yourself modular systems. While pursuing her M.Arch. at MIT, designer Ying Chee Chui responded to a challenge to propose a \$1,000 dwelling with the

**“Our ambition is that it should be at least as easy as an IKEA kit to put together.”**

Pinwheel House, a variation on a traditional Chinese courtyard structure. Based on L-shaped modules of hollow bricks threaded onto steel bars, the house can be expanded with new components around the perimeter. “If you can build one-quarter of the house, you can build the rest,” says Chui. A 970-square-foot prototype completed in 2010 for a farming family in Sichuan, China, cost \$5,900 to build, but Chui says it demonstrated the design’s capacity to keep expenses down while still allowing for customization by putting construction in the community’s hands.

The designers of WikiHouse, an open-source modular building system, share Chui’s enthusiasm for employing local manpower, but they combine it with a high-tech delivery method. On the WikiHouse website, users can download SketchUp files for a series of compo-

nents. Then, using what the designers envision as a donated or collectively owned CNC milling device, they can “print” the component pieces of a wood structure to be assembled on-site. “Most cities are made by the users, not by real-estate developers,” says Alastair Parvin of 00%, the London design firm behind the project. “Putting tools and

knowledge into the hands of everybody is really important.” The firm estimates the construction cost for the structural components at about \$14 per square foot, depending on location. “Our ambition is that it should be at least as easy as an IKEA kit to put together,” says Parvin. “It’s like building by numbers.”

IKEA’s flat-pack approach also informs the design for Tecnocasa, a venture-capital-backed project for Guerrero, Mexico, that begins prototyping this spring. The Mexico City-based engineering firm ETXE and industrial-design firm AGENT devised a Lego-like system of large but lightweight bricks. Six different shapes made from two molds will enable residents to assemble rooms of a size and layout of their choosing. “It actually looks a bit like Tetris,” says AGENT’s Tom Pelzer. The designers expect it will take two people

four to seven days to thread the bricks onto a steel structure (a similar process to that of the Pinwheel House) and build a basic \$6,700, 385-square-foot dwelling.

Viñoly’s concept, called Casapanal, is also highly configurable, but it uses a different set of materials for speedy construction: a metal skeleton fitted with structural insulated panels (SIPs). “They can be handled without heavy machinery, like an erector set,” says the architect. The project would allow families to build a 370-square-foot house with a kitchen, bath, and dual living room/bedroom. “This is a system that you could buy, lay out on your property, sit down with your husband and your kids, and say, ‘Well, how do we want it to look?’” Viñoly says.

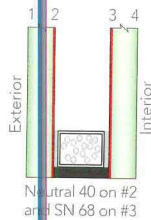
That’s the promise common to each of these ideas: they will empower residents to take control of the design process. “One of the features of this system is to do away with the need for an architect,” says Viñoly, “and to make it possible for people to build a house that responds to their needs.” How these projects will perform is still largely untested, but providing houses that are not only inexpensive but that residents are proud to call their own will be the greatest measure of their success. ■

Lamar Anderson is based in San Francisco and frequently contributes to RECORD.

Collective Studio’s \$2,500 Modified House (above and above left) is one of six types that the firm developed for Trapyan Anchang, a village on the outskirts of Phnom Penh, Cambodia. Every model in the series provides an in-ground septic system, a connection to a main water supply (as well as a rainwater-collection tank), covered outdoor areas, cross- and convection ventilation, and other features lacking in typical village houses. But each type fits a different housing need—from the Big Roof House, with a sleeping loft and broad eaves, to the live/work Ware House (both not pictured).

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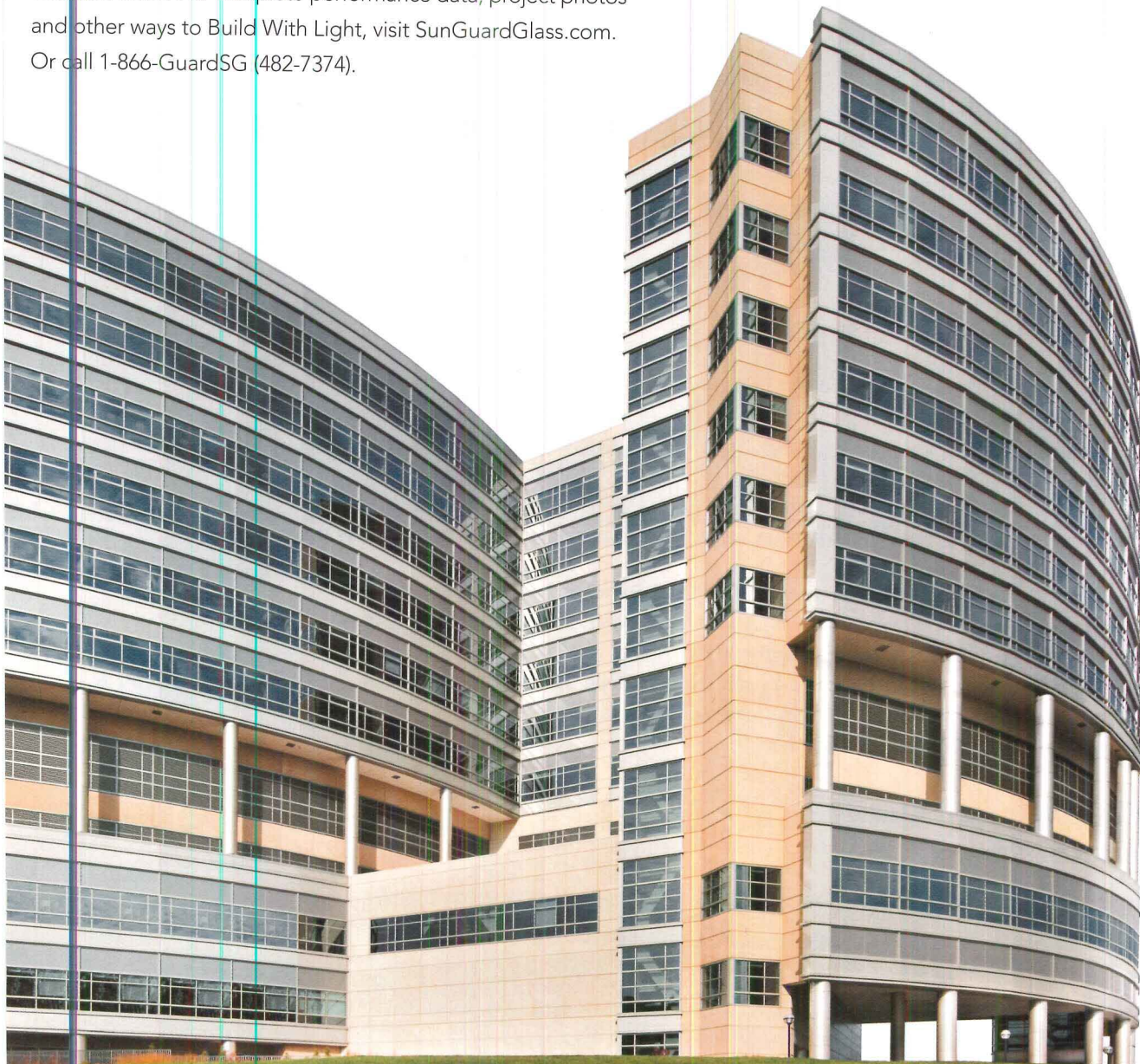


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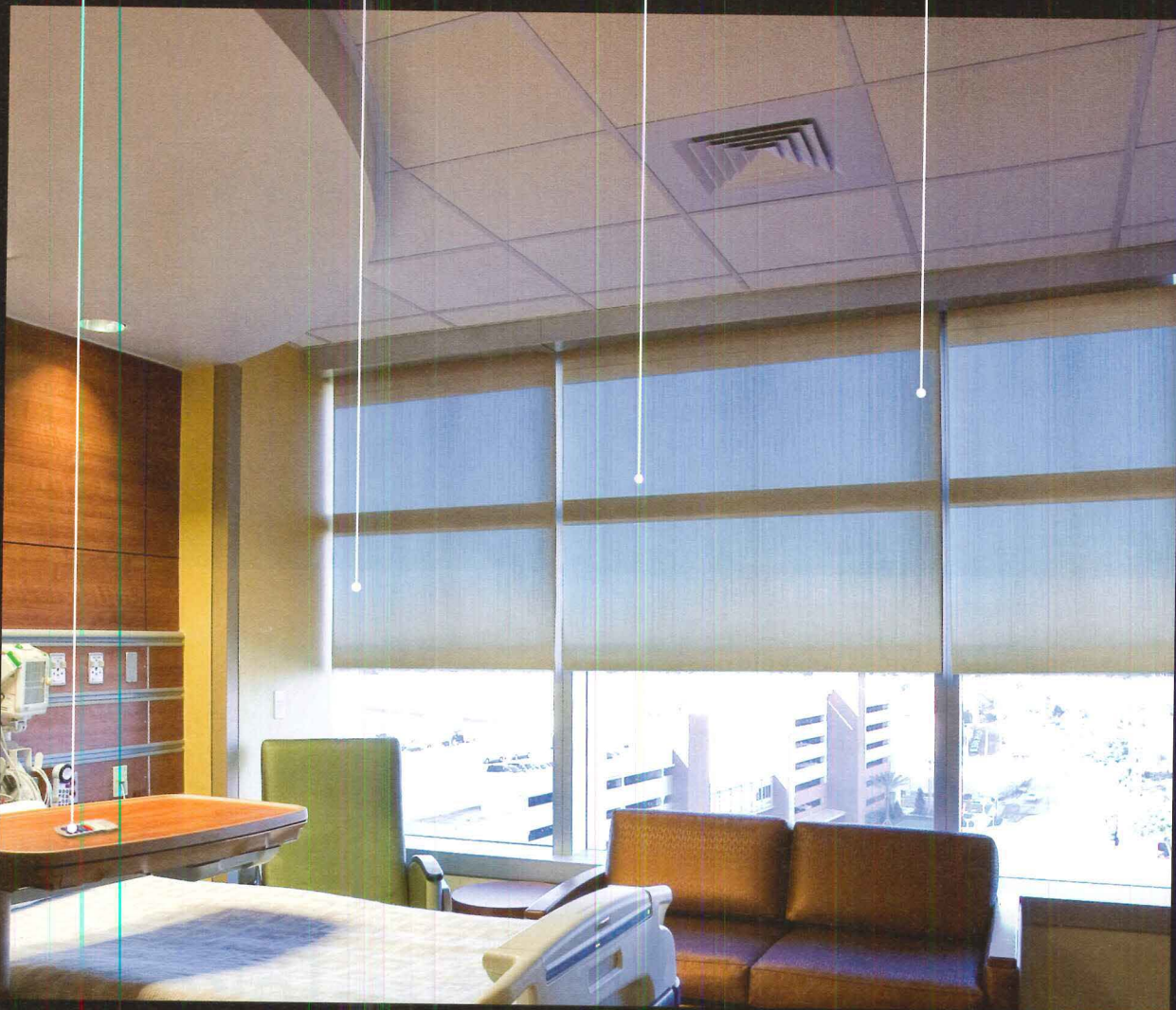
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BY RIEDER

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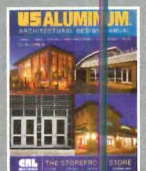


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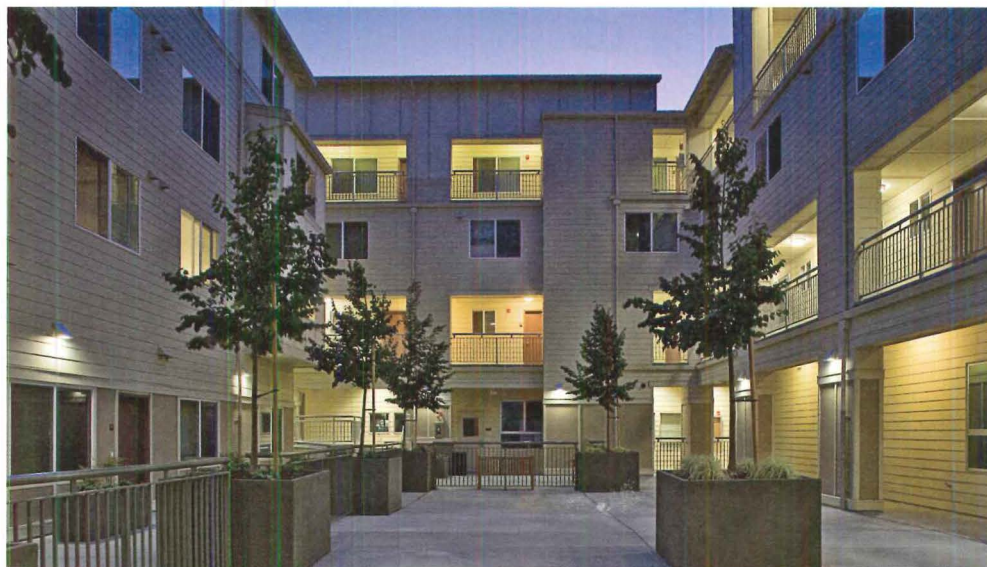
## Social Housing U.S.A.

The architecture has evolved, joining design with support services.

BY BEN ADLER

OVER THE last five decades, models for social housing in U.S. cities have continually evolved. First, the postwar subsidized brick high-rises—based on Le Corbusier's towers-in-the-park of the 1920s—were largely abandoned. Then, starting in the 1970s, smaller infill developments, often mimicking a neighborhood's rowhouses, were increasingly adopted. But low-rises with separate entries and limited communal space have not been able to serve all the needs of some populations, such as the elderly, disabled, or formerly homeless.

More and more, architects, planners, and community activists are recognizing that housing for growing low-income and special-needs urban populations should be flexible. It has to accommodate single adults (young and



**OPEN COURTS** Michael Pyatok of Pyatok Architects designed Fox Courts affordable housing in Oakland to provide 80 dwellings for families and single people. The four-story, stucco-on-wood-frame structure is distinguished on the exterior (left) by projecting aluminum-sided bay windows that alternate with double-height, carved-out spaces. The sustainable complex, completed in 2009 for Resources for Community Development, includes two courtyards (one shown above) and a day-care center.



safe. "Defined, observable open space with a clear definition of entries to a building leads to a sense of security," says Theodore Liebman, a principal at Perkins Eastman who was chief of architecture for the New York State Urban Development Corporation from 1971 to 1975. "But crime reduction in public housing is as much about active street life as the design of buildings."

Hallways inside the buildings can be dangerous as well, points out Deborah Gans, principal of Gans Studio in New York City and a professor of architecture at Pratt Institute in Brooklyn. Gans advocates an "eyes on the hallway" design approach as the interior equivalent of Jane Jacobs's famous "eyes on the street" formulation. If a window looks onto the hallway from an apartment's kitchen, parents can cook and still see kids playing in those corridors. Liebman notes that buildings should locate laundry rooms next to children's playrooms, with a window from one to the other, so parents can keep an eye on their kids while doing the wash.

Twenty-first-century social networks differ from the norm that guided designers in the urban-renewal building boom of the 1950s and

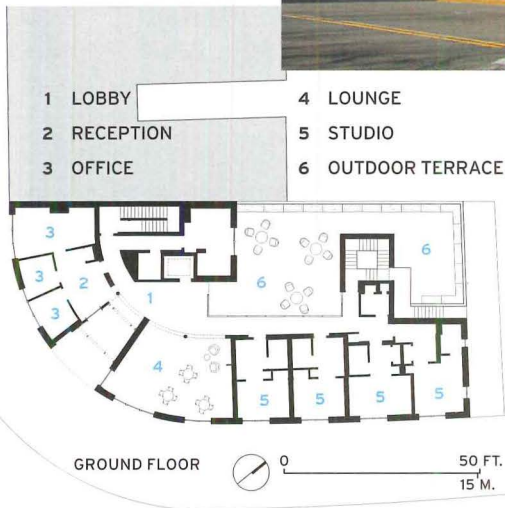
old), single-parent families, and multigenerational clans bunking together. Furthermore, housing experts maintain that social and community services are as essential to the success of public housing as building design.

And so a new prototype is emerging: mid-rise apartment buildings that maintain the street wall, achieve a desirable density, and better meet the needs of the communities they serve. Actually, this type of housing has been part of middle-class city neighborhoods since

before World War II—but it was aimed at the private market. The important shift today is recognizing that it should go hand in hand with a strong social agenda.

In talking to advocates and architects, it becomes clear that low-income housing must be integrated into a healthy neighborhood; that it must accommodate a variety of household configurations; and that it should project the dignity and interior warmth of market-rate architecture. And it needs to feel

**CURVED SITE** Jonathan Kirschenfeld Architect designed Teller Avenue (right), a five-story load-bearing-masonry and precast-concrete-plank structure with 43 single-room units in the Bronx. The building, completed in 2011 for the Postgraduate Center for Mental Health, offers tenants common spaces at the ground level and on the top floor. The building's curve follows the site's contour; inside, translucent sandwich panels admit daylight to the halls (far right).



'60s. During those years architects conceived of public housing as shelter for two-parent nuclear families. But today's low-income households are frequently headed by a single mother who needs child-care support. "You have to do a careful analysis of how people live," says Gans. "If the single parent works in three jobs, who's going to take care of the kids?" Many families rely upon grandparents for child care, or, sometimes, a steady flow of relatives arriving from a home country. In many cases, these communities have three

increasingly concerned about whether there is a well-designed public park in close proximity to the housing complex, or at least an attractive interior courtyard or community garden within its confines.

In addition, multigenerational family living requires more than simply making apartments bigger. Michael Pyatok, principal of Pyatok Architects in Oakland, who has been specializing in affordable housing for several decades, points out that including space for grandparents or adult children is different from building an apartment with the same number of rooms for a family with kids. "The best way to accomplish this cohabitation by different generations is to separate the bedrooms at opposite ends of an apartment or put them on separate floors of a townhouse," says the architect, who is a winner of the American Institute of Architects' 2013 Thomas Jefferson Award for Public Architecture.

Architects today seek to destigmatize public housing with designs that fit into the surrounding urban realm, both in scale and in interaction with the street. They can also employ subtler elements—such as materials

which is traditionally identified with solid 1930s and 1940s good urban fabric. We spend a lot of time finessing the facade: windows are punched, compositions carefully calibrated."

Historically, housing projects have been known for uninviting double-loaded corridors lit with harsh or flickering fluorescent fixtures. Kirschenfeld and other architects include lot-line windows at the end of each corridor to bring daylight into the hallways. At the Hegeman (page 102), a mix of supportive and low-income housing in Brownsville, Brooklyn, the architect, CookFox, introduced daylight into the lobby by placing glazed entrance walls across from the elevator in the middle of an L-shaped building.

The designs of a number of recent projects reflect current thinking about the importance of offering social and community services to residents—so placing those amenities with

## Designs of recent projects show the importance of offering social and community services to the residents and locating them wisely.

generations under one roof where extended-family members come and go. "Maybe it's good to have a grandma unit on one floor and yours on another," suggests Gans.

Unlike wealthier families, people in public housing usually depend on the community for such amenities as gyms and after-school and summer activities for children. Architects are

and detailing—not typically associated with low-income housing.

"My goal is to make the new structure look like housing, period," says New York architect Jonathan Kirschenfeld, who often designs single-room-occupancy supportive housing for recently homeless or mentally ill residents. "We use iron-spot brick for every exterior,



**CORBU ENCORE** While Le Corbusier's towers-in-the-park idea didn't fare well in the U.S., Alexander Gorlin Architects returned to the master's low-rise housing schemes for the Brook, a six-story, 190-unit residence in the Bronx (2010). Designed for Common Ground, the building features double-height common porches in the brick-and-aluminum-clad structure.

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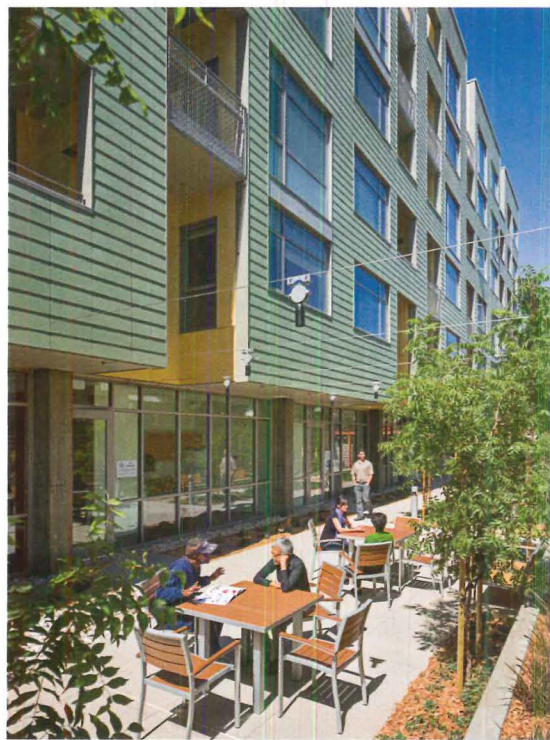


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**GOLDEN AGE** In 2012 Leddy Maytum Stacy Architects completed the 70-unit Merritt Crossing Senior Apartments for Affordable Housing Associates in Oakland. The design, with cement-board panels and brick cladding (top), includes open outdoor spaces (left) that puncture the exterior wall plane. A variety of community multipurpose spaces on the ground floor connect to outdoor landscaped areas for the residents (above).

care is a priority. And while ground-floor shops in apartment blocks might seem ideal for generating activity in the neighborhood, rooms providing social services or amenities also help create engagement with the street. "Often, affordable housing is in an economically challenged neighborhood where the location may not be great for retail," says Richard Stacy, a partner at the San Francisco firm Leddy Maytum Stacy Architects, which has designed many affordable-housing projects in the Bay Area. "So what we do instead is place community spaces—the common room, computer room, and gym—along the street, where they offer built-in casual surveillance," as demonstrated by his firm's Merritt Crossing Senior Apartments in Oakland.

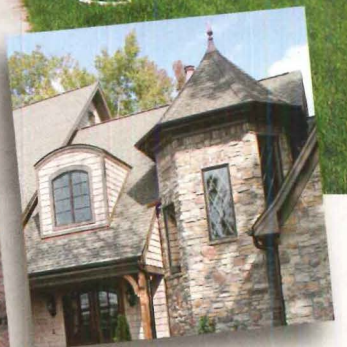
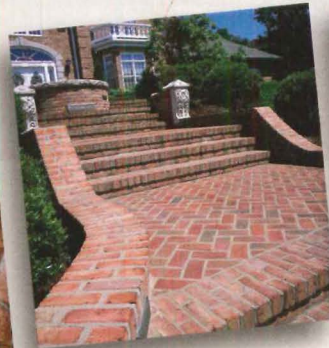
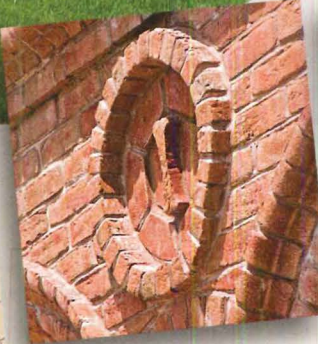
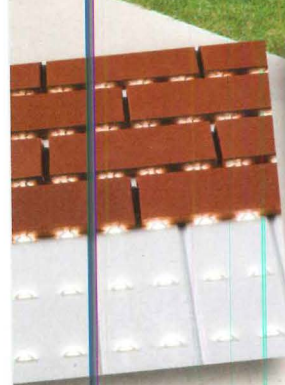
Common Ground, a nonprofit organization that built and manages the Hegeman in Brooklyn and the Brook in the Bronx (designed by Alexander Gorlin), reinforces community engagement by providing classes in everything from résumé writing to knitting for residents, and sometimes for anyone from the neighborhood. While public housing originally addressed a perceived housing shortage, advocates and architects now understand that problems such as homelessness are social issues, requiring social solutions. Common Ground's supportive housing includes on-site case management, with staffers, including medical personnel, who are available to meet with residents having problems. "We have big buildings because we set the bar high on programming and staff, and in order to do that you need economies of scale," explains Brenda Rosen, executive director of Common Ground.

Incorporating various activities into a housing complex to help generate economic opportunities is advocated by Rosanne Haggerty, who founded Common Ground and, in 2011, began Community Solutions, also a New York nonprofit focused on affordable housing. Inspired by The Stop, a community food center in Toronto, Community Solutions is developing a 2.5-acre site in Hartford, Connecticut, that contains an abandoned 65,000-square-foot 19th-century factory. The organization plans to build housing and a library, plus a community food center with classes in cooking and nutrition as well as a commercial kitchen that residents can rent for their food-related businesses. Nearby will be a community garden. "You need to create optimism and hope for people who are living from crisis to crisis," says Haggerty. "Design once contributed to the problem, but it can now contribute to the solution." ■

*Ben Adler is a Brooklyn-based journalist covering politics, architecture, and urban design.*



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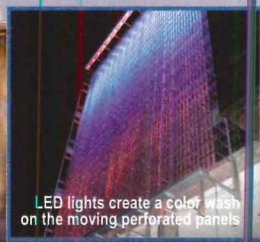
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CIRCLE 23

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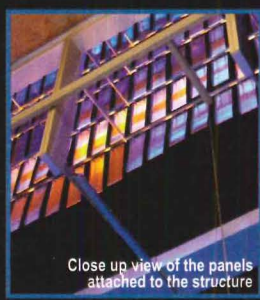
CHANDLER CITY HALL



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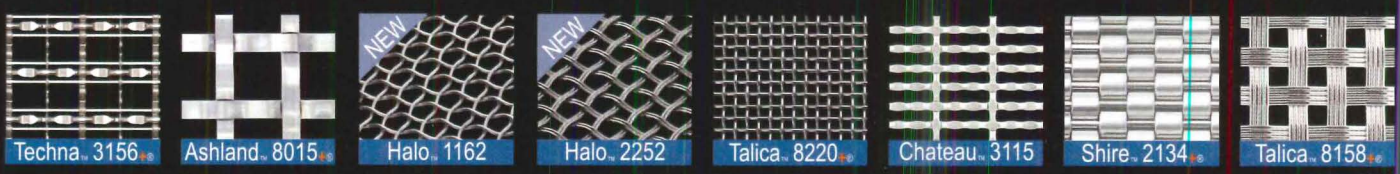


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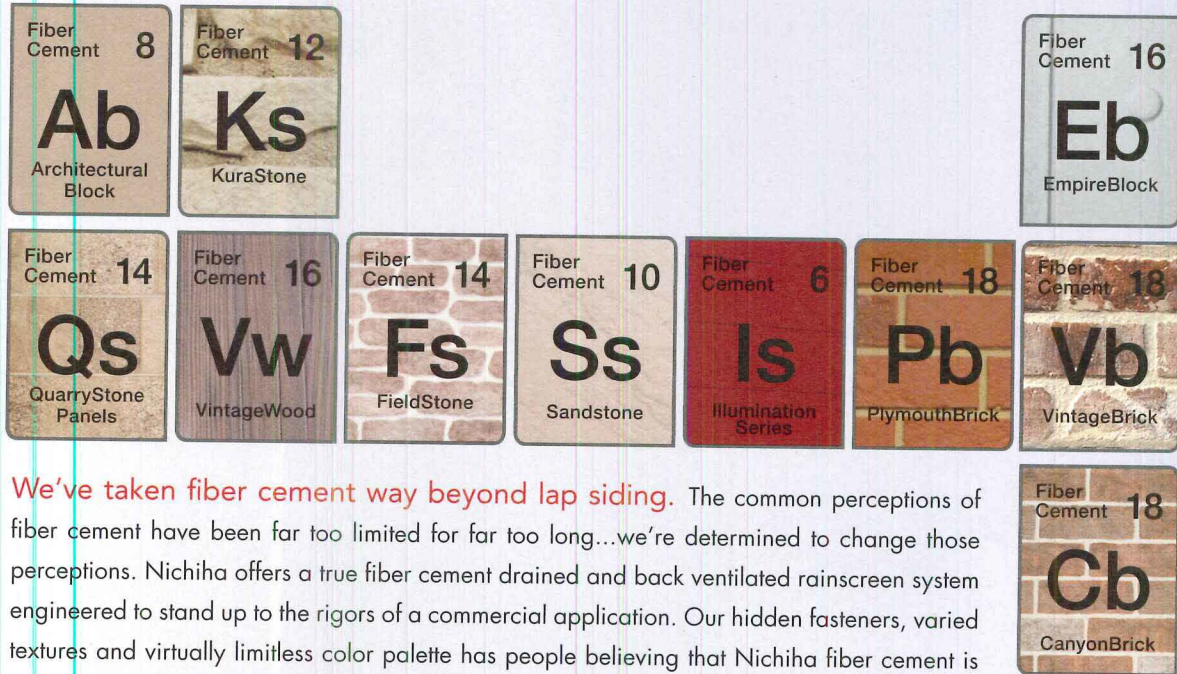
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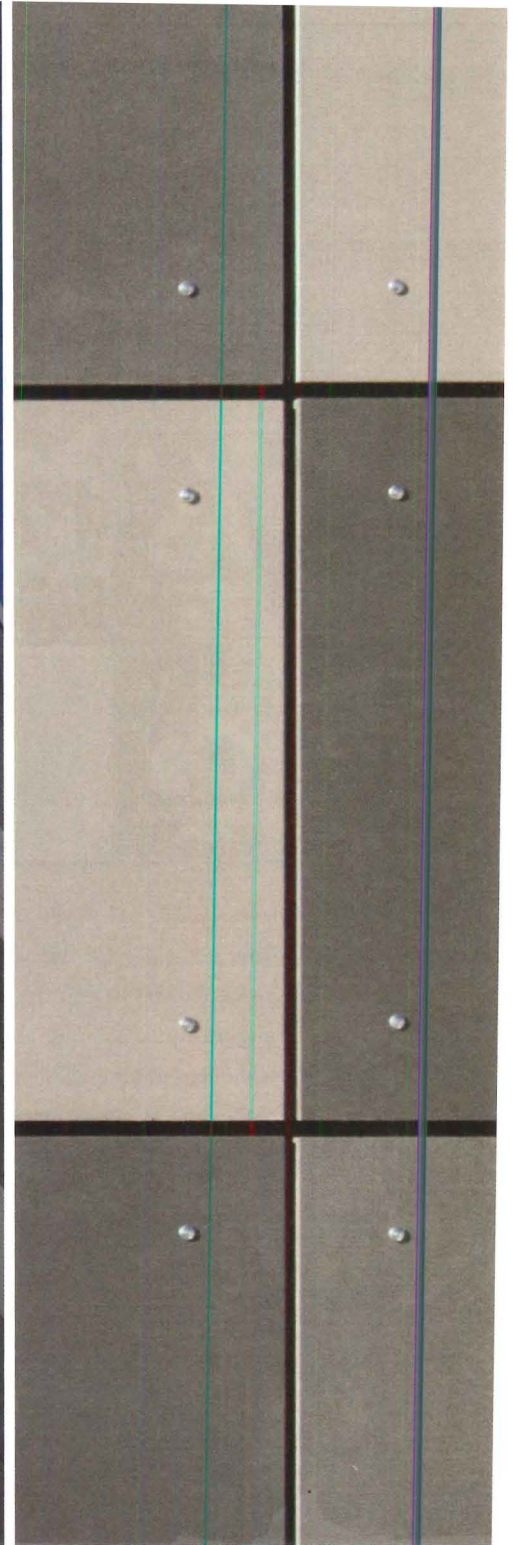
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# An Art School's Canvas on the Boston Skyline

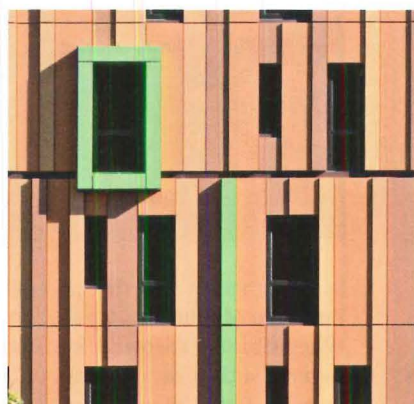


WHEN THE Massachusetts College of Art and Design (MassArt) completed its new 20-story, \$52 million residence hall on Boston's Avenue of the Arts last year, it created a bold addition to the city's skyline. Designed by ADD Inc, the building has a striking facade inspired by Gustav Klimt's 1909 painting *Tree of Life*—fitting for the country's first independent public art college.

Clad with over 5,500 aluminum-composite panels in five custom colors, five widths, and five depths, the facade "expresses the beauty and color of what is happening inside the institution," says ADD Inc principal B.K. Boley. The design team held a large charrette with students, faculty, and neighbors, who overwhelmingly voted that the facade

should read as strongly as a painting.

The variety of panel formats that would allow the building skin to resemble the bark of a tree could have blown the budget, but the team found a solution. "There was enough visual interest created by the depths of the panels changing that if all we did was change the colors between those groupings, you could never see it was exactly the same metal-panel extrusion being repeated over and over again," says the project's design-team leader, Tamara Roy. An extensive color study resulted in the browns, greens, and golds of a tree in autumn. The illusion is perhaps *too good*. "People go by it and ask us if it might be wood," says Roy. "It's not so easy to pin down."

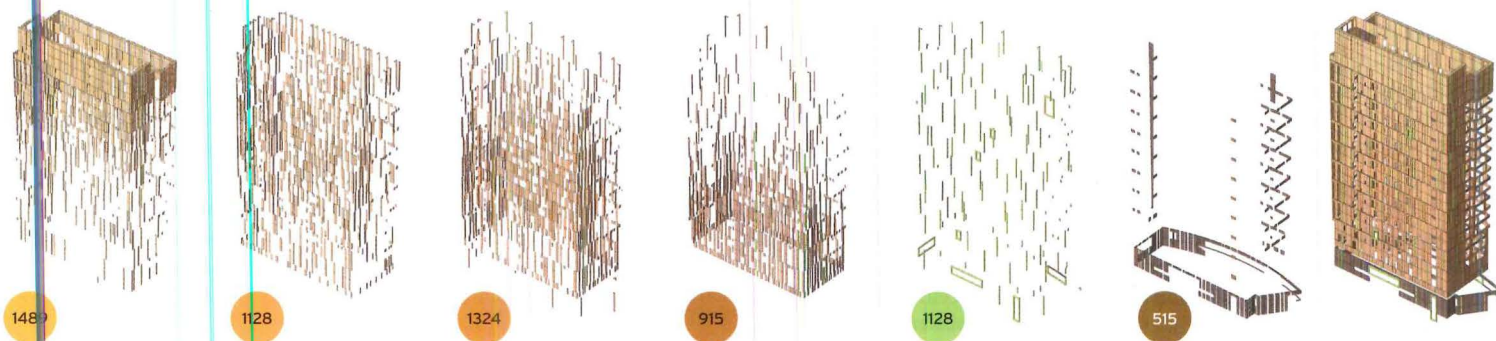


**ART PROJECT** Over 5,500 composite-metal panels in five custom colors, widths, and depths, combined with energy-efficient windows, make up the facade of MassArt's new residence hall (left and above). Below, a breakdown of the different color panels used in the facade; the colors get progressively lighter toward the top.

The double-insulated metal panels, made of Alucobond Plus aluminum-composite material, were fabricated and installed by Lymo Construction. The Massachusetts State Energy Code-compliant wall assembly is a pressure-equalized rainscreen system that meets the NFPA 285 multistory fire test. The building's facade includes a curtain wall and punched low-E windows made by Oldcastle BuildingEnvelope that have a solar tint to reduce heat gain.

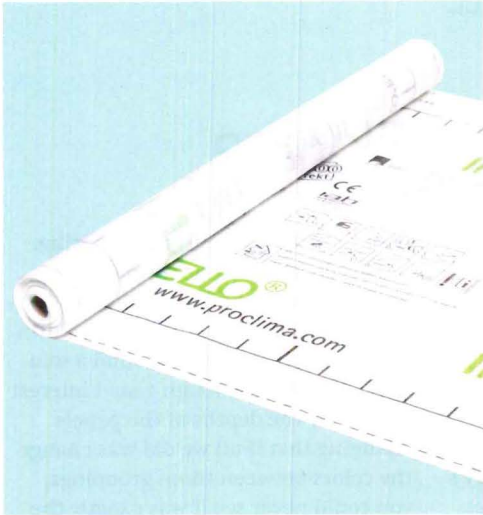
Boley feels the team met the goal of creating a facade that stands out in the skyline without being too brash: "In the end Boston needed a building like this, the Avenue of the Arts needed a building like this, and MassArt, above everything else, needed a building that was more expressive."

[alucobondusa.com](http://alucobondusa.com) CIRCLE 206



For more information, circle item numbers on Reader Service Card or go to [architecturalrecord.com/products](http://architecturalrecord.com/products).

PHOTO TOP: CHUCK CHUI (2); COURTESY ADD INC



#### Intello Interior Air & Vapor Barrier

475 High Performance Building Supply  
[foursevenfive.com](http://foursevenfive.com)

475 distributes a range of European systems, such as Pro Clima's Intello (shown), a smart vapor retarder that provides an insulating air barrier in roofs, walls, and floors. The founders launched 475 after discovering a need for super-high-performance products in the U.S. while working on a passive-house retrofit in New York in 2011. **CIRCLE 207**

#### Terralite Cement

Terra Bona Materials [terrabonamaterials.com](http://terrabonamaterials.com)

Terralite cement is a lightweight, thermally insulative material that delivers increased R values and performance over conventional lightweight concrete, according to the manufacturer. Appropriate for both interior and exterior applications, Terralite is 20 percent lighter than traditional concrete, making it ideal for roofs, walls, and geotechnical fill. **CIRCLE 208**

#### Scottish Rite Cathedral: Curved Metal Roof

Petersen Aluminum Corporation [pac-clad.com](http://pac-clad.com)

When Chicago's Scottish Rite Cathedral relocated to the suburb of Bloomingdale, the organization hired the Chicago office of Tvsdesign to create a two-story, 61,000-square-foot house of worship. Both the interior and exterior of the cathedral feature Masonic forms that incorporate traditional masonry materials like stone and brick, as well as modern systems like precast concrete and metal roofing. To achieve the Gothic arch shape of the curved metal roof, the team used approximately 13,200 square feet of Petersen's Tite-Loc standing-seam architectural metal panels. Tite-Loc panels are mechanically seamed in the field, after installation, to a 90° lock. The 24-gauge, 21' panels were curved on the job site to an 18'2" radius and installed by Anthony Roofing Tecta America. **CIRCLE 209**

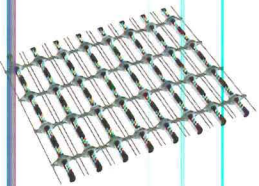
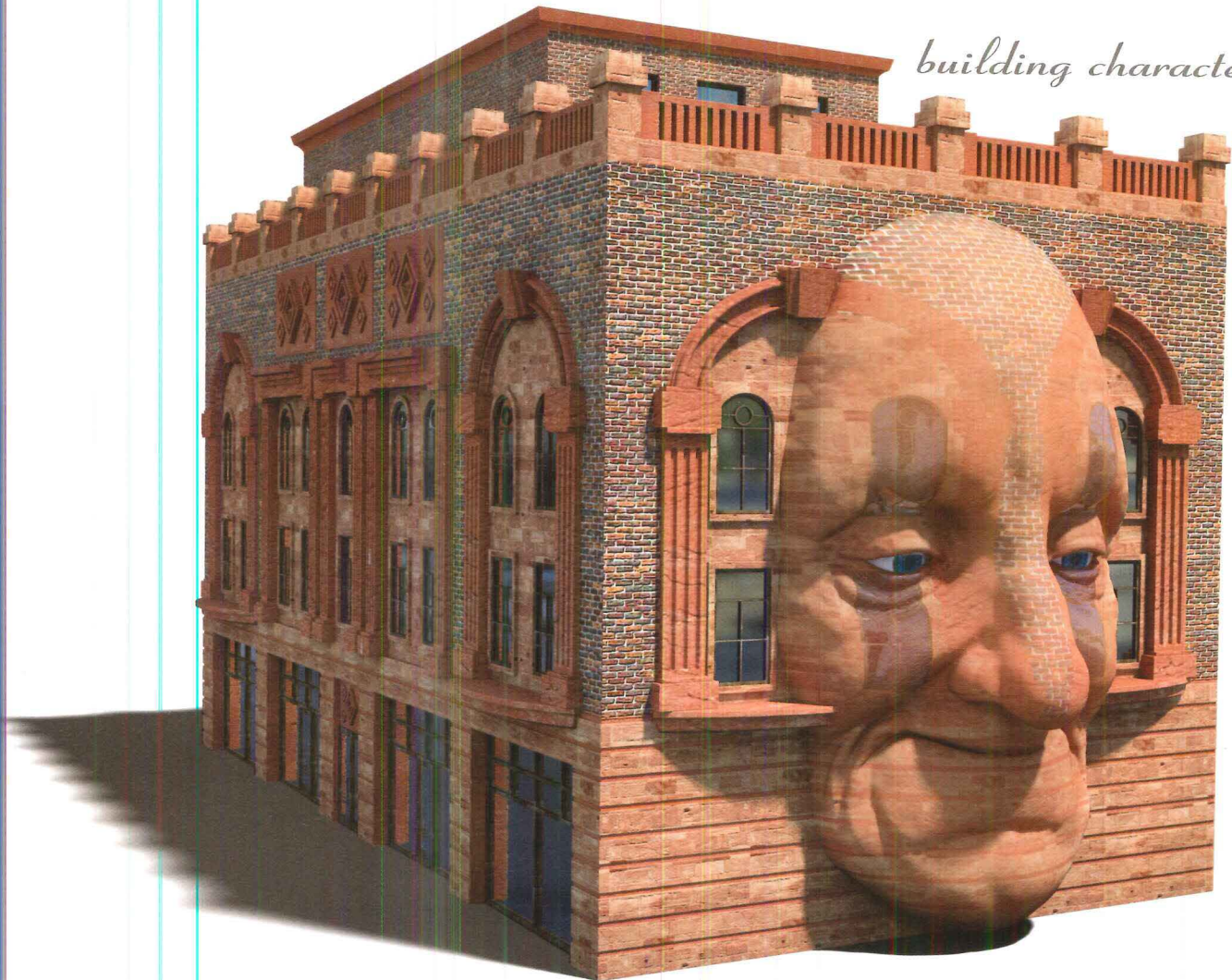
#### Baylor Cancer Center: Metal-Composite-Panel System

Centria [centriaperformance.com](http://centriaperformance.com)

The Baylor Charles A. Sammons Cancer Center is a 459,000-square-foot, 10-story outpatient cancer-treatment facility in Dallas. The center features a facade of glass-fiber-reinforced concrete, stone, glass, and metal panels. To help create a clean, modern aesthetic reflecting the medical advancements within the facility, the Dallas office of Perkins+Will selected Centria's FormaBond metal-composite-panel fabricated system. A proprietary reaction-injection-molding process creates a stronger, flatter finish with high-performance air and water ratings. The 37,000 square feet of thin, bright silver-colored aluminum-composite panels work with Centria's IW Series' concealed fastener profiles and Profile Series louvers to eliminate visual breaks in sightlines. **CIRCLE 210**

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CIRCLE 96

## Healing Aids

These new solutions for hospitals, assisted-living facilities, and other spaces for treatment and recovery prove that aesthetics do not need to suffer when high performance is required.

By Rita Catinella Orrell

### Wellness Collection

Wolf-Gordon's Wellness Collection of wallcoverings, upholstery, and privacy-curtain textiles is made of durable materials, including polyester, vinyl, and polypropylene, to meet the demands of health-care and assisted-living markets. Depending on the design, the textiles can withstand 85,000 to 500,000 double rubs; some are also bleach-cleanable and offer antimicrobial protection. Shown here is the leaf-inspired Flourish Type II vinyl wallcovering and the Dawn privacy-curtain textile, a serene horizontal stripe in 100% polyester. [wolf-gordon.com](http://wolf-gordon.com) CIRCLE 200



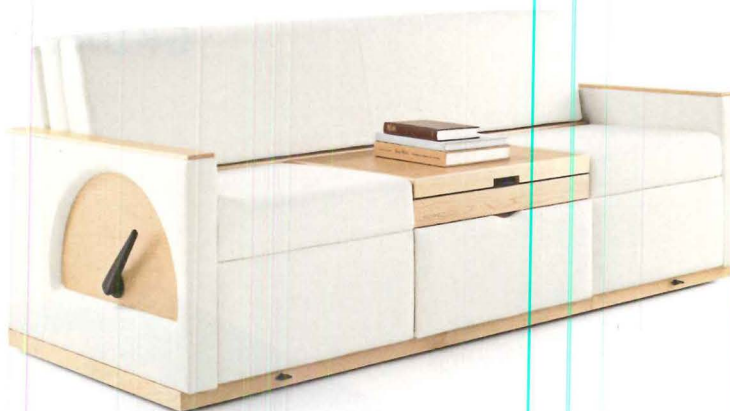
### CuVerro Wall Plates & Switches

Cooper Wiring offers the industry's first line of switches and wall plates made with EPA-registered CuVerro antimicrobial copper surfaces. The line is intended to help address health-care-associated infections (HAIs), which patients acquire during the course of receiving care for other conditions. According to the Centers for Disease Control, approximately one out of every 20 hospitalized patients will contract an HAI. Lab tests show that when cleaned regularly, CuVerro surfaces deliver ongoing antibacterial protection, effectively killing more than 99.9% of bacteria within two hours. [cuverro.com](http://cuverro.com) CIRCLE 203



### Ulna Swing-Arm Sconce

In honor of the 85th anniversary of designer Walter Von Nessen's first "folding" wall sconce, his namesake company has introduced a new foldable, rotatable, and dimmable LED direct/indirect contemporary-design swing-arm sconce. Called Ulna, the tubular-shaped sconce provides aimable, softly diffused ambient, accent, and reading light for corporate, health-care, assisted-living, or residential interiors. [nessenlighting.com](http://nessenlighting.com) CIRCLE 204



### Merge Sofa

This convertible patient-room sofa from Herman Miller Healthcare and Nemschoff offers multiple configurations for family and visitors to sleep, work, eat, and socialize more comfortably. Merge features an integrated table, recliner, 75"-wide sleep surface, and multiple storage options. Safety features include a front-accessible, rear-locking caster system and an antimicrobial sleep surface with removable covers. Custom options include dovetail storage drawers, footrests, and a stationary or adjustable-height center table.

[nemschoff.com](http://nemschoff.com) CIRCLE 201

### Ruth Adler Schnee Fabrics

Considered one of the pioneers of modern textile design, Ruth Adler Schnee worked closely with KnollTextiles creative director Dorothy Cosonas to translate some of her earlier printed patterns into woven fabrics for use as privacy curtains and drapery fabrics for health-care facilities. The collection includes the landscape-inspired Strata (top in photo), which started as a printed burlap wallpaper in 1949, and Fission Chips (bottom in photo), a pattern based on a geometric 1950s design. Each 72"-wide fabric comes in six colorways and is Greenguard-certified.

[knolltextiles.com](http://knolltextiles.com) CIRCLE 202



### Lightline Wall System

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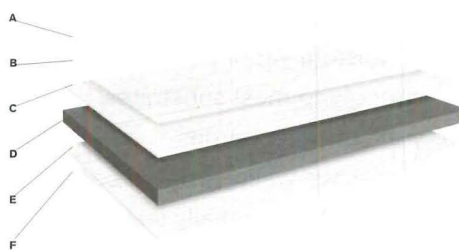
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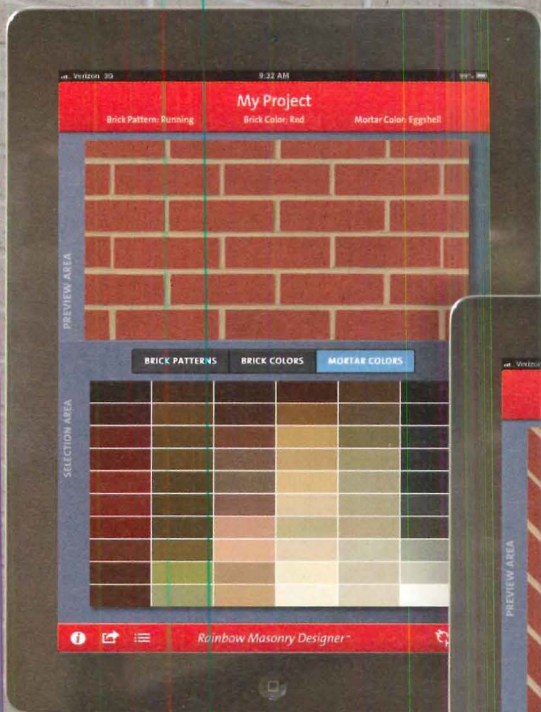
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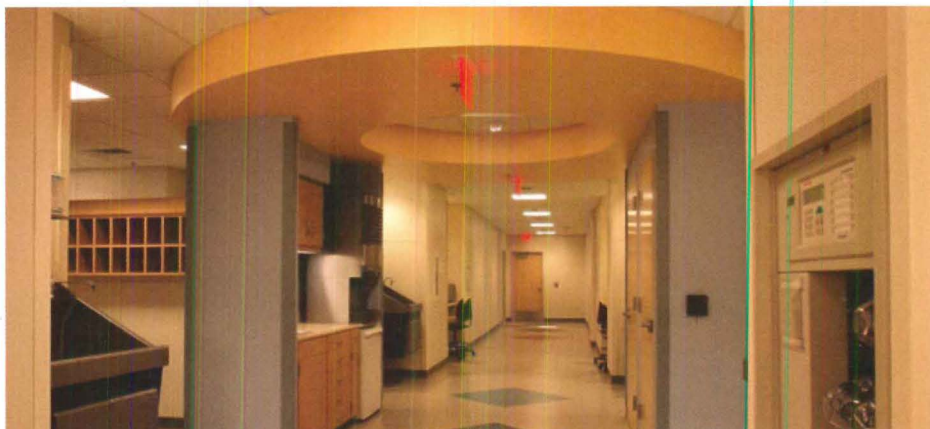
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## A Remedy for Better Healthcare Buildings

### How BIM is improving the design, construction, delivery and management of facilities for Bronson Healthcare



The business value of BIM for healthcare organizations like Bronson doesn't end at just managing the building lifecycle process more effectively. We see potential for using the model to pursue regulatory compliance. Given the effort to document and defend submissions for reimbursements from state and federal agencies, it is becoming more critical to account for every square footage we have. With 3D Revit models, that space information is more accurate and easier to access.

— Steve Hyde  
Energy/Facility Coordinator  
Bronson Facility Planning  
and Development

Image left and above: \$3 million renovation to construct four catheterization labs started November 2008 and finished May 2009. The new \$1.7 million prep/recovery unit at the Bronson Methodist Hospital features a state-of-the-art nurse station and work core, and was the first project completed by Bronson using BIM. Images courtesy of Bronson Healthcare

The U.S. healthcare industry is in the midst of a building boom. In a recent survey at the Fall 2012 Healthcare Design Conference, 80 percent of healthcare providers reported that their design and construction activity grew in 2012 and 67 percent expect continued growth in 2013. In addition, two-thirds of the surveyed healthcare providers felt that the Affordable Care Act will result in increased capital expenditures over the next 5 years.

However, the complexity and critical nature of healthcare facilities make them one of the most challenging types of building projects due to the cross-functional collaboration required to ensure success. In response, many healthcare facility owners are turning to Building Information Modeling (BIM) to facilitate efficient design and construction processes and improve building outcomes. BIM is an intelligent model-based process that helps owners and service providers achieve business results by enabling more accurate, accessible, and actionable insight throughout project execution and lifecycle. The use of coordinated, accurate 3D building models during design and construction can result in substantial cost and time savings for the owner. And beyond the design and construction phases, BIM can help improve the performance of facilities over their lifecycle, supporting improved patient care and reducing operating expenses.

But the vast majority of BIM projects—for all building types including healthcare facilities—have been new construction of very large, multi-million dollar facilities. Do the cost and time savings from BIM translate to smaller projects, especially renovations or upgrades? In 2011, one Michigan healthcare owner decided to find out by launching a head-to-head project comparison.

#### Bronson Healthcare

Bronson Healthcare Group, located in Kalamazoo, Michigan, is a not-for-profit healthcare system serving southwest Michigan and northern Indiana. Bronson operates three hospitals that total 3.1 million square feet. After years of working with hardcopy drawings and 2D computer-aided design (CAD) files, Bronson began investigating the use of BIM for its building renovation and construction projects, and to support its ongoing facilities management, operations, and maintenance.

“We felt sure that the benefits of BIM would be worth its costs, but we had to exercise due diligence and prove the value of BIM to our executive team,” says Michael DiFranco, manager of facility planning and development for Bronson. “So we embarked on a BIM pilot project to demonstrate the ROI for future build outs and, at the same time, gain support from our construction teams.”

For the sake of comparison, Bronson decided to use BIM on a new renovation project directly adjacent to a recently completed renovation that used CAD. The completed project was a \$3 million renovation to construct four catheterization labs that was finished in May 2009. The new project, which started in early 2011, was a \$1.7 million renovation and addition of a 13-bed prep/recovery unit (PRU).

### BIM Execution Plan

To prepare for BIM and get advice on the pilot project, Bronson turned to Kal-Blue, a local Autodesk channel partner that specializes in solutions and services for building lifecycle innovation. Kal-Blue has been an early advocate of extending BIM to a building's operational phase. "BIM is transforming the design and construction of buildings, and is being widely adopted by the AEC industry. But there's a disconnect when it comes to building owners," says Christopher (Kip) Young, President & CEO of Kal-Blue. "We help owners understand how new processes like BIM can improve the entire building lifecycle."

Kal-Blue works with owners like Bronson to develop a plan specific to their needs and communicate those needs to their architects and contractors, streamlining the data transfer during project delivery. In addition, the firm helps owners use BIM to support facilities management, operations, and maintenance.

The first order of business was to create a plan for using BIM on the pilot project and future projects, as well as the development of longer-term plans for using BIM for lifecycle management. Kal-Blue worked with Bronson to define the BIM goals and the deliverables for a capital project. The plan outlines requirements for each party including software and hardware requirements, and provides information regarding collaboration site usage, file naming conventions, model accuracy and tolerances, level of development definitions, and even MEP color-coding.

### Apples-to-Apples Pilot

Bronson's plan specifies that the architectural firm maintains a building model throughout every project, reducing the potential for information loss at handoffs and creating a more consistent process. The project architect and engineer of record for the PRU project, Diekema Hamann, used Autodesk Revit Architecture software to create an as-built model of the area based on existing 2D AutoCAD layouts. In addition, the team opened up walls and ceilings to field-verify the accuracy of the layouts, particularly in problematic above-ceiling spaces. The plan also calls for the architectural firm to use the virtual building model for project coordination and clash detection, which has long been recognized as one of the biggest benefits of BIM for design and construction. Diekema Hamann used Revit Architecture for its design of the renovated space, and also modeled the major building systems based on design and fabrication drawings supplied by the general contractor and subcontractors.

	Cath Lab (Trad.)	Cath Lab (by %)	PRU (BIM)	PRU (by %)	Results (PRU v. CL)
Contract Value (under)	\$79,330 Under GMP	2.6%	\$159,234 Under GMP	9.2%	↑ 71.7%
Cont. Value	\$231,107	7.44%	\$31,942	1.88%	↓ 74.7%
MEP Field Coord.	\$94,456	3.04%	\$1,700	.01%	↓ 96.7%
Change Orders	19	N/A	5	N/A	↓ 73.4%
Timeline Reduction	0	N/A	3/wk	11.5%	↓ 11.5%
Revenue Impact	0	N/A	1.41M	N/A	↑ 5.77%

Table of comparative project metrics

To promote team building and develop trust between all these players, Bronson gathered them all around a table at the outset of the project to discuss the use of BIM. "The BIM fee for the prep/recovery unit project was about \$40,000, so we wanted to make sure that everyone was on-board with BIM," says Steve Hyde, an energy/facility coordinator within Bronson's facility planning and development group. "After the meeting, the teams agreed to reduce their contingency fees based on the prospect of a more coordinated project, delivered under budget and ahead of schedule."

### Pilot Project Results

The results of the pilot were a resounding success—definitively proving the business value of BIM and Revit software on small-scale renovation projects.

The CAD-based catheterization project was 2.6 percent (approximately \$80K) under budget. The contingency value spend was 7.4 percent and the MEP field coordination spend was 3 percent. There were 19 change order requests and no reduction in construction time. Bronson reports that these numbers are typical for a CAD project of this size.

Whereas on the PRU project, **BIM and Revit Architecture** software helped Bronson almost quadruple its savings. The project was almost \$160,000, or 9.2 percent, under budget. The contingency value spend was only 1.9 percent, due to the upfront coordination work within the field and between trades. The MEP field coordination spend was only 0.01 percent, representing just \$1,700 on the \$1.7 million project. There were only five change order requests and the project was completed three weeks early. In addition, the PRU supports the catheterization labs and, as a result, the early completion of the PRU resulted in \$1.4 million in additional revenue for Bronson from those labs.

### Going Forward

Currently, Bronson is using BIM and Autodesk Revit Architecture on a \$5 million, 25-bed construction project begun in April 2011. Revit Architecture was used to complete the MEP coordination during demolition, which helped shorten the project timeline. And the proven value of BIM helped Bronson convince the HVAC contractor to decrease its bid by more than \$100,000 and the construction management firm to reduce its contingency from 8 to 2 ½ percent—saving Bronson an immediate \$350,000.

### Into the Future

The successful use of BIM has also convinced Bronson to launch a campus-wide BIM Execution Plan that includes using Autodesk Revit software to create as-built models of all existing buildings, and (with assistance from Kal-Blue) integrating that information with operations and maintenance systems. "BIM is helping owners like Bronson redefine how its buildings are designed, constructed, delivered, and managed," says Young. "Intelligent, data-rich models of existing buildings will help us organize and, at the click of a mouse, access the information we need to do our jobs and get that information to the people who need it in a timely fashion," adds Hyde. "BIM and Revit software will be used on all of our future projects," reports DiFranco. "Revit building models will help us better maintain our assets, make our staff more productive, and reduce our lifecycle costs."

Mortenson Construction, *Healthcare Industry and Design Trends*, [www.mortenson.com/ResourcePage\\_Whitepaper\\_HealthcareDesignTrends](http://www.mortenson.com/ResourcePage_Whitepaper_HealthcareDesignTrends), January 2013

WESTERN RED CEDAR

# ARCHITECTURAL

## Design Awards 2012

Sponsored by the Western Red Cedar Lumber Association (WRCLA) and hosted by Architectural Record, the Western Red Cedar Architectural Design Awards specifically recognize innovative design using one of the world's most unique building materials: Western Red Cedar.

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CIRCLE 15



**\* HONOR**



Tahoe City Transit Center  
**Sherman Wright, WRNS Studio**

Located in Tahoe City, California, the Tahoe City Transit Center (TCTC) is a vital step toward a more sustainable transit network within the region. The structure's long, low roof clad in Western Red Cedar hovers above the land and is carefully situated among the dramatic features of the site. TCTC responds to all seasons and integrates sustainability wherever possible. Its' unique shape is tailored to featuring Western Red Cedar.

**\* MERIT**



SEMA4  
**Brian Church Architecture**

The four mixed-use, live-work buildings of SEMA4 are designed to feel and function like live-aboard boats. Western Red Cedar was the ideal material to provide the beauty, warmth and durability of these coastal buildings. The defining feature of the design, the gracefully curved hulls (1x6 WRC) and sails (hand laminated WRC curved members) are only possible because of the wood's versatility.

**\* MERIT**



Sandy High School  
**Dull Olsen Weekes - IBI Group Architects Inc.**

Sandy High School achieved a contemporary yet regional synthesis using heavy timber cedar frames and unpainted cedar board siding coupled with pitched roofs and asymmetrical massing, which exceeded both the City and District expectations. The favorable weathering of the cedar proved to be a recognizable aesthetic element used to meet the City requirements and a benefit for the long-term maintenance issues.

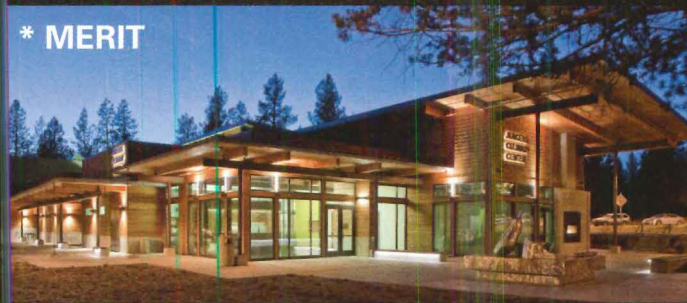
**\* MERIT**



CUC Admin Campus Center  
**LTL Architects**

The project deploys a series of intertwined elements that transform the existing facility and redefines its public presence. These include a 74 foot-long screen, made of Western Red Cedar. To redefine the building's character, the continuous cedar surface wraps portions of its north, east and south elevations. When passing over windows, the spacing of the cedar panels is increased to allow light in.

**\* MERIT**



Jungers Cullinary Center  
**Yost Grube Hall Architecture**

Special consideration was given to wood species selection and detailing to accentuate the cottage atmosphere. Exposed wood structure, ceiling and soffits embellish the warm cottage feel expressed throughout the exterior and interior. The materials retain a careful interplay of contrasts, the transparency of glass adjacent to the textural qualities of cedar shingles and horizontal cedar siding.

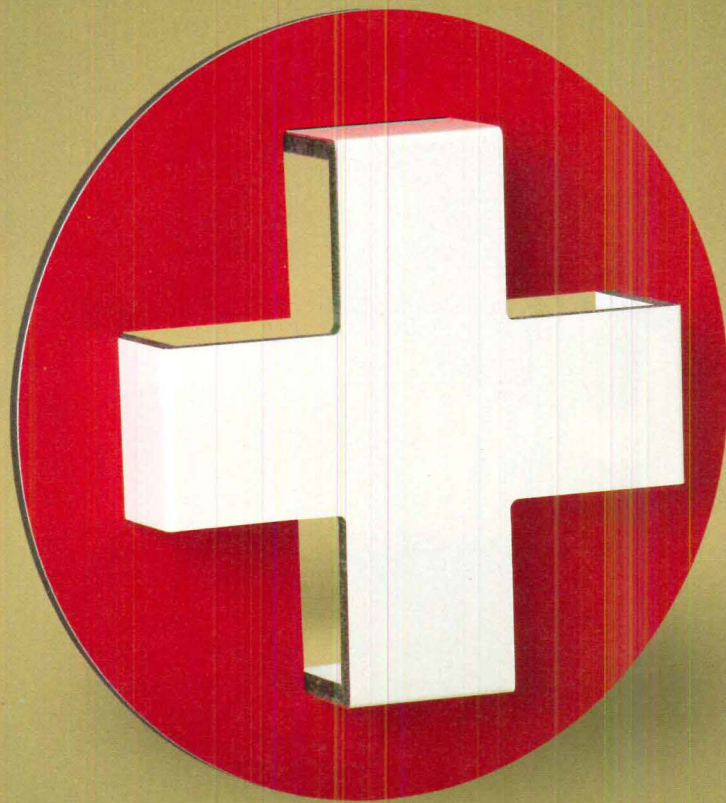
**\* HONORABLE MENTION**



Local Church of the Saints  
**C.Y. Lee Architect Inc.**

The 50 year-old vacant 37,000 sq. ft. industrial building that previously functioned as a furniture factory required a major renovation. The existing brick facade was dilapidated and underwent major deterioration due to extreme winter conditions. The best material choice for the recladding was Western Red Cedar chosen for its warm and welcoming characteristics.

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# SHELTERING THE WORLD

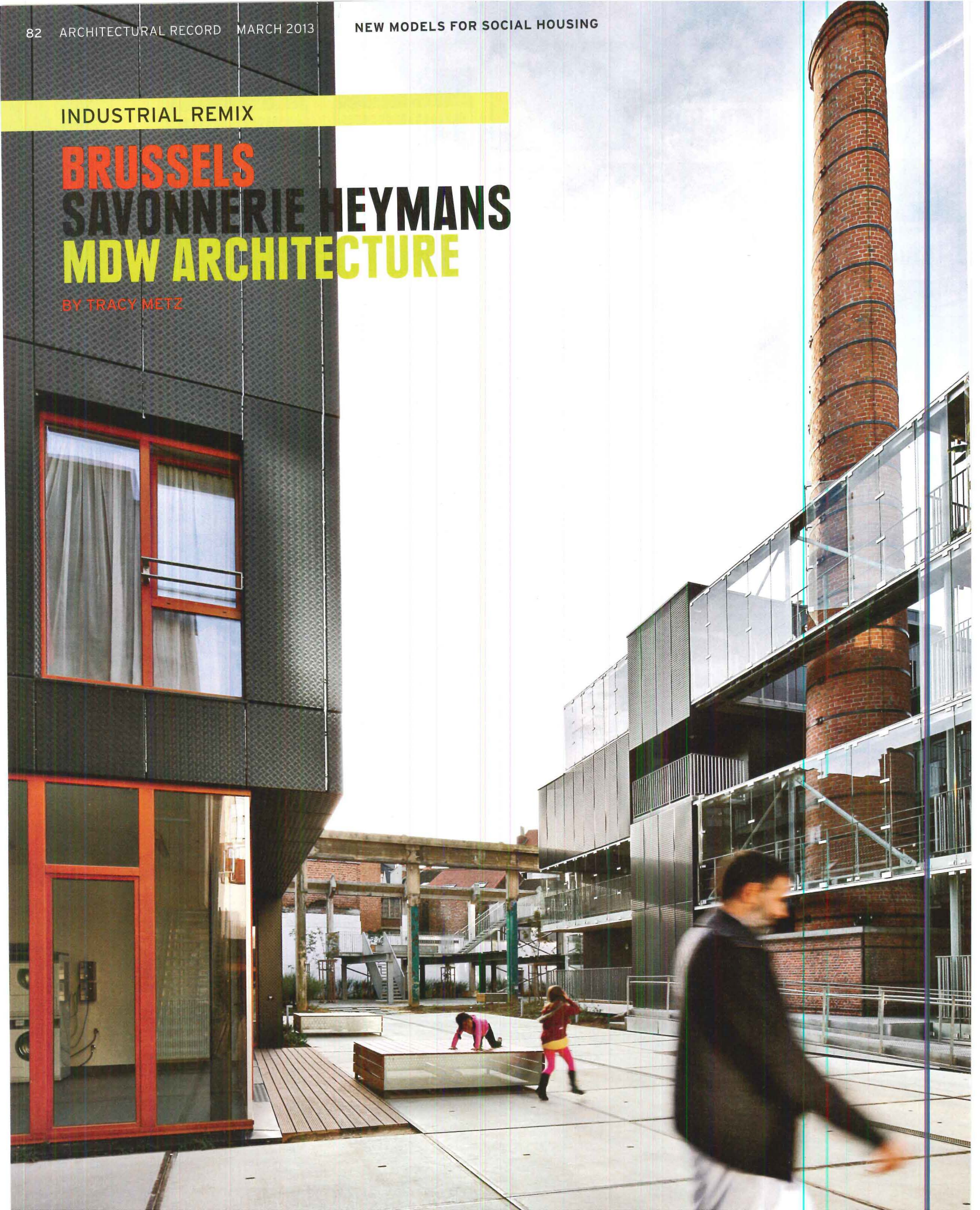
As we all know too well, the progressive values of early Modernism led to great experiments in social housing. Architects today are adopting, as they have before, the vision of their idealistic predecessors, but learning from the mistakes of post-World War II public projects. There is a growing insight that the best housing is integrated with social services as well as connected to the urban fabric and the wider community. One size, though, does not fit all. In the following pages, we present more than a dozen new examples that demonstrate the vastly different scales, contexts, and approaches to accommodating the needs of various populations around the world. Most are new construction; some, such as Park Hill in Sheffield, England, represent a radical reworking of the failed promises of Modernist ideals from an earlier era.

Park Hill, designed by Jack Lynn and Ivor Smith (1961).  
Renovated by Hawkins\Brown and Studio Egret West.

INDUSTRIAL REMIX

**BRUSSELS**  
**SAVONNERIE HEYMANS**  
**MDW ARCHITECTURE**

BY TRACY METZ





**WHEN THE** social-services department of a central Brussels municipality bought the contaminated 70,000-square-foot site of a former soap factory in 2005, it established a competition for the design of subsidized apartments. The winning plan by a local firm, MDW Architecture, retains the industrial flavor of the property, which dates back to the 18th century, but transforms it into a sustainable oasis of 42 middle-income rentals grouped around three private courtyards. Named for its precursor, the Savonnerie Heymans is now a model public-housing complex that provides shared green spaces and amenities in a dense but underserved neighborhood on the rebound that is populated by a mix of young people and immigrants, mainly from North and Sub-Saharan Africa and Eastern Europe.

Project architect Gilles Debrun calls the Savonnerie Heymans “a village” that offers protected space for interaction in an otherwise cramped urban setting. Once hidden behind four derelict houses (now demolished), the complex still presents a discreet face to the street—but a welcoming one. All you see from outside is its recessed entrance gate and new community day-care center with tall, playful windows, some in bright colors. An inviting glazed back

wall here allows views through to a small garden behind it called the “mini-forest,” which sits on top of the residents’ underground parking garage.

Saving what they could, the architects renovated two existing structures that house 10 dwellings. They supplemented these with four new buildings, adding 32 living spaces of various housing types: studios, lofts, duplexes, and maisonettes. The number of bedrooms varies from one to six—a rarity in the old city, especially in subsidized housing. The architects were also intent on providing the inhabitants with collective amenities, such as day care, communal meeting and laundry rooms, and outdoor areas. In addition to the narrow “mini-forest,” there is a playground and the Grande Cour, a large central plaza. The project even has its own concierge.

Reminiscent of Le Corbusier’s much larger post-World War II Unité d’Habitation in Marseilles, France, almost all the units open to integrated porches or loggias, protected by operable window walls that fold out and double as acoustic and thermal barriers when closed. These also supply ventilation and some privacy in the close quarters of this “village.”

The architects paid special attention to efficient, low-

**URBAN EVOLUTION**

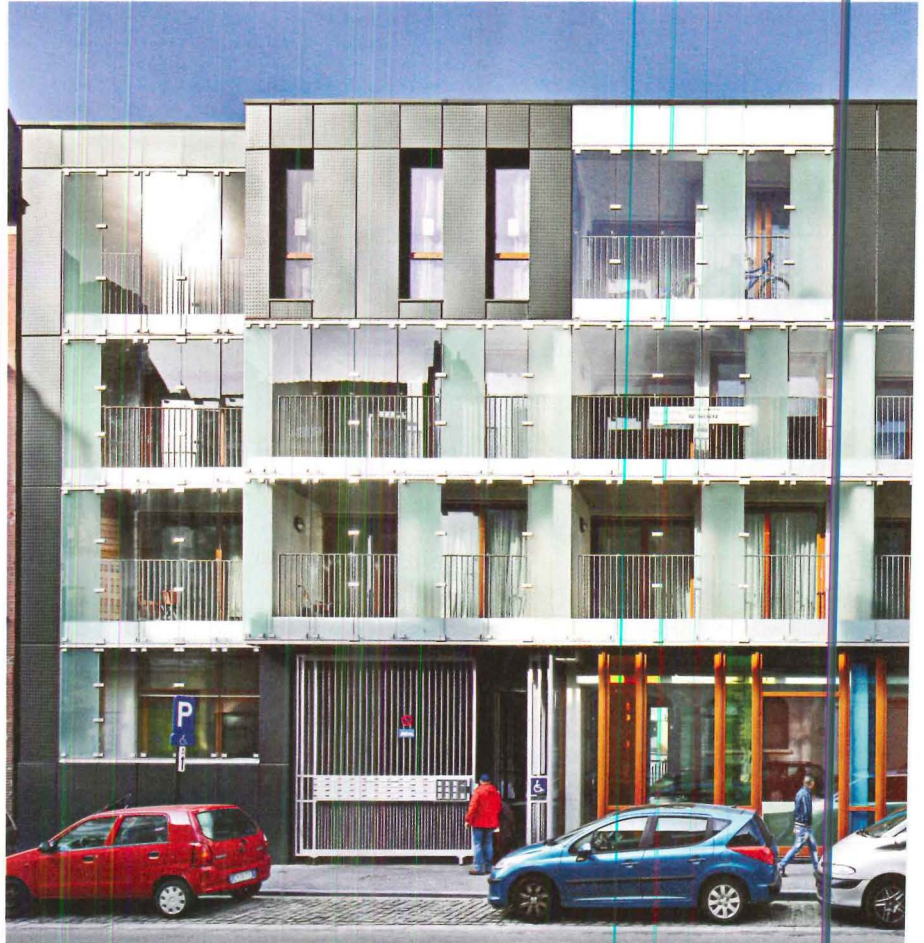
Children play on the Grande Cour of the former soap factory turned public-housing project (opposite), where an old chimney rises among new buildings and the remains of a 1950s warehouse are now a bilevel playground. The architects renovated existing 18th- and 19th-century buildings into lofts and apartments (above), fusing them with new metal-faced dwellings and a colorfully glazed day-care center on a small garden or “mini-forest.”

maintenance measures in order to reduce energy costs during and after construction. For example, they wrapped the new buildings with industrial-style metal panels—a reference to the location's history—backing them with 5½-inch-thick hemp insulation. Then they restored an existing 19th-century steel-frame industrial building, sandwiching a lighter cellulose insulation between a new brick facade and the inner walls, isolating the concrete slabs from the exterior to create a thermal break. This building, which now houses the Savonnerie's lofts, meets the passive very-low-energy building-performance requirements of the Brussels Institute for Management of the Environment (IBGE) and uses less than 7,300 BTUs per square foot a year to heat. Additional sustainable elements include 646 square feet of solar panels for hot-water heating, and rainwater harvesting for toilets and gardens.

To preserve the Savonnerie's sense of place, MDW incorporated various remnants of the factory's industrial heritage. The most prominent, a 131-foot-high brick chimney, rises amid the metal stairways and bridges linking the apartment buildings around it. More than a relic, it is now used to ventilate the underground garage. Similarly, a warehouse from the 1950s was largely demolished to create a playground with a viewing platform. Its surrounding walls were lowered from 33 to 10 feet high, and sections of the old steel beams were preserved as visual artifacts.

Tucked within the heart of Brussels, a city where only 10 to 15 percent of the housing is for low- and middle-income families, the Savonnerie Heymans represents a promising future for a diverse population. ■

*Amsterdam-based Tracy Metz is an international correspondent for RECORD and author of Sweet & Salt (NAi Publishers, 2012).*



- 1 ENTRANCE
- 2 DAY-CARE CENTER
- 3 GARDEN
- 4 PARKING
- 5 PLAYGROUND
- 6 CHIMNEY
- 7 COURTYARD
- 8 COMMUNAL LOUNGE/  
LAUNDRY AREA
- 9 EXISTING STRUCTURE/  
HOUSING
- 10 NEW HOUSING



GROUND FLOOR PLAN





**STREET WISE** The sustainable complex presents a discreet but welcoming face to the street with a community day-care center next to the entrance gate (above). Almost every unit opens to a comfortable loggia (right) surfaced with wood and enclosed by operable folding window walls that protect occupants from inclement weather and neighboring sounds.



## DOWNTOWN CATALYST

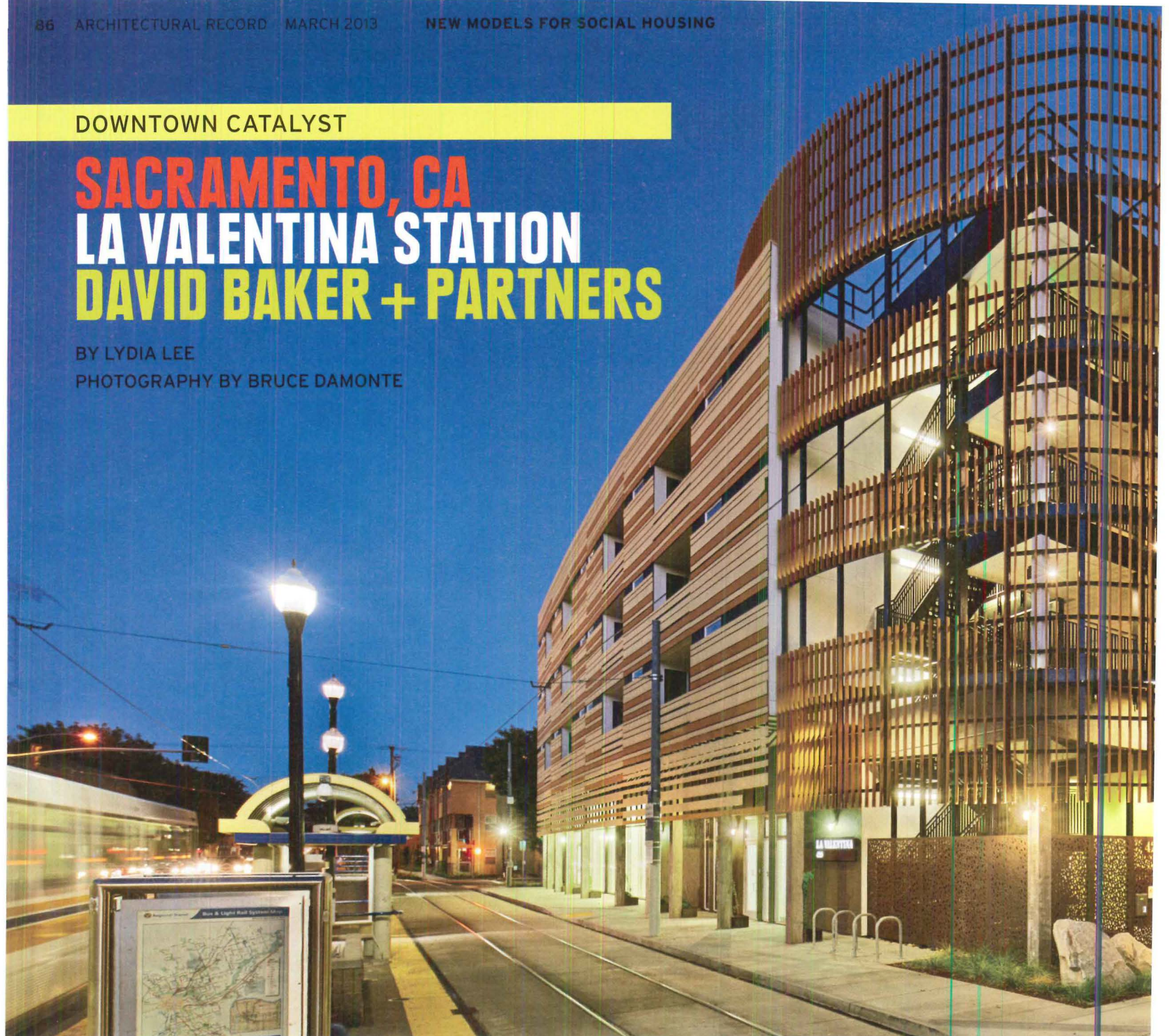
# SACRAMENTO, CA

## LA VALENTINA STATION

### DAVID BAKER + PARTNERS

BY LYDIA LEE

PHOTOGRAPHY BY BRUCE DAMONTE



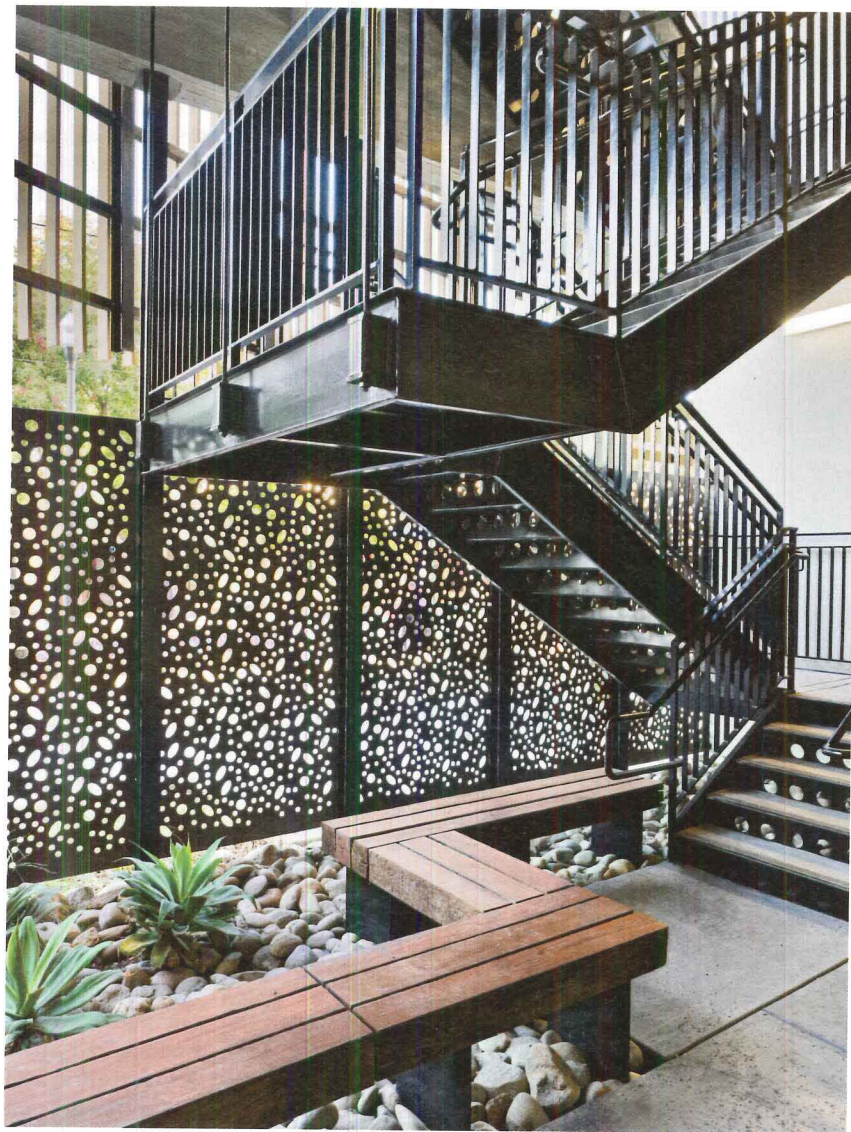
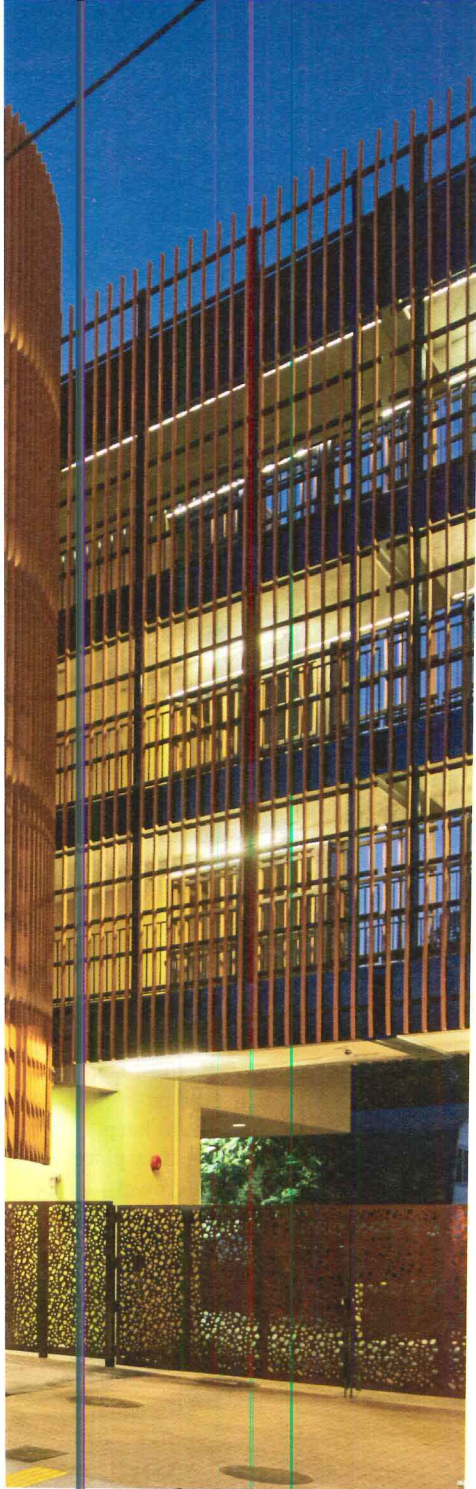
**AFTER DESIGNING** 44 affordable-housing projects over the last 30 years, San Francisco architect David Baker has developed a formula for making them look like their market-rate cousins: “You build 20 percent with high-end materials, and the other 80 percent with less expensive ones. But they must be used creatively,” he says. “It’s kind of like competing on *Iron Chef*—you make the most of what you have.” At La Valentina Station, a 63-unit, transit-oriented housing project in Sacramento, California, Baker applied this culinary-style innovation to a highly visible site three blocks north of City Hall, next to a light-rail station and a busy arterial route.

The architect employed an inexpensive, recyclable polyvinylchloride (PVC) rainscreen over cement board, painted

to create a lively striped facade, with curved PVC slatwork wrapping around a four-story exterior stairwell. He then supplemented the lower-priced materials with ornately patterned, water-jet-cut Cor-Ten steel for the balcony fronts and fencing. The \$12.3 million mixed-use wood-frame and concrete-deck structure, which includes space for ground-level retail and a corner café, cost only \$162 per square foot. Completed last summer, it was soon filled with an energetic mix of young families and singles who qualified for the low-income housing.

The 1-acre site, formerly occupied by auto-body shops, had been vacant for 20 years and had become a destination for drug dealers when the city’s Housing and Redevelopment





**EASY COMMUTE** David Baker+Partners designed La Valentina Station, an affordable-housing complex, in an old, down-at-the-heels neighborhood of Sacramento. The complex, which edges the light-rail station (above), is also close to downtown. Built by Domus Development, the 63-unit structure is composed of two rectilinear blocks linked at the middle by an elevated-walkway system (right) over a former alley. Recyclable polyvinylchloride siding sheathes the exterior, while PVC slats wrap around an open-air stair. Water-jet-cut Cor-Ten steel with an ornate pattern enlivens balcony fronts and fencing (above, right).



**LINEAR AND LEAN**  
As the southern-end elevation of La Valentina Station (above) shows, the long and narrow residential complex is girded with balconies. The amenity gives a sense of spaciousness (right) to the apartments in the wood-frame and concrete-deck four-story structure.



Agency put out a request for proposals in 2007. The winner was Domus Development, headed by Meea Kang, who has an M.Arch. from the University of California, Berkeley. With her 17-year track record in building private affordable housing, Kang had often admired Baker's accomplishments in this area. While she originally planned to include some market-rate housing, the recession prompted her to drop that component; in a tight economy, she managed to fund the project through state low-income-housing tax credits and obtained financing from the city's redevelopment agency and local banks.

Since the rectilinear lot, like most Sacramento blocks, had an alley severing its middle, Baker created a structure of elevated walkways to bridge the gap and link the two linear housing blocks in the complex. The elevated "streets" are high enough to provide clearance for emergency vehicles at ground level; otherwise the alleyway, covered in a soft-fall surface, serves as a play area.

The interior floor plans feature typical double-loaded corridors, although the key circulation routes, including the main stairwell, are open-air. While this may be unusual for the hot climate of Sacramento, it reflects the design's emphasis on sustainability. To make the most of natural ventilation and lighting, the majority of the apartments, which range from 440-square-foot studios to 1,000-square-foot three-bedroom units, have private balconies, recessed for shade. Solar electricity and hot-water systems, along with other measures, allow the building to exceed California's stringent Title 24 energy-efficiency standards by 30 percent.

The occupants make only 30 to 60 percent of the area's median income and pay rents ranging from \$347 to \$1,100 a month, depending on income and the size of the unit. The pride that the burgeoning community has in its new home is apparent, from the care that people take to keep communal areas neat to the plants and furniture they place on their balconies. Both the developer and the architect also feel enriched by their efforts to improve the design level of Sacramento's oldest neighborhood. "People notice the neighborhood in a good way now," says Baker. "It's an exclamation point on the street." ■

*Lydia Lee is an architecture writer and editor based in San Francisco.*



UPPER LEVEL

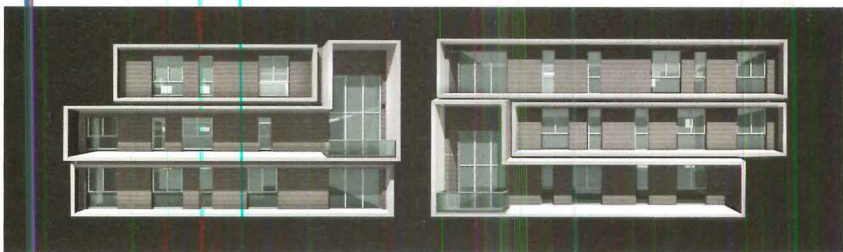
- 1 RESIDENTIAL UNITS
- 2 PRIVATE BALCONIES
- 3 OPEN-AIR STAIR
- 4 ELEVATOR
- 5 OPEN-AIR BRIDGE



## BRIDGING GENERATIONS

# SINGAPORE SKYTERRACE@DAWSON SCDA ARCHITECTS

BY CLIFFORD A. PEARSON



**STACKED MODULES** The project's five towers contain 758 dwelling units ranging in size from 475 to 1,315 square feet (rendering, top). Studio apartments for senior citizens are attached to larger ones for their grown-up children (diagram, above), providing independent living and familial connections. The project is under construction (right), scheduled to be completed in the first half of 2014.

**WITH ITS** population jumping from 4 million in 2000 to 5.2 million in 2011 and housing prices rising fast, Singapore needed to expand its supply of public housing at the end of the last decade. But instead of building banal apartment blocks, the city-state's Housing & Development Board (HDB)—which provides public housing for both middle- and working-class residents—hired some of the most talented local architects to create a new generation of subsidized projects that would be greener and built at much higher densities than older ones.

For an area called Dawson, not far from Singapore's downtown, HDB planned three large projects to replace a low-rise housing "estate" razed a decade ago. Two of these complexes—SkyTerrace and SkyVille (following page)—are under construction; the third waits to move forward. SCDA Architects, headed by Soo K. Chan, designed SkyTerrace, focusing on the buildings' relationship to an adjacent linear park running along the Alexandra Canal and the need for multi-generational living units. Comprising five towers ranging from 40 to 43 stories and sitting atop a parking podium, the project will offer residents great views from their apartments as well as a series of landscaped spaces flowing over the podium, down to a large courtyard, and into the linear park. Terraces with lush tropical plants will connect the towers at various heights, offering elevated gardens to residents, who begin arriving in the first half of 2014.

To accommodate Singapore's growing number of elderly, SCDA designed studio apartments that attach to larger duplexes, so aging parents can live next to their children while maintaining their independence. Clearly expressed on the exterior of the mostly precast-concrete buildings, each apartment was fabricated off-site as a set of modules, then hoisted into place. Prices range from \$225,000 for a studio to \$520,000 for one of the largest units. The project has earned a Platinum rating from Singapore's Green Mark system by taking advantage of the tropical climate to harvest rainwater, provide drip irrigation for plantings, filter water in bio-retention basins, and generate energy with rooftop solar arrays. And its design uses natural ventilation and sun shading to keep apartments cool without air-conditioning. ■



View additional images at [architecturalrecord.com](http://architecturalrecord.com).

## GARDENS IN THE SKY

# SINGAPORE SKYVILLE@DAWSON WOHA

BY CLIFFORD A. PEARSON

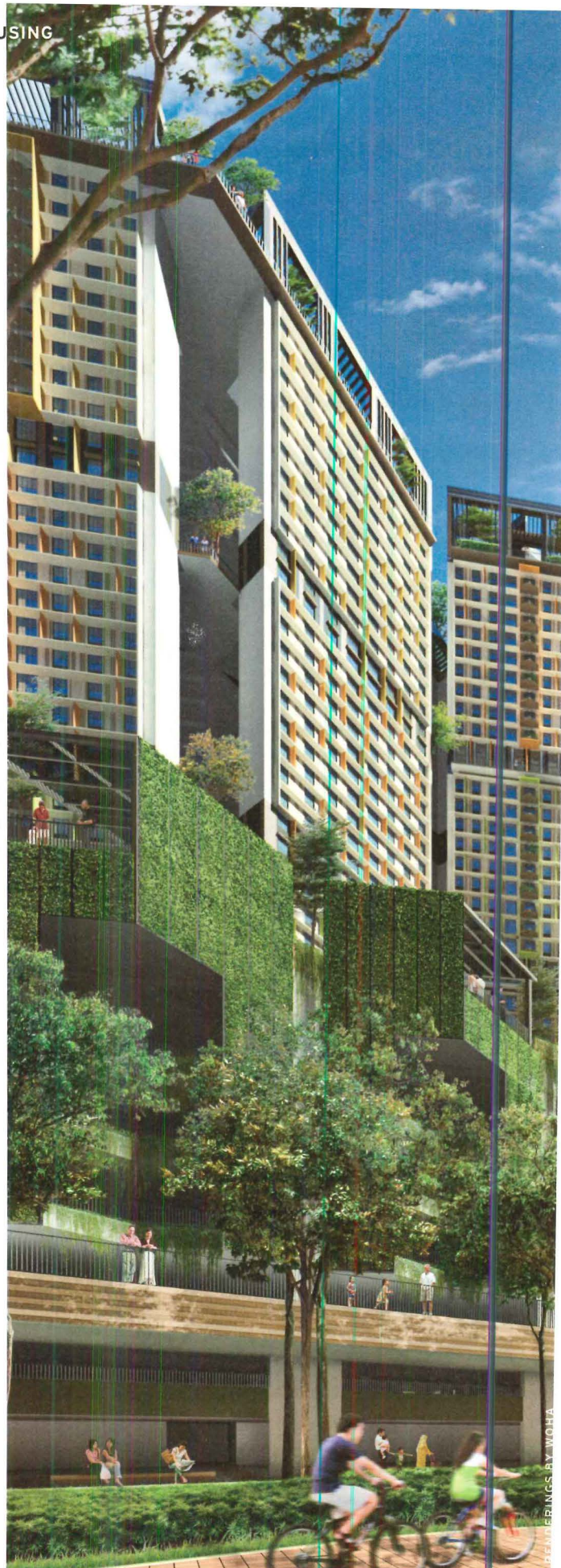
**RIGHT NEXT** to SCDA's SkyTerrace (previous page), WOHA's SkyVille@ Dawson offers a different response to the Singapore Housing & Development Board's call for new approaches to public housing. While SCDA tackled the problem of multigenerational living, WOHA looked at ways of providing a sense of community in a huge complex with 960 dwelling units. Both projects, which will open by mid-2014, emphasize sustainable design adapted to a tropical climate and connect their buildings to a number of new and existing outdoor spaces and parks.

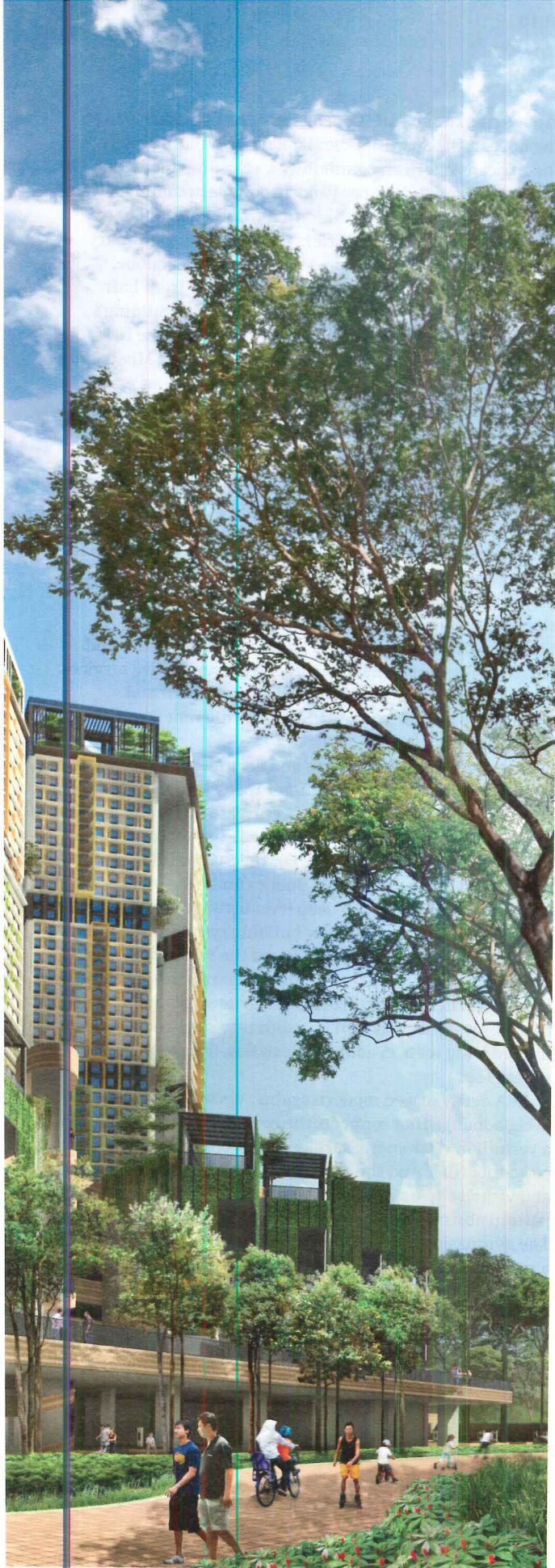
Roughly 80 percent of Singaporeans live in public housing and most buy their units, so projects are populated by the middle as well as the working class. With the quality of the buildings high and the price of the apartments low (from one-quarter to one-half that of market-rate units), only the wealthy live in privately developed housing. And since the government deducts money from all residents' paychecks and puts it in housing savings accounts, almost everyone can afford to buy an apartment just a few years after starting a career.

Wong Mun Summ and Richard Hassell, WOHA's two principals, realized from the start that they needed to break the enormous scale of their project into humane pieces. So they developed the concept of "sky villages": 11-story neighborhoods oriented around communal gardens with residences on four angled sides. Each sky village has 80 apartments looking onto and sharing use of its high-rise garden, a scheme that encourages interaction among neighbors. Instead of enclosed hallways, covered balconies overlooking the garden provide access to all dwelling units and serve as shaded places for people to meet. WOHA stacked four villages on top of one another in each of the complex's three diamond-shaped towers. Roof gardens at the top of each building and covered spaces at the base offer a variety of outdoor places where residents can socialize and enjoy Singapore's lush setting.

The architects designed the project so all apartments face either north or south and oriented the buildings to maximize their relationship to an existing park on one side and a new landscaped area on the other. The project's sky gardens and covered balconies bring cooling breezes and daylight into the residences so they can be naturally ventilated instead of air-conditioned. Horizontal and vertical shades on the outside of the buildings reduce solar loads inside, while photovoltaic arrays on the roofs provide electricity for all common spaces. A 495-foot-long bioswale running on one side of the site filters water naturally before discharging it.

The project's entirely precast-concrete structure allows apartments to be free of columns. As a result, interior walls can be removed or moved, creating flexible layouts. To improve comfort in the cross-ventilated units, WOHA designed a new type of monsoon window, set a few feet above the floor so it directs breezes to people as they're seated. While privately developed condos often emphasize luxurious materials, both SkyVille and SkyTerrace generate interest by creating high-density communities attuned to their tropical setting. ■





**GREEN DIAMONDS** From a linear park running along an existing canal, the project (under construction, above) looks like a folded wall of housing towers sitting above a parking and retail podium (rendering, left). In plan, each tower forms a diamond, with four angled wings enclosing a common outdoor space. In section, each tower is made of stacked “sky villages” with 80 apartments overlooking a raised garden every 11 stories (rendering, below).



## BUILDING ON HISTORY

# LOS ANGELES 28TH ST. APARTMENTS KONING EIZENBERG

BY SARAH AMELAR

PHOTOGRAPHY BY ERIC STAUDENMAIER

**THE 28TH STREET YMCA** opened in Los Angeles in 1926 on the upbeat: the Spanish Colonial Revival building offered the African-American community a sparkling recreational facility with an indoor pool and affordable accommodations for young men who were migrating from other regions (and prevented by color barriers from staying at ordinary hotels). Philanthropist Annie Minerva Turnbo Malone, a black entrepreneur who amassed a fortune from hair pomades, was one high-profile donor. And the building's designer was Paul Revere Williams (1894–1980), the first registered African-American architect west of the Mississippi. His celebrated output would eventually range from mansions for Hollywood stars, including Frank Sinatra and Lucille Ball, to hospitals, hotels, and even Los Angeles airport's 1961 Jetson-style restaurant building. But the YMCA was an early work, introducing a commitment to affordable housing that would reemerge throughout his career.

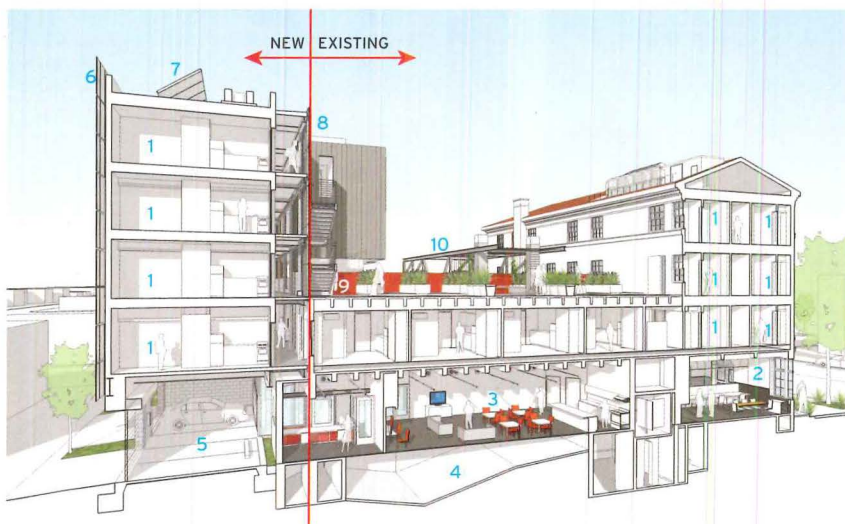
This four-story concrete building became a city, state, and national landmark, but by 2009, when the nonprofit developer Clifford Beers Housing (CBH) acquired the property, it was in serious disrepair, the residential quarters shuttered. CBH engaged Santa Monica-based Koning Eizenberg Architecture (KEA) to revive the structure and create quality permanent housing, with supportive services, for low-income tenants, including a mentally ill and chronically homeless population. Monthly rent is one-third of each tenant's income.

Drawing on archival photos and documents with the help of the preservation consultant Historic Resources Group, the firm restored original architectural features and replicated lost elements, such as the facade's balcony and some of its cast-concrete medallions. For the \$11.9 million project financed with tax credits and public funds, the architects cleverly inserted a 14-inch-deep level between the first and second floors to integrate new building systems. Upgrading to ADA standards, they reconfigured the 52 existing single-room-occupancy units into 24 studio apartments, each with its own kitchen and bathroom, and created ground-floor community spaces, as well as a slim new steel-and-wood-framed wing with 25 additional studios, for a total of 38,300 square feet.

KEA deftly played modern against vintage. The roof deck, a lounge that connects the new and old buildings, has a vermilion elastomeric surface—a riff on Williams's terracotta roof tiles. And the aluminum sunscreen that shades and visually dematerializes the new wing has a perforated pattern abstracted from the main entrance's 1920s bas-reliefs. The gymnasium has been refurbished, but to accommodate a residents' lounge the architects filled in the pool, leaving its outline and mosaic surrounds visible. Encapsulated in geo-textile and foam board beneath fill with a concrete cap, the pool could someday regain its original use.

With such sustainable features as a solar hot-water system and an electricity-generating 38.7-kilowatt photovoltaic array, the project is on track for LEED Gold certification.

KEA reinterpreted the building's original, and still much-needed, role. "It's not exactly adaptive reuse—it was housing then, and it's housing now," says firm principal Julie Eizenberg. "You've got to respect what a huge story the place was for this community in its day. We definitely didn't want to lose that." ■



SECTION-PERSPECTIVE

- |                     |                          |                  |
|---------------------|--------------------------|------------------|
| 1 STUDIO APARTMENT  | 5 PARKING                | 8 SHADING SCREEN |
| 2 COMMUNITY CENTER  | 6 PHOTOVOLTAIC PANELS    | 9 ROOF DECK      |
| 3 RESIDENTS' LOUNGE | 7 SOLAR HOT-WATER PANELS | 10 TRELLIS       |
| 4 FILLED-IN POOL    |                          |                  |



**VINTAGE TO MODERN** The architects drew on archival materials to re-create the facade's original cast-concrete balcony (opposite). An outdoor lounge (above), with a vermilion elastomeric surface, connects the old and new buildings. The addition's aluminum sunshade has a punched pattern abstracted from the main entrance's 1920s bas-reliefs of Booker T. Washington and Frederick Douglass. In the former pool area (below), Newsom Design's black-and-white photomural evokes water. Every unit has its own kitchen (inset).

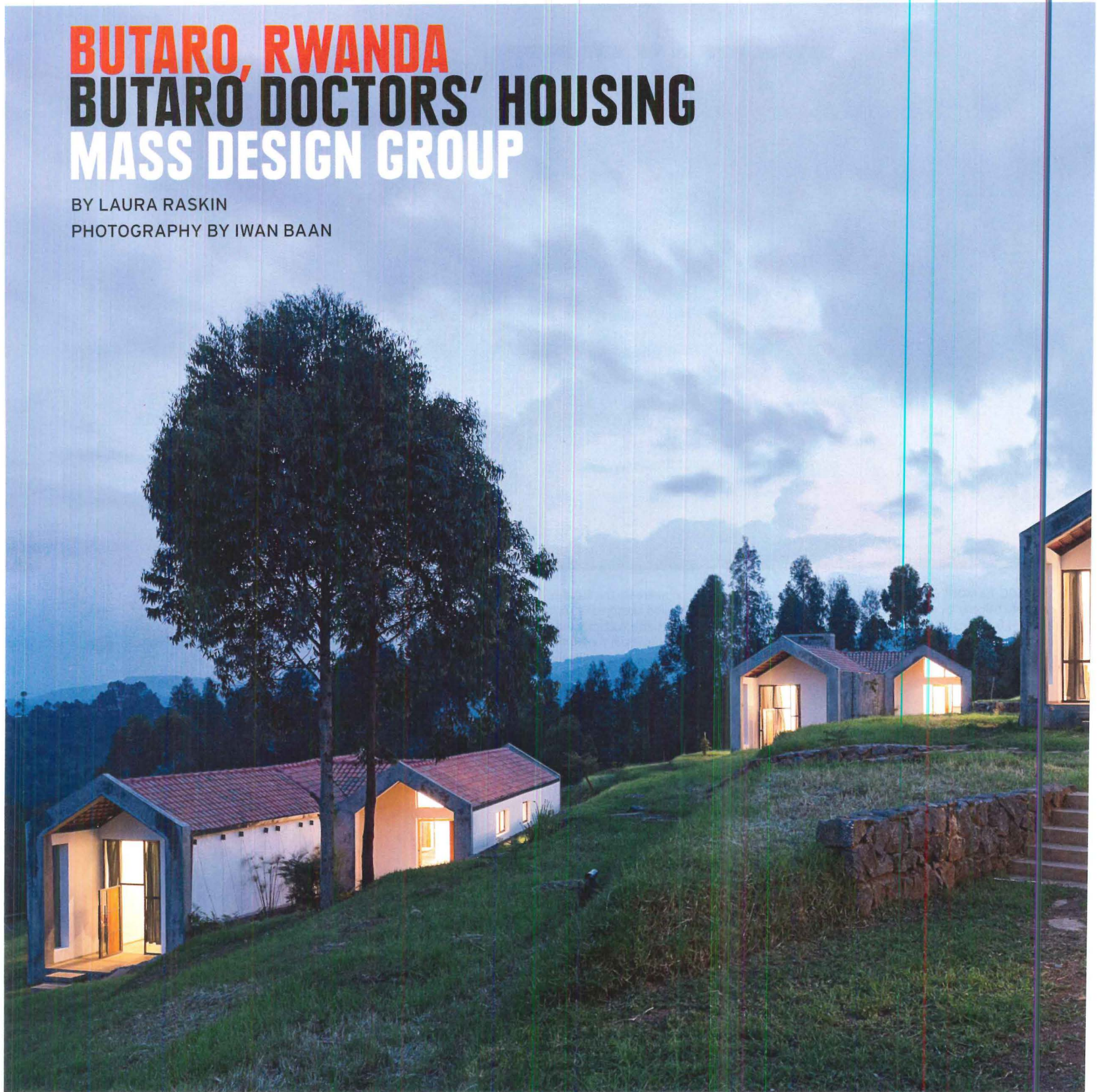


HOUSE CALL

**BUTARO, RWANDA**  
**BUTARO DOCTORS' HOUSING**  
**MASS DESIGN GROUP**

BY LAURA RASKIN

PHOTOGRAPHY BY IWAN BAAN







**BEFORE 2007**, people living in the rural Burera district of northern Rwanda had little access to a health-care facility or doctors. Then the nonprofit Partners in Health and the Rwandan Ministry of Health began creating a health-care network in the region, including the 150-bed Butaro Hospital, designed by Boston-based MASS Design Group. The hospital opened in January 2011 and quickly made an impact on the health of the nearly 350,000 people in the area.

Despite its success, the hospital has grappled with a pivotal challenge. How to attract and retain Rwanda's brightest medical professionals, as well as doctors from other countries? A response to that challenge opened this past November: the first phase of permanent doctors' housing, built by MASS about a five-minute walk from the hospital. The project, developed in partnership with Boston's Brigham and Women's Hospital (BWH) and its Global Surgery program, was the brainchild of BWH donor Daniel Ponton. The four houses are the first structures on Umusozi Ukiza—the Healing Hill—which MASS has master-planned to eventually include more individual dwellings, shared housing for staff without families, a community center, and living quarters for cancer patients and their families. The houses are owned by the Ministry of Health, and the doctors who live there do not pay rent. "This is the first step in trying to instigate the development of the whole area," says Michael Murphy, founding partner and executive director of MASS.

Murphy and Alan Ricks, along with classmates of theirs, began working on the design of Butaro Hospital as students at the Harvard Graduate School of Design. The two incorporated the nonprofit MASS (Model of Architecture Serving Society) in 2010. The doctors' housing is emblematic of MASS's commitment to a particular metric of success. "We try to calculate value in terms of people affected as opposed to simply the object produced," says Murphy. The housing was a design-build project that involved training local labor to work with materials at hand. In addition to employing six MASS fellows—including project manager and Kigali native Commode Dushimimana—on the housing project, the firm trained 10 local Rwandans in steel bending and 14 in masonry, and the total construction created many jobs. (Murphy says

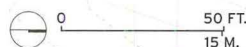
**BUILDING GREEN**  
Some walls have a layer of local volcanic stone, which increases their thermal mass. The 14 Rwandans trained as masons by MASS used chalk to draw the outline of the stones already in place on the stone they were about to set. Then they used hammers and chisels to give it the required outline, minimizing the need for visible mortar (above). Poured-in-place-concrete portals express the dwellings' structure (left).



- 1 SITE ENTRY
- 2 GARDEN
- 3 BEDROOM
- 4 KITCHEN
- 5 LIVING ROOM



SITE PLAN



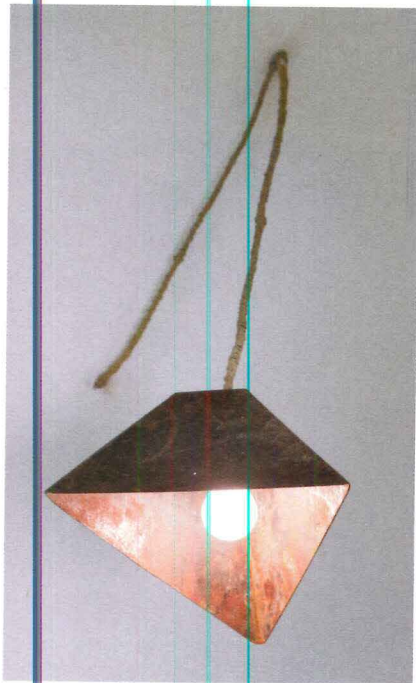
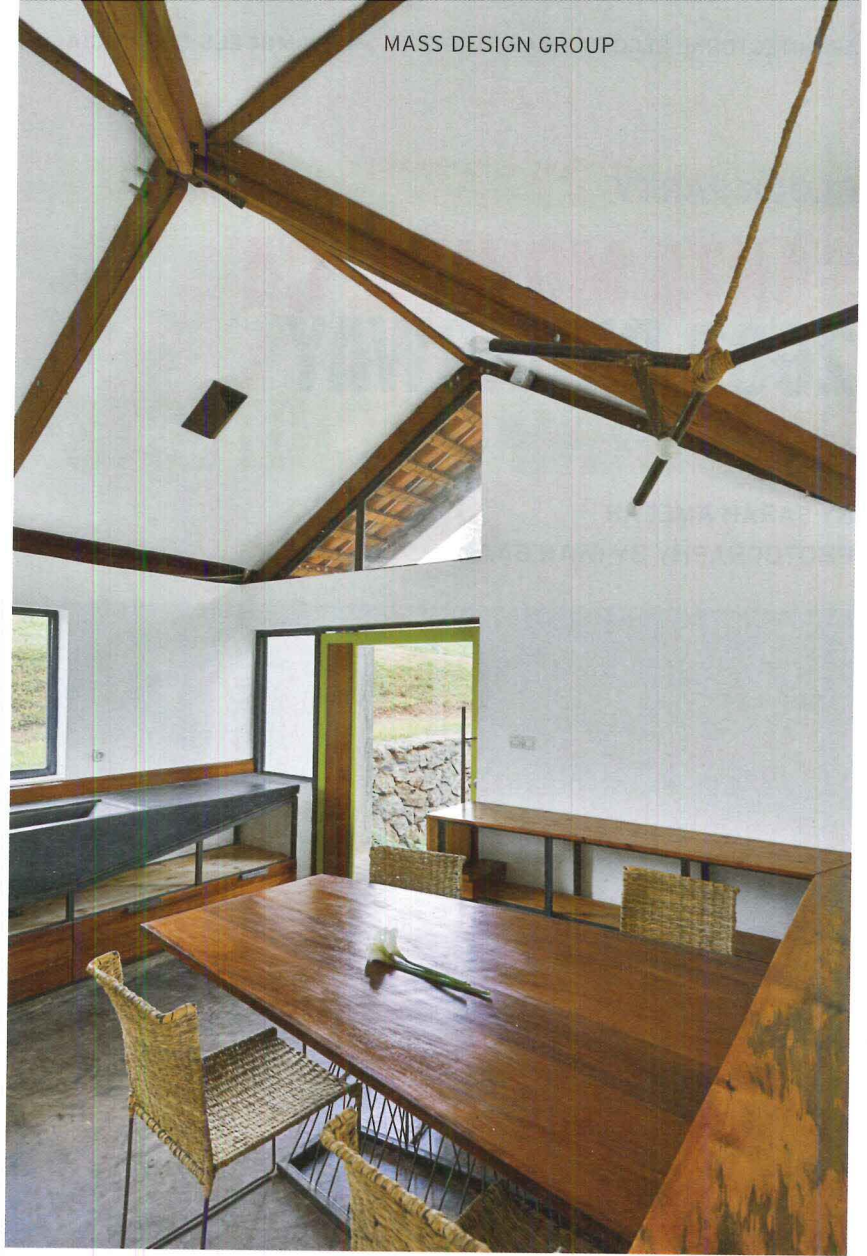
Dushimimana's nickname on the site was Umujyambere, or "he who will go far," because of his management and training skills, though Dushimimana modestly insists others were called this, too.)

The two-bedroom houses—roughly 1,300 square feet each—mimic the hospital buildings' low-slung forms with clay-tile roofs. While they spill down a steep hill, they cluster together in plan. As Dushimimana explained by e-mail: "Courtyards and backyards are important to Rwandan houses. They are where the family and close friends gather." The houses were constructed with reinforced-concrete frames to make them seismically sound, and with a total of 29,000 compressed stabilized earth blocks (CSEBs) made by local workers with soil from the site. The CSEB walls are covered with plaster and white paint. Some have a second layer of local volcanic stone. Inside, whitewashed walls contrast with mvura-wood roof trusses, cypress and pine furniture, and metal light fixtures—all made by local artisans. The project cost \$400,000, a figure that includes the construction of a road, extensive pedestrian paths, and infrastructure to bring water and electricity to the site.

In conversation, Murphy stresses the stories of the Rwandans who helped make the housing a reality, which belies the fact that quietly beautiful architecture is at the heart of the project. "Most housing in this area is substandard," says Murphy, "but it didn't cost us any more to push [a design] agenda. Why do these doctors deserve anything but the best of what's available?" ■



**HEALING HILL** Rather than excavating, the architects stepped the houses down a hill to have a light touch on the topography (above). Visitors enter the site from the south. Each house has its own courtyard gardens; these are important spaces for Rwandans to gather with friends and family (opposite). MASS recruited local artisans to fabricate the custom interior furnishings on-site; reclaimed-metal light fixtures, woven papyrus chairs, and cypress and pine tables and desks can be found in each house (right, below, and below right).



## BLOCK PARTY

**SANTA MONICA, CA**  
**2602 BROADWAY**  
**DALY GENIK ARCHITECTS**

BY SARAH AMELAR

PHOTOGRAPHY BY IWAN BAAN

**THE BEACHFRONT** city of Santa Monica, California, with its stylishly laid-back restaurants and hotels, plus freeway access to downtown Los Angeles, may not seem the obvious place for affordable housing. And that's precisely why advocates began safeguarding its modestly priced options more than 30 years ago.

Today, one of the city's biggest residential landlords is a nonprofit affordable-housing organization: the Community Corporation of Santa Monica (CCSM), a developer-owner-manager with 1,575 units in 88 complexes, and more in the works. Founded in 1982 with a mission to preserve the area's economic and social diversity, the corporation enables service-sector workers to live near their jobs. CCSM has also emerged as a champion of local architectural talent, consi-



tently engaging rising Santa Monica design practices to rehabilitate existing buildings or construct new ones.

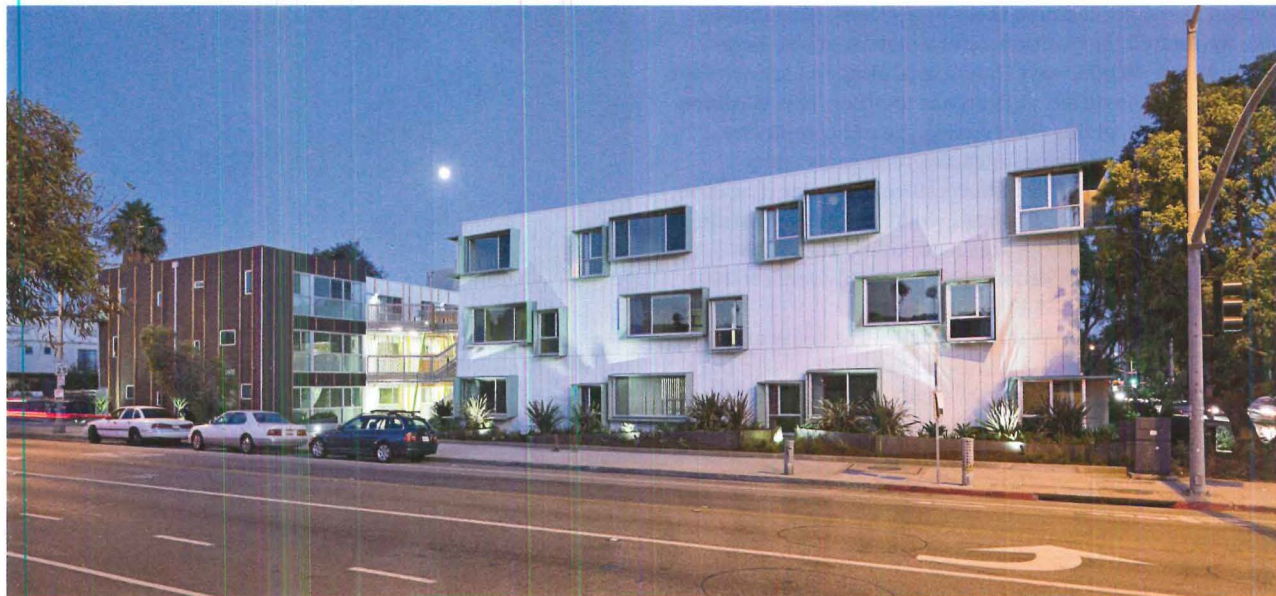
One of those firms, Daly Genik Architects (DGA), recently completed its second CCSM project: 2602 Broadway, a 33,000-square-foot, \$10.9 million compound with 33 rental units and ancillary community buildings. Though the four residential structures are almost identical in their L-shaped footprints, massing, neighborhood scale, and basic “kit of parts,” the complex achieves a remarkable sense of variety, with qualities reminiscent of a forest or thicket of tall grasses.

Like most CCSM properties, the urban, 1.5-acre corner parcel was an economical choice, nearer to commercial streets than most residential developments, but with such advantages as proximity to bus and cycling routes.

DGA preserved the site’s mature quinine trees and took inspiration from the dappled light, integrating into the architecture tornillo-hardwood screens that evoke a bamboo grove while doubling as balustrades for outdoor stairs and walkways.

For privacy and sustainability, the architects pushed the wood-and-steel-framed buildings to the property edges, focusing views inward to a leafy, starfish-shaped courtyard. The dynamic pinwheel arrangement “let us offset facing windows,” explains Kevin Daly, DGA principal. “Also, when people look out through layers of wood screen and landscape, they’re more comfortable opening blinds or windows for daylight and cross-ventilation.” Natural airflow replaces air-conditioning, and translucent partitions make even inner

**SHADY REFUGE**  
Though sited along an urban thoroughfare (below), the complex turns inward to a central courtyard (opposite), where outdoor stairs and walkways are edged in wood rails reminiscent of a bamboo grove. Here, newly planted sycamores, supplementing the existing mature quinine trees, will create a cool oasis.



- 1 RESIDENTIAL BUILDING
- 2 COURTYARD
- 3 COMMUNITY ROOM
- 4 CHILDREN'S PLAYGROUND
- 5 LAUNDRY ROOM
- 6 COMMUNITY GARDEN

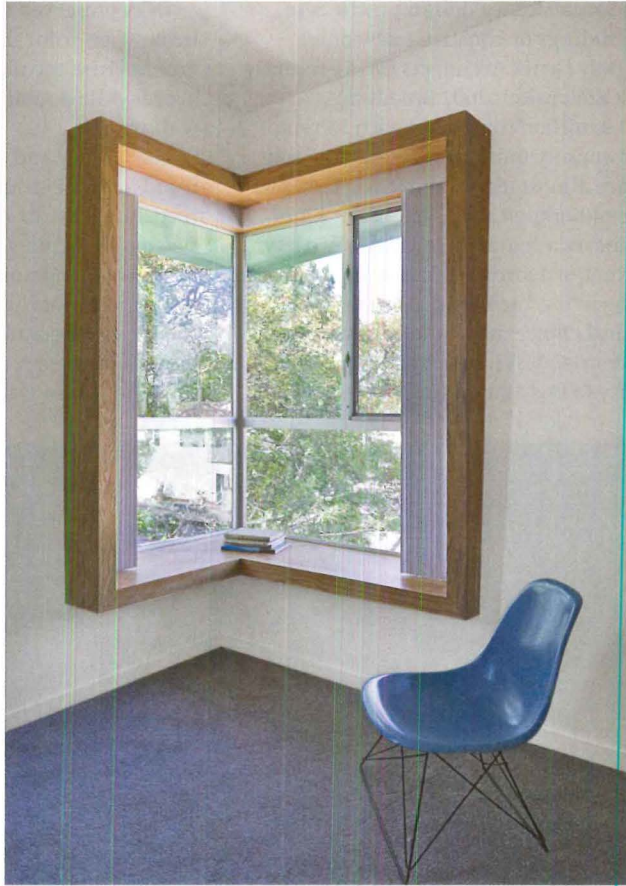
zones luminous. Fostering privacy and openness, the public circulation minimizes the number of units passed en route to any front door.

“Green features enhance our building both environmentally and economically,” says CCSM executive director Sarah Letts, whose organization values durability and easy maintenance. “Our savings help us keep rents low,” she points out, “and promoting sustainable living helps tenants reduce their utility bills.”

Sustainable measures also animate the place aesthetically and experientially, most strikingly with window surrounds calibrated for solar angles. These powder-coated-aluminum boxes permit a playful array of window sizes while mitigating heat gain. Each residential building has three elevations simply clad in fiber-cement board, but the face most exposed to direct sunlight features these projections. “Around the site, we rotated the position, or orientation, of the high-performance facade,” says Daly, explaining, in part, why the buildings feel so different from one another. This elevation also cant backs, giving the massing greater complexity. Other sustainable features include green roofs and a 15,000-gallon cistern that collects stormwater for irrigation.

The complex is geared toward working families earning significantly less than the area median income. With only two- and three-bedroom units, monthly rents at 2602 Broadway range from \$569 to \$1,315.

“For us, these projects offer opportunities to rethink housing in general, not just affordable housing,” says Daly. “They can become templates for small, high-performance infill development in cities everywhere.” ■



**BAY WINDOWS**  
Calibrated for sun angles, the external window hoods, made of powder-coated aluminum, allow for large and varied apertures—opening the interior to light and views while diminishing heat gain. Interior window surrounds (left) are of Douglas fir. The complex's vertical circulation (below) was configured to minimize the number of units passed en route to any front door. Small ancillary buildings (left in photo below) house the laundry room and community space for adult education, after-school programs, and other tenant uses.



## STARTER APARTMENTS

# NINGBO, CHINA

# YINZHOU TALENT APARTMENTS

## DC ALLIANCE

BY CLARE JACOBSON



**AWARD-WINNING** With two 326-foot-high towers (above) and a pair of attached 170-foot-high blocks (right), the complex provides stylish residences at subsidized rents to college graduates new to Ningbo or living there without residency papers. The 1,000 units range in size from 485-square-foot one-bedroom apartments to 750-square-foot two-bedroom ones. Yinzhou Talent Apartments was recently honored by the China Architecture Media Awards with a special award for residential architecture.

**FACED WITH** soaring prices of housing in urban China, what is a young college graduate to do? The Shanghai-based architecture firm DC Alliance provides one option in its Yinzhou Talent Apartments. The state-subsidized project in the Yinzhou district of Ningbo—a city of 5.7 million people three hours south of Shanghai—offers 1,000 rental units at a discount. It was developed by Yinzhou City Construction Investment Development Company, which is also responsible for the area's new central business district. The idea behind the apartment complex is to help university-educated people get started in Ningbo, a port city with four college campuses. The state-run developer can offer below-market rates because it is not a for-profit enterprise. Its “return” is bringing talent to Yinzhou.

According to Yinzhou Construction's general vice manager, Hu Jun, tenants pay 60 percent of the market price for the first year, 80 percent the second, and nearly 100 percent the third; they are encouraged to leave after that. Seventy percent of the units are owned by Yinzhou Construction and distributed by lottery; the other 30 percent have been sold to local businesses that offer them to their employees.

DC Alliance partner Dong Yi says the popularity of the project is due to more than the low rent. Amenities include north and south views for both the two-bedroom apartments (which are 750 square feet) and the one-bedroom units (485 square feet). The architects achieved this through smart sectional design that makes each apartment a duplex with bedroom, office, and/or storage space on the second level. Two 326-foot-tall towers sit diagonally on the site to face the preferred directions, while a pair of attached 170-foot buildings angle their windows to the views. The project also offers large public spaces every 12 floors in the tall towers and every four in the short ones. These indoor areas do not yet house the services planned for them (such as cafés and computer stations), but their current use as places to dry laundry makes them ideal communal spaces. The project includes other features that set it apart: compositionally bold facade treatments, indoor and outdoor sports facilities, and multilevel roof decks on the smaller towers. With its low rents (starting at \$95 per month) and stylish design, Yinzhou Talent Apartments serves an important but often-overlooked group: the young professionals expected to drive future growth. ■

*Clare Jacobson is a Shanghai-based writer whose book *New Museums in China* will be published by Princeton Architectural Press in the fall.*

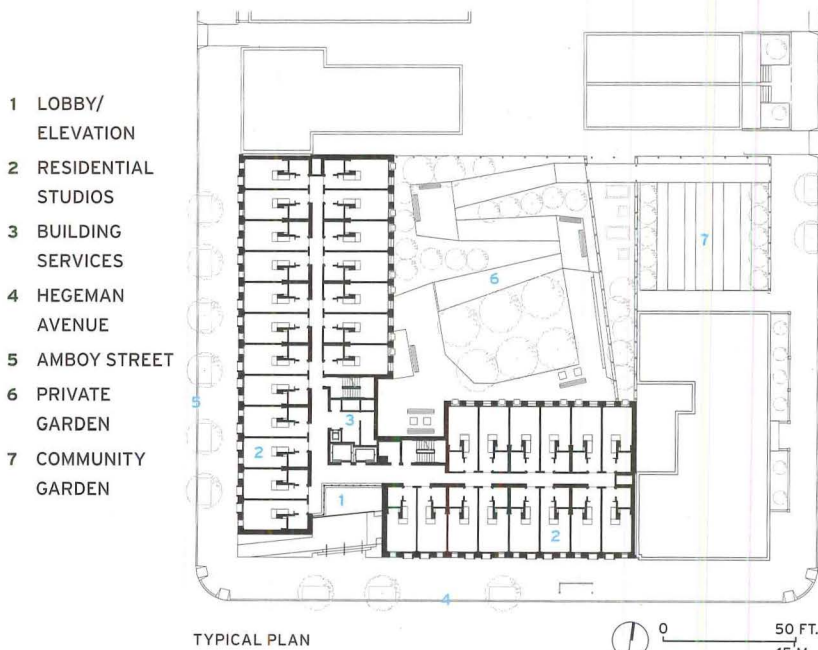


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## SUPPORTIVE AND GREEN

# BROOKLYN THE HEGEMAN COOKFOX ARCHITECTS

BY SUZANNE STEPHENS



WHEN COOKFOX Architects was going after a LEED Platinum rating for One Bryant Park, in New York (2009), its younger staff approached principals Rick Cook and Robert Fox. Granted, at 1,200 feet, the office tower would be the tallest green skyscraper in the world. But, Cook says, his employees asked, “Why not bring sustainability to low-income and affordable housing?” The architects contacted Common Ground, a New York nonprofit social-services organization (page 59). Soon the firm was designing the Hegeman in Brooklyn, a LEED Silver building with 161 efficiency units for low-income and previously homeless men and women. The double do-good (social and environmental) project, completed in 2012 on Hegeman Avenue in the Brownsville neighborhood, not only bolsters Common Ground’s desire to bring support services and affordable housing to long-ignored parts of the city, but now, says executive director Brenda Rosen, it acts as a talisman to Common Ground’s Green Campaign.

While various governmental housing programs helped finance the \$25 million construction cost (\$320 a square foot) plus furnishings, Common Ground sought private funding for certain features and services—including a few green ones. The architects added energy-control devices to the 285-square-foot units; installed a 3,400-square-foot sedum roof and a photovoltaic system to harness sunlight energy for exterior lighting; and specified low-E and fritted glazing and solar shades.

On the more than half-acre site, formerly a parking lot, CookFox designed the six-story masonry-wall and concrete-plank structure to form an L that embraces an outdoor courtyard. A small garden for the larger community shoots off the northeast corner. To avoid relegating social-service activities and administration offices to windowless basement rooms, the architects placed the main level slightly below grade, where its spaces still have daylight and views of the courtyard. By partly submerging this level, the architects could also fit 77,000 square feet into a zoning area where the floor/area ratio of 3.44 would allow only 60,000 square feet to be built above ground.

In addition to green features, the design evokes the solidity of the early-20th-century brick rowhouses nearby, owing to the use of oxblood-red, molded (not extruded) brick, laid with a corbe pattern. In addition, deep recesses of the boxlike aluminum framing for the windows

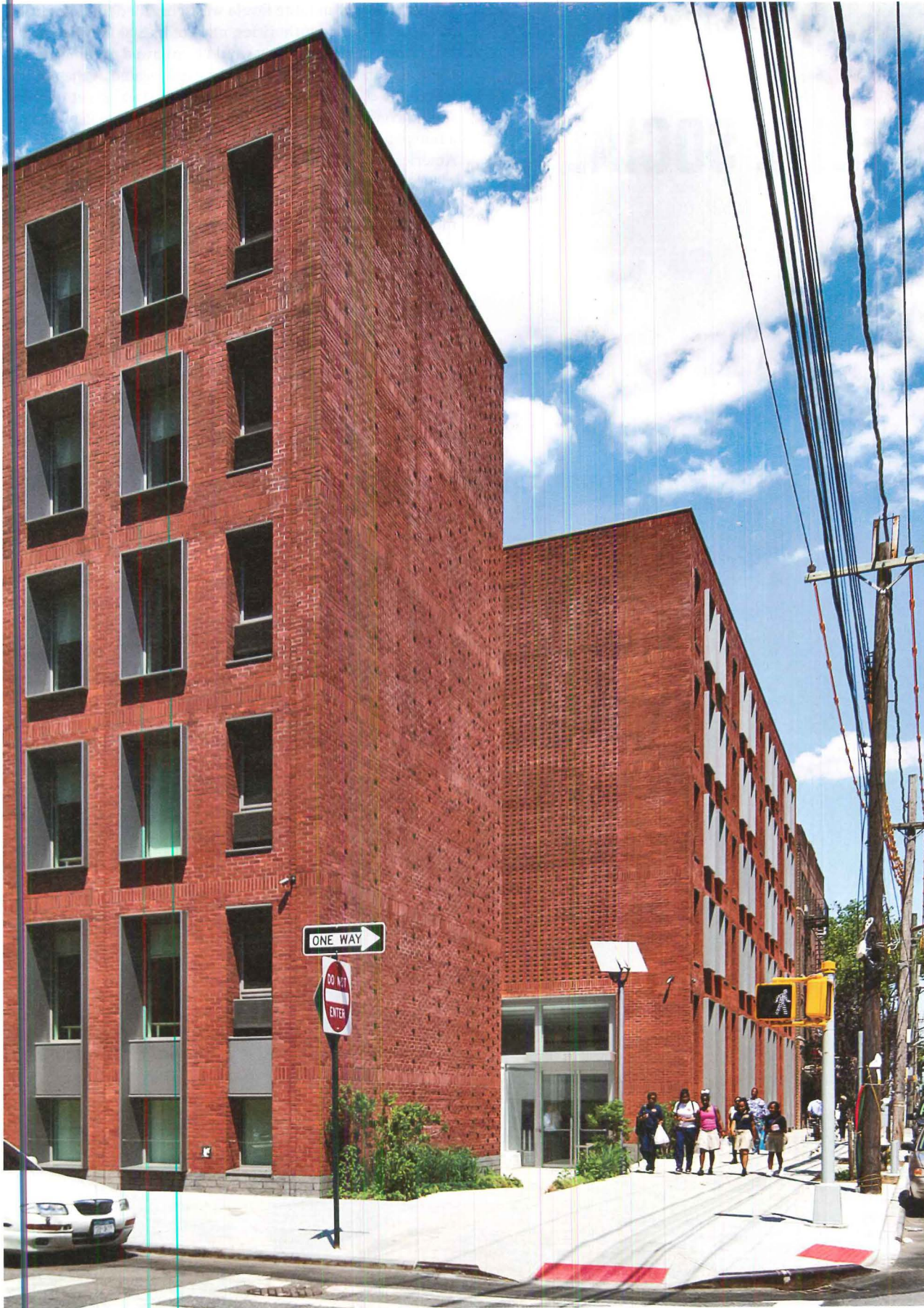


along the street underscore the depth of the load-bearing masonry walls and help shade the apartments inside.

The architecture exudes stability and permanence—core values of the program, where some residents pay \$215 to \$228 a month and others \$600. The energy-efficient, clean, light-filled spaces, which include such amenities as a computer lab and a gym, seem to combine design, social services, and sustainability in a triple (not double) do-good success story. ■

View additional images at [architecturalrecord.com](http://architecturalrecord.com).





**STABLE LIVING**  
 In designing the Hegeman for low-income and special needs/ formerly homeless residents in Brownsville, Brooklyn, CookFox wanted to make sure the building had ample daylight and access to fresh air. "Studies show the benefit of a healthy, nontoxic environment," says principal Rick Cook. Working with the social-services organization Common Ground, the architects arrived at a six-story structure with 161 efficiency units and a host of support services. The lobby (cutaway perspective shown opposite, top) off Hegeman Avenue is glazed for ample views and light, but set into thick load-bearing walls faced with molded brick (left). Furniture in the efficiency units (opposite, bottom) is provided by Common Ground.

STAYING PUT AND MOVING UP

# SÃO PAULO JARDIM EDITE SOCIAL HOUSING

## MMBB & H+F ARQUITETOS

BY TOM HENNIGAN

**WHEN THE** Jardim Edite favela was scheduled for demolition by São Paulo's city authorities, most of its 800 families had little expectation that they would be allowed to remain in their neighborhood. Their shacks were located at the point where the corporate towers of Avenida Berrini meet the new luxury condos sprouting up along Avenida Água Espraiada, a hotspot of the real-estate boom that has gripped South America's largest metropolis for the last five years.

So sure were they of being relocated to the city's periphery that most residents accepted meager government help to move to grim public-housing projects hours away from their jobs serving the needs of Berrini's office workers. But for the lucky 252 families who held on, the city is now putting the finishing touches on a development that will rehouse them on the site of their old slum.

The land on which the favela sat was declared a Special Social Interest Zone by the city, so it could not be turned over to the market. São Paulo architects MMBB and H+F, in a joint venture, have transformed the favela into the Jardim Edite development, three 17-story poured-in-place-concrete towers alongside two five-story blocks. With a budget constrained by



low, the spare complex sits humbly alongside its taller, brasher neighbors. Each of the two-bedroom units is just 540 square feet, the maximum size allowed for social housing.

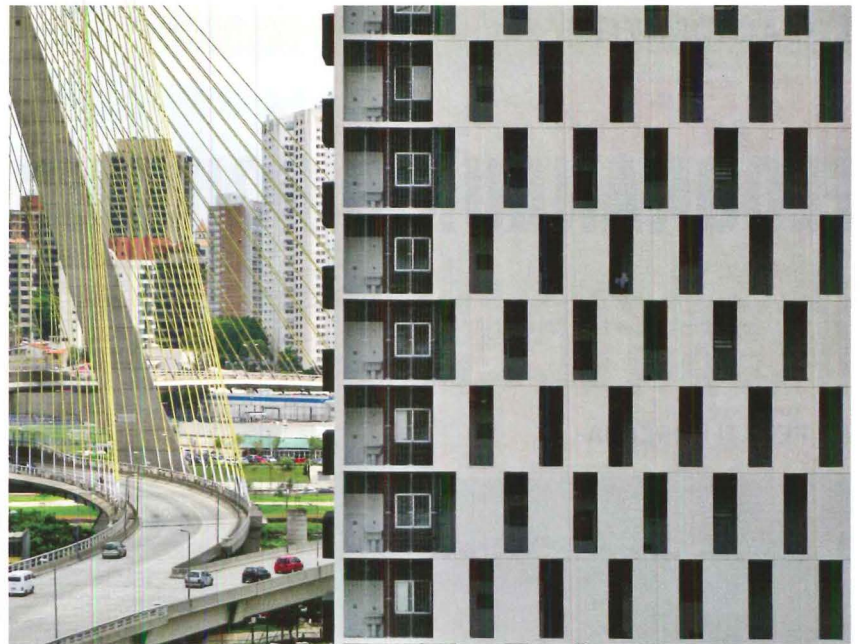
In the wake of decades of zoning laws that contributed to the construction of a socially and functionally segregated city, Jardim Edite is part of a new generation of developments reminiscent of the more integrated neighborhoods once found around São Paulo's deteriorated downtown—an arrangement that is not without challenges. "How do we avoid turning Jardim Edite into that terrible word—a ghetto?" asks MMBB's Marta Moreira. The solution was to install a city-owned clinic, day-care center, and catering school on the ground floor, therefore linking the building to the wider fabric of the area and holding authorities responsible for the upkeep of the surrounding public space.

The architects have eased the transition from the intense communal life of the favela into a more formal housing environment by creating interconnecting terraces and wide exterior halls for outside living and gatherings. And they have increased the sense of space inside with smart storage solutions and generous horizontal bands of fenestration.

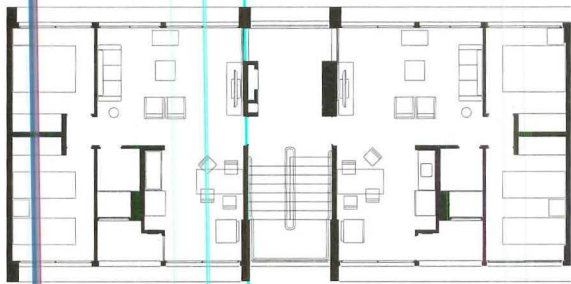
The cheap public financing provided (families pay about \$52 a month on a 30-year mortgage, or \$35 per square foot, compared with local prices as high as \$470 per square foot) contains anti-flipping clauses, lest the units attract Berrini's corporate workers. But the designers have built in additional safeguards. The building has none of the extras increasingly taken for granted by the middle class—no pool or brick pizza ovens on spacious verandas. Most important, the project lacks parking—the ultimate disincentive in this car-obsessed city.

At first glance Jardim Edite might not seem revolutionary. "But for us it is a laboratory for investigating ideas for the kind of city we want to build here in São Paulo," says H+F's Eduardo Ferroni. For residents it is an unqualified success. "We were afraid we would be brought to the end of the world," says Glaide Jane Barbosa Costa. "But now we get to stay in our neighborhood. It makes us feel valued." ■

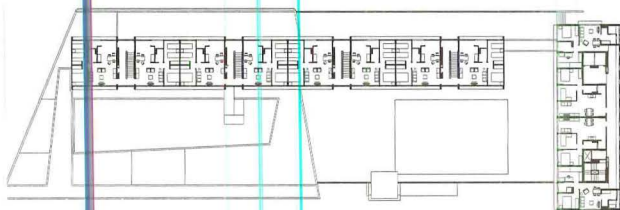
*Tom Hennigan is the South America correspondent of the Irish Times, based in São Paulo.*



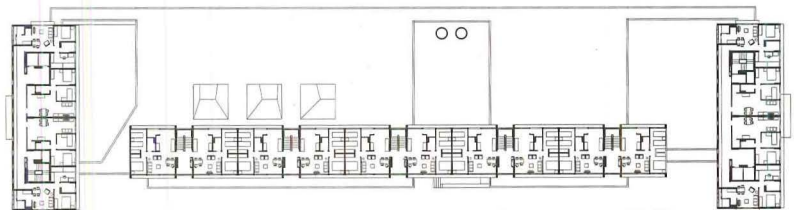
**LOCATION, LOCATION, LOCATION** In a city as visually chaotic as São Paulo, Jardim Edite does not stick out, but its well-heeled site makes this social-housing development special. The architects designed extra-wide exterior halls in the towers (above and visible from the exterior, top). These spaces are a kind of elevated reinvention of the alleyways so characteristic of favela life, where neighbors can sit out together while keeping an eye on each other's children. Broad white bands wrap the exterior (opposite), sheltering windows from the city's tropical sun and rain. The bands also provide extra floor space by housing alcoves above and beneath the windows on the interior, all without counting toward the units' 540-square-foot legal limit.



TYPICAL UNIT PLAN



TYPICAL PLANS



LOCAL IDENTITY

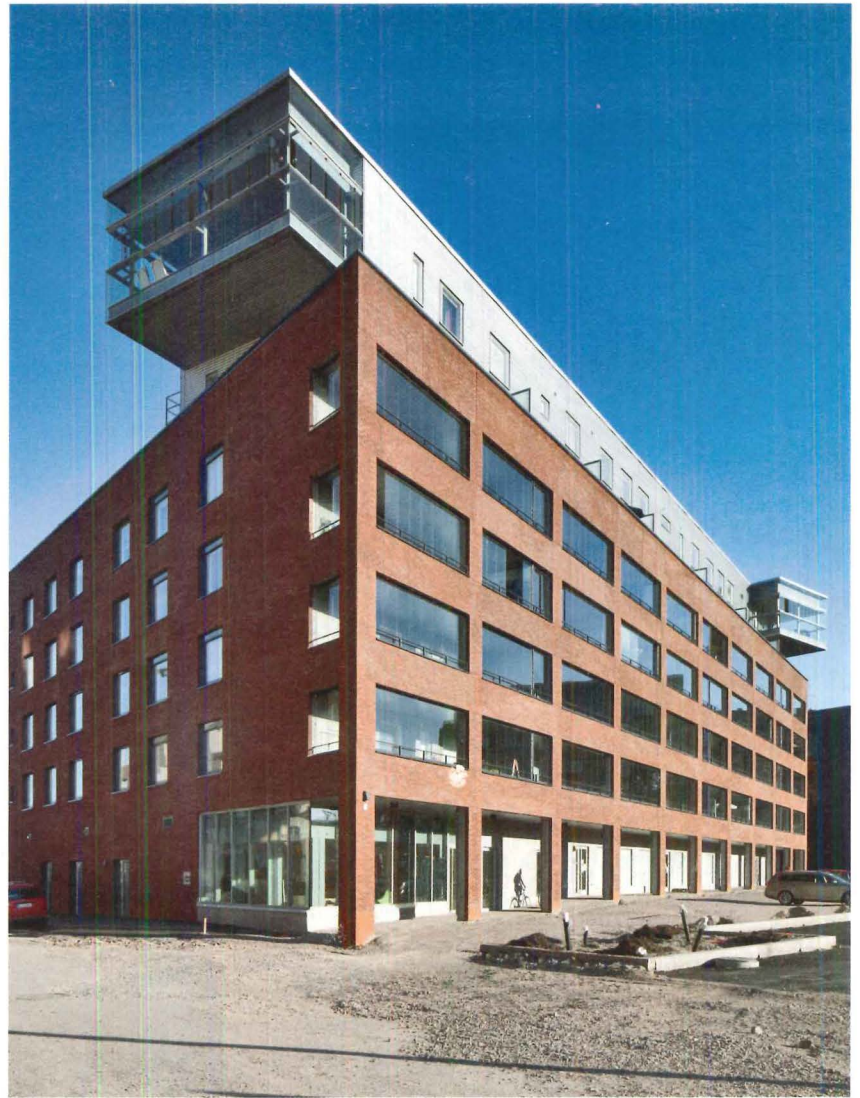
# HELSINKI FLOORANAUKIO HOUSING HEIKKINEN-KOMONEN ARCHITECTS

BY PENTTI KAREOJA



**THE EVOLUTION** of Finnish architecture is most clearly manifested in the nation's residential projects, especially social housing, the most regulated form of building construction. The design of these structures is influenced not only by local traditions, urban planning, codes, and financing, but also by the culture of the Finnish people. For instance, Finns expect saunas to be built into all housing units, even small apartments.

Designed by Helsinki-based Heikkinen-Komonen Architects, the new Flooranaukio Housing project in the Arabianranta area of the Finnish capital is mixed-income social housing. Seventy-four of the units are government-subsidized rental apartments, and the other 48 are city-price-controlled owner-occupied housing under Helsinki's HITAS development scheme, which seeks to provide

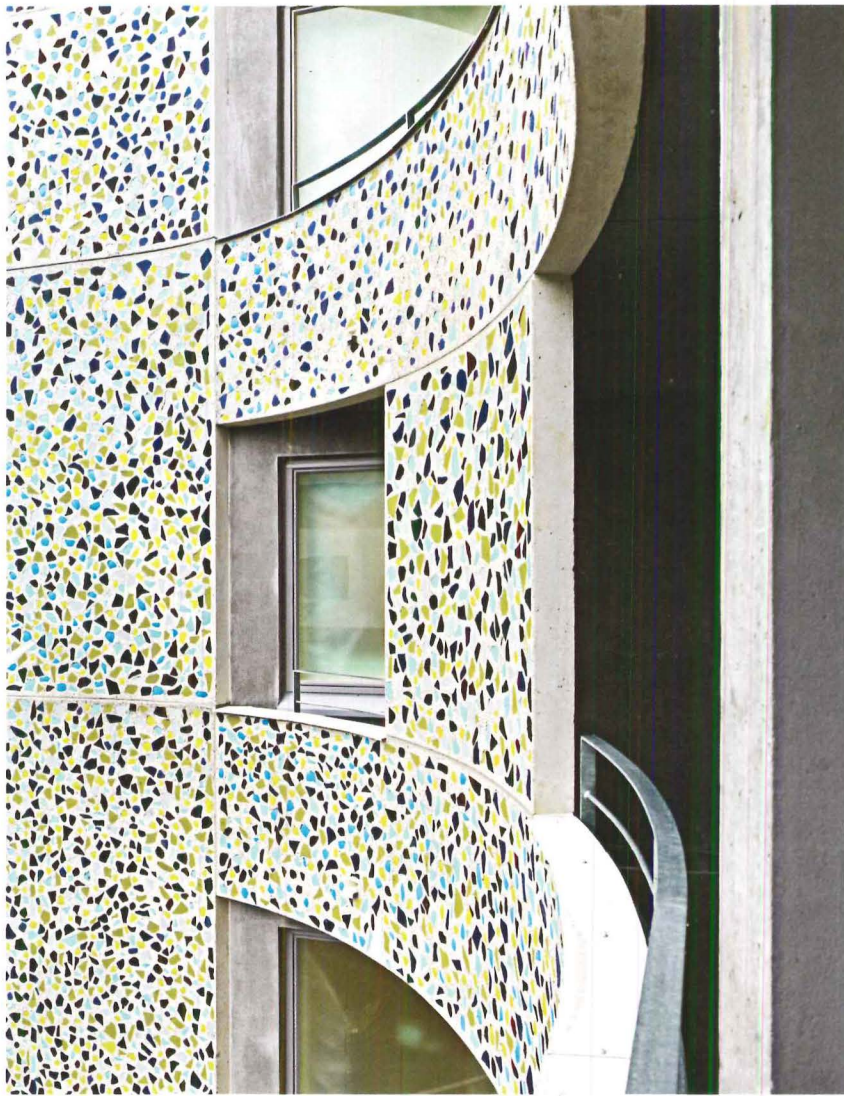


**FINE FINNISH**  
The bright colors of the waste-porcelain chips that make up the pattern on the building's curved white concrete facade (left) were dictated by the production run at the local Arabia factory. The porcelain includes surprises such as characters from Finland's popular Moomin cartoon series (detail, above left). At street side, an arcade in the red-brick front gives the impression of a public building while protecting entrances to the private spaces (right).



PHOTOGRAPHY: © JUSSI TIAINEN (BOTTOM LEFT AND TOP RIGHT); BRENDAN AUSTIN (TOP LEFT)





reasonably priced, high-quality housing in the capital. The average sale price runs from about \$435 to \$500 per square foot, with a starting price equivalent to about \$259,000. While the residents of Flooranaukio—Finnish citizens with an average monthly income of \$4,000 and a rent of about \$1,350—are representative of typical inhabitants of the city, they get the extra benefit of living in a home with a strong connection to its history.

Known primarily for its public buildings, including the Finnish Embassy in Washington, D.C. (1993), Heikkinen-Komonen does not typically focus on the residential-building market, which may be a factor in the firm's refreshing approach to the building's contours and facade. Rather than relying on normal Finnish residential design, the architects were inspired by Antoni Gaudí and his integration of craft into his work.

The project is located in a historic area next to the place where Helsinki was founded in 1550. The community's most important local industry has been the Arabia porcelain factory, which is still in operation. The neighborhood is named after the factory, which played an important role in the emergence of Finnish design.

The identity of Flooranaukio relies heavily on this Finnish design tradition, both figuratively and in a more literal fashion. The organically shaped facade of the building's inner courtyard, produced with a cost-efficient prefabrication technique, is dominated by a large, recurrent floral pattern, based on that of a 1932 Arabia ceramic bowl. Composed of crushed porcelain waste from that manufacturer's nearby factory, the facade was created by lining the steel molds with the china shards before the concrete was poured. The resulting slabs are faced with a lively mosaic.

The seven-story building is clearly divided into contrasting front and back sides. On the street level, a sensible red-brick elevation maximizes the architectural tension in terms of both mass and openings. An arcade lends the structure the appearance of a public building, while protecting the entrances leading to stairwells and communal rooms. The inner courtyard is elevated from the street level to avoid flooding but also to improve views and privacy. Dictated by a strict master plan, the uppermost floors are contained within a separate metal-clad volume, made up of two-story apartments with magnificent sea views.

The spatial concept of the building is based on a prevalent principle in Finnish housing, in which a cluster of four to five apartments is grouped around one stairwell on each floor. Most of the units span the building's depth front to back and enjoy multidirectional views and changing light conditions. At an average of 800 square feet, the dwellings are the size of a typical two-bedroom home for a small Finnish family, and include access to a private or communal sauna—a necessity, not a luxury, in this Nordic city. ■

*Pentti Kareoja is a professor at the Aalto University School of Arts, Design, and Architecture and a partner at ARK-house Architects in Helsinki.*

**NORDIC LIGHT** The duplex apartments on the building's uppermost level feature abundant natural light, balconies, and sea views (left). The architects were inspired by Antoni Gaudí more than by Finnish residential design; his integration of craft into his work is reflected in the facade's porcelain chips (above left).

## PATTERN LANGUAGE

# OAXACA, MEXICO

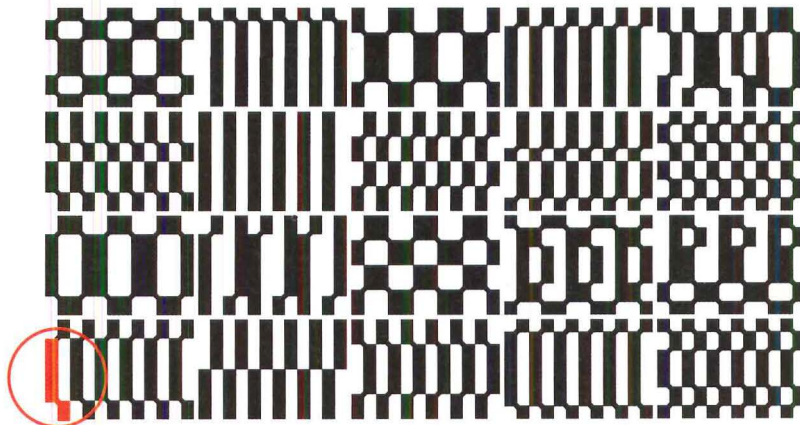
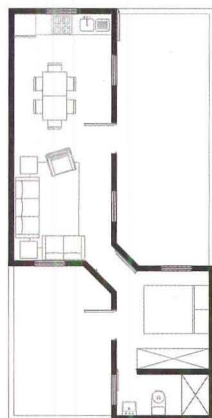
## TLACOLULA SOCIAL HOUSING

### DELLEKAMP ARQUITECTOS

BY LAURA MIRVISS



**FLEXIBLE FUSION** Dellekamp Arquitectos has completed two model houses (above) for working-class residents in southwest Mexico. The firm has also envisioned an adjacent low-income housing complex, where roughly 1,200 units can be joined, broken apart, and reconfigured like Legos to meet residents' needs. Gaps between the units leave room for courtyards and walkways (right).



**FOR AN** up-and-coming architect, Derek Dellekamp is in an enviable position, by many measures. Based in Mexico City, he has been recognized internationally for his work and wins commissions for trendy bars, high-end apartments, and luxury hotel extensions. But Dellekamp continues to explore new directions for the practice he founded in 1999. Looking for deeper meaning in his work, he has increasingly focused on the shortage of quality affordable housing across the country. "The speed at which big developers build in Mexico is frightening," he says, likening the phenomenon to a factory that churns out buildings "one after the other."

His most ambitious design, a 1,200-unit social-housing complex just outside the town of Tlacolula in the state of Oaxaca, has drawn attention and accolades for its sensitivity to the local climate and culture. Despite the buzz, the project has been stalled for over two years because of zoning issues, but it may soon have a second life. This winter, for the first time, the local government gave the project its OK to proceed once a wastewater-treatment program is in place.

Dellekamp's scheme involves a series of building blocks, or housing units, that can be rotated, stacked, or broken apart across the 27-acre site. Each 409-square-foot block contains a living room, kitchen, dining area, bedroom, bathroom, and storage. Families can combine the basic units as needed, with the option to add a second floor, extra bedrooms, or more square footage for a store or business. There is ample space for outdoor courtyards, and residents move from room to room via sheltered exterior corridors—a feature common to this temperate region, where much living takes place out of doors. To create ideal interior climate conditions, the architects used a computer program to adjust ceiling height, window and door sizing, and placement for optimal cross-ventilation and heat retention.

In 2010, Dellekamp finished two brightly colored concrete prototypes on a neighboring 7-acre site, where he plans to build 90 slightly larger houses for working-class families. Each prototype sits on a relatively spacious 2,150-square-foot plot, and the smaller of the two, at 830 square feet, has a construction cost of about \$37,000.

Today the prototypes function as model homes. As is so often the case with these sorts of speculative projects, not just smart designs are needed but also a tenacious champion and a bit of luck. With construction slated to restart later this year, Dellekamp is guardedly optimistic. "It's a battle that's been going on for years," he says. "But I do think we have found a subtle way to make a big difference." ■

View additional images at [architecturalrecord.com](http://architecturalrecord.com).

## NATIVE AMERICAN HOMECOMING

# OHKAY OWINGEH, NM OWE'NEH BUPINGEH PRESERVATION PROJECT ATKIN OLSHIN SCHADE ARCHITECTS

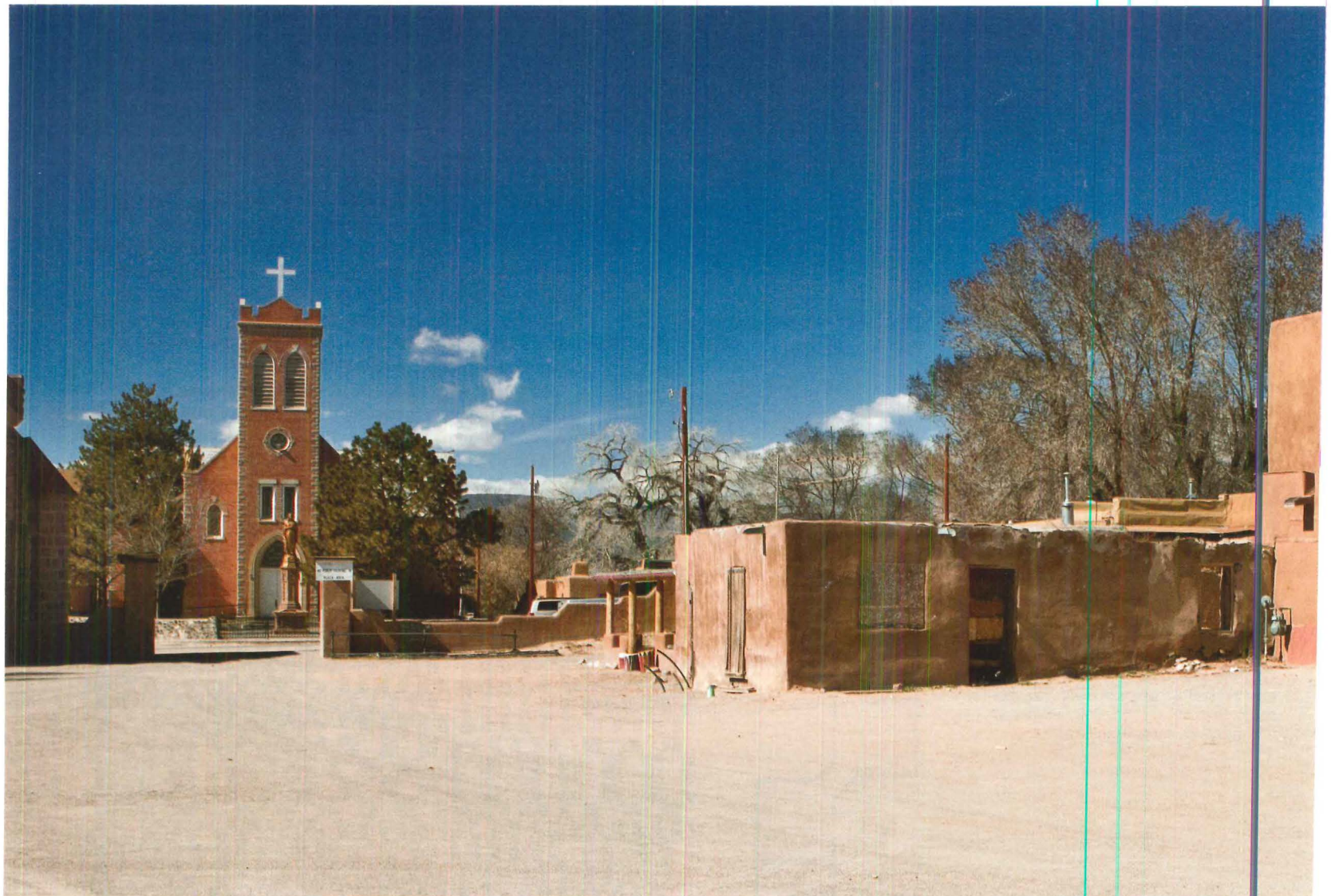
BY JOANN GONCHAR, AIA

PHOTOGRAPHY BY KATE RUSSELL

**NOT FAR** from where the Chama River meets the Rio Grande, about 30 miles north of Santa Fe, the Ohkay Owingeh—one of 19 federally recognized Native American Pueblo tribes in New Mexico—live on land they have inhabited for at least 600 years. For almost all of this history, daily life revolved around a series of plazas loosely delineated by attached adobe houses. This village center, known as Owe'neh Bupingeh, also served as the backdrop for the community's feast-day celebrations and ritual dances.

The 2,700-member tribe still considers Owe'neh Bupingeh the spiritual and cultural heart of the pueblo. However, in recent decades it had slowly depopulated and its condition deteriorated, as many residents left their traditional homes in favor of new, but nondescript, manufactured housing subsidized by the Department of Housing and Urban Development (HUD) on subdivision-like lots elsewhere on the 16,000-acre reservation.

Now an unusual project is helping tribal members, who otherwise could not afford it, return to their ancestral homes. It is also allowing Ohkay Owingeh to restore its center, which is listed on the state and national registers of historic places, without creating a museum piece frozen in





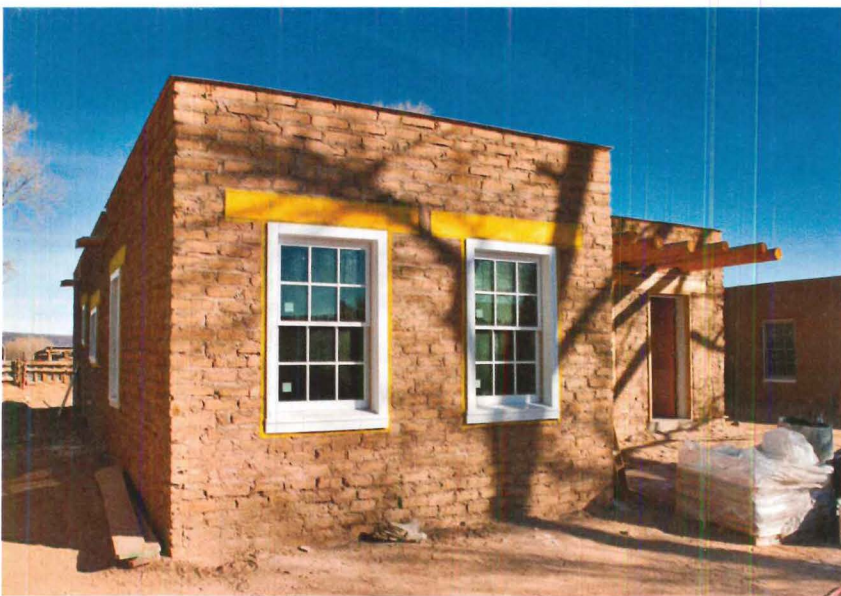
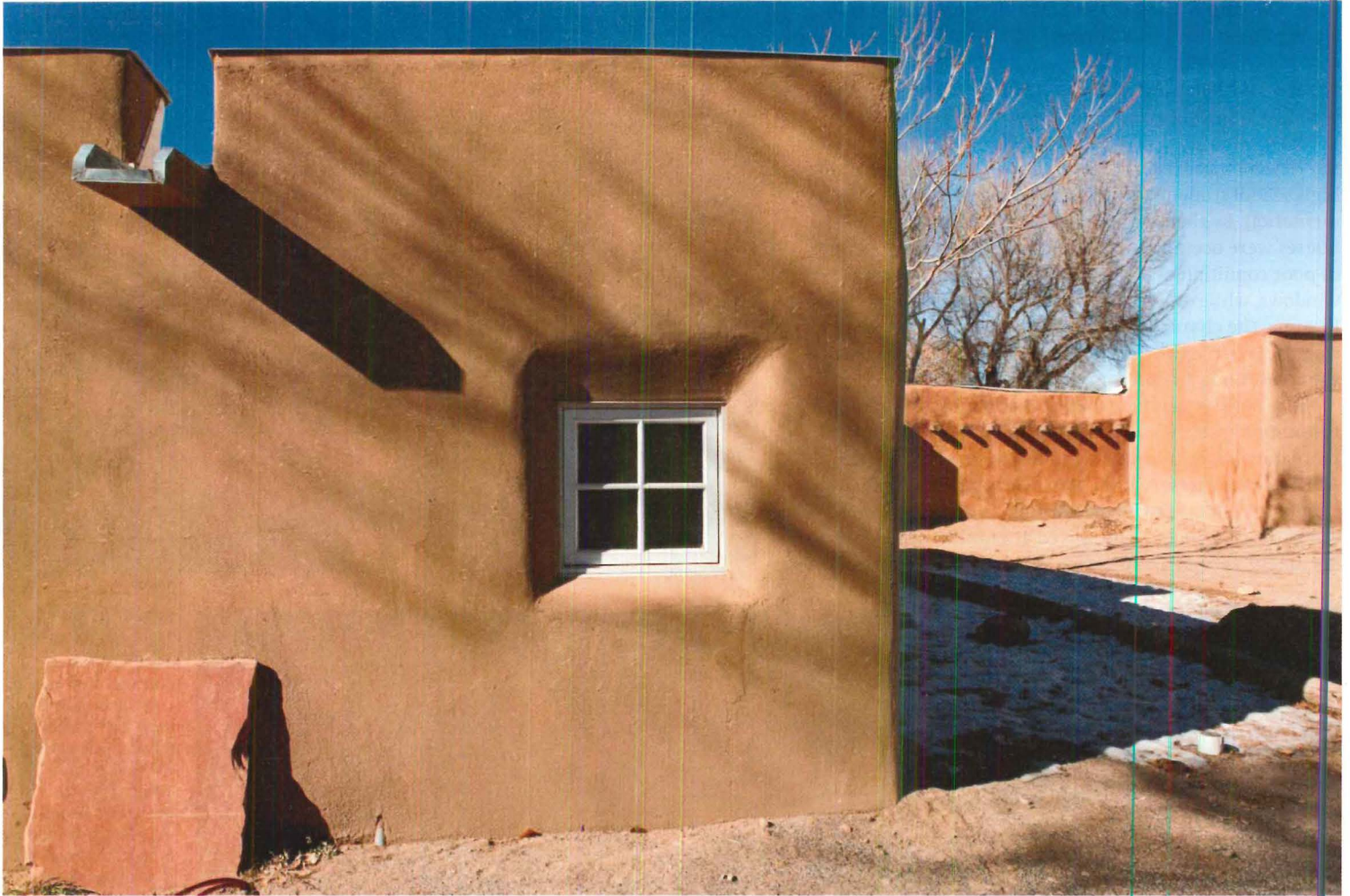
time. The core is “part of the life of the pueblo, and is in an ongoing state of transformation, as it has been for many centuries,” says Tony Atkin, a principal of Atkin Olshin Schade Architects (AOS), the Santa Fe- and Philadelphia-based firm working on the multiphase rejuvenation.

The project got its start in 2005 with a \$7,500 grant from the New Mexico Historic Preservation Division to train six high school students from the tribe in preservation documentation. By then, only about 25 of the historic core’s 60 houses were occupied, and about half the structures were in poor condition or worse. Many had missing doors or windows, while others had vegetation growing on their roofs. In some, the character-defining and structurally essential *wegas* (beams roughly hewn from logs) were rotting, and in a few cases houses had completely collapsed.

Since 2010, general contractor Avanyu has completed the restoration of 20 houses, with the rehabilitation of nine more under way. In order to guide the construction process, AOS created a preservation plan, working closely with the client—the Ohkay Owingeh Housing Authority—as well as a group of tribal elders who served as cultural advisers. The document defines an approach that balances the sometimes



**GROWING UP**  
Two-story houses were common in Owe'neh Bupingeh through at least the early 20th century (above). But by the 1970s all of the dwellings were one-story. As part of the preservation project, the contractor is building upper stories (left), but not necessarily in locations where they existed previously. Instead, the upward extensions are being added to meet the space needs of families without encroaching on the public plazas. The new upper stories also enable the project to comply with HUD bedroom requirements and size standards.



**EARTH AND WATER** The restored and rebuilt walls are made of traditional adobe: sun-dried brick-and-mud mortar (above) that is then covered with mud plaster (top). To improve the walls' durability, the client elected to incorporate elements such as metal caps on the roof parapets and flagstone splash blocks at the base of the walls under the *canales*, or roof drainage spouts. With the goal of further enhancing the longevity of the adobe, the client has instituted a series of mud-plaster workshops to train residents to maintain the finish of their homes' walls.

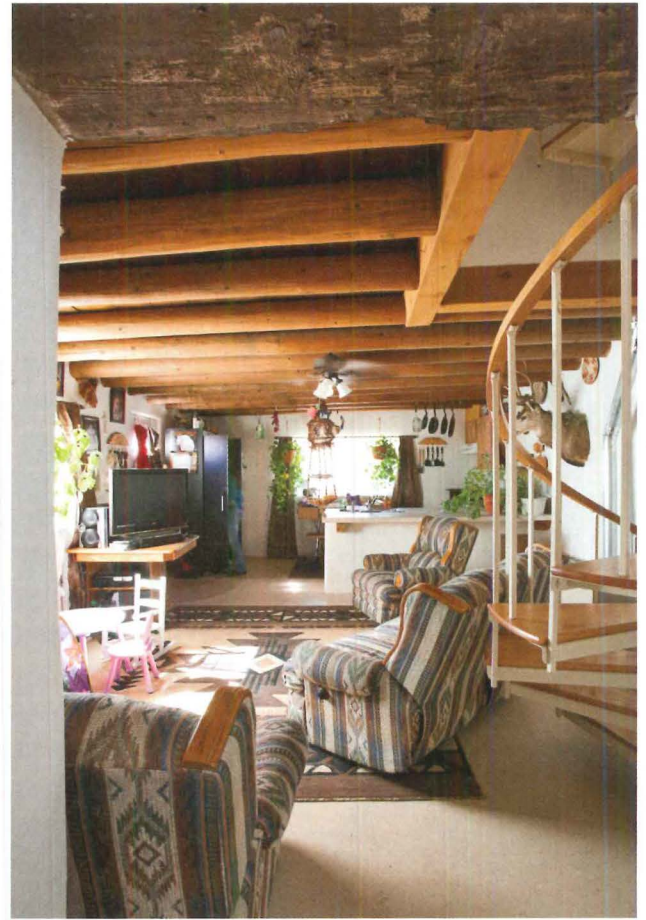
conflicting requirements for funding, restoration standards, and the tribe's cultural values. And it provides a strategy for creating cost-effective and comfortable living environments.

The plan helps the project team make myriad decisions, including determining when modern materials and construction methods are appropriate. For example, the restored adobe houses include membrane roofs and metal parapet caps. The coping, painted to match the color of the mud plaster, alters the typically soft profile of adobe against the sky. However, it should greatly improve durability.

The work to date, including five years of planning plus replacement of the 25-acre core's utility infrastructure, has been financed with more than \$8 million from foundations, the 2009 federal stimulus, and HUD grants, among others.

Homeowners with income below 50 to 60 percent of the county median qualified for the project's first three phases. Future phases will likely include families with income above this threshold. They will be eligible for low-interest loans to fund the renovations through the housing authority's community-development financial institution, or CDFI.

Ultimately, Ohkay Owingeh hopes to build 20 new homes on now-vacant but previously occupied lots. "The tribal council's vision for Owe'neh Bupingeh," says Tomasita Duran, the housing authority's executive director, "is 100 percent occupancy." ■



**DOWN TO THE DETAILS** Inside the houses, the project team restored the ceiling *vigas* (roughly dressed logs) and *latas* (small-diameter wood poles) wherever it could. Although the existing floors were sometimes wood (above left), typically they were dirt. In such cases, the client elected for finishes such as carpet or linoleum (above right) over plywood and sleepers. Concrete slabs have been omitted so that future residents can opt to remove the flooring system and restore the direct connection with the earth.



# RENEWED PROMISE

Two teams of architects employ very different strategies to reinvigorate a pair of ambitious 1960s apartment projects, one in the north of England and the other in Paris. **BY CHRIS FOGES**



## Park Hill

The initial phase of Park Hill's revamp has concentrated on a 261-unit block at the sloping site's northern end. The first residents began moving in at the end of 2012.

*The enthusiasm with which Britain and France took to the construction of Mid-Century Modern social housing is equaled only by their present appetite for its demolition. In 2003, the French government announced a 10-year urban-renewal plan in which 200,000 dwellings would be replaced; in Britain, Alison and Peter Smithson's Robin Hood Gardens, completed in London in 1972, is one of many projects that once enjoyed international prestige and are now facing the wrecking ball. But an alternative course is plotted by the rehabilitation of two 1960s buildings—the 170-foot-tall Bois-le-Prêtre in the northwest of Paris, extended by Lacaton & Vassal and Frédéric Druot, and Park Hill, a Brutalist megastructure in Sheffield, in the north of England, where architects Hawkins\Brown and Studio Egret West have completed the first phase of a comprehensive renovation.*

## PARK HILL, SHEFFIELD, ENGLAND

Designed by Jack Lynn and Ivor Smith, Park Hill has dominated Sheffield's skyline since 1961. Remarkably, the bridge-linked chain of slab blocks that snakes across the 32-acre sloping site constitutes a single building of almost 1,000 apartments. Below the datum of a horizontal roofline, it ranges from four stories at the southern end to 13 stories at the north, where the block renovated in the first phase is located. Outdoor corridors, or "streets in the sky," occur every three stories, serving duplexes at deck level and above, and single-story apartments below. All are dual-aspect, with bedrooms facing north and east on the corridor side and living areas facing south and west, where the grid of the expressed cast-in-place concrete frame is enlivened by double-height bays and sheltered balconies.

Though initially well liked, Park Hill by the 1980s was a byword for failed public housing; it was plagued by poor maintenance, while postindustrial decline brought social problems. Nevertheless, in 1998 the building was given protected status for its architectural significance, precluding demolition. To secure its future, Park Hill was sold to Urban Splash, a commercial developer; two-thirds of all renovated apartments will be for sale from around \$150,000 for 550 square feet, with the remainder—materially identical—providing subsidized rental homes owned by a nonprofit housing association. With 79 of 261 first-phase apartments complete, residents began to move in at the end of 2012.

The building's protected status "covered everything down to the door handles," says David Bickle, project director at Hawkins\Brown, so the developer's desire to signal a break with the building's past had to be weighed against legally

binding conservation requirements. After painstaking element-by-element negotiation, the supervisory body, English Heritage, agreed that the building could be stripped back to its frame, and it devised a "squint test" as a principle for reconstruction: faithful reproduction of its timber-framed windows and brick infill panels was not required; rather, through narrowed eyes, from a distance, the reconditioned building should be recognizable as Park Hill.

Further intense discussion covered 5,500 individual repairs to the spalling concrete frame. Conservationists initially insisted each repair should be both visible—to acknowledge the building's history—and carefully matched to its immediate surroundings, while the developer wanted a uniform appearance with less evident scarring. A "reasonable compromise" was agreed on, says Bickle. Decayed concrete was removed with high-pressure water jets, leaving a neat



Park Hill's interconnected housing blocks (shown soon after completion in 1961, far left) snake across its 32-acre grounds near the city center. One of the key features is its open corridors, or "streets in the sky," which occur every three floors (left). The new facade's expanses of glass provide more daylight and better city views (below).



geometric outline at each repair site. The exposed steel reinforcement was treated with an anticorrosion agent before these areas were patched with ready-mix mortar. Finally, the whole outer face of the frame was washed with a pale-ocher semi-opaque mineral paint. Up close, the repairs can be read, but from a distance the structure looks new.

The building's distinctive precast-concrete balustrades were beyond salvation—their 2.4-inch-square-section balusters had provided insufficient coverage of steel reinforcement. These were replaced with acid-etched precast units whose balusters taper from 2.2 inches to 1.4 inches from front to back, increasing daylight to apartments.

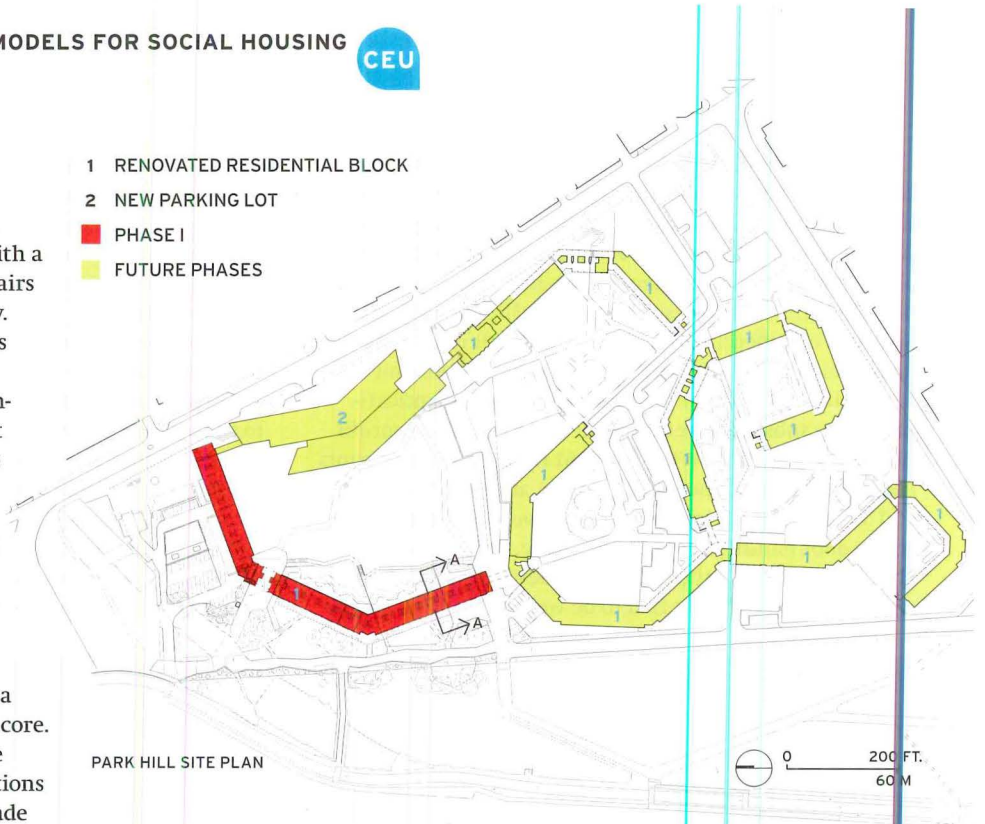
Internally, the apartments share much of their DNA with the original layouts, though enlarged kitchens and bathrooms and open-plan living areas reflect current preferences and enhance views and cross-ventilation. As before, homes are grouped in three-story, three-bay “clusters.” However, two bedrooms have been removed from each cluster to leave pairs of a two-bed duplex and a one-bed apartment on either side of each H-shaped stair core.

Along with the need to improve thermal performance and the quality of interiors, the desire to change perceptions of the building informed the choice and detailing of facade materials. Within the expressed concrete grid, drab-hued, rough-textured brickwork and intricate windows are supplanted by a crisp, graphic composition of glass and brightly colored aluminum panels. On the bedroom elevations, the ratio of infill to glazing across each structural bay was inverted, from 2:1 to 1:2. Floor-to-ceiling powder-coated-aluminum-framed windows, fitted with low-E glass, are nonoperable to achieve an unfussy appearance and maximize daylight penetration. A laser survey revealed numerous irregularities in the apparently regular concrete frame—the tops of some verticals are out of line with the base by up to 1.5 inches—giving sufficiently wide variation in bay widths that the subcontractor was required to produce several sizes of each window type. “What appeared in the drawings to be maybe 20 types overall actually meant 60 variants for the manufacturer,” says Hawkins|Brown architect Greg Moss.

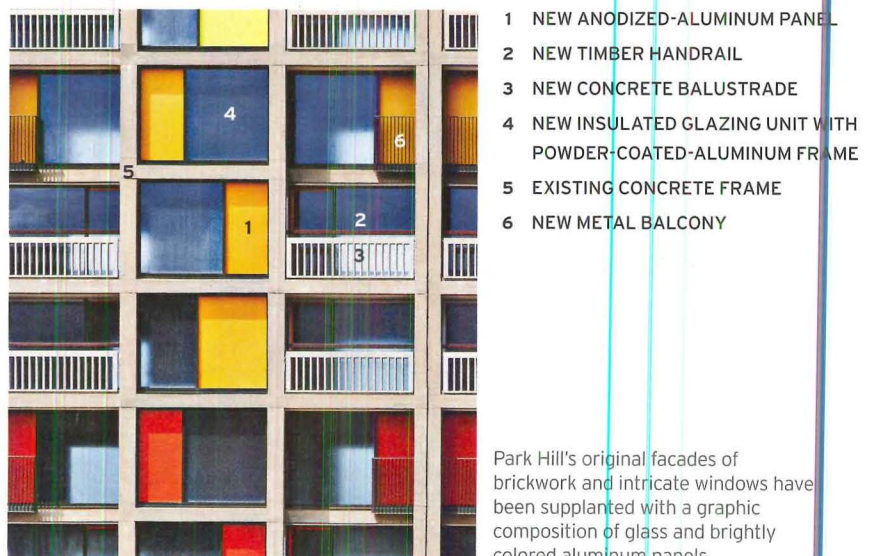
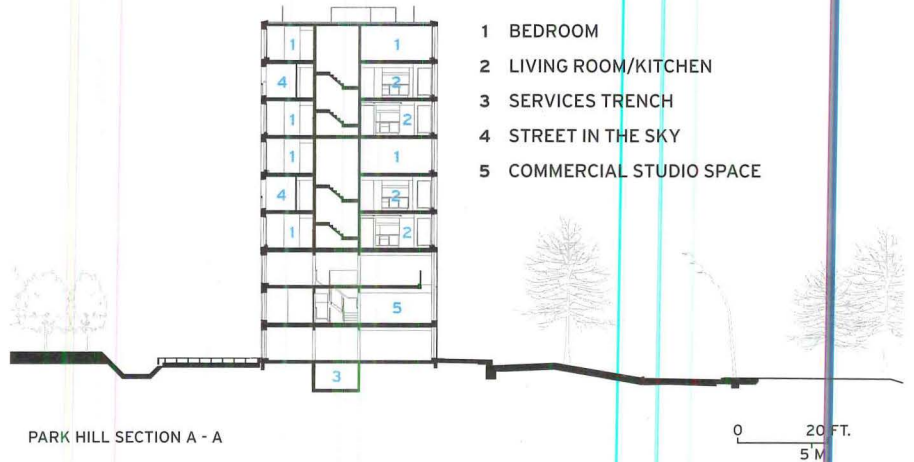
To ventilate the rooms, adjacent 1.7-inch-thick insulated aluminum panels slide behind the windows. The red, orange, and yellow panels, each identified with a different deck, refer loosely to the coloration of the original building, but for the architects it was important that the facade material be more radiant than “light-sapping” brickwork, says Bickle. Anodized aluminum was selected for its metallic sheen and its behavior in sunlight: the appearance of the building changes subtly but distinctly from different angles and throughout the day. The organic pigments used in the anodizing process are stable, and panels were subjected to accelerated UV testing to ensure that colors will not fade.

Luster is added by glass elevators and a mirror-polished, steel-clad helical escape stair set within the frame. The material also forms the soffit of a new four-story entrance at the northwestern corner, intended to improve the sense of connection with the city. The face Park Hill now presents to its neighbors is certainly brighter and more open, but the aversion felt by many citizens remains. Nevertheless, architect Roger Hawkins is confident that perceptions are changing. “It is difficult to get people to believe that transformation is possible, but Park Hill shows that it is,” he says.

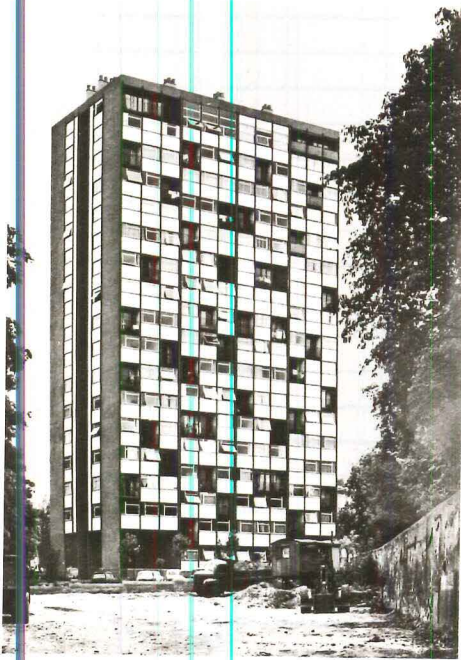
- 1 RENOVATED RESIDENTIAL BLOCK
- 2 NEW PARKING LOT
- PHASE I
- FUTURE PHASES



- 1 BEDROOM
- 2 LIVING ROOM/KITCHEN
- 3 SERVICES TRENCH
- 4 STREET IN THE SKY
- 5 COMMERCIAL STUDIO SPACE



Park Hill's original facades of brickwork and intricate windows have been supplanted with a graphic composition of glass and brightly colored aluminum panels.



### Bois-le-Prêtre

Originally, the 17-story Bois-le-Prêtre was clad in a lively combination of aluminum and glass (above left). In the 1980s, this facade was covered over with insulated panels (above center) in an attempt to improve thermal performance. Both skins have been removed in favor of a new, multilayered elevation that includes a 10-foot-deep extension to the building on all four sides. It was erected as a framework of story-tall columns and 24-foot-6-inch-wide floor decks over the course of several months (above right). Today, sliding screens, operable windows, and solar curtains animate the tower's exterior (this photo).



## BOIS-LE-PRÊTRE, PARIS

The \$15.4 million overhaul of Bois-le-Prêtre, completed in 2011, is a more explicit manifesto for renovation. Its roots are in a combined response by Lacaton & Vassal and Frédéric Druot to the French government's 2003 demolition plan: "We were shocked by the idea that nothing could be done except tabula rasa redevelopment," recalls Anne Lacaton. The two architecture firms embarked on a published research project which concluded that such buildings could be repaired and expanded for half the cost of replacement. Two years later, in 2006, the authors won a competition run by the government-funded social-housing provider Paris Habitat-OPH for the renovation of the tower and put their ideas into action.

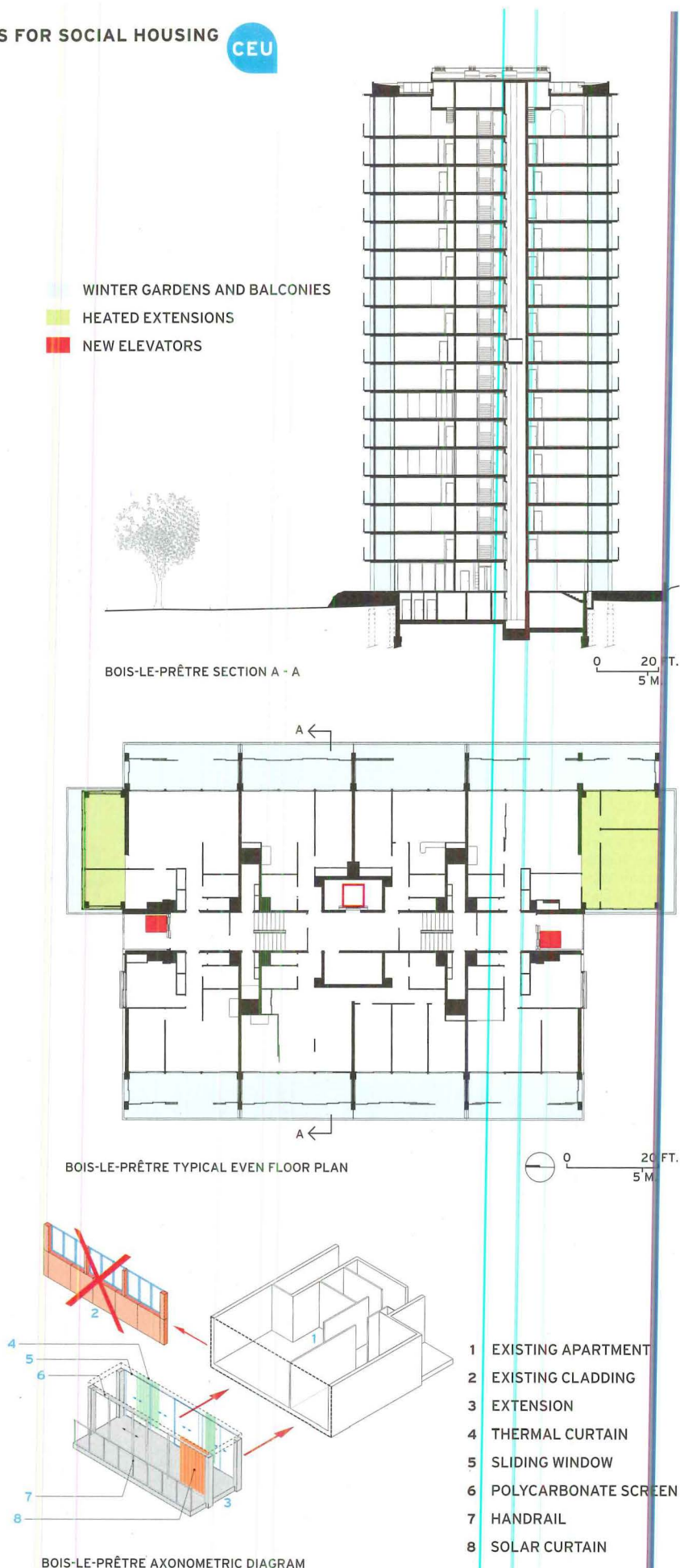
Designed by Raymond Lopez, Bois-le-Prêtre was completed in 1961, predating the adjacent eight-lane Périphérique that encircles the inner city. A facade of glass and aluminum with recessed balconies wrapped its 17-story precast-concrete frame. But in the 1980s, this lively Miesian skin was overlaid with insulated panels in an attempt to improve thermal performance, shrinking the windows and lending the block a defensive air that earned it the nickname "Alcatraz."

It is now transformed in every respect—spatial, technical, and aesthetic—by an approximately 10-foot-deep extension on all four sides. The east and west facades were replaced with aluminum-framed double-glazed sliding doors, occupying the full width of each apartment and opening onto 6-foot-7-inch-deep winter gardens. From these enclosed, unheated terraces, sliding polycarbonate screens lead onto 3-foot-3-inch-deep balconies with glass balustrades. On the narrower north and south facades, double-glazed extensions create additional internal space, allowing an increase to the number of apartments from 96 to 100 without reducing any in size. The building has a tripartite stepped section, with floor levels at the ends a half-story above the middle. New elevators at each end make it fully wheelchair-accessible.

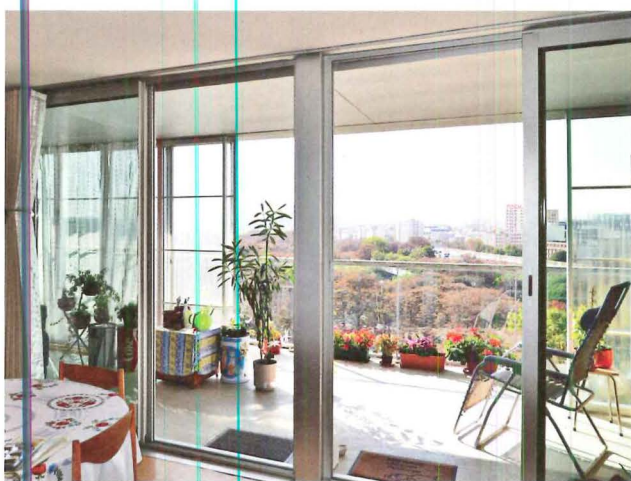
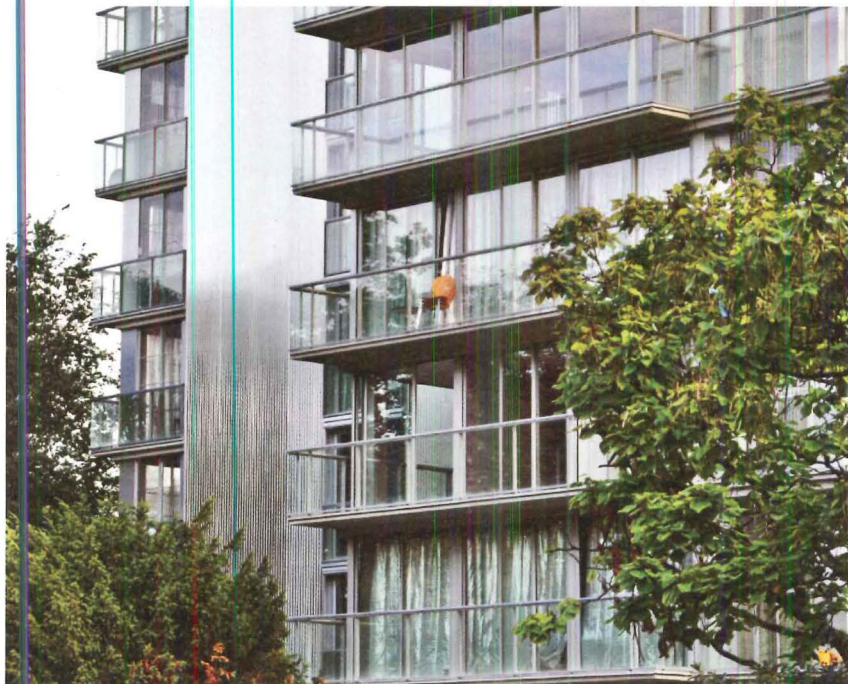
Enlarged from 95,800 to 134,100 square feet, the building now touches the site's street edge to the north and stretches as far as regulations allow toward a cemetery to the south. The extensions add 242 square feet of usable outdoor space to 452-square-foot one-bedroom apartments, while larger corner apartments gain 290 square feet of outdoor space and up to 430 square feet of indoor space. This increase is the key to making reuse preferable to rebuilding, says Lacaton: "More space means more pleasure, freedom, and peace for the family." Thanks to an agreement brokered by the architects, rents remain the same: a 1,450-square-foot, five-room apartment goes for about \$950 a month.

The cost—approximately \$150,000 per apartment—was higher than estimated in the architects' earlier research but compares favorably with the typical figure of over \$200,000 for demolition and rebuilding. Extensive internal renovations also offer poor value in comparison with extension, says Lacaton, and involve significant disruption and expense, since residents must be moved into temporary housing. Bois-le-Prêtre's 400 residents, ranging from young families to retirees, remained in the building throughout.

To minimize disturbance, the architects designed the extension as a self-supporting steel frame, tied to the concrete frame with steel brackets. Their initial intention was to assemble it as fully prefabricated modules, including replacement facades, which would be stacked on-site, each forming







By creating unconditioned winter gardens (left) and new balconies (above), Bois-le-Prêtre's architects added 242 square feet of usable space to a typical one-bedroom apartment without modifying the building's interior.



### Continuing Education

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### Learning Objectives

- 1 Discuss the physical and social problems that plagued two 1960s housing projects—Park Hill in Sheffield, England, and Bois-le-Prêtre in Paris—prior to their renovation.
- 2 Describe how the renovation strategy for Park Hill allows the building to retain

its historic character but addresses deterioration and improves livability.

- 3 Identify the key elements of Bois-le-Prêtre's renovation and explain how they help residents control their apartments' environmental conditions and save energy.
- 4 Explain how Bois-le-Prêtre's renovation strategy and the sequence of construction helped minimize disruption to the occupants.

AIA/CES Course #K1303A

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a working platform for the removal of the old facade. When it became clear how long it would take to manufacture 150 modules, the plan was revised, and only the insulated steel-and-concrete floor decks were fabricated off-site.

The asbestos-ridden overcladding was stripped from each facade before the original skin was removed, apartment by apartment, with new glazing installed the same day. The framework of 24-foot-6-inch-wide floor decks and story-tall steel columns was assembled over several months. Once in place, the polycarbonate outer facades were fitted.

Large areas of glazing and operable windows are in counterpoint to much contemporary architecture, where energy efficiency is pursued through increasing airtightness and insulation—an approach that prioritizes energy performance over well-being, says Lacaton. "We try to push another way of thinking, which has the same goals but works with the sun and natural ventilation, and gives the user the responsibility to decide when to open or close windows."

Bois-le-Prêtre's extensions are part of an environmental strategy that has reduced heating-energy demand by 60 percent, says Lacaton. They shade apartments from the high summer sun, while the low winter sun penetrates the enlarged areas of glazing. In spring and fall, the winter gardens work like greenhouses, producing welcome solar gain.

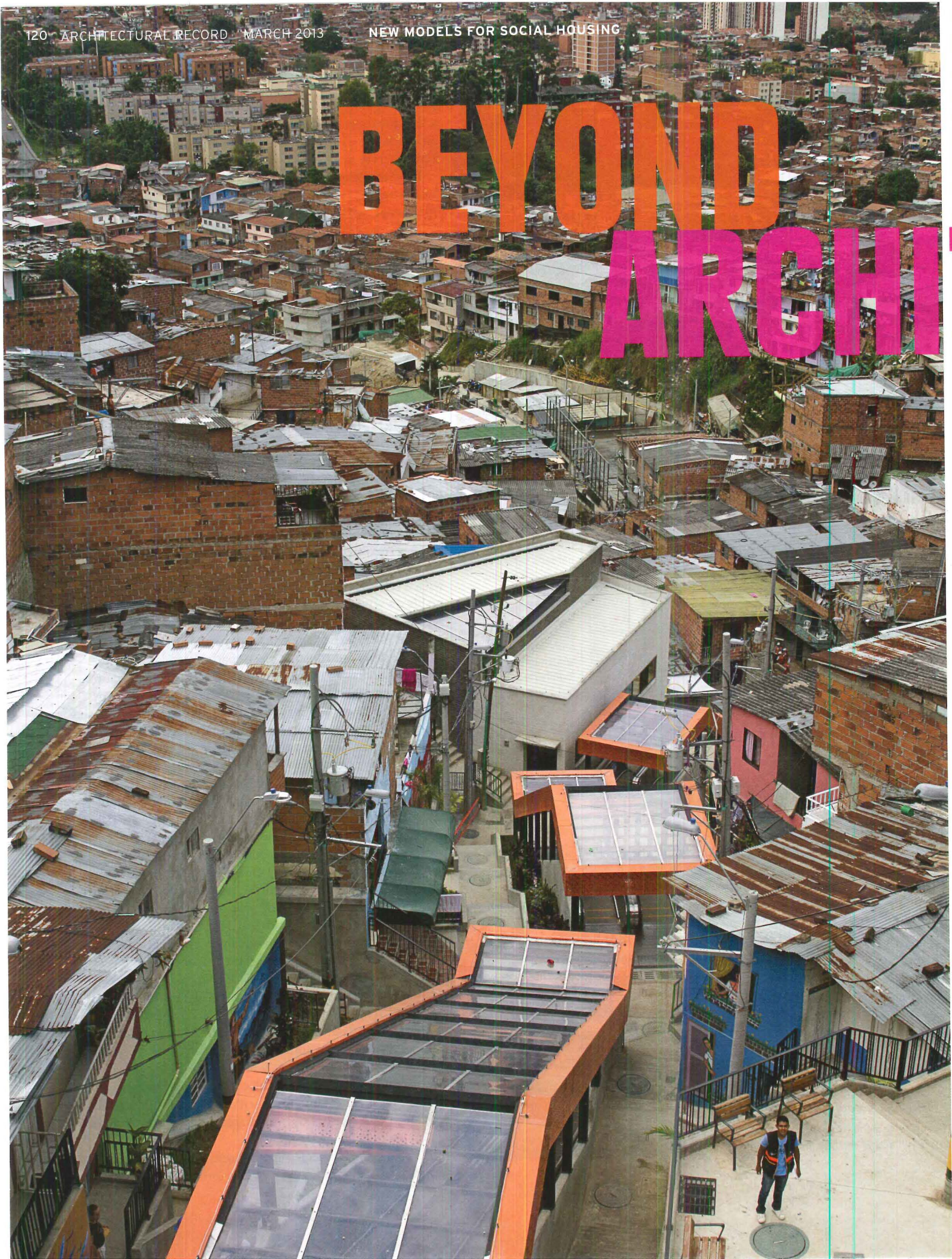
The operation of the double facade is supported by two further flexible layers. The first, a half-inch-thick thermal curtain, hangs inside the glass sliding doors. Made of wool with a reflective outer face of aluminum foil, it keeps heat inside on winter nights and out on hot summer days. The second, a thin, reflective solar curtain, hangs inside the loose-fit enclosure of the winter garden. When closed, it permits views out through close-spaced vertical stripes of mesh, while its foil outer face reflects most solar radiation. In summer, when residents ventilate their apartments by opening both sets of doors with the solar curtain closed, the internal temperature can be cooler than outside by up to 10 degrees Fahrenheit; on a winter morning, with both doors closed and the curtain open, up to 20 degrees warmer.

The solar curtains are manufactured for use in commercial greenhouses. Other materials more commonly found in agricultural or industrial structures were also specified, says Lacaton, because they are easy to use and inexpensive, with minimal structural requirements. The unusual application required commitment, however; the engineer was initially reluctant to include the thermal curtains' insulating properties in calculations, since their proper use could not be guaranteed. An assumption that half the curtains will be closed on winter nights as intended was eventually agreed on.

Folds of silvery fabric, sliding screens, and signs of occupancy animate the building's layered carapace, whose refinement supports the architects' belief that an appropriate outward appearance will ensue from concern for quality of life inside. As with Park Hill, the renovation of Bois-le-Prêtre restores something of the building's original promise—more space, great views, and a well-tempered environment—and, through the outward manifestation of change, gives something to the city. Both are buildings first conceived in a spirit of optimism, revived by another dose. ■

London-based Chris Foges is editor of *Architecture Today* and an *ARCHITECTURAL RECORD* international correspondent.

# BEYOND ARCHIT



As the world's population of informal-settlement dwellers races to the 1.5 billion mark, designers and planners must play a central, if redefined, role.

BY FLAVIE HALAIS

# LECTURE

**THIS CENTURY'S** biggest architectural challenge is taking place in the developing world. There, already overcrowded cities must absorb a constant influx of migrants fleeing the lack of economic opportunities or the armed conflicts plaguing their rural hometowns. Soon the world will house 1.5 billion slum dwellers, half of them in Asia, with the 2 billion mark scheduled to be reached by 2030.

In large settlements such as Rio de Janeiro's Rocinha, Nairobi's Kibera, or Mumbai's Dharavi, hundreds of thousands of residents coexist in the highest densities ever seen, often squatting on the land where they built their makeshift homes. Living conditions engender poor sanitation, a dire lack of public services, and gang-induced violence. Quick, cheap, and efficient infrastructure solutions for the urban poor were needed yesterday. However daunting, the challenges have been made more bearable by the past successes of municipality-initiated upgrading programs such as the recent one in Medellín, Colombia (RECORD, March 2009, page 37), and in Rio's Favela-Bairro, as well as the community-based Orangi Pilot Project in Karachi, Pakistan, led by architect Arif Hasan in the 1980s.

These programs have revealed that, more than ever, architects and planners are needed to play a central, though largely redefined, role in the development of substandard neighborhoods. In the slums of this world, problem solving and creativity are favored over design in its purest form; vernacular aesthetics over an architect's distinctive style; community participation over unilateral decisions. The approach to architectural practice that these qualities suggest can be at once thankless and deeply gratifying, as a single project holds the potential to dramatically affect the lives of thousands.

Over the years, architects have risen to the challenge and have led projects whose influence resonates in the work of today's practitioners. Two initiatives in India—Charles Correa's small Artist Village in Belapur (1983–86) and B.V. Doshi's Aranya in Indore (1989)—stand out as early examples of incremental-housing programs, in which communities are built with minimal infrastructure and designed for future expansion by their inhabitants. In the minds of these architects, neighborhoods and cities should flourish over time.

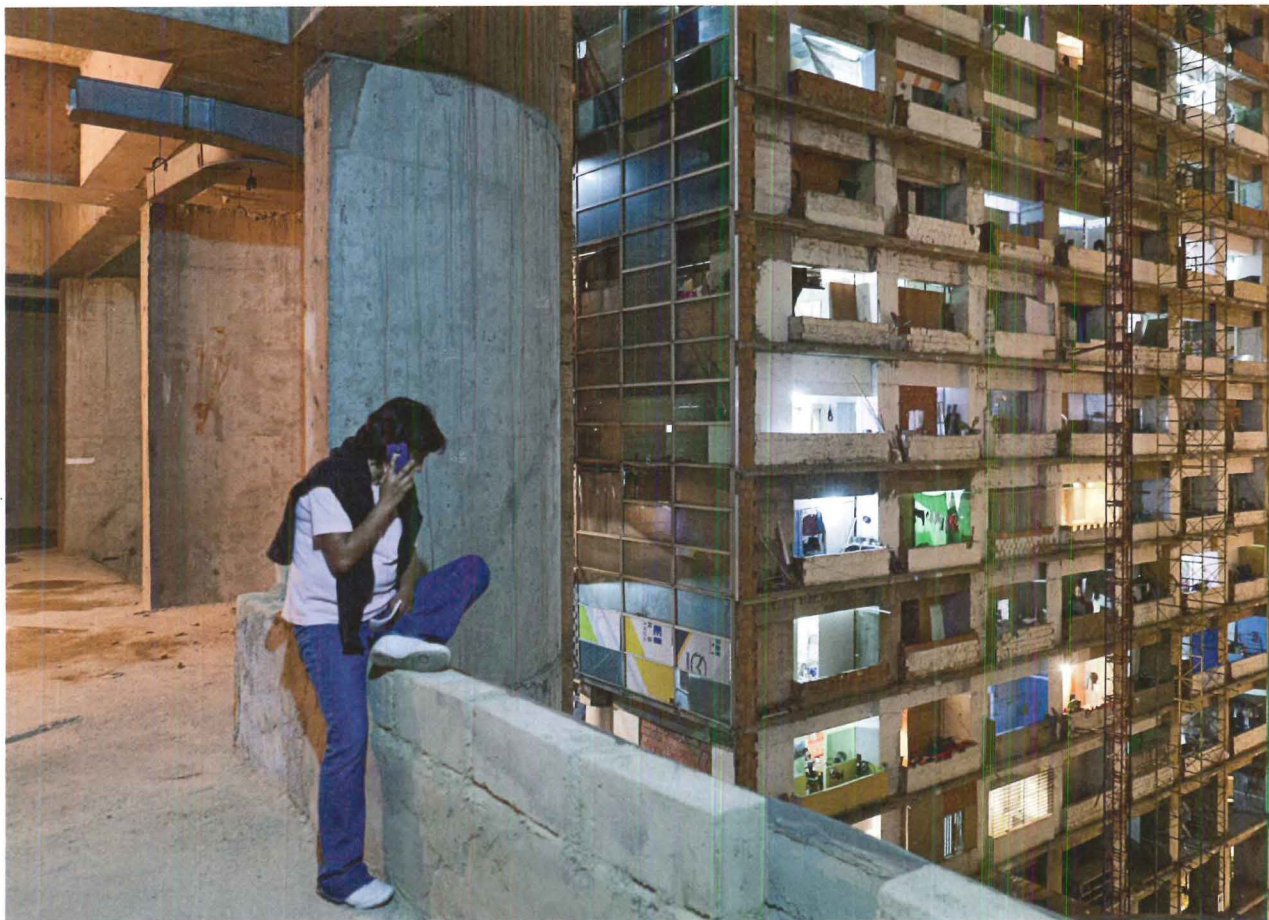
The idea that informal settlements should be seen not as a problem but rather as a natural step toward the formation



**BANGKOK** (Left and below) Collaborating with local residents and students, Norwegian architects TYIN Tegnestue created Community Lantern in Bangkok's largest informal settlement, Klong Toey. The 980-square-foot design-build project, completed in 2011, is made of salvaged wood and concrete. With a price tag of just \$6,000, it provides a space for recreation and repose—with basketball hoops, a stage, and a playground—on a lot once strewn with detritus.

**MEDELLÍN** (Opposite) A string of six open-air escalators carries residents 12 stories up the hillside of Medellín's notorious Comuna 13 district. Completed in 2012 for about \$7 million, it is part of a larger public-works effort to connect neighborhoods, public spaces, and public transport through a series of infrastructure projects.





**CARACAS** (Left and below) Rising 45 stories, Torre David is the world's tallest informal settlement, housing an estimated 3,000 residents. The tower was planned for commercial use, but construction stopped in the early 1990s and squatting began in 2007. Since then a community has emerged, repurposing the building with living spaces, a church, a gym, and shops.

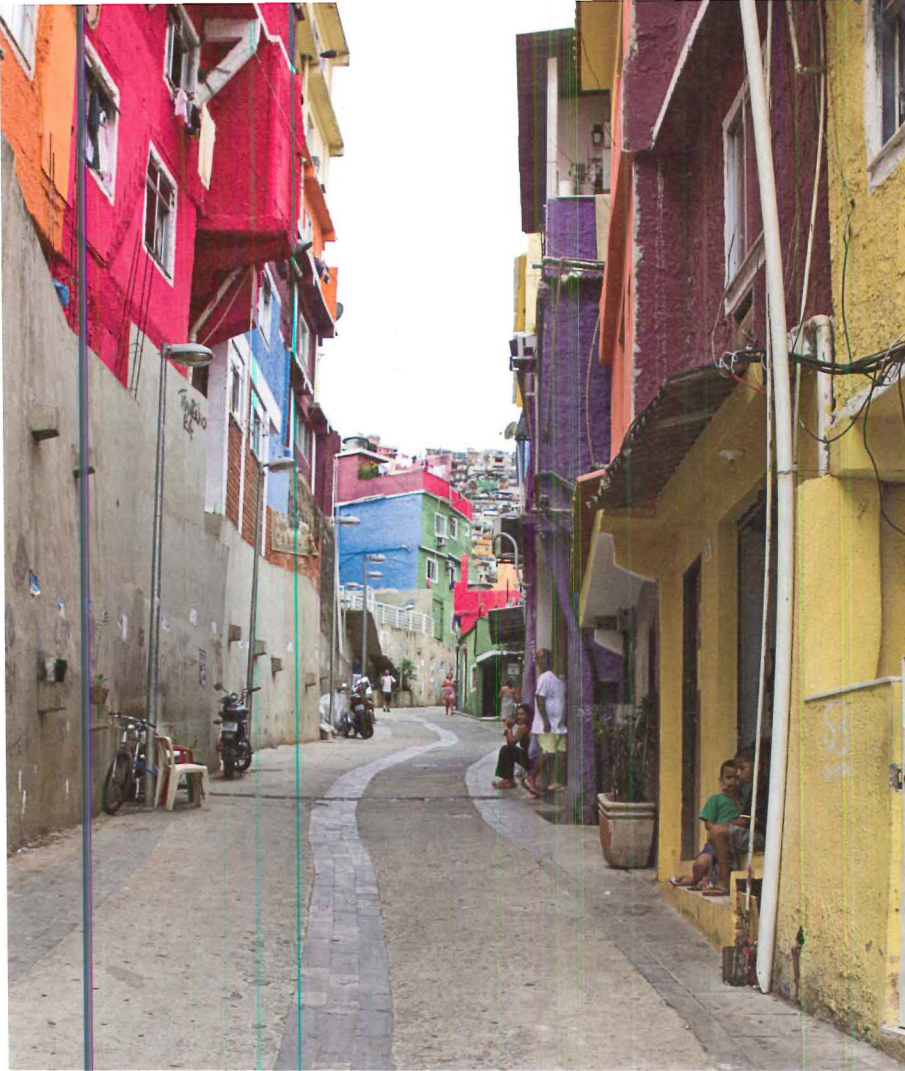
**RIO DE JANEIRO** (Opposite, top) The wide, paved walkway and painted houses in this section of Rio's most populous favela, Rocinha, are the result of the federally funded Growth Acceleration Program, which entered its second phase in 2010. The project includes widening of footpaths (some previously just 2 feet across), improving public spaces, and increasing safety. Residents displaced by the street widening were relocated to nearby social housing.

of vibrant metropolises is what led Rio to launch its ambitious Favela-Bairro program. With funding from the Inter-American Development Bank (IADB), the scheme (which ran from 1994 to 2007) focused on small-scale, targeted infrastructure creation and upgrading such as street paving, rather than on dwellings themselves. The federal Growth Acceleration Program later added another layer of public works, with larger projects, like social housing. "By upgrading favelas and investing in them, the public sector sent a message to residents, which was: 'We're investing in you,'" says Theresa Williamson, who heads the Rio-based NGO Catalytic Communities, dedicated to integrating favelas into the formal city.

Favela-Bairro's successor, Morar Carioca, is even more ambitious. The \$4 billion initiative, also backed by the IADB, was launched in 2010 in anticipation of the 2016 Summer Olympics. Forty architecture firms, selected after a citywide competition, have submitted substantial upgrading plans slated for completion over the next seven years. But while seeking to resolve Favela-Bairro's shortcomings, namely a lack of public participation and poor maintenance, Morar Carioca does not address the unlawful evictions that have taken place to "sanitize" the city in preparation for the upcoming World Cup, Olympics, and other mega-events. In the small hillside community of Providência, Rio's oldest favela, 671 families have been notified of their upcoming eviction to make way for projects—branded as Morar Carioca—which they say were planned by the city without their input, including



**NAIROBI** (Opposite, bottom) The result of a collaboration between Kenyan-born British architect James Howard Archer and Kenyan architect Mumo Musuva, the Community Cooker is a refuse-burning stove for food preparation in the Laini Saba section of Kibera, Nairobi's largest informal settlement. Featured in the Cooper-Hewitt National Design Museum's recent exhibition *Design With the Other 90%: Cities*, the stove, powered by the never-ending supply of trash, offers an alternative to traditional charcoal- and wood-fueled versions.



## Problem solving and creativity are favored over pure design, community participation over unilateral decisions.

an eye-catching cable-car line. A local advocacy group estimates that 30,000 residents will be removed ahead of the World Cup and Olympics, with the municipality claiming infrastructure construction as the reason. Relocation programs mainly consist of sending families to faraway, poorly built social-housing projects.

In places like Rio, where land speculation strangles low-cost housing development and links between developers and politicians are inextricable, even the best-intentioned initiatives can't entirely escape the effects of corruption and poor governance. With the potential to affect thousands of residents, politicians can use large-scale top-down programs as straw favors. In her book *Cities With 'Slums,'* Marie Huchzermeyer of the School of Architecture and Planning at the University of the Witwatersrand, in Johannesburg, describes how the repeated use of the slogan "cities without slums" and the word "slum-free" by UN-Habitat and its offshoot agency Cities Alliance led certain African countries to put aggressive removal programs into place. UN-Habitat, she writes, failed to properly monitor the implementation of the U.N. Millennium Development Goals to improve the living conditions of 100 million slum dwellers by 2020, which the "cities without slums" campaign was intended to promote.

By contrast, some of the latest innovative approaches for housing construction are more modest in scale, in part as a way to limit political interference. Two recent examples of incremental housing—one by Alejandro Aravena's Chilean firm Elemental, the other by an international team of architects led by Stockholm-based Filipe Balestra and Sara Göransson—have taken Correa's and Doshi's concepts a step further. The houses come with minimal programmed space,

enabling future expansion by tenants. This replicates the slow but organic building process of families without access to loans and mortgages. While Elemental's units have been used in orderly-looking government housing projects across Latin America, Balestra and Göransson's strategy is being implemented in dense areas of Mumbai and Pune, India, in partnership with the local NGO SPARC and Mahila Milan, a grassroots, women-run organization managing credit and savings activities.

In Mumbai's sprawling, chaotic Dharavi slum, Matias Echanove and Rahul Srivastava run URBZ, a design practice dedicated to consultancy (one of their current projects, a community mosque, is being developed in collaboration with the Italian architecture firm Studio Marc). Conception and implementation, they say, can mostly be achieved by drawing from the community's pool of resources and the technical know-how of contractors. Traditional tools used by professionals, such as maps and drawings, can lose their value in areas with strong traditions of oral communication. "We feel there must be another model for affordable housing based on local construction logistics," Echanove says. "It already exists, but it's not recognized or invested in by municipalities."

The careful, localized approach taken by this new generation of practitioners reflects the difficulty of establishing best practices and a clear housing model to be replicated universally on a large-scale basis, as each community must respond to site-specific circumstances and needs. Effective approaches must first seek to understand such variables as the urban fabric and the use of private and public space before moving on to the design stage.

In informal settlements, the role of the architect, planner, and anthropologist can intersect in complex but often advantageous ways, and traditional roles and responsibilities must be put aside. Here individual clients are virtually nonexistent; practitioners serve communities and, beyond that, a cause. "The role of professionals is to be the voice of the people who have no voice themselves," says British architect and urban-development consultant Geoffrey Payne. To some, architectural practice in these places can be unsettling. To others, it is deeply exhilarating. ■

*Flavie Halais is a freelance writer in Montreal specializing in urban issues.*



## PROJECT CREDITS AND SOURCES

**Savonnerie Heymans**

**LOCATION:** Brussels  
**ARCHITECT:** MDW Architecture – Xavier De Wil, Marie Moignot, Gilles Debrun  
**COST:** \$15 million  
**CLIENT:** CPAS de Bruxelles  
**ENGINEERS:** MK Engineering; Waterman TCA; SETESCO  
**ACOUSTICAL CONSULTANT:** ATS  
**GENERAL CONTRACTOR:** CFE Brabant  
**SOURCES**  
**INSULATION:** STEICO Canaflex  
**ROOFING:** DERBIGUM; Kingspan  
**FENESTRATION:** Riche; CRISTAL  
**GLAZING:** Saint-Gobain Glass  
**ELEVATORS:** Schindler

**La Valentina Station**

**LOCATION:** Sacramento, CA  
**ARCHITECT:** David Baker + Partners – David Baker, design principal; Peter MacKenzie, principal in charge (recently deceased); Bradley Sugarman, project architect; Kevin Markarian, architect  
**COST:** \$12.1 million  
**CLIENT:** Domus Development  
**LANDSCAPE ARCHITECT:** Garth Ruffner Landscape Architect  
**LANDSCAPE CONSULTANT:** Fletcher Studio  
**GENERAL CONTRACTOR:** Brown Construction  
**SOURCES**  
**RAINSCREEN:** AZEK  
**CLADDING:** James Hardie Panel Siding  
**ALUMINUM STOREFRONT:** Kawneer  
**ROOFING:** Johns Manville  
**DOORS:** DKS Doors; T.M. Cobb; Milgard; Wayne Dalton  
**VINYL FRAME:** Milgard  
**LOCKSETS:** Schlage  
**ACOUSTICAL CEILINGS:** Tectum  
**PAINTS AND STAINS:** Frazee  
**Paints:** Kelly-Moore Paints  
**PLASTIC LAMINATE:** Formica  
**FLOORING:** Mannington VCT (laundry and utility rooms); Armstrong Cushion Step (bathrooms); Mannington Adura (kitchens)  
**CARPET:** Bigelow Broadloom (corridors); Shaw Eco Ultimate II (units)

**Skyville@Dawson**

**LOCATION:** Singapore  
**ARCHITECT:** WOHA – Richard Hassell, Wong Mun Summ, partners  
**COST:** \$126 million  
**CLIENT:** Housing & Development Board (HDB) Singapore  
**ENGINEERS:** LBW Consultants (civil and structural); BECA Carter Hollings & Ferner (m/e)  
**CONSULTANTS:** ICN Design International (landscape); BECA Carter

Hollings & Ferner (sustainability)  
**GENERAL CONTRACTOR:** Hor Kew  
**SOURCES**  
**WINDOWS:** LHL International  
**LIGHTING:** Krislite  
**ELEVATORS:** Fujitec

**SkyTerrace@Dawson**

**LOCATION:** Singapore  
**ARCHITECT:** SCDA Architects – Chan Soo Khian, Oon Jin Aik, Lilian Dirgantoro, Maulana Islami, Paulin Tay, Chai Hoon  
**COST:** withheld  
**CLIENT:** Housing & Development Board (HDB) Singapore  
**ENGINEERS:** Ronnie & Koh Consultants (c/s); BESCON (m/e)  
**CONSULTANTS:** ZEB-Technology (sustainability)  
**GENERAL CONTRACTOR:** Sunhuan Construction  
**SOURCES**  
**STEEL TRUSSES:** TTJ Design & Engineering  
**CONCRETE:** Syscon  
**ALUMINUM MESH CLADDING:** Xin Long  
**WINDOWS:** Durabeau  
**GLASS:** Durabeau  
**PAINTS AND STAINS:** Jotun  
**ELEVATORS:** Fujitec  
**PHOTOVOLTAIC SYSTEM:** Utica Energy

**28th St. Apartments**

**LOCATION:** Los Angeles  
**ARCHITECT:** Koning Eizenberg Architecture – Brian Lane, principal in charge; Julie Eizenberg, design principal; Hank Koning, technical principal; Paul Miller, project architect; Robert Fabijaniak, Gina Grillo, Crystal Chan, Jason Ro, Roderick Villafranca, project team  
**COST:** \$11.9 million  
**CLIENT:** PRW Residences, L.P.; Clifford Beers Housing, Inc.; Coalition for Responsible Community Development  
**ENGINEERS:** Parker Resnick (structural); VCA Engineers (civil); Khalifeh & Associates (m/p); OMB Electrical Engineers (electrical)  
**CONSULTANTS:** Historic Resources Group (historic architect); Lighting Design Alliance (lighting); Newsom Design (signage/graphics)  
**GENERAL CONTRACTOR:** Alpha Construction  
**SOURCES**  
**ELASTOMERIC ROOFING:** Parex/Mer-Ko  
**HISTORIC DOOR AND WINDOW RE-CREATIONS:** Spectra  
**VINYL WINDOWS:** Milgard  
**GLASS:** Oldcastle

BuildingEnvelope; PPG  
**ELEVATOR SMOKE CURTAIN:** Smoke Guard  
**RESILIENT FLOORING:** Forbo  
**LIGHTING FANS:** Modern Fan Company  
**ELEVATORS:** KONE  
**PHOTOVOLTAIC SYSTEM:** SunPower  
**SOLAR HOT-WATER SYSTEM:** SunEarth

**Butaro Doctors' Housing**

**LOCATION:** Butaro, Rwanda  
**ARCHITECT:** MASS Design Group – Alan Ricks, Sierra Bainbridge, Commode Dushimimana, Chris Maurer, Michelle Benoit, Andrew Brose, Jennifer Gaugler, Benjamin Hartigan, Jean Michel Maniragaba, Sarah Mohland, Chris Maurer, Christian Benimana, Michael Murphy  
**COST:** \$400,000  
**CLIENT:** Ministry of Health, Republic of Rwanda  
**ENGINEERS:** Kayihura Nyundo, Christian Uwinkindi  
**SOURCES**  
**MASONRY PRESSES:** Hydraform; Auroville  
**ROOFING:** Ruliba Clays  
**PAINTS AND STAINS:** Sadolin

**2602 Broadway**

**LOCATION:** Santa Monica, CA  
**ARCHITECT:** Daly Genik Architects – Kevin Daly, principal in charge; Tom Perkins, project manager; Kody Kellogg, Jason Pytko, Gretchen Stoecker, Jared Ward, project team  
**COST:** \$10.9 million  
**CLIENT:** Community Corporation of Santa Monica  
**ENGINEERS:** John Labib & Associates (structural); TKSC (m/p); FBA Engineering (electrical); Paller-Roberts Engineering (civil)  
**CONSULTANTS:** DRY design (landscape); Davy + Associates (acoustical)  
**GENERAL CONTRACTOR:** Ruiz Brothers  
**SOURCES**  
**CEMENT BOARD:** James Hardie  
**ALUMINUM WINDOW BOXES:** Daly Genik, designer/ Machineous, fabricator  
**RAINSCREEN FIBER CEMENT PANELS:** Minerit  
**WINDOWS AND STOREFRONT:** Milgard; Arcadia  
**FIRE-CONTROL DOORS, SECURITY GRILLES:** Smoke Guard, Lawrence, Cookson  
**RAINWATER-HARVESTING CISTERN AND IRRIGATION:** SkyHarvester

**Yinzhou Talent Apartments**

**LOCATION:** Ningbo, China  
**ARCHITECT:** DC Alliance  
**CLIENT:** Yinzhou City Construction Investment Development Company

**The Hegeman**

**LOCATION:** Brooklyn  
**ARCHITECT:** CookFox Architects – Rick Cook, Robert Fox, Peter Aaron, Darin Gregory Reynolds, Daniel J. Rogers, Simon Rearte, Guido Elqueta  
**COST:** \$26.2 million  
**CLIENT:** Common Ground Communities  
**ENGINEERS:** Goldman Copeland Associates (m/e/p); Murray Engineering (structural)  
**CONSULTANTS:** Terrain NYC (landscape); SESI Consulting Engineers, Mueser Rutledge Consulting Engineers (soil); YRG Sustainability Consultants (LEED); Steven Winter Associates (energy modeling and conditioning agent); Philip Angel Expediting (codes)  
**GENERAL CONTRACTOR:** Mountco Construction and Development  
**SOURCES**  
**MASONRY:** Glen-Gery Brick, Kingston Block  
**ROOFING:** Johns Manville  
**GLASS:** Viracon  
**SKYLIGHTS:** Oldcastle BuildingEnvelope  
**LOCKSETS:** Schlage  
**EXIT DEVICES:** Von Duprin  
**DEMOUNTABLE PARTITIONS:** 3Form, Modernfold  
**PAINTS AND STAINS:** Benjamin Moore  
**SOLID SURFACING:** DuPont Corian  
**DOWNLIGHTS:** Lightolier; Focal Point; Lucifer Lighting  
**ELEVATORS:** ThyssenKrupp  
**PLUMBING:** American Standard; Sloan; Delta

**Jardim Edite Social Housing**

**LOCATION:** São Paulo  
**ARCHITECT:** MMBB & H+F – Fernando de Mello Franco, Marta Moreira (MMBB project architects); Pablo Herenu, Eduardo Ferroni (H+F project architects); Eduardo Martini, Marina Sabino, Giovanni Meirelles, Cecília Góes, Gleuson Pinheiro Silva, Adriano Bergemann, André R. Costa, Maria João Figueiredo, Naná Rocha, Tiago Girao, Guilherme Pianca, Giselle Mendonça, Eduardo Pompeo (MMBB team); Tammy Almeida, Joel Bages, Natália Tanaka, Diogo Pereira, Gabriel Rocchetti, Thiago

Benucci, Mariana Puglisi, Luca Mirandola, Thiago Moretti, Bruno Nicolliello, Renan Kadomoto (H+F team)  
**COST:** \$28 million  
**CLIENT:** SEHAB, São Paulo Prefecture  
**ENGINEERS:** Kurkdjian e Fruchtergarten Engenheiros Associados, Projetal Projeto Estrutural e Consultoria  
**GENERAL CONTRACTOR:** Kallas Engenharia  
**SOURCES**  
**WINDOWS:** Trialux Esquadrias Metálicas  
**METAL DOORS:** Serralheria Arcobox  
**WOOD DOORS:** Eucatex  
**ELEVATORS:** Otis  
**PLUMBING:** Tigre; Amanco

**Flooranaukio Housing**

**LOCATION:** Helsinki  
**ARCHITECT:** Heikkinen – Komonen Architects – Mikko Heikkinen, Markku Komonen, architects; Kai van der Puij, project architect  
**COST:** withheld  
**CLIENT:** Asunto Oy Helsingin Flooranaukio, Helsingin kaupungin asunnot  
**ENGINEERS:** Finnmap Consulting (structural); Sähköinsinööri-toimisto Niemistö (electrical); Insinööri-toimisto Livair (HVAC)  
**CONSULTANTS:** Maisema-arkkitehdit Byman & Ruokonen (landscape); Helimäki akustikot (acoustical); Kai van der Puij (interior design)  
**GENERAL CONTRACTOR:** Lujatalo  
**SOURCES**  
**CONCRETE:** Parma Betoni  
**WOOD FRAME WINDOWS:** Stala  
**GLASS BALCONIES:** Lumon  
**KITCHEN FURNISHINGS:** Novart  
**ELEVATORS:** Schindler  
**SOFTWARE:** AutoCAD

**Tlacolula Social Housing**

**LOCATION:** Oaxaca, Mexico  
**ARCHITECTS:** Dellekamp Arquitectos – Sandra Pérez (project leader), Ignacio Méndez, Salvador Martínez, Pedro Sánchez, Jachen Schleich (project team); DAS Arquitectura – Gerardo Asali  
**COST:** \$37,000  
**CLIENT:** Luis Miguel Torres Bolaños Cacho  
**SOURCES**  
**ELASTOMERIC ROOFING:** Thermotek  
**METAL FRAME WINDOWS:** Cuprum  
**PAINTS AND STAINS:** Comex  
**SHOWER HEAD, FAUCET:** Urrea

**Owe'neh Bupingeh**

**LOCATION:** Ohkay Owingeh, NM  
**ARCHITECT:** Atkin Olshin Schade Architects – Tony Atkin, principal in charge; Jamie Blosser, housing and sustainability project manager; Shawn Evans, preservation project manager; Daniel Barboza, preservation specialist; Tom Pederson, GIS manager  
**COST:** \$5.1 million (phases I–III)  
**CLIENT:** Ohkay Owingeh Housing Authority  
**ENGINEERS:** ABQ Engineers – Phase I, II (civil, structural, m/e/p); M&E Engineers – Phase III (m/e/p); Chavez Grieves Consulting Engineers – Phase III (structural)  
**GENERAL CONTRACTOR:** Avanya General Contracting  
**SOURCES**  
**ADOBE BRICKS:** Adobe Man  
**TPO ROOFING:** Mule-Hide  
**WOOD-FRAME WINDOWS AND DOORS:** Semco

**Park Hill**

**LOCATION:** Sheffield, England  
**COST:** \$57.6 million (phase Ia)  
**ARCHITECT:** Hawkins|Brown – Greg Moss, project architect  
**ASSOCIATE ARCHITECT:** Studio Egret West  
**ENGINEERS:** Stockley (structural); Ashmount Consulting Engineers (m/e/p)  
**LANDSCAPE CONSULTANT:** Grant Associates  
**GENERAL CONTRACTOR:** Urban Splash Build  
**SOURCES**  
**SINGLE-PLY ROOFING:** Everlast Waterproofing  
**ALUMINUM INFILL PANELS:** United Anodisers  
**BALUSTRADES AND HANDRAILS:** Thorp Precast  
**ANODIZED WINDOW UNITS:** S.G. Aluminium  
**METAL BALCONIES:** F&J Hauc

**Bois-le-Prêtre**

**LOCATION:** Paris  
**ARCHITECTS:** Frédéric Druot Architecture, Lacaton & Vassal Architects – Frédéric Druot, Anne Lacaton, Jean Philippe Vassal, Adis Tatarevic, Florian De Poul, Miho Nagashima, Yuko Ohashi  
**COST:** \$15 million  
**CLIENT:** Paris Habitat (OPAC of Paris)  
**ENGINEERS:** VP & Green (structural); Inex (m/e/p)  
**ACOUSTICAL CONSULTANT:** Gui Jourdan  
**SOURCES**  
**CURTAIN WALL:** Renovinyl  
**GLASS:** Technal

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- 138 ARIZONA STATE UNIVERSITY HEALTH SERVICES-TEMPE BUILDING

# The Royal Treatment

Madrid

Rafael de La-Hoz Arquitectos crafts a serenely restorative environment for Madrid's Rey Juan Carlos Hospital.

By David Cohn

Photography by Duccio Malagamba

**LUMINOUS LOBBY** Patients and their families enter through an airy, daylit hall that leads off to diagnostic and treatment areas.

**BEHIND THE** eye-catching design of the 969,000-square-foot Rey Juan Carlos Hospital in the Madrid suburb of Móstoles, Spanish architect Rafael de La-Hoz has created a therapeutic atmosphere, organizing the building around accessible atria that help orient patients and immerse them in a protective, inward-looking environment. These spaces also ensure that all patient areas have direct access to natural light.

Working with a tight site and leaving room for a future addition, De La-Hoz organized the program into a dense, compact building divided vertically into two distinct realms. A rectangular podium contains technical and outpatient services, while two ovoid glass drums on top house patient rooms. De La-Hoz resolves the different geometries of the two zones by adding an intermediary floor between them that efficiently delivers mechanical services to both. "Each section responds to its necessities, unlike so many hospitals where the structural requirements of one area condition the other," he explains. The arrangement gives the facility an abstract identity when seen from an adjacent highway.

De La-Hoz won a competition for the project in 2010, and it was designed and built in only 18 months for \$140 per square foot, a low cost even for Spain. De La-Hoz cites the country's financial crisis and a lack of work in the construction industry as major reasons these goals were met.

The three-story base of the building is organized into a trio of parallel horizontal bands separated by two atria that

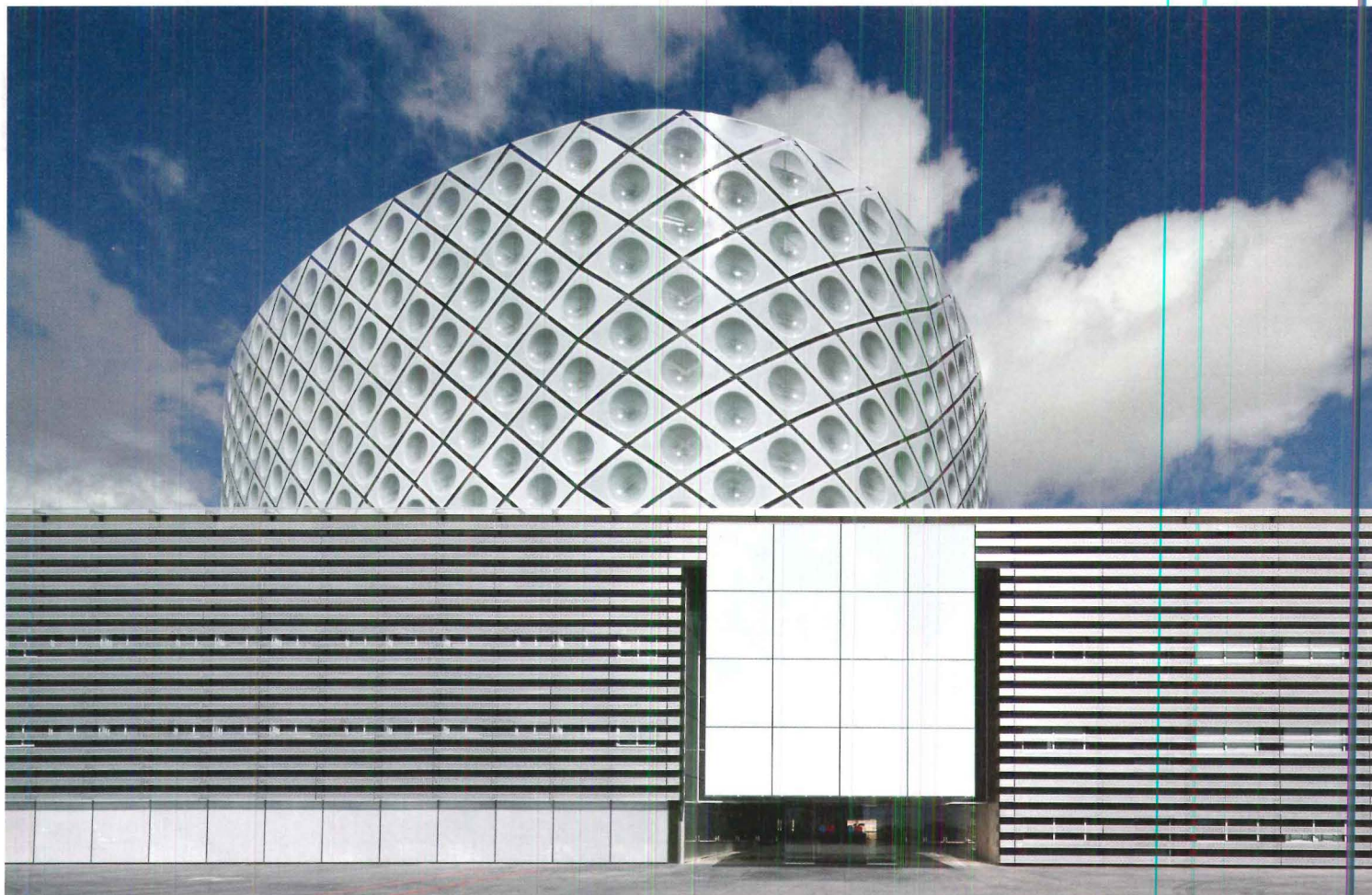
run across its full width. One band, containing outpatient services, faces the street and features a line of eight light wells that bring daylight into corridors and waiting areas. Examining rooms look outside, where windows are shielded by a screen of continuous metal slats. Emergency services occupy a second band on the opposite side of the building and one level up, with ramped access for ambulances and dropoffs. Diagnostic equipment, operating rooms, and other technical areas are in the central band, for easy access from all areas, including the patient rooms above them.

Entries to the building from parking areas on both sides and from the street bring visitors into the main atrium.

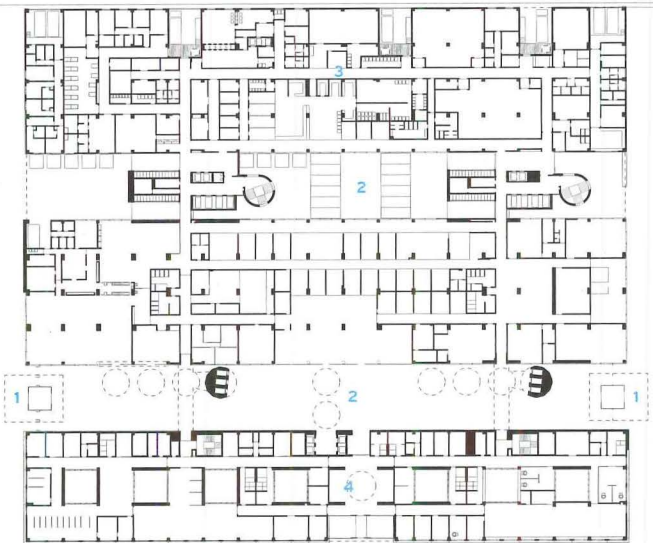
Despite its clean finishes and clear organization, the space is Piranesian in impact, crossed by bridges and with natural light sifting down from lofty circular skylights. The second atrium, lined on both sides with corridors for technical areas, is quieter and more isolated.

De La-Hoz and his team organized the curving drums above this base around accessible gardens, which are surrounded by glazed corridors and patient rooms. Each of the five floors contains a single nursing station, comprising a total of 260 beds. Within these drums, patients and visitors find themselves in a luminous, womblike space that includes them in a larger community of patients. The elevated ground plane of the gardens feels almost celestial. Sunlight filters through tilted roof canopies to create—together with the

**FIT FOR A KING**  
A motif of circles—appearing as windows, skylights, and roof planters throughout (opposite and below)—extends beyond the hospital to its grounds and a heliport. Six circular skylights punctuate the bright-red canopy of the emergency entry (opposite).



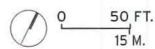




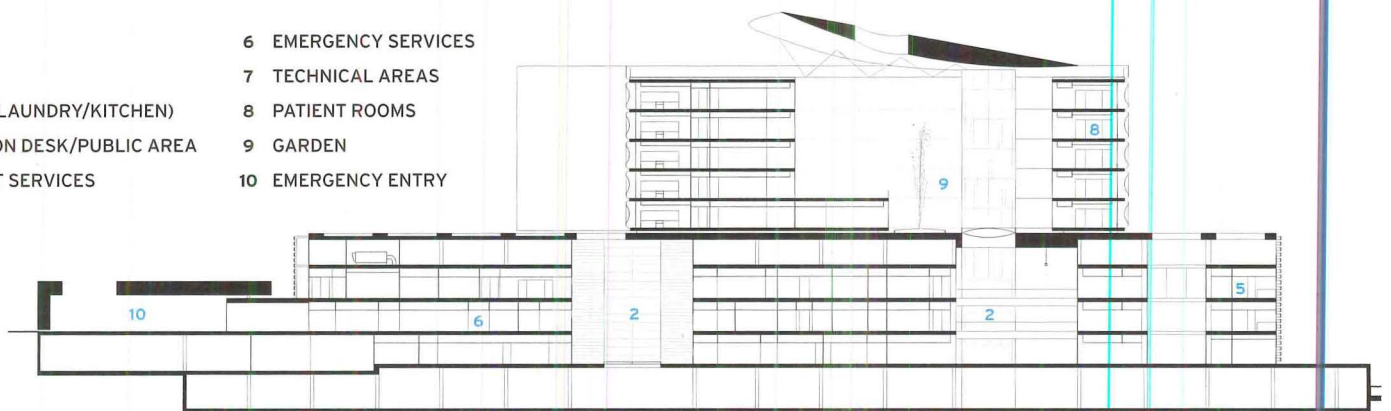
GROUND FLOOR



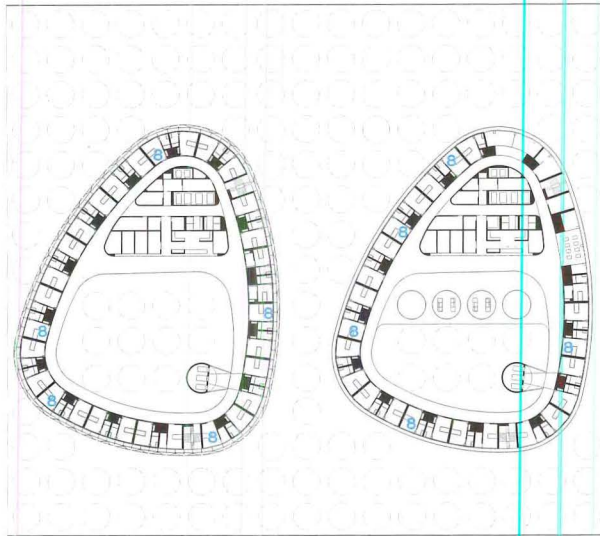
FIRST FLOOR



- |                                |                      |
|--------------------------------|----------------------|
| 1 ENTRANCE                     | 6 EMERGENCY SERVICES |
| 2 ATRIUM                       | 7 TECHNICAL AREAS    |
| 3 LOGISTICS (LAUNDRY/KITCHEN)  | 8 PATIENT ROOMS      |
| 4 INFORMATION DESK/PUBLIC AREA | 9 GARDEN             |
| 5 OUTPATIENT SERVICES          | 10 EMERGENCY ENTRY   |



SECTION A - A



FOURTH FLOOR

credits

**ARCHITECT:** Rafael de La-Hoz Arquitectos

**ENGINEER:** GHESA Ingeniería y Tecnología (structural, m/e/p)

**CONSULTANT:** Habitum (landscape)

**CLIENT:** Madrilenian Public Health Service Department of Health, Autonomous Community of Madrid

**GENERAL CONTRACTOR:** Obrascón Huarte Lain

**SIZE:** 969,000 square feet

**COST:** \$126 million

**COMPLETION DATE:** March 2012

**SOURCES**

**TILE:** Porcelanosa, Discesur

**GLASS:** Cricursa, Control Glass

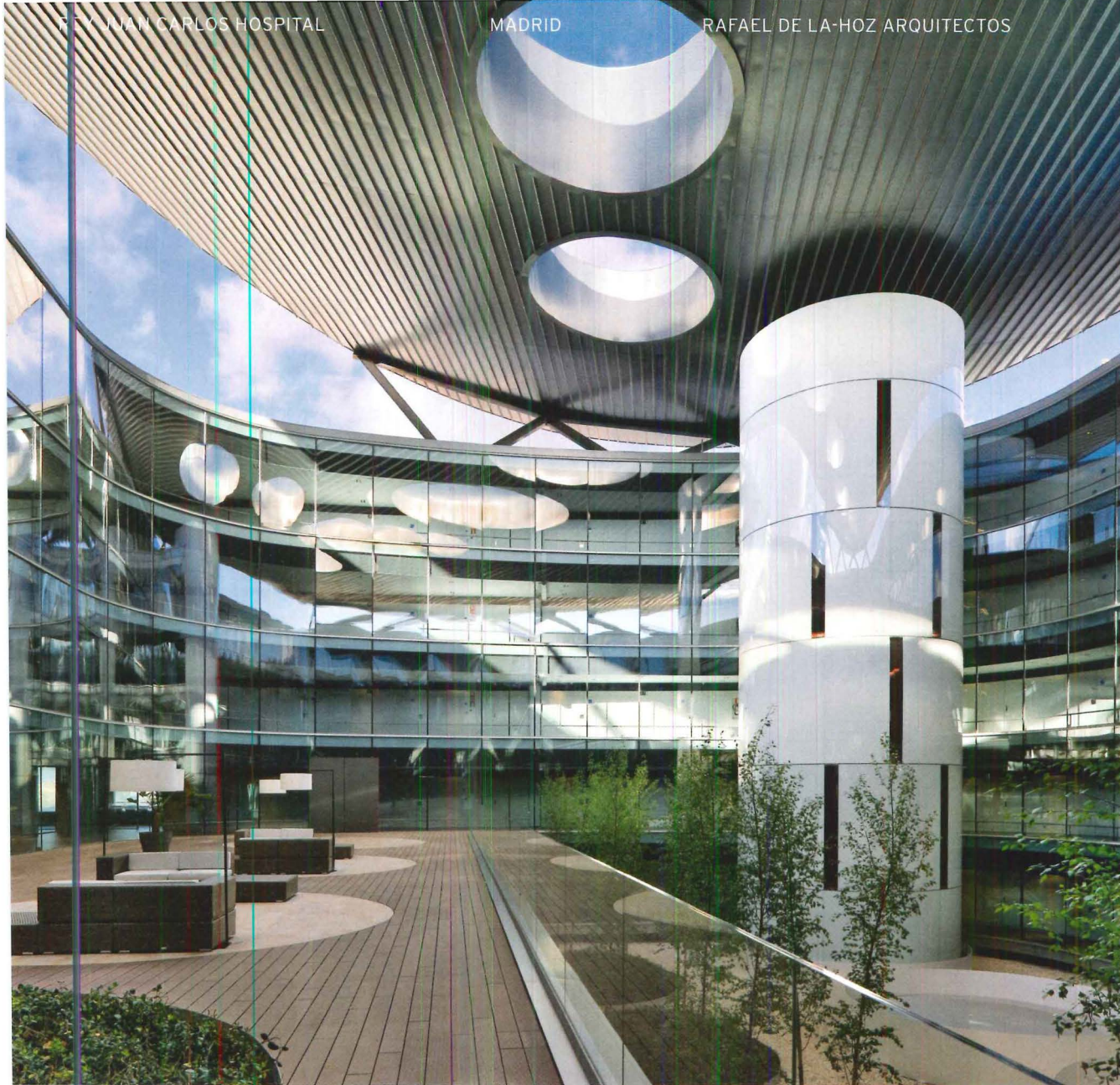
**CLADDING:** Permasteelisa, Cricursa, FERGA

**FURNISHINGS:** Actiú

**FLOORING:** Armstrong DLW Ibérica, Tarkett







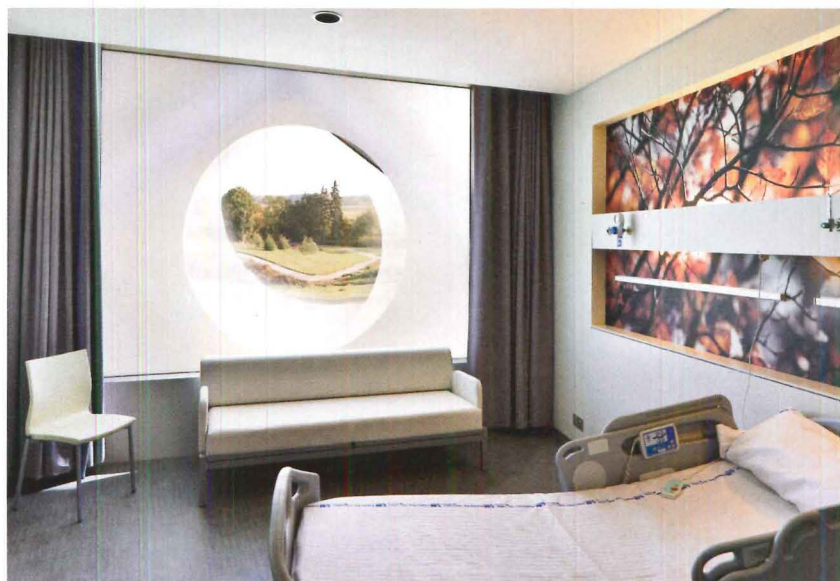
**ROOMS WITH VIEWS**

The ovoid patient-room modules atop the main medical-services plinth are centered on two planted atria (left). Porthole-like windows in each private room look out onto the hospital's suburban surroundings (below).

wood-plank floors, planters, and seating—an intimate and habitable space. In spirit these gardens are cloisters, places of repose, tranquility, and protection.

Patient rooms have expansive windows that overlook a suburban landscape. Even bathrooms have exterior windows. “Usually the hotel-room type is extrapolated to the hospital,” says De La-Hoz. “But you only sleep in a hotel; hospital rooms are lived in. And the bathroom is basic to this.” Outward-facing bathrooms give nurses greater visibility and access into the room.

Working with Spanish suppliers, the design team developed the curved glass sheath of the two drums as construction began. The resulting ventilated facade, supported by stainless-steel arms, is textured with a diamond pattern of dimpled glass panels—each configured with a surface of white ceramic frits that enable clear views from inside. Resting above the horizontal banding of the plinth, this milky glazing punctuated by hundreds of abstract “eyes” glitters in the sun, a beacon of rescue for all those in the community seeking care. ■



# High-Rise Healing

Chicago

The Ann & Robert H. Lurie Children's Hospital hires three design firms to take pediatric medical care to new heights with a 23-story tower.

By Lee Bey



GARDEN

**LEVELS OF CARE** The hospital's towering new facility (right) near downtown Chicago integrates emergency and trauma services, imaging, and acute care. A sky garden on the 11th floor (opposite) provides kids and their families a place for recreation and relaxation, while playful touches—like life-size mother-and-calf whale sculptures—animate the entrance lobby (below) and provide some whimsy in what can be a tense environment for parents and children.

**LOCATED ALONG** a row of utilitarian high-rise buildings on a busy thoroughfare in Chicago's Streeterville neighborhood, one 23-story tower just east of Michigan Avenue stands out: its facade is a lively mix of color, light, and form. Curved glass encloses a ground-level lobby; a sky garden on an upper floor projects beyond the precast-concrete grid that composes the building's facade. Visually, it looks like a set of giant building blocks, piled high by a child—and with good reason.

This is the \$605 million Ann & Robert H. Lurie Children's Hospital, which opened last June on the Northwestern Memorial Hospital campus about a mile northeast of downtown Chicago. At 1.25 million square feet, the building is nearly twice as large as the hospital's former home on a crowded, block-long site in the city's Lincoln Park neighborhood.

The tower is the work of a three-firm architectural team: the Los Angeles office of ZGF Architects, which has an extensive medical-design background; high-rise specialists Solomon Cordwell Buenz of Chicago; and Anderson Mikos Architects, a firm based in Oakbrook Terrace, Illinois, that has worked with the hospital for almost 30 years.

The design team's plan artfully stacks the old hospital's multiplicity of functions on less than 2 acres. It also carries the facade's sense of whimsy indoors, where there are colorful gardens and themed floors—one with a custom Chicago Fire Department truck, complete with insignia, that kids can play in. Given that many of the patients are dealing with life-threatening illnesses or face complicated surgeries, these cheery, well-planned spaces and amenities make the hospital experience less foreboding for children and their families. "They really wanted a facility for families," explains ZGF principal Sue Ann Barton. "This is important, because these kids can sometimes spend months in the hospital."

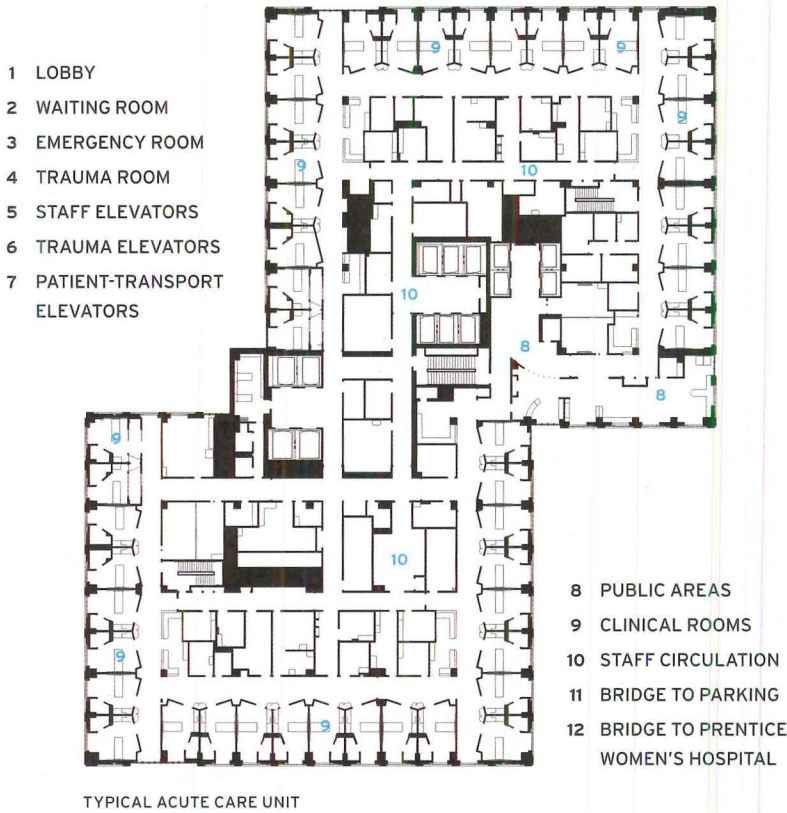
Perhaps the signature example of this approach is the 5,000-square-foot sky garden, designed by Boston landscape architect Mikiyoung Kim, on the hospital's 11th floor. The space, a glass box that cantilevers 7½ feet beyond the main structure, features a sinuous landscape with seating and planted trees, a waterfall, and a small cafeteria. The hospital's Kids Advisory Board came up with the idea for the garden.

"The feedback we were getting from the Kids Advisory Board underscored the importance of having a place where patients could feel the sun," says ZGF principal Stuart Baur. "If they can't leave the hospital, they can, at least for one small period of time, get out of the building."

The building accommodates 288 inpatient beds, a 45-bed ER, and a suite of operating rooms on the sixth and seventh floors connected by dedicated internal stairs. "They had to be stacked vertically so that they work as one surgery department," says architect Robert Schaefer of Anderson Mikos.

In addition, dedicated trauma elevators take emergency



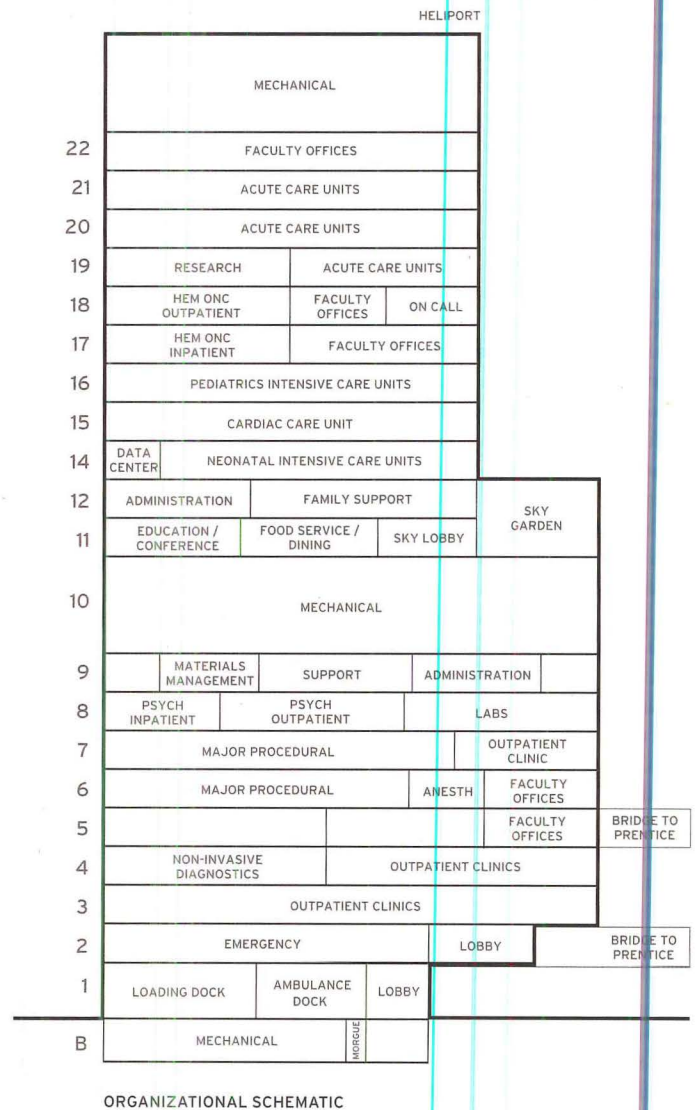


patients to an ER that's on the second level rather than the ground floor. "So far, it has been going very, very well," Barton says of the elevator setup. "It allowed us to bring the patient from the ambulance to the trauma core of the ER. In the old hospital, you'd have to take them down the hall. It's faster than it used to be."

Even the lobby is essentially split between two floors. The airy main floor has a maritime theme, with a boat-shaped café and a life-size replica of mother and calf whales hanging from the ceiling; the second floor acts as a main street, with a reception desk and connection to the neighboring Prentice Women's Hospital and a parking garage. "This is like a city," says Martin Wolf, a design principal at Solomon Cordwell Buenz whose vision helped shape the project.

Despite the building's size and complexity, the architects' thoughtful organization and playful geometry are sure to help take the sting out of hospital stays. ■

*Lee Bey discusses and writes about architecture for Chicago public-radio station WBEZ-FM.*





**LIGHT TOUCH** Pops of color in patient rooms (right) and themed installations (above) provide lighthearted diversions for patients and their visitors.



#### credits

**ARCHITECTS:** ZGF Architects, Solomon Cordwell Buenz, Anderson Mikos Architects  
**ENGINEERS:** Affiliated Engineers (m/e/p); Magnusson Klemencic Associates (structural)  
**CONSULTANTS:** Mikyoung Kim Design (landscape art); Mitchell Associates (signage)  
**CLIENT:** Ann & Robert H. Lurie Children's Hospital of Chicago  
**SIZE:** 1.25 million square feet  
**COST:** \$605 million  
**COMPLETION DATE:** June 2012

#### SOURCES

**CURTAIN WALL:** Kawneer, Okalux  
**GLAZING:** Viracon, Oldcastle BuildingEnvelope, Skyline Design (glass)  
**WINDOWS:** TGP (metal frame); Super Sky Products (skylights)  
**DOORS:** Horton Automatics (ICU/CCU)  
**FINISHES/FURNISHINGS:** Armstrong (acoustic ceilings, suspension grid); 3form (special surfacing); Doug Mockett

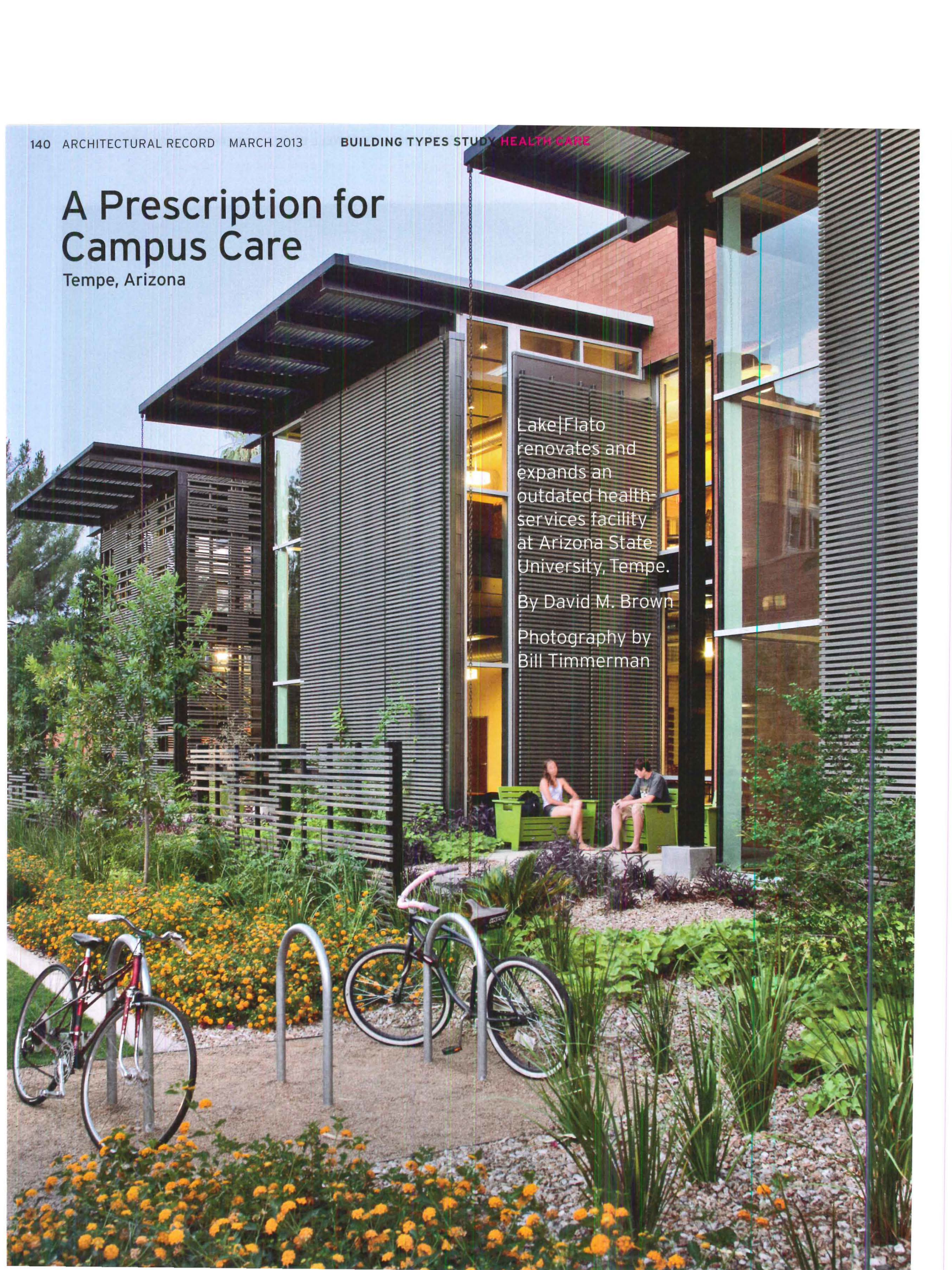
# A Prescription for Campus Care

Tempe, Arizona

Lake|Flato renovates and expands an outdated health services facility at Arizona State University, Tempe.

By David M. Brown

Photography by Bill Timmerman



BUILT AS two structures in 1953 and 1968, the Health Services–Tempe Building (HSTB) at Arizona State University (ASU) had become inefficient and out of rhythm with the vibrant, growing campus around it.

Designed by San Antonio–based Lake|Flato in collaboration with architect of record Orcutt|Winslow of Phoenix, the overhauled, 36,900-square-foot HSTB is light-filled, inviting, and designed for LEED Platinum certification. Its gardenlike environment is a refuge for the campus’s 60,000 students when they need medical treatment and guidance.

the two existing structures into one, partially razing the single-level 1953 wing and expanding it into a two-story, 20,000-square-foot clinic on the south, while renovating the bilevel 1968 building on the north. Then they created a series of gardens and small plazas that face the central campus.

“Our approach to design starts with the notion that humans need a meaningful connection to the natural environment,” says Lake|Flato’s Andrew Herdeg. To ensure this, the two firms employed a number of strategies, orienting



**POCKET PARK**  
To create a welcoming environment for students and staff, the design team carved gardenlike seating areas in alcoves along the building’s main facade (left and opposite).

Located in the historical heart of ASU, the HSTB is adjacent to three century-old structures, all on the National Register of Historic Places—Old Main, the University Club, and the Piper Writer’s House—and it faces the campus’s main pedestrian corridor, Palm Walk, which is dotted with palm trees as old as the landmarks.

The architects aimed to engage both the old and new structures and Palm Walk with a dynamic, welcoming building that relates to its context in terms of texture, color, scale, and landscaping. Optimizing the site, they combined

the building east toward Palm Walk for morning daylight and creating xeriscape gardens, whose desert flora fits in with the surrounding context. In addition, the verticality of the structural steelwork responds to the thrusting palms, and outdoor waiting areas spread out from the facility toward the pedestrian walk; these are shaded by angled overhangs and form lushly planted oases between them.

The entry pavilion is the center’s highly visible “front door,” providing a clear circulation pattern into and through the new structure. A centralized, easy-to-monitor entrance

## credits

**ARCHITECT:** Lake | Flato**ARCHITECT OF RECORD:** Orcutt | Winslow**ENGINEERS:** Littlejohn Engineering Associates (civil); Caruso Turley Scott (structural); Van Boerum & Frank Associates (m/e/p)**CONSULTANT:** Ten Eyck Landscape Architects (landscape)**CLIENT:** Arizona State University**GENERAL CONTRACTOR:** Okland Construction**SIZE:** 36,900 square feet (15,570 renovated, 21,330 new)**COST:** \$7.6 million**COMPLETION DATE:** June 2012**SOURCES****GLAZING:** Oldcastle BuildingEnvelope**WOOD DOORS:** VT Industries**INSULATION:** Owens Corning, GreenGuard**INTERIOR FINISHES:** Armstrong (acoustical ceilings, resilient flooring, suspension grid); Daltile (floor and wall tile); Staron (solid surfacing); Johnsonite (resilient flooring)**LIGHTING:** Focal Point (interior ambient lighting)**FURNISHINGS:** Steelcase, Landscape Forms**CONVEYANCE:** ThyssenKrupp**PLUMBING:** Sloan (flush valves)

**GATHERING PLACE** While awaiting care, ASU students can relax in the light-filled, double-height lobby and use it to work, read and charge their electronic devices.



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|------------------------|----------------------|
| 1 ENTRANCE/CONCIERGE   | 5 IMAGING/LABORATORY |
| 2 PUBLIC AREAS/SEATING | 6 ACUTE CARE         |
| 3 PHARMACY             | 7 FAST TRACK         |
| 4 ADMINISTRATION/STAFF |                      |

also allows staff to keep track of visitors, while supporting way-finding and care delivery.

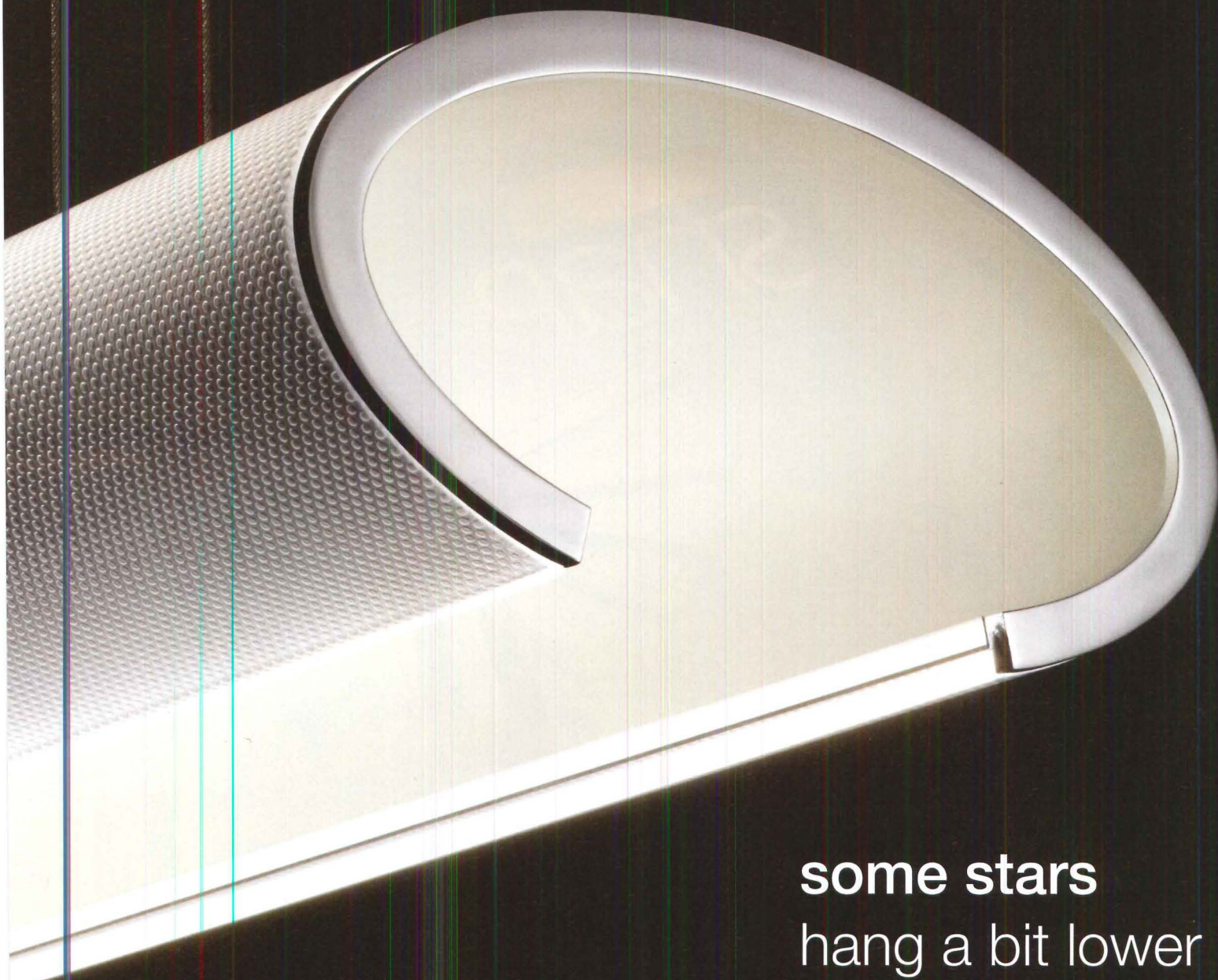
The double-height, sunlit lobby, with its polished aggregate-concrete floor, centers on a concierge desk where students are greeted. Orcutt|Winslow, which was responsible for the interiors, created a wraparound desk finished with bear grass encased in backlit acrylic. Whenever possible, the design team chose sustainable materials and finishes in natural colors to reaffirm the indoor-outdoor theme, while subtly integrating ASU's school colors, maroon and gold.

During the planning stage, students favored a facility with a noninstitutional atmosphere and requested ample electrical outlets in waiting areas for plugging in and recharging electronic devices. Okland Construction, the general contractor, even mocked up areas in its Phoenix facility to test and refine these suggestions.

The staff immediately responded to the increased efficiency, says Dr. Allan L. Markus, ASU's health-services director. "The building design assists the health-center staff to decrease wait times for appointments and ancillary services," he adds. Ultimately, Markus says, "the facility has made an impression on our students about coming to the health center—not just when they are feeling ill but also to maintain their health." ■

David M. Brown is a freelance writer based in Mesa, Arizona.





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The projects may be new construction, renovation, or adaptive reuse; commercial or residential; domestic or international. Special consideration will be paid to works that incorporate innovation in design, program, building technology, sustainability, and/or materials. The winning projects will be featured in the September 2013 issue.

The fee is US\$75 per entry. Download the official entry form with submission and payment instructions at [architecturalrecord.com/call4entries](http://architecturalrecord.com/call4entries). E-mail questions and submissions to [ARCallForEntries@mcgraw-hill.com](mailto:ARCallForEntries@mcgraw-hill.com). (Please indicate **Record Interiors** as the subject of the e-mail.) **Submissions are due May 31, 2013.**

# 2013 CALL FOR ENTRIES Record Kitchen & Bath

The editors of ARCHITECTURAL RECORD are currently accepting submissions for the **2013 Record Kitchen & Bath** competition. Entry is open to any registered architect who has completed an innovative residential and/or commercial kitchen or bath project in the last year. We are looking for projects that feature unexpected materials, address unique client needs, or are designed in a manner that allows these utilitarian spaces to be functional, sustainable, and beautiful. Winning projects will be featured in the September 2013 issue.

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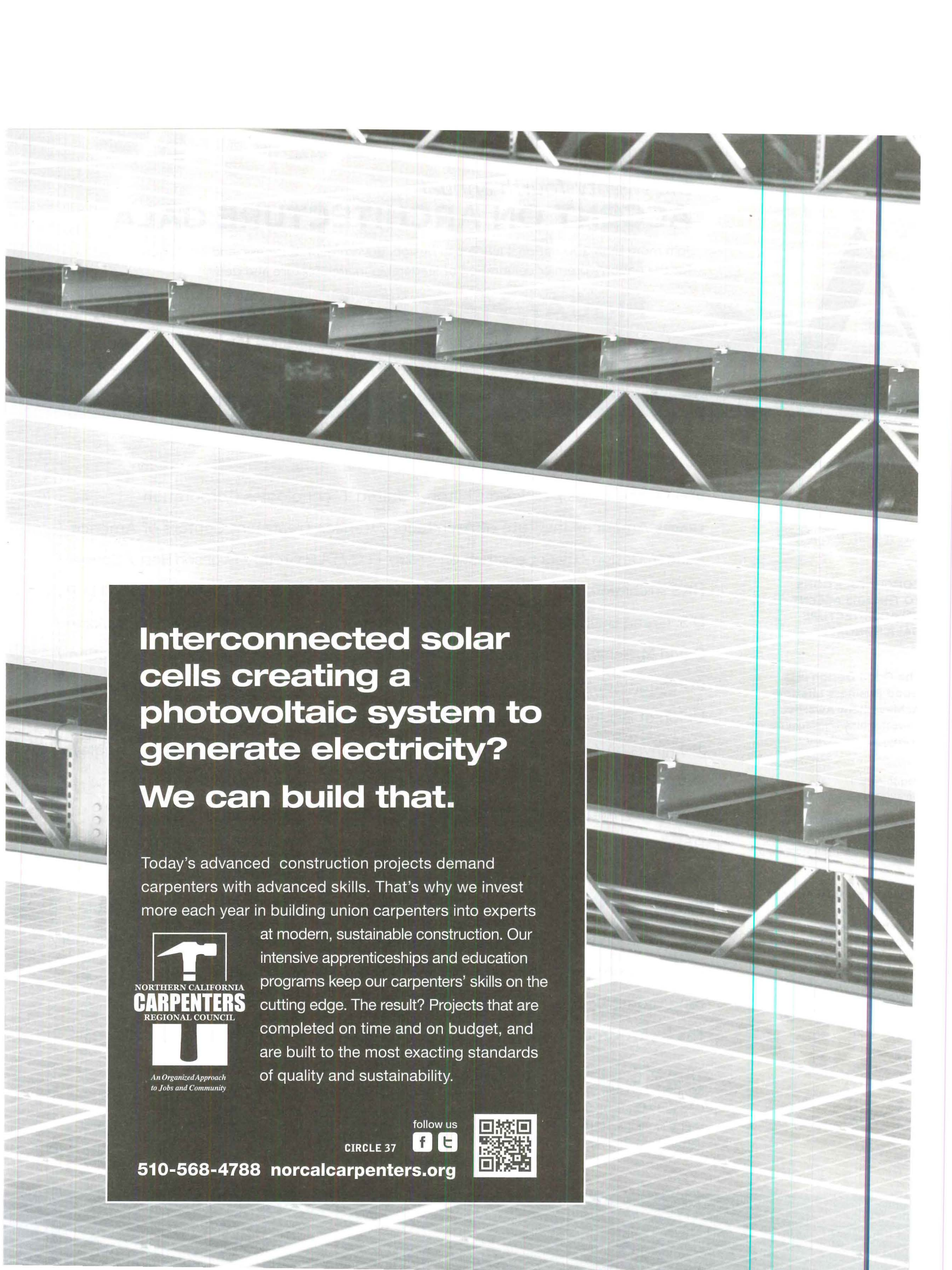
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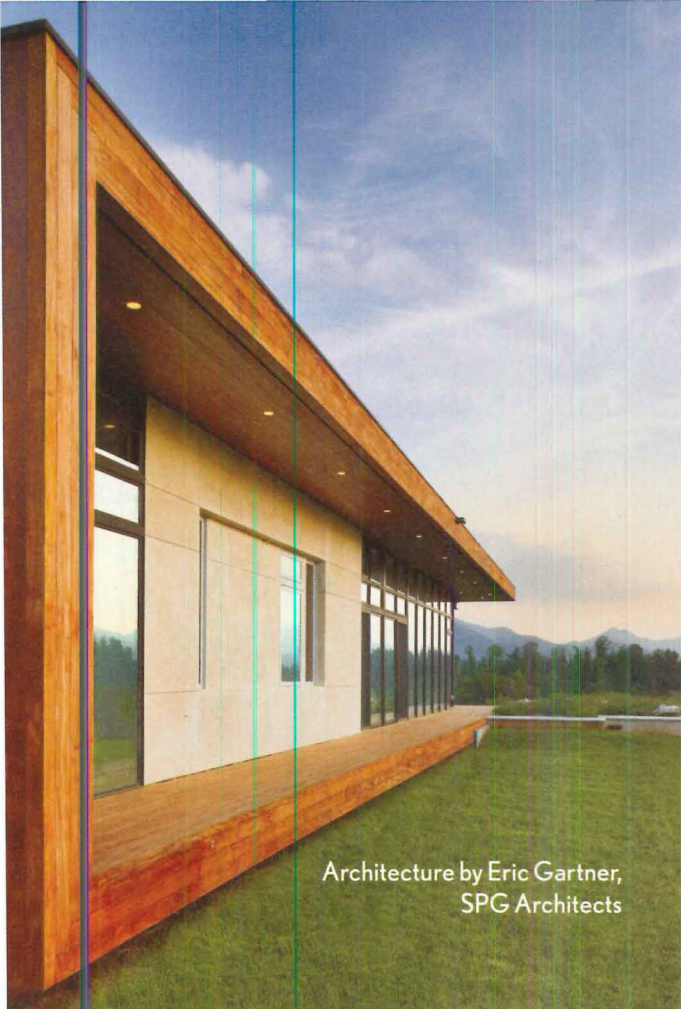
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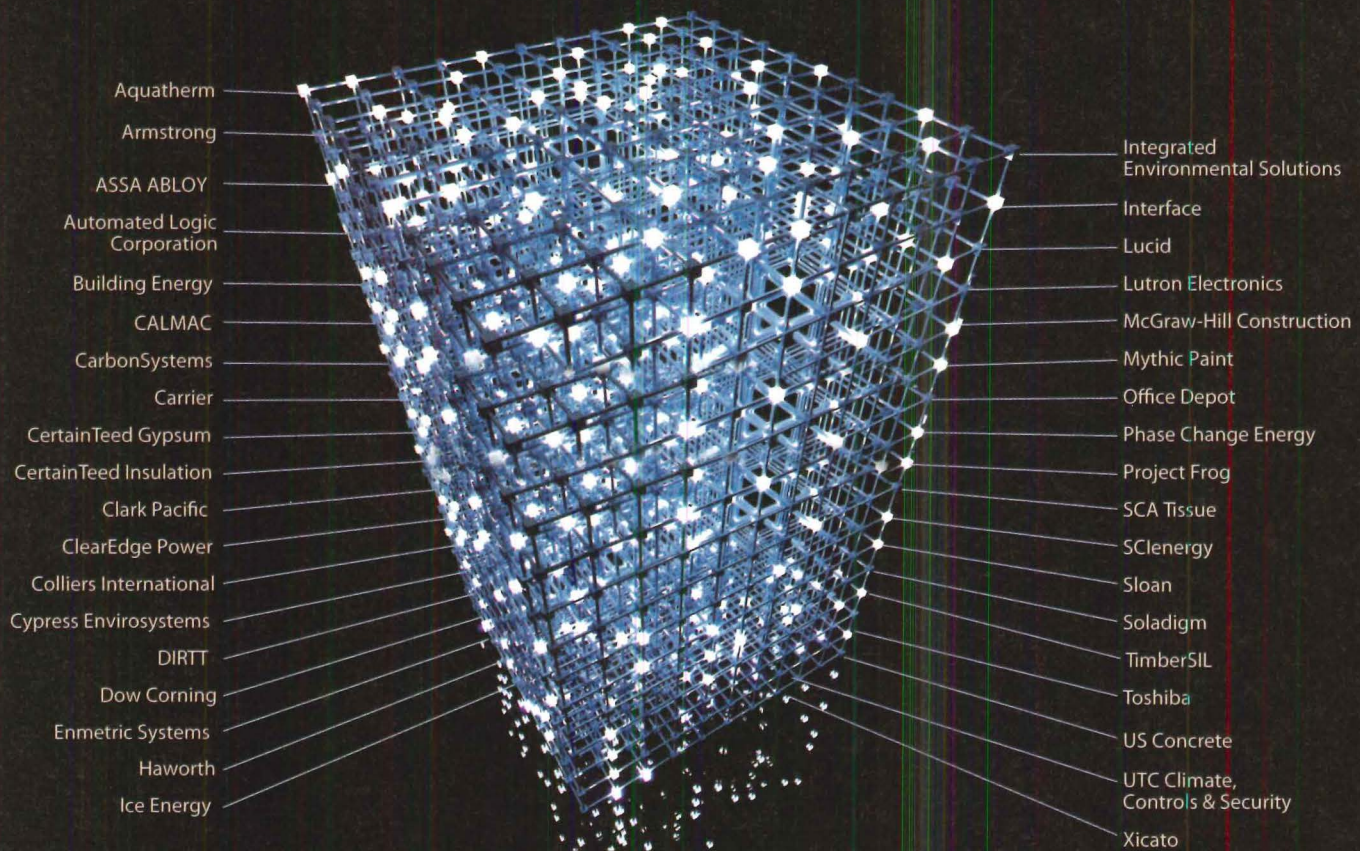
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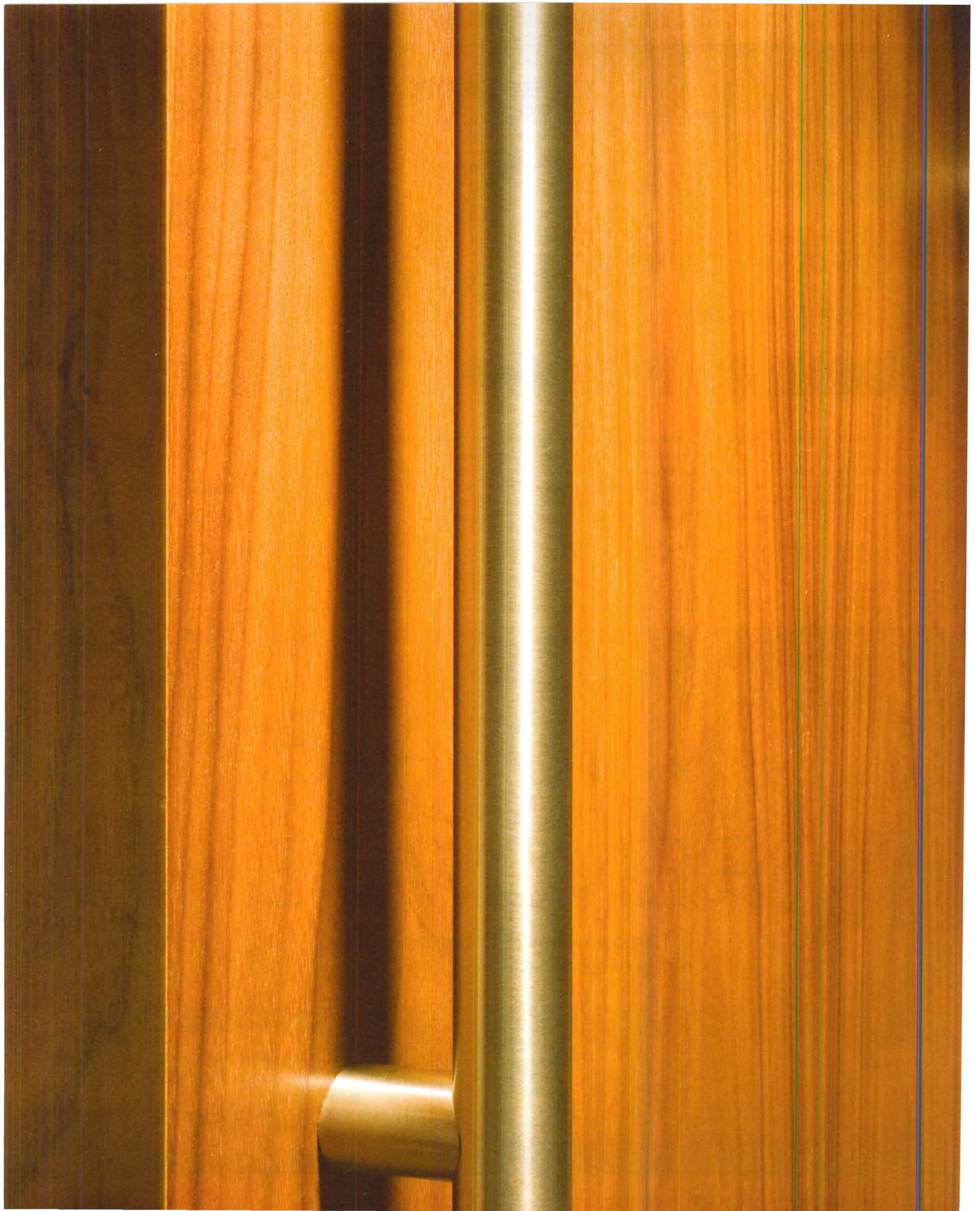
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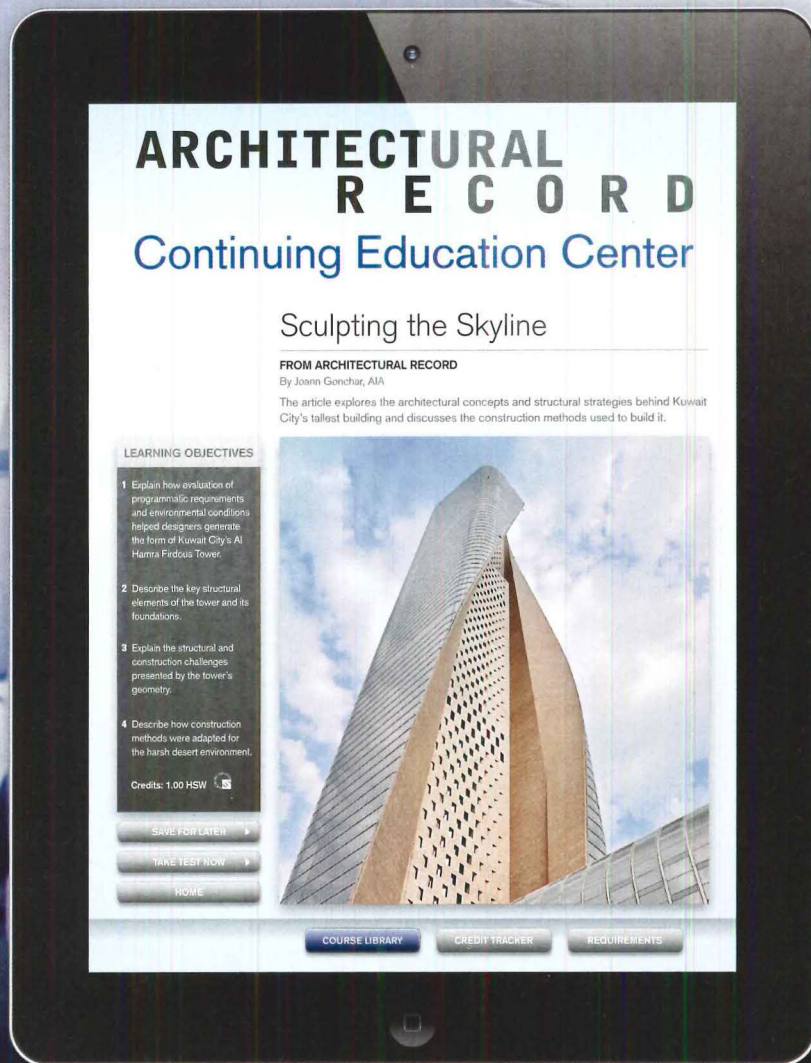
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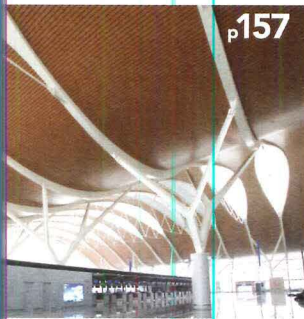
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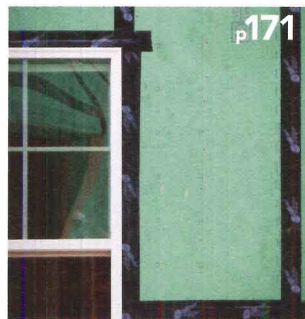
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## Considerations and Applications of Wood Ceilings

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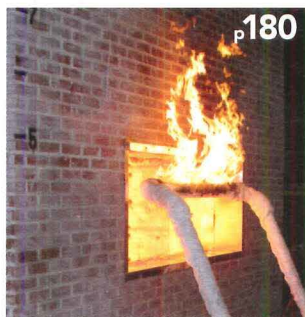
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Linear slats inside Pudong Airport in Shanghai add dramatic curves in a simulated wood finish printed on a lightweight metal, covering more than 1 million square feet without any actual timber.



# Considerations and Applications of Wood Ceilings

Innovative materials for wood look, high performance

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Engineered products for building interiors have evolved rapidly over recent decades, with notable advances in materials and performance in only the last few years. These changes have helped architects improve the performance of interior spaces overall and the spaces' contributions to sustainability, resiliency, and productivity—the ultimate design goals.

While interior materials, finishes, and systems have generally brought significant benefits, specific techniques for the ceiling have been especially valuable. With its high visibility—and high potential for improving such design variables as acoustics, light reflectance (LR), and system integration—treatment of the ceiling plane has taken on renewed importance in design circles. Many of the newer solutions employ hybrid materials as well as lightweight, engineered surface systems with carefully calibrated acoustical insulation, joint treatments, and structural supports.

Metal composite finish systems are in the modern vocabulary of architectural surface techniques, a reliable and resilient material well suited to alternative finishes. While some of these use thin film or real veneers laminated to metal or printed simulated wood-grain finishes, all of the techniques dramatically reduce the need for timber, and the simulated products allow unusual visual effects, such as colored wood grains.

The history of alternative, simulated finishes used for interior systems is longer than many realize. Crude plaster and stucco mixes used in ancient Mesopotamia as long as 5,000 years ago were used to reproduce the look of naturally occurring textures and patterns, including wood, marble, and other stones. The ability to color the surface expanded the use of polychromatic finishes in dwellings and larger structures. Later, classical architecture enjoyed a surge in the use of faux stones—mainly

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### Learning Objectives

After reading this article, you should be able to:

1. Describe applications of simulated wood products for interiors and ceilings, including engineered wood and metal substrates, and their benefits to sustainable design.
2. Compare the environmental and health impacts of traditional and engineered wood solutions with composite wood-look materials including films, profile wrapped veneers, and powder coating on metal, wood, and plastic substrates.
3. List key criteria for ceiling material selection, including fire safety and fire ratings, as well as such IEQ factors as acoustics, light reflectance, toxicity, and durability/performance.
4. Evaluate wood-look and other ceiling systems in terms of their green-building benefits, such as recycled materials, light weight, good acoustics, and low VOC content.

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marble—and *trompe l'oeil* spot images and murals, as well as simulated wood.

The use of alternatives mimicking wood-grain finishes continued through the millennia, but had perhaps its greatest revivals for neoclassical buildings in the 1800s and in modern architecture styles, notably Art Deco, in the early part of last century. The glaze and plasterwork employed to achieve the effects remains a valuable craft today, especially for commercial and public buildings.

During the premodern and early modern eras, however, manufacturing methods and new classes of coatings began to change the simulated finish landscape. Pre-engineered, mass-produced systems were shop finished with stamping, rolling, and spraying applications—many approaches borrowed from the aerospace and consumer products industries.

#### BENEFITS OF FAUX WOOD

Faux wood finishes, for example, offered a few obvious advantages over the real thing for the manufacture of one particular American classic: the woody station wagon.

Automobiles constructed in steel alone beat out the true veneer-paneled vehicles in strength, cost, and durability. (Makers of furniture were pleased with this outcome, as the carmakers had been outbidding everyone for timber supplies with the most visually appealing grains.) Coated steel, plastics, and vinyl materials like Di-Noc—a self-adhesive, flexible laminate film first used in the 1920s—became the standards for American woody wagons. In architectural

settings, such wood-look metals were seen as ideal because they easily attain the Class A fire ratings needed for interior finish materials.

At about the same time, hybrid materials were being produced that built on the success of plywood, a material invented a century earlier by Swedish architect, engineer, and industrialist Immanuel Nobel. (He was also father of the famous prize creator, Alfred.) Nobel invented the rotary lathe, which made the manufacture of plywood feasible. Plywood's cross-grained layers, each set at a right angle to the grain of the adjacent ply, gave it strength and resistance to shrinkage and warping. Later in the 1900s, however, newer composites became preferred backup materials for high-quality wood veneers.

Sandwiches of thin veneer and backups such as particleboard, medium-density fiberboard (MDF), and oriented strand board (OSB) provided a dense, uniform substrate without knots but retaining their attractive, consistent grain patterns. After its introduction as a specialty material, wide use of MDF took hold in the 1980s. OSB, with its layered, directional wood strands, grew dramatically in use around the same time. These linear wood composites offered improved structural and dimensional stability over resin-saturated wood-look laminates and certainly over pure veneers, which often had paper or fleece backings to protect the delicate 1/8-inch slices of solid flitches—flat cuts of logs with natural edges.

Particleboard and chipboard, made with wood flakes, are similar substrate materials in that they require a binding agent, typically

a resin. However they are more sensitive to moisture effects than fiberboard. MDF and OSB formulations have migrated over the last decade from urea-formaldehyde (UF) resins, which have noxious emissions, to non-emitting phenol-formaldehydes and also vegetable starch binders, which have no formaldehyde at all.

#### INNOVATIONS IN WOOD-LOOK CEILINGS

These wood-look composites, however, have been adopted widely for nonstructural ceiling applications, reducing costs associated with high-quality full timber while providing good workability with standard tools. Innovations such as fire-rated particleboard, or FRPB, have improved applicability in situations where interior construction must comply with building codes and other public safety considerations.

More so, a large range of wood substitutes have been introduced for architectural applications. These include innovative wood-look composites made with veneering on plastic substrates, as well as blended composites of wood fiber or wood flour mixed with thermoplastics such as polyethylene, polypropylene, and polyvinyl chloride (PVC), which don't look like wood. To get the look of wood, veneers may be adhered with contact cements to expanded PVC board, which cuts like wood. Porcelain and ceramic tiles have also been introduced with simulated wood finishes, typically applied in tile mortar or thinset to the ceiling. Similarly, some glass panels are treated with a faux wood grain and can be used for a ceiling.

As went the woody wagons, however, so did many architectural applications of wood, moving from the real thing to simulacra. Metal substrates, including steel and aluminum, grew quickly after their introductions in the 1930s, to bear a wood look. Some are made to be adhered to the ceiling surface—similar to pressed tin ceilings of the Victorian era (see sidebar on the next page), while others are produced for dropped-ceiling grids or other suspended configurations. Again, these materials were prized for a number of characteristics, including their fire resistance and ability to earn Class A material ratings. Three techniques are used to produce the wood grain appearance:

**Profile wrapping.** In this linear process, a specialized machine laminates a decorative surface onto a substrate, such as coil metal or planks of solid composite.

Because it was more efficient than manual laminating, the profile-wrapping machine emerged in Europe in the 1960s driven by demand in the furniture industry. It quickly migrated to industries requiring decorative applications to substrates. Metals including aluminum and steel have been profile-wrapped for decades.

Photo courtesy of Hunter Douglas Contract



Powder-coated large-format ceiling panels simulate wood at the entry area for the new Georgia Tech arena designed by Populous. The panels conform to the ASTM E-84 Class A fire rating required by code and required less time to install than heavier composite wood panels.



Photo courtesy of Hunter Douglas Contract

## EVOLUTION OF METAL CEILINGS

Metal ceilings have long been attractive since the pressed tin of Victorian-era U.S. interiors came to replace ornate plasterwork as the “modern” alternative of the late 1800s. The treatment is fireproof and durable, and easy to install thanks to its light weight and hidden nail rails. Almost a century after these stamped sheets dropped out of favor, a small revival is underway for this authentic, old-timey material—not just for ceilings but also for backsplashes and wainscoting. Tin-plated steel or corrosion-

resistant aluminum can be specified.

Yet the pressed metal was originally always white, to simulate plaster. Today’s sheet metal products include metallic finishes but also imitation surfaces that are hardly recognizable as the steel or aluminum sheets they are. With numerous production techniques available to simulate wood, today’s interiors increasingly share a cost-effective look of finish carpentry—an idea that would have been very attractive in the Victorian era, too.

Vinyl films, laminates, and paper can be profile wrapped on a range of substrates. The use of wood veneer, however, created a valuable composite combining the strength, durability, and light weight of metal with the warmth and human biophilic attraction of wood. Both rotary-cut and sliced veneer can be used in profile wrapping, often with a fleece backing to improve flexibility of the veneer for the wrapping process. Finger-jointed veneer can be used to prevent variance in the finished look. Rolls of veneer with an aluminum indicator strip along the joint lines can be used in place of finger joints. The aluminum strips also help automate the process of aligning the substrate and veneer.

Profile wrapping can also be accomplished with paper layers of backers and finish papers treated with patterns and colored dyes, known as base and décor papers, which are also used as the final layers in laminate manufacture. A transparent overlay may also be applied. Wood-look décor papers and other specialized patterns have been on the market for some time now, and they can be applied to fairly complex profiles and sharp angles that may not be suitable for actual wood veneer.

Typical adhesives for profile wrapping include hot-melt glue, such as polyurethane, ethylene vinyl acetate (EVA), and amorphous poly-alpha-olefins (APAOs)—all known simply as polyolefins—including PE and PP, mentioned previously. Water-based glues such as PVA have some applications, though its performance may suffer as compared to hot-melt glues due to the high water content; in particular, wrapping on highly profiled substrates may not hold as well. Solvent-based glues, while effective, tend to be high in volatile organic compounds (VOCs) and for that reason may not be ideal for interior surfaces such as ceilings unless they are aqueous solvents.

However, significant strides have been made in the area of adhesives that dramatically improve bond strength. Moreover, many sustainable design projects are using profile-wrapped metals materials

in place of solid wood, particularly for the cost savings and other performance advantages.

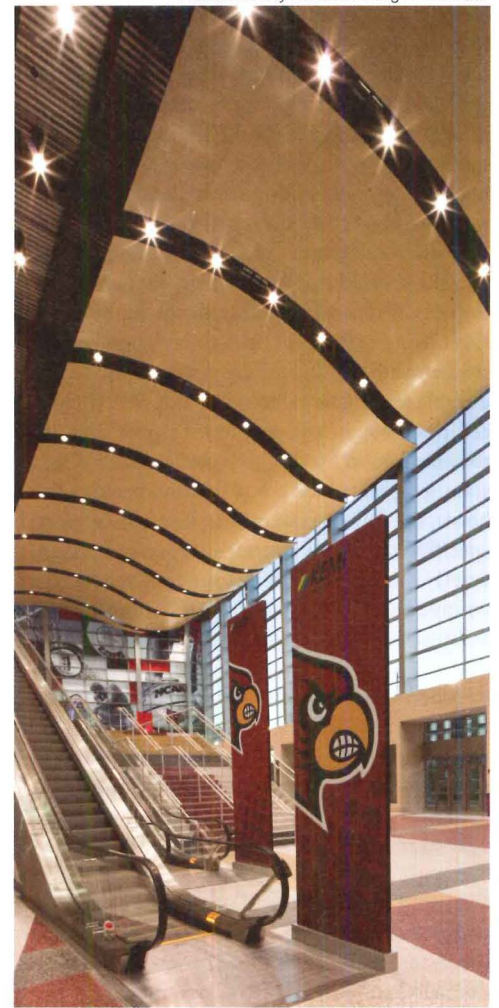
**Film.** This is typically a thin, decorative vinyl or PVC sheeting adhered to a metal substrate. As far as ceiling applications go, it is relatively recent as a faux-wood finish but based on a well-established technology.

Architectural vinyl finishes are durable and cleanable, but their flexibility has also attracted industry groups to use of the films. Three-dimensional surfaces and substrates with tight angles or complex curves can also successfully use the vinyl film. Another benefit is that, on properly treated metals, the films can be used outdoors, providing for a consistent design statement, though some films may change in color if exposed to direct ultraviolet (UV) rays from sunlight. Applications are common for both new construction and renovation projects.

Not all films are formulated for the same applications or environmental conditions. Some of them can shrink over time. For these, the strips of film may be lapped, with a substrate primer applied at the joints. A number of films work well for three-dimensional surfaces, but not all of them: Their adhesion strength ranges from 5-12 pounds per inch, depending on which metal substrate is specified and whether a primer is used. Metal substrates suitable for film adhesion include PVC-coated steel, aluminum, stainless steel, galvanized steel, and metals with a baked enamel coating.

**Coatings.** Coating processes that can simulate wood grain on metal and other surfaces include powder coating, ink sublimation, and other painting processes. Powder coating, which produces a fully cured, resilient surface, is also a sublimation process, meaning that it uses pressure and heat to transfer decorative patterns including simulated wood to a substrate.

Sublimation techniques typically use a drawing or photograph—of a wood grain sample,



A film-on-metal ceiling system provides the look of maple veneer at Louisville, Kentucky’s KFC Yum! Center, designed by Populous.

for example—printed on film, which is pressed and heated on the target surface. Specific powders are applied to the metal substrate and partially baked in; after cooling, the wood grain transfer is overlaid on the surface with a vacuum process to remove any air between the two. The piece is heated again to fuse the decorative coating; dye on the transfer begins to volatilize, creating the grain look with a portion of the powder film, yielding a photorealistic reproduction.

Unlike typical liquid paints, powder coating involves thermoplastic or thermoset polymers that are applied electrostatically and then heated, rather than the liquid techniques where the coatings typically require solvents. The resulting finish is durable and resilient, typically more so than the shells created by liquid paints. Many formulations of powder coats include polyester resins and other additives to allow transfer films to be removed easily and to keep the resulting wood-grain images sharp and realistic.

Powder coating is typical for metal substrates, although more recent techniques allow for its use on MDF and other building materials.

### GREEN AND AESTHETIC BENEFITS

In general, these three classes of simulated wood ceiling materials—profile wrapping, vinyl films, and powder coating—have successful track records. They can also be used for a variety of surfaces, not just ceilings, allowing architects to match their metal ceilings with identical faux-wood window coverings, chair rails, wainscoting, acoustical wall panels, and other specialties.

Like pressed tin before them—actually, the old ceilings were almost always painted sheet iron or steel, not tin—today's light-gauge steel and aluminum ceiling systems tend to be durable and sustainable substrates. The metal ceilings are light and easy to transport, and they have good life-cycle characteristics. With stamped perforations or insulation backing (or both), the ceiling systems can be engineered and specified for optimal acoustical performance. Briefly, the main green attributes of veneer-wrapped and wood-look steel and aluminum ceilings that are sustainable include:

**Recycled and recyclable.** Metal ceilings have the most recycled content of all material types, with up to 85 percent recycled aluminum and up to 75 percent post-consumer content, both contributing to LEED Credit MR-4. Steel panels and suspension systems may be up to a third recycled materials.

**Certified wood and local materials.** Depending on the source, a profile-wrapped ceiling system may use a veneer certified by the Forest Stewardship Council (LEED Credit MR-7), or it may be produced local to the project (LEED Credit MR-5).

**Low-emitting materials.** Profile-wrapped composite wood products and metals treated with powder coating or vinyl films may be very low in VOCs and other emissions (LEED Credit EQ-4.4). The ceiling panels, cores, and glues are free of urea-formaldehyde resins.

**Life safety and fire ratings.** Some ceiling materials are inherently combustible, but metal ceiling panels are generally considered incombustible in architectural settings. Coatings, films, and acoustical backings can contribute to fire development, so metal ceiling systems—including simulated wood alternatives—are tested as installed assemblies to verify Class A performance.

These benefits—and the growth in manufacturing techniques that help produce a millwork look without finish carpentry costs—have created an attractive set of opportunities for



Photo courtesy of Hunter Douglas Contract

To expand San Jose Mineta International Airport, the client's desire for natural wood finishes led to the choice of a profile-wrapped veneer on metal for wall and ceiling treatments. Designed by Fentress Architects, the low-toxicity ceiling system contains at least 70 percent recycled content.

modern architecture. First and foremost is the value proposition of preserving forests and tree species by using efficient, thin veneers or by using only transferred images of beautiful wood grains. Wood in architecture is a longstanding tradition, and today's use of films, veneers, and powder coat on metal and plastic substrates has set off a profession-wide rethinking of wood finishes for ceilings, wall panels, and window treatments.

Examples of these opportunities are everywhere. For large-scale design gestures like the KFC Yum! Center arena in Louisville by the architecture firm Populous, a simulated wood finish can span a monumental arabesque hung from a torsion-spring grid three stories above sports fans' heads. In high schools and universities, similar large-scale uses of real timber would prove untenable; recently, Perkins+Will employed a linear metal ceiling that simulates wood planks across a 100-foot expanse at Chanhassen High School in Minnesota.

Longstanding users of faux finishes such as casinos and resorts are now adding lightweight, simulated wood ceilings to interiors of ersatz plaster and gold-plated metals, as at Lumiere Place Casino in St. Louis by Las Vegas-based Marnell Architecture. Around the world in airports, cultural venues, civic buildings, and even the graceful Zaragoza Church designed by

Úrsula Heredia y Ramón Velasco, architects are creating the look of solid, dimensional timbers across large surfaces in a cost-effective, sustainable manner.

The aesthetic benefits of wood are both intuitive and well studied, with recent years bringing a better understanding of how wood elicits responses such as biophilia—literally the human love of living systems—and other ameliorative effects proven in evidence-based design. According to Michelle Kam-Biron, P.E., S.E., director of education at the American Wood Council, “Wood makes people feel good,” thanks to its “visual variety, natural irregularity, and expressiveness.” Wood brings warmth, softness, and a calming effect to buildings and interiors, says Kam-Biron, noting clinical studies showing occupants responding positively to exposed wood grains. Anecdotal proof can be seen in long-held customs, for example in Japanese and Finnish schools where wood is favored because it elicits a positive student response.

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*Chris Sullivan is principal of C.C. Sullivan, a communications consulting and marketing agency focused on architecture and building products.*

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# Metal Safety Flooring

Incorporating safety, sustainability, profitability, and productivity into workplace design

Sponsored by SlipNOT® | By Peter J. Arsenault, FAIA, NCARB, LEED AP

**T**he choice of flooring in workplaces, particularly in industrial or high-traffic settings, has a significant impact on the safety of workers in those spaces. As a result, flooring that is safe for people to walk on can directly influence the operation and profitability of the businesses or organizations. Since there is a range of choices, it is important to select and specify the best flooring that is not only safe, but will hold up and be durable over time, provide the needed design characteristics for the work environment, and address sustainability.

## SAFETY FLOORING OVERVIEW

All flooring materials are clearly intended to be walked on. However, it is usually the walking surface characteristics of those different materials that constitute the difference between them being inherently safe or notably unsafe in common work environments.

### The Problem—Unsafe Flooring

Unsafe flooring and walkway conditions are defined as those that are prone to cause people to slip, trip, or fall and become injured,

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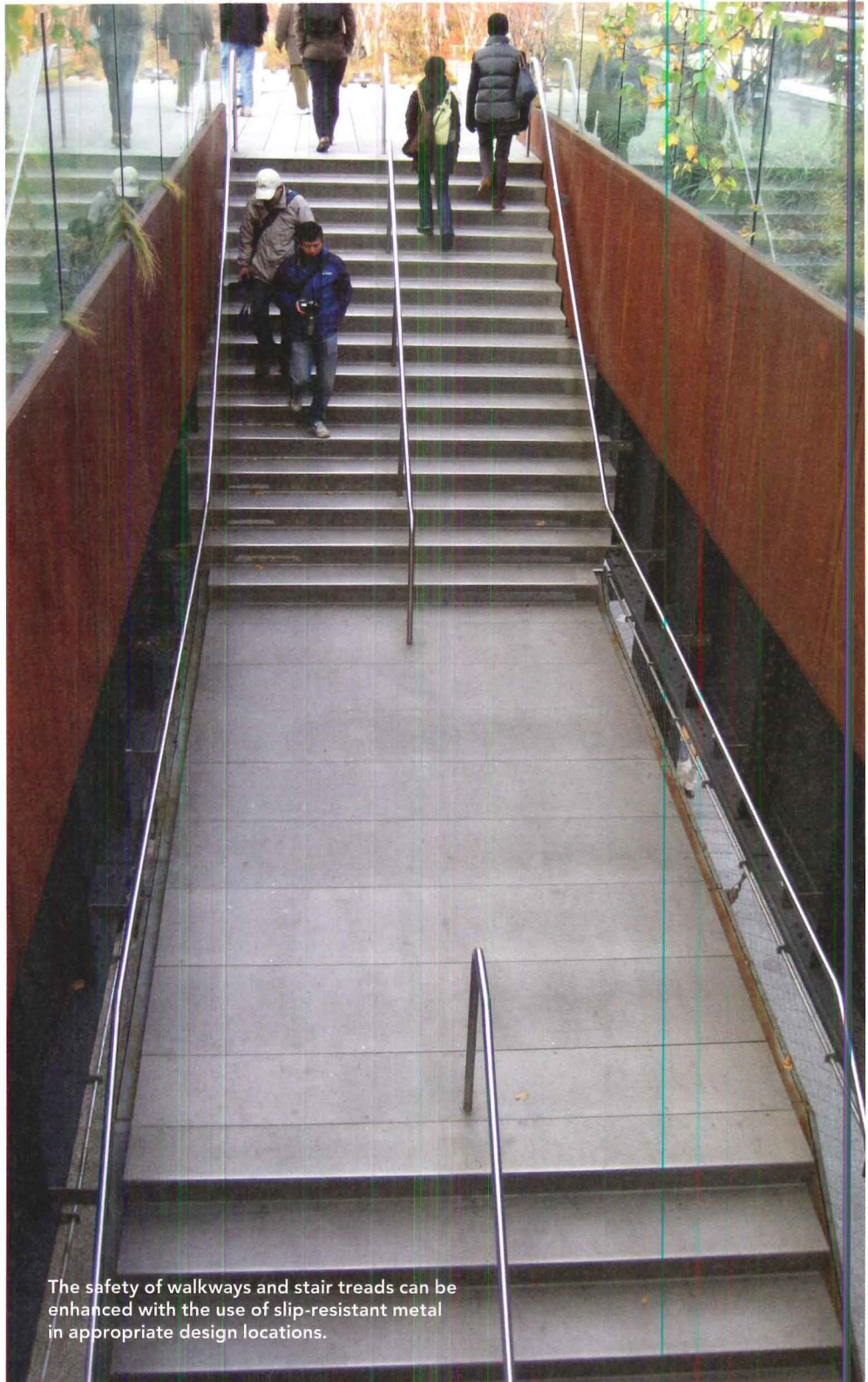
### Learning Objectives

After reading this article, you should be able to:

1. Identify and recognize the characteristics of flooring that contribute to safety, elimination of hazards, and liability control.
2. Compare and contrast the characteristics among the common choices for safety flooring in workplace environments.
3. Assess the design contributions of safety flooring, particularly when metal safety flooring is incorporated.
4. Specify metal safety flooring in a variety of green and conventional buildings and formulate appropriate selections related to specific applications.

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The safety of walkways and stair treads can be enhanced with the use of slip-resistant metal in appropriate design locations.

Photo courtesy of SlipNOT®

sometimes quite seriously so. In fact, the Occupational Safety and Health Administration (OSHA) points out that walkway related injuries constitute the majority of general industry accidents. Further, OSHA and others that have looked at this issue have identified the following facts:

- ▶ Slips and falls are the leading cause of workers' compensation claims and occupational injury for people aged 15-24 years.
- ▶ 85% of workers' compensation claims are attributed to employees slipping on slick floors.
- ▶ Compensation and medical costs associated with employee slip/fall accidents is approximately \$70 billion annually.
- ▶ 22% of slip/fall accidents result in more than 31 days away from work.
- ▶ According to the National Safety Council over 9 million slip/fall accidents happen per year resulting in expenses of \$3.5 million per hour every day of the year.
- ▶ Slips and falls cause 15% of all accidental deaths, making them second only to motor vehicles as a cause of fatalities.

This widespread common occurrence means that it is incumbent upon anyone designing or specifying flooring to appropriately address safety in order to avoid potential accidents from occurring in the first place. That implies elimination of hazards such as slippery substances on the floor but it also means using materials that help minimize these hazards should they be present. The goal is of course not to achieve perfection, but to create a real and meaningful reduction in incident rates of any such accidents occurring. Lower-than-average incident rates mean fewer people are hurt, associated costs from those accidents are less, and productivity in the workplace remains high. It also means that liability and risk are better managed not only for the owner of the workplace, but also for those designing and installing the flooring who could be found professionally liable.

### The Solution—Slip-Resistant Flooring

As a means to identify what can be regarded as safe flooring, the American Society of Testing Materials (ASTM) has published Standard F 1537-10 titled "Standard Practice for Safe Walking Surfaces" which has been accepted as an international standard for the creation and maintenance of walking surfaces that can be considered safe. In very clear language, the standard states in its opening paragraph: "This practice covers design and construction guidelines and minimum maintenance criteria for new and existing buildings and structures. This practice is intended to provide reasonably safe walking surfaces for pedestrians wearing ordinary footwear." It later goes on to state that, "This practice addresses elements along and in walkways including floors, and walkway surfaces,

Case Study

## Slip-Resistant Aluminum Grating Utilized at Innovative, Environmentally Friendly Green Roof for the American Society of Landscape Architects Headquarters

### The Situation

ASLA's headquarters in Washington, D.C., needed a new, environmentally friendly grating for their rooftop flooring surface, which allowed plants to grow up through the grating. The green roof is part of ASLA's commitment to promote environmentally friendly designs to make green roofs a more widely accepted option for architects and contractors. The 3,000-square-foot green roof will grow a variety of plants and also have a viewing area for the public. ASLA was looking for a walking surface that would allow plants to grow up and through the floor surface to maximize the roof space, allow people to walk on the space without damaging the plants, and would remain slip resistant against transpiration from the growing plants.

### The Solution

Slip-resistant aluminum grating was chosen as the optimal grating for the project.

Slip-resistant aluminum was the ideal substrate because it is a lightweight material that reduced the overall weight of the grating on the roof while still being extremely durable. The aluminum coating also remains slip resistant against transpiration from plants and other outdoor elements, providing a safe walking area for pedestrians. The slip-resistant aluminum grating is corrosion resistant and will be able to withstand installation in an outside environment with minimal maintenance.

### The Impact

The aluminum grating has provided the American Society of Landscape Architects with an aesthetically pleasing slip-resistant walking surface for the green roof. The aluminum grating has proven to be the ideal solution to help ASLA showcase their green roof.



Photo courtesy of SlipNOT®

**Owner:**  
American Society of Landscape Architects

**Location:**  
Washington, D.C.

**Industry:**  
Commercial

**Number of Employees:**  
500

**Website:**  
[www.asla.org](http://www.asla.org)

sidewalks, short flight stairs, gratings, wheel stops, and speed bumps." Hence, it clearly applies to all walking areas inside and outside of buildings both during the initial design and construction as well as the operation of a facility.

A key safety characteristic defined for flooring and walkways is the presence of surfaces that are slip resistant. The cited ASTM Standard makes it clear by stating: "Walkway surfaces shall be slip resistant under expected environmental conditions and use." It goes on to state, "Interior walkways that are not slip resistant when wet shall be maintained dry during periods of pedestrian use." Hence the distinction is

made that the surrounding environment must be factored in when considering slip resistance, specifically recognizing the ability of water on flooring to reduce resistance. Therefore, under the ASTM Standard, either slip resistance must be sustained when a floor is wet or the floor must be maintained as dry so that its slip-resistant properties continue to be effective.

OSHA has also published standards for walking/working surfaces that apply to all permanent places of employment (except where only domestic, mining, or agricultural work is performed). Specific standards have been written for walking/working surfaces for general industry,

shipyard employment, marine terminals, longshoring, and the construction industry. These OSHA standards cover all walkways and areas where people are standing to work plus all stairs and ladders. Standard 1910.24 (f) for example specifically addresses stair treads and states, "All treads shall be reasonably slip resistant and the nosings shall be of nonslip finish. Welded bar grating treads without nosings are acceptable providing the leading edge can be readily identified by personnel descending the stairway and provided the tread is serrated or is of definite nonslip design."

Other organizations and standards quite familiar to architects also address the issue of slip resistance. The Americans with Disabilities Act (ADA) points out the need to address slipping and tripping hazards and has accompanying guidelines with specific requirements for slip-resistant surfaces. The American National Standards Institute (ANSI) has initiated Standard A1264.2 with the intent of reducing falls due to slippery conditions which are preventable in the workplace. The three basic areas of this standard include 1) provisions for reducing hazards, 2) test equipment, and 3) slip-resistance criteria. Even the National Fire Protection Association (NFPA) has developed standard 1901 entitled Standard for Automotive Fire Apparatus which includes a specification in section 13-7.3 for slip resistance.

Clearly, then, there is widespread acceptance of addressing slip resistance. Therefore, it falls on the design and construction team to be sure that these safety criteria for slip resistance are met, installed, and function as intended.

### Measuring Slip Resistance

All of the preceding discussion begs the obvious question—how is slip resistance determined? The intent is obviously to determine at what

Photo courtesy of SlipNOT®



Bremen Castings, Inc. installed slip-resistant steel plates around their CNC machines where oil and coolant collect on the foundation pit. This provides a safer work surface for their personnel.

Photo courtesy of SlipNOT®



### Prevent Flooding on Walkways

To help combat flooding issues on walkways, the architectural firm involved in Beargrass Creek Nature Preserve in St. Matthews, Kentucky, needed material that could be slip resistant when wet. They chose treated metal grating that was able to withstand installation in an outdoor environment while allowing for drainage of debris and liquids to help prevent flooding on the walkways.

point people might lose their footing and become injured, but what is the acceptable means to determine when that might happen?

The answer is that slip resistance on walkway surfaces is based on measuring the frictional force necessary to keep a shoe heel (or a crutch tip in the case of ADA) from slipping on the walking surface under conditions likely to be found on the surface. Contrary to popular belief, some slippage is necessary to walking, especially for persons with restricted gaits; a truly "non-slip" surface could not be negotiated.

The standard measurement used for slip resistance is the Coefficient of Friction (COF) which is defined simply as a measure of the amount of resistance that a surface exerts on a substance or object that sits on or moves over it. The COF is expressed as a decimal from zero to 1 in most cases, with a few exceptional conditions warranting a number higher than 1. This number represents the ratio between the maximal frictional force that a surface exerts (such as a walkway) and the force pushing an object toward that surface (such as a person walking in shoes). The COF can be measured both for objects that are static (motionless) and for objects that are dynamic (in motion). As might be expected, static objects typically experience more friction (i.e. higher COF values) than moving ones. While the dynamic coefficient of friction during walking varies in a complex and non-uniform way, the static coefficient of friction, which can be measured in several ways, provides a close approximation of the slip resistance of a surface.

Thinking about COF more conceptually, envision the difference between walking over a piece of glass which will obviously be more slippery (i.e. less friction) compared to walking over a piece of sandpaper (more friction). The sandpaper in contact with a shoe has a notably higher coefficient of friction than the glass. The best walkway surface is somewhere in between. OSHA recommends that walking surfaces have a

minimum static coefficient of friction of 0.5. However, a research project sponsored by the Architectural and Transportation Barriers Compliance Board (Access Board) conducted tests with persons with disabilities and concluded that a higher coefficient of friction was needed by such persons. A static coefficient of friction of 0.6 is recommended for accessible routes and 0.8 for ramps.

It is commonly recognized that the coefficient of friction varies considerably due to the presence of contaminants such as water, lubricants, floor finishes, or other items not necessarily under the control of the designer or builder and not subject to design and construction guidelines. Nonetheless, many common flooring materials are labeled with information on their static coefficient of friction sometimes in both wet and dry modes so that designers are able to specify materials with appropriate values.

The variable of motion as part of slip resistance is also measured using COF. When looking at dynamic COFs for some common materials, it is worth noting that some materials might exhibit very high COF properties at rest, but less so in motion. Glass against glass for example when measured in a static condition (at rest) exhibits a COF on the order of 0.9 to 1.0, which is quite good. But measure it in a sliding or moving condition and that value drops down to the Teflon range of 0.4. Perhaps that helps explain why it can be very difficult to walk on glass.

The process for determining these various COF numbers comes from test procedures developed by ASTM. Perhaps because of the need to address slip resistance in a variety of conditions and for a variety of materials, ASTM has a long history of many different test methods and procedures for COF. Some look at specific materials like ceramic flooring; some are suitable for either dry testing or wet testing or both, and some are limited to laboratory testing compared to others that can be used in the field. The following is a partial list:

**ASTM 1679:** This had been the premier testing method approved for both dry and wet testing; however it was withdrawn in 2006 since it did not address all methodological issues. Nonetheless, some manufacturers may still issue COF values based on this test. A device known as the English XL Tribometer is used for this method and operators need to be certified to use the equipment.

**ASTM 1677:** This testing standard is also approved for dry and wet testing. The method can be used on nearly all surfaces. The method also avoids the problem of adhesion by applying the horizontal and vertical forces simultaneously. It uses a different testing device known as the Brungraber Mark II.

**ASTM 1678:** This test method covers the operational procedures for using a portable articulated strut slip tester (PAST) to determine the slip resistance of footwear sole, heel, or related materials (test feet) against planar walkway surfaces or walkway surrogates (test surfaces) in either the laboratory or field under dry conditions.

**ASTM F489:** This covers laboratory measurement of the dry static coefficient of friction of shoe sole and heel materials on controlled walking surfaces and under controlled conditions. This method uses the stationary James Machine. This method is not used to test floor slip resistance, just shoes.

**ASTM D2047:** This method is for the laboratory measurement of the static coefficient of friction of floor surfaces. The James Machine apparatus is not suitable for use on wet, rough, or corrugated surfaces. Because of the leather pad specification and problem with adhesion, this method should not be used for wet testing.

**ASTM F609:** This test method covers measurement of the static slip resistance of footwear sole, heel, or related materials on walkway surfaces in the laboratory and in the field. Note that this method is not intended to test walkway surfaces, but the footwear material. In addition, this method would also result in adhesion problems on wet surfaces.

**ASTM E303:** This method is for measuring surface frictional properties using the British Pendulum Tester (exterior), which is designed primarily for wet and oily testing. This test is a dynamic slip-resistant test method.

**ASTM C1028:** This test method covers the measurement of static coefficient of friction of ceramic tile or other surfaces under both wet and dry conditions while utilizing neolite heel assemblies. This test method can be used in the laboratory or in the field and uses a large, 50-pound drag-sled that is constructed in accordance with the procedure. The method also would be subject to adhesion problems on wet surfaces, but is approved for this use.

**ASTM F2913:** This non-proprietary laboratory test method allows for reproducible testing of whole pieces of different footwear and their related sole materials for evaluating relative walking slip performance. This test method determines the dynamic COF between footwear and flooring materials under laboratory conditions that are reproducible for the purpose of evaluating relative slip performance of the tested combinations. The method is applicable to all types of footwear and to most types of indoor floorings, including matting and stair nosing, plus the presence of surface contaminants on the flooring surface such as liquid water, ice, oil or grease.

Typically, several of these tests are appropriate to determine the safety of flooring products in given building situations. The resulting COF is the relevant information that a material supplier or product manufacturer should provide. The best outcomes are those that approach a COF above the minimums of 0.5 or 0.8 and are closer to a safer but still very navigable level of 1.0.

### SAFETY FLOORING MATERIAL COMPARISONS

So, given all of the above information, what materials or products are best to use? For the purpose of this article, we will look at four very common choices of flooring in workplace settings: finished concrete, wood strip or plank flooring, plastic tile or sheet goods, and metal flooring made from either plate or open grate. Of course, it is possible to assemble these choices in combination with each other to suit different conditions in a building, but let's look at them individually for comparative purposes.

### COF Comparison

We'll start with this most basic of criteria—what is the measured coefficient of friction of each of these common choices when tested as walking surfaces? Broom finished concrete is often used and tests out a fairly good 0.87 COF—even under wet conditions. Add a resin floor epoxy on top of it and it remains comparable when dry at about 0.85. Wood by comparison is a bit more slippery at 0.77 under wet conditions meaning it would not meet ADA criteria for unprotected outdoor ramps. Move on to plastic tile products, particularly those with raised domes such as tactile edges at crosswalks, etc. and some interesting variations emerge—the top of the domes perform differently than the bottom areas between the domes. When the tops are dry, they measure at a moderate level of 0.77, but get them wet and the COF drops down notably to 0.55. The area between the domes remains a fairly constant 0.85 in both the wet and the dry condition, perhaps because of its configuration in part along with the fact that shoes would have a tougher time coming into full contact with these areas.

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*Peter J. Arsenault, FAIA, NCARB, LEED AP, practices, consults, and writes about sustainable design and practice solutions nationwide. [www.linkedin.com/in/pjaarch](http://www.linkedin.com/in/pjaarch)*

## Keep High-Traffic Stairways Safe

Askew Nixon Ferguson Architects chose treated metal stair treads in conjunction with concrete floors based on their design for this slip resistant stairway at the Memphis, Tennessee hub of Federal Express where over 8,000 people access their stairways on a daily basis.



Photo courtesy of SlipNOT®

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# Automated Shading and Light Systems

Automatically improve the productivity and efficiency of the daylit workspace

Sponsored by MechoSystems | *By Jeanette Fitzgerald Pitts*

**A**utomation may be considered one of the hallmarks of the 21st century. Voice recognition software, ATMs, e-commerce, and airport kiosks are just a few examples of the automated solutions that have already become commonplace. People are increasingly interfacing with machines in the pursuit of improved productivity and efficiency in their daily and professional lives, happily relegating some routine action items to new automated resources. Buildings are becoming increasingly more automated too.

The 21st century demands that the built environment become more economical, more environmentally friendly, and more comfortable for the occupants and employees within. It has been proven that incorporating daylight into the interior, a practice referred to as daylighting, can advance all three legs of that agenda. When daylight is present, electric lights can be dimmed or turned off, dramatically reducing the lighting costs. Consuming less energy reduces the overall

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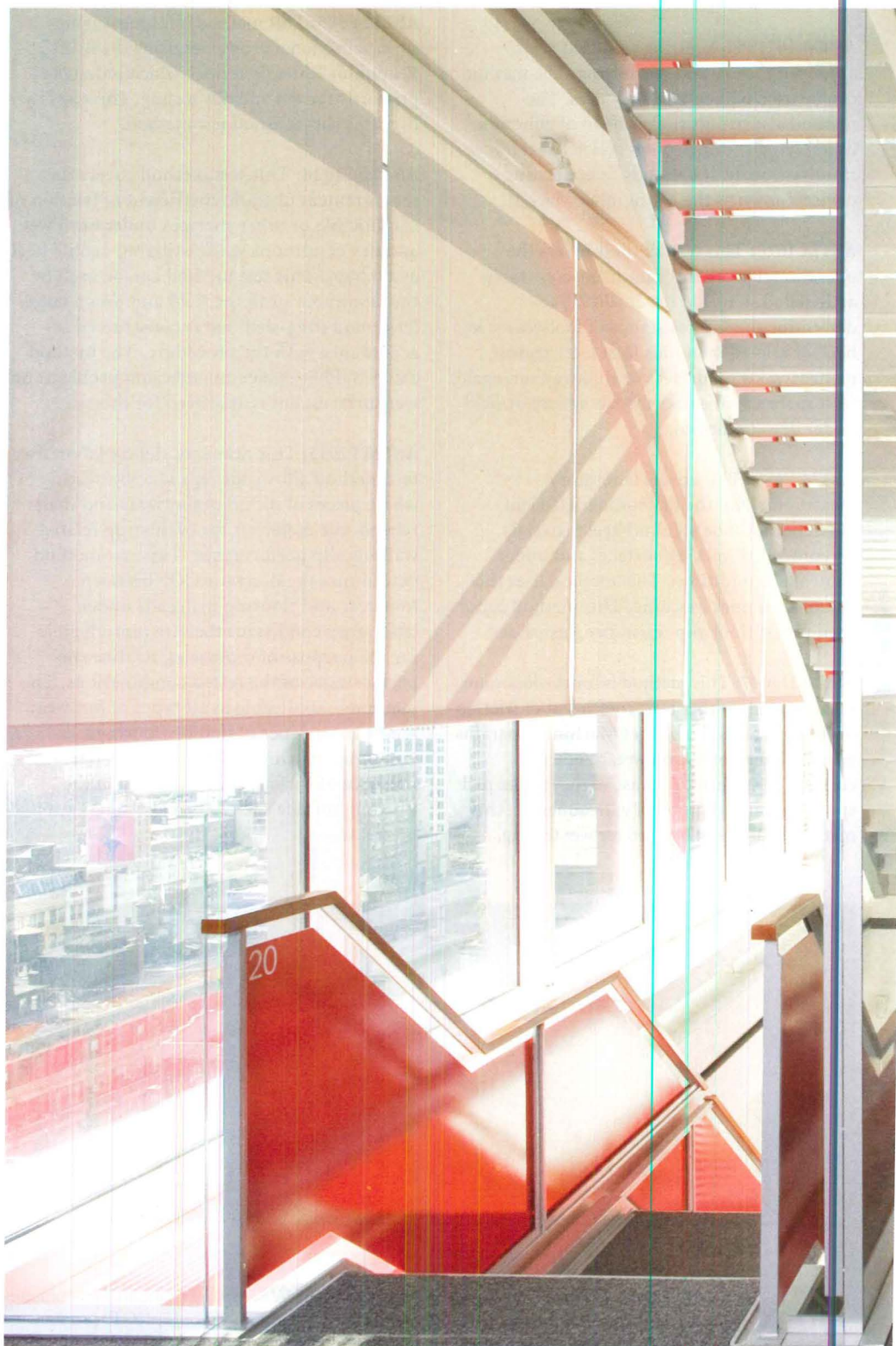
### Learning Objectives

After reading this article, you should be able to:

1. Compare traditional daylighting methodologies and automated shading systems in their ability to maximize daylight exposure in a space and control glare.
2. Describe how automated shading and lighting control systems work together to execute daylighting and daylight harvesting strategies in a workspace, maintaining an optimal visual environment, improving occupant comfort, and saving energy.
3. Explain the daily functionality of the automated shading and lighting system in The New York Times Building and how the dynamic nature of the control has resulted in impressive energy savings.
4. Select daylighting systems that can maximize the amount of glare-free daylight exposure.

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**NOTE:** The results of a post-occupancy study are available at: [windows.lbl.gov/comm\\_perf/nyt\\_post-occupancy.html](http://windows.lbl.gov/comm_perf/nyt_post-occupancy.html)



carbon footprint of the building, and studies have shown that people have a positive response to daylight and views of the outside, improving their productivity, workplace satisfaction, and morale.

The only drawback to daylight is that the sun is a dynamic light source that requires constant attention and most people do not have the time and resources to actively manage it. Walking

*Photo courtesy of Bernstein Associates*

around a building, it is not unusual to see manual shades that have been pulled down weeks before to block intense early morning light, but are now keeping soft, ambient afternoon light out as well. The management of daylight seems like the perfect candidate for automation.

Automated shading and lighting control systems offer specifiers a dynamic daylighting solution that readily adjusts to custom fit the microclimate of any building, without active oversight by personnel. These systems are cutting-edge in their ability to optimize a building's use of and response to the sun. They can predict and respond to cloudy or clear sky conditions, maximizing the diffuse daylight allowed into the space and actively defending the interior from distracting direct sunlight. A combination of daylight control (shading) and electric lighting control systems equips specifiers with a tool to maximize the collaboration between these two types of light, improving efficiency and the ability to control the complete visual environment. Automated shades are affordable and have cost-effective return on investment (ROI) considering all their benefits.

#### **DAYLIGHTING GOAL #1: MAXIMIZE DAYLIGHT, CONTROL GLARE**

In 2013, designing for daylighting has become increasingly standard. More and more green building initiatives are incorporating language that defines the minimum amount of daylight that should be incorporated into a space and stipulates that some level of glare control is necessary. The preeminent green building rating system in the United States, the Leadership in Energy and Environmental Design (LEED) 2009 New Construction contains credit 8.1 Daylight and Views—Daylight which requires that specific daylighting levels be satisfied in 75 percent of regularly occupied spaces and mandates the inclusion of glare control devices.

Similar recommendations are finding their way into local guidelines and international rating systems like the Buildings Research Establishment Environmental Assessment Method (BREEAM™). Even the federal government is getting on-board with daylight in the workspace. The guidelines for High-Performance Sustainable Buildings (HPSB) as defined by the federal government require that federal buildings achieve a minimum daylight factor in 75 percent of all spaces occupied for critical visual tasks and provide glare control.

#### **The Daylight Advantage**

One impetus for the growing popularity of daylighting in design is the scientific validation that daylighting is both good for business and good for people. A significant body of work has been amassed over the last 40 years extolling the

virtues of daylight in the workspace. Providing building occupants with a visual connection to the outdoors has been proven time and time again to improve morale, motivation, mental functioning, and maintain circadian rhythm. Documented increases in productivity and reductions in absenteeism are just two of the reasons why a daylit workplace works harder.

#### **The Direct Sunlight Threat**

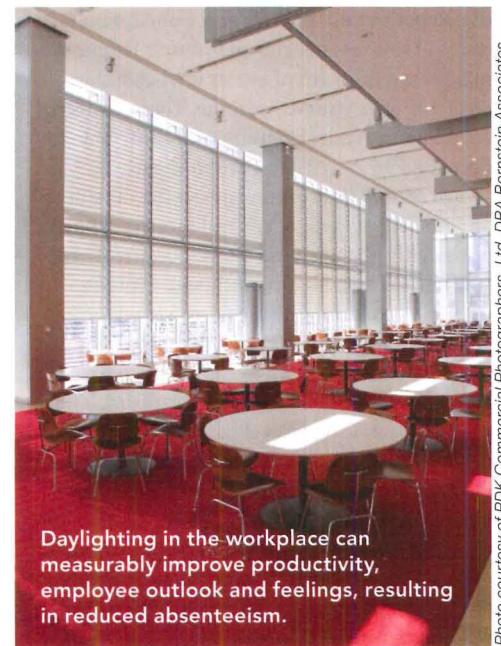
However, not all daylight is created equal. The soft, diffuse daylight that fills the sky on a cloudy day has very different properties than the intense direct sunlight that seems to stream straight from the sun into a building. The intensity of direct sunlight can create glare and solar heat gain, ultimately causing discomfort and distraction for the people inside. So while bringing diffuse daylight into a workspace improves productivity, direct sunlight may destroy it and should be excluded to the greatest degree possible.

**Causing glare in the office.** As more and more daylight is being incorporated into the workspace, the threat of glare becomes more pressing and the use of glare control mandatory. People perceive the brightness of an object in terms of its contrast with surrounding objects. Car headlights on a sunny day are barely noticeable. The same car headlights on a dark stretch of highway can appear so radiant they are uncomfortable to look at for any period of time. Glare occurs when a light source or the reflection of a light source is significantly brighter (generally more than three times brighter) than the ambient light surrounding it, causing visual discomfort.

The visual discomfort is a result of the human eye being ill-equipped to deal with glare. The eye is capable of increasing or decreasing its overall

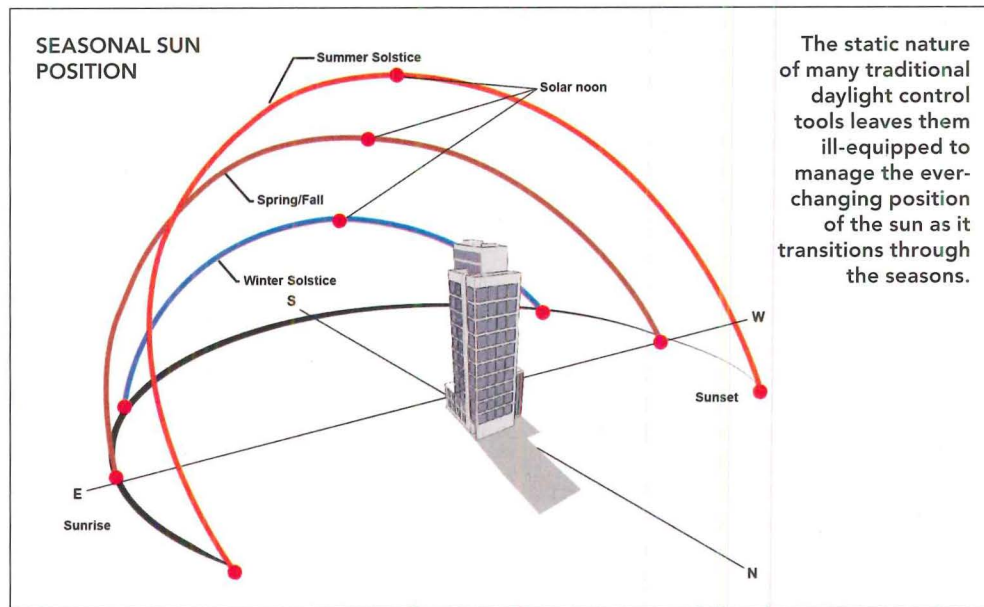


Automated shading and light systems continuously manage the presence of daylight in the workspace to improve occupant comfort and create energy savings, as in The New York Times Building, New York City.



Daylighting in the workplace can measurably improve productivity, employee outlook and feelings, resulting in reduced absenteeism.

*Photo courtesy of PDK Commercial Photographers, Ltd. DBA Bernstein Associates*



The static nature of many traditional daylight control tools leaves them ill-equipped to manage the ever-changing position of the sun as it transitions through the seasons.

Image courtesy of MechoSystems

sensitivity to light to function in both bright and dark settings. Unfortunately, the adjustment in sensitivity is uniform across the eye, making it impossible for the eye to compensate for hot spots that may exist in the visual field. If the eye's sensitivity is decreased to focus on the brightest object, the surrounding objects are too lowly lit to be seen clearly. If the eye's sensitivity is increased to read a dimly lit object, brighter objects in the visual field become glaring.

Because their eyes cannot effectively adjust to glare, building occupants will use their bodies to accommodate it. Squinting, frowning a brow, lowering a head, contorting the neck, these are all examples of how a person will attempt to physiologically accommodate a hot spot in their visual field. This is often an unconscious, automatic response, like blinking when eyes are dry. Repetitive use of these accommodation tactics can lead to stress injuries and muscle fatigue that manifest in the form of eye strain, headaches, and computer vision syndrome. These problems are uncomfortable, fatiguing, and contribute to decreased productivity in the workplace.

An office space with views to the outside and no active daylight control sets the stage for potentially glaring conditions, because direct sunlight is often significantly more intense than the general lighting of the average office space. Daylight can range in intensity from a few foot-candles, on an overcast day, to over 1,000 foot-candles on a clear, sunny day. The average electric light level in an office space is between 35 -50 foot-candles. This extreme contrast in intensity paired with the highly visual tasks occurring in an office, explain why direct sunlight is prone to create glare in the office environment and why it is so detrimental to the functionality of the space. When direct sunlight streams through a window in an office,

it can create distracting hot spots as it reflects off darker computer screens or desktops. The window itself can become a hot spot in the visual environment. If the difference between the intensity of the light streaming through the window and the ambient office light surrounding it is too great for the human eye to accommodate on its own, it will become uncomfortable to look at.

### The Limitations of Traditional Daylighting Tools

In the early 1900s, with the incandescent light source still in its infancy, the sun was the greatest, most reliable source of light. Architects paid particular attention to the siting and orientation of a building, because they relied on available daylight to illuminate the interior.

Today, building orientation and shallow floor plates are still used to maximize the daylighting levels in a building, while providing some protection against glare-causing direct sunlight. Good building orientation helps minimize the building's exposure to direct sunlight throughout the day, especially during sunrise and sunset, and shallow floor plates help to maximize the daylighting levels that are possible throughout the interior.

New innovations in permanent exterior and interior shading devices, like fixed overhangs and high-performance glazing, provide constant glare control, but are limited in their ability to offer any variety in the amount of daylight protection they provide. As a result of their static and unmoving nature, these systems may be vulnerable to direct sunlight penetration at certain times of the day or year, or, if designed for aggressive daylight management, they may minimize the amount of daylight allowed on the work floor altogether.

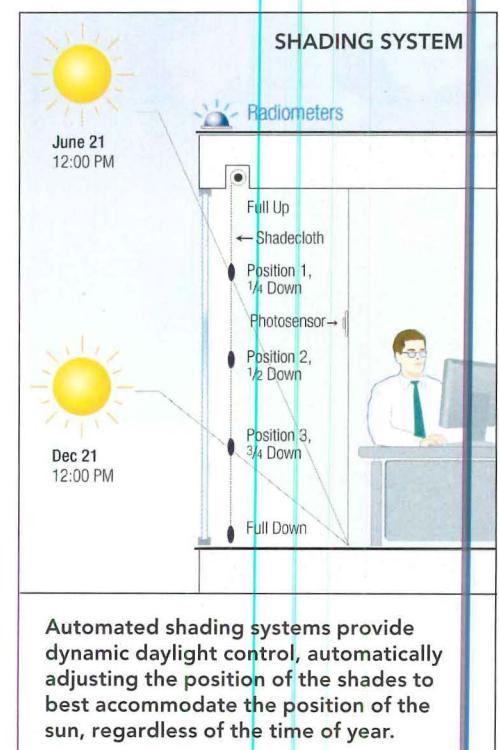
Internal shading or blinds systems that rely on daily manual manipulation are often pulled down on a bright day to block the harsh direct light streaming through the windows and then let down every day after that, negating the original design intent to provide a view to the outdoors and illuminate the interior with daylight.

Unfortunately, these traditional approaches to daylighting do not offer any dynamic, automated control of the daylit environment. The building envelope, complete with glazing and fixed overhangs, treats daylight on a cloudy day and daylight on a sunny day as if they had equal opportunity to create glare. It is the same structure every day, all year round, through summer sun, winter sun, and shadow. Manually controlled devices put the onus on individual occupants to manage the building's interaction with the sun, which almost always results in the daylight not being managed at all.

### New Daylighting Tool—Automated Shading Systems

There is a new daylighting solution that equips buildings to actively monitor and respond to ever-changing daylight conditions. An automated shading system predicts, monitors, and responds to the unique microclimate of the building. For example, the system can determine if the day is sunny or cloudy, or if a zone of windows is in shadow and adjust the shade positions accordingly to maximize the amount of ambient daylight in the space.

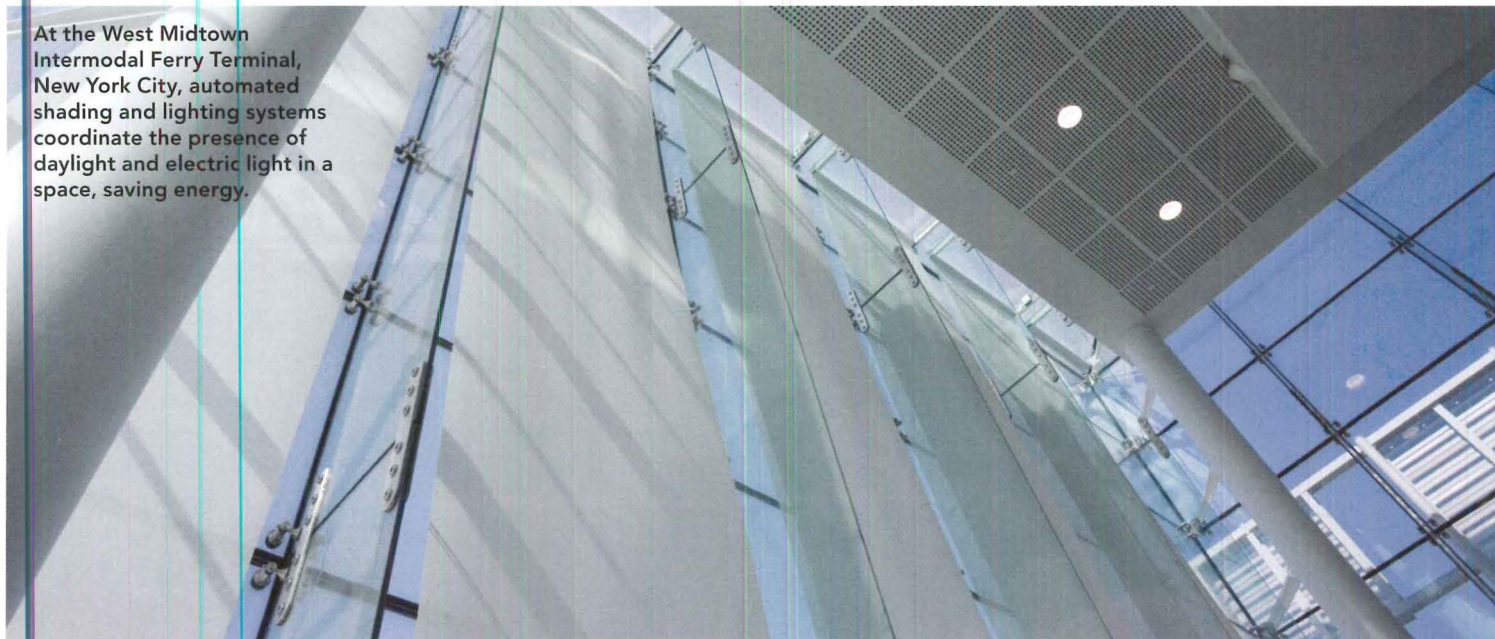
Comprised of motorized solar shades, roof-mounted solar radiometers that monitor sky conditions in real time, exterior-mounted photometers that monitor sky brightness,



Automated shading systems provide dynamic daylight control, automatically adjusting the position of the shades to best accommodate the position of the sun, regardless of the time of year.

Image courtesy of MechoSystems

At the West Midtown Intermodal Ferry Terminal, New York City, automated shading and lighting systems coordinate the presence of daylight and electric light in a space, saving energy.



Architect: William Nicholas Bodouva & Associates; photo courtesy of Jim Roof Creative, Inc.

interior-mounted photosensors that monitor each building façade for the presence of direct sunlight (local brightness), and advanced daylighting software, this system raises and lowers solar shades automatically in response to the position of the sun and the sky conditions detected by the sensors. In addition, the woven solar fabrics used as the physical shades enable building occupants to view the outdoors, even when the shade is deployed in the down position.

Architects used to refer to historical weather data and sunpath diagrams to predict where the building was at risk for direct sunlight penetration, addressing the potential threat with a permanent shading solution. Now, automatic shading systems monitor and respond to the actual, daily microclimate of the building, offering a customized shading solution that changes whenever weather conditions, direct sunlight, or new season warrant. They also have the ability to recognize when skies are cloudy and compensate for undesirable sky brightness and shadow. This informed flexibility enables an automated shading system to maximize the amount of daylight that can penetrate the space and still protect the interior from direct sunlight, when present.

Actively manage direct sunlight. The automated shading system continuously monitors for the presence of direct sunlight and actively manages the access that direct sunlight has to the interior. The system constantly calculates the sun's angle on each window in the building. It takes into account

window elevation, solar geometry, orientation, and profile angle. Structural elements such as balconies, overhangs, and fins that may block the sun are included in these calculations. The system then adjusts the shade position to manage the distance that any direct sunlight can enter a space.

#### Differentiate between clear and cloudy days.

Specialized scientific solar radiometers are mounted on the roof and monitor real-time sky conditions, enabling the system to determine if it is clear or cloudy. When cloudy, the shades are raised, welcoming the pleasant and diffused daylight into the building. When clear, the shade position is adjusted according to the solar angle and any user-defined zone parameters to prevent glare-causing direct light from wreaking havoc in the visual environment.

**Recognizes overcast, but bright.** Sometimes Mother Nature makes it overcast, but bright. In these conditions, the automated default response to cloud cover, which is to raise the shades, would be inappropriate, because the general brightness of the sky could create glare in the workspace. Luckily, these shading systems are equipped with a brightness-override module. A photosensor placed near working level by a window detects the amount of daylight that is streaming through the window and onto the work plane. When illuminance levels exceed a specified threshold, the system automatically adjusts the shade to a predefined position to reduce the risk of excessive brightness in the space.

**Compensates for shadow.** If a window is in shadow, there is no immediate threat of glare-causing sunlight streaming in through it, even if the day is one of the brightest and sunniest of the season. A shadow-override module considers adjacent structures, such as buildings or trees, and identifies when the façade will be in shadow for some predetermined minimum amount of time. When the shadow conditions exist, the system raises the shade, so that occupants can enjoy glare-free views.

#### DAYLIGHTING GOAL #2: COORDINATE ELECTRIC LIGHT AND DAYLIGHT

Daylight control can offer more to an office space than improving productivity and controlling glare, especially when combined with an automated lighting control system. The visual environment of an office space that has windows or some connection to the outdoors is comprised of two types of light: electric light and daylight. While many offices contain these two types of light, few are equipped to coordinate them. This lack of light coordination creates two significant issues in the workspace. First, most buildings today are over-lit because lights are on at full intensity while there is ample daylight streaming in through windows and skylights. Second, a large amount of electric lighting energy is being wasted. Luckily, automated shading and lighting systems can now be specified to coordinate the presence of daylight and electric light, maintaining an optimal visual environment and saving energy.

▶ Continues at [ce.architecturalrecord.com](http://ce.architecturalrecord.com)



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FROM THE  
CREATORS OF **AdvanTech**

CIRCLE 68

# Acrylic Flashing Tape Keeps It Together

Making tighter building envelopes possible

Sponsored by Huber Engineered Woods

**B**uilders have long battled the intrusion of unwanted moisture and air into their structures. Water of any kind is a prime factor in building damage, and can cause mold growth, decay, and corrosion responsible for both health and structural durability issues—that goes for both gross water leakage into the structure as well as for infiltrated air through the building envelope which can result in the condensation of moisture. Every year billions of dollars are spent combating moisture intrusion and rectifying its harmful effects. When it comes to preventing moisture or bulk water into a building, flashing is on the front lines. Placed around windows, doors, and other penetrations, flashing protects the building envelope and is a prime defense against unwanted moisture penetration and its consequences.

How well flashing accomplishes its intended mission depends on the material used and its proper placement and installation. This article will offer a comparative discussion of various types of flashings, with an emphasis on the incorporation of acrylic tapes. Tests and standards for determining durable, reliable, self-adhered flashing materials will also be discussed, as well as the role these materials play in creating effective air barrier systems.

## CONTINUING EDUCATION



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### Learning Objectives

After reading this article, you should be able to:

1. Name various types of flashing as they relate to building soundness.
2. Identify and compare three types of construction tapes that are commonly used for flashing around windows, doors, and penetrations.
3. Discuss the importance of an air barrier system in building integrity.
4. Identify testing standards for self-adhered flashing tapes as they promote safety of buildings and occupants.

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Acrylic flashing tape enables  
an airtight building.

Photo courtesy of Huber Engineered Woods

### FLASHING—THE BASICS

A thin continuous piece of impervious material applied to prevent the passage of water into a structure from an angle or joint, flashing is a key protector against leaks and water damage. Flashing, which may be either exposed or concealed, has to be carefully applied so that water is actually directed away from the structure and not inside. Sometimes flashing is improperly installed by inexperienced laborers who do not understand its purpose, which can result in severe water intrusion and mold. The service life of flashing can determine the service life of an entire building. There are several types of flashing available.

#### Rigid Flashings/Sheet Metal

Plastic sheets or sheet metal, generally aluminum, copper, painted galvanized steel, stainless steel, lead or lead-coated copper, can also be used as flashing materials. Sheet metal can be molded to fit a space, though expansion joints should be provided to prevent deformation of the metal. The selected metal should not stain or be stained by adjacent materials or react chemically with them. Plastics may cost less than other materials, and can be tough, flexible, and durable. Many plastic products are made of polyvinyl chlorides, which may deteriorate considerably when exposed to ultraviolet light, and consequently should be concealed.

bond well to a range of materials from wood-based products to metal, and accommodate movement from expansion and contraction. Correctly installed flashing tapes can provide long-lasting waterproof protection.

Generally speaking, self-adhered tapes offer several benefits over other types of membrane flashing. Installation is faster, with no cure time or clamping required, or the need for special tools to brush on adhesive material. Greater efficiencies translate to a more cost-effective process, with less time and resources expended in setup, installation, and clean up, and fewer products such as tubes and buckets to dispose of. Tapes also help to raise a building's green quotient. The absence of volatile organic compounds (VOCs) means less exposure to toxic fumes, along with minimization or outright avoidance of toxic landfill contributions from residual liquid adhesive waste. Clean up necessitating hazardous solvents is eliminated as is toxic outgassing during cure time.

#### THE EVOLUTION OF CONSTRUCTION TAPES

Building materials are constantly evolving, with manufacturers offering new and improved products that contribute to a building's energy performance and service life. Construction tapes are no exception, and relatively recent advances have

are a better choice in colder weather situations. Problematic application also applies when asphalt tape is subjected to high temperature or direct and prolonged sunlight. The asphalt will soften and begin to flow between 185°F and 210°F. Some asphalt membranes are specially formulated for high-temperature situations and can withstand temperatures of up to 240°F though they are typically not as sticky.

#### Butyl Tapes

Butyl rubber is a synthetic rubber, or elastomer, a copolymer of isobutylene with isoprene. It is impermeable to air and used in many applications requiring an airtight rubber. Butyl tape has a butyl rubber core, and has an expanded temperature range and greater durability than its asphalt counterpart, that is, it stays more flexible in cold weather and is more stable at high temperatures than asphalt tapes. Compared to asphalt tapes, butyl products form better bonds with difficult substrates and can be peeled off and adjusted during installation. However, butyl-based tapes are often susceptible to UV degradation, drying, and degradation of its adhesive properties. The temperature range is greater than asphalt, with application from 40 to 120°F, and service from -40 to 200°F. Typical recommendations are to avoid installation below 40°F unless it can be verified that the surface is free of moisture and contaminants. There are some tapes that can be installed in lower temperatures with the use of a primer.

#### Acrylic Tapes

Acrylic tapes are engineered for superior durability and temperature range and have been shown to perform so well that they are routinely used not only in the construction field but in high-performance applications in the automotive, marine, and aviation industries as well.

Water-based, solvent-based, or "solid," acrylic tapes are becoming increasingly popular. The least expensive acrylic tape is water-based; however, this type of tape may not bond to as many types of substrates as the other varieties. According to BuildingGreen.com, "solid acrylic adhesives can form the strongest adhesive bonds

Flashing is a key protector against leaks and water damage, and must be carefully applied. Its service life can determine the service life of an entire building.

#### Self-Adhered Flashing

Today, many builders use pressure-sensitive membranes to flash around windows, doors, and other penetrations. These self-adhered materials will stick to a surface with applied pressure without the need for any type of solvent, heat, or water for activation. Generally these membranes consist of pressure-sensitive adhesives that are coated onto paper, plastic, cloth, foil, or other backing material. In some self-adhered flashing, a removable liner acts to protect the adhesive. These so-called peel and stick membranes are typically 4 to 12 inches wide and facilitate creation of a continuous barrier around windows and doors in wood frame construction. Some tapes used for flashing purposes can also be used to properly seal the seams in sheathing to prevent water entry through these and other penetrations. Pressure-sensitive tapes are bendable, and consequently able to achieve a more accurate fit around windows, doors, and penetrations. If pressed firmly into place, most pressure-sensitive tapes

shown superior durability and performance under a range of temperature and climate conditions.

#### Asphalt Tapes

It used to be that most construction tapes were asphalt-based tapes. Asphalt tapes are made from modified bitumen, similar to the rubberized asphalt commonly found in eaves flashing. Though widely used, asphalt tapes have several drawbacks. They are messy to install, and their durability is often of questionable quality. A priming may be required to achieve a full bond with some substrate materials, such as oriented strand board (OSB) and concrete, which may present particular problems for certain asphalt flashings.

Asphalt tapes also have a poor temperature range. According to the *Encyclopedia of Building & Environmental Inspection, Testing, Diagnosis, Repair*, many rubberized asphalt products start to lose stickiness at around 50°F and have problems bonding below 40°F. Unless the rubberized-asphalt product is specifically formulated for low temperatures, other products

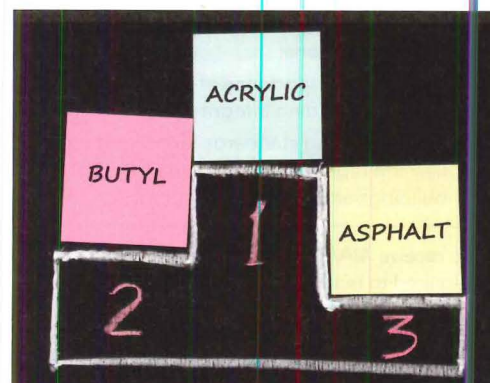
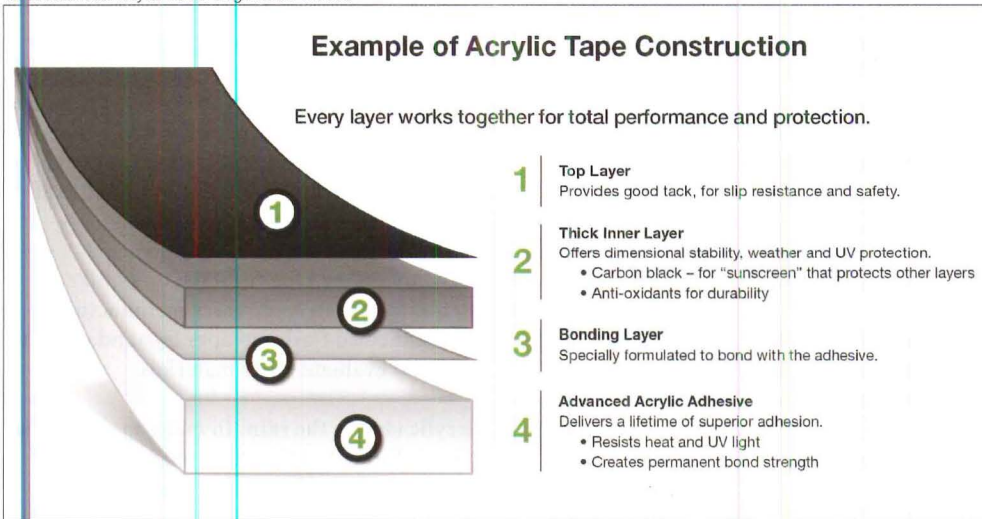


Illustration courtesy of Huber Engineered Woods

Illustration courtesy of Huber Engineered Woods



compression, deformation, and flattening. Viscoelastic tapes are widely considered to be engineered for long-term jobsite performance.

#### Tape Construction

Each layer of acrylic tape is engineered for functionality. The illustration on the left is an example of how one type of advanced acrylic tape is constructed. The top layer provides tack for safety. A thick inner layer provides dimensional stability, weather and UV protection, with darker shades being the preferred color for sunscreen and containing sufficient antioxidants for durability. A thin bottom layer is formulated to bond with the adhesive layer.

#### Heat and UV Resistant

Heat and ultraviolet light are two key factors that degrade tape life. The acrylic adhesive in some tapes resists heat and UV sunlight far better than butyl and asphalt. Cross-linked polymer chains create extremely strong molecular bonds that withstand a much wider range of temperatures. In addition, they dissipate light energy, which can break the bonds in asphalt and butyl. Even in severe conditions, certain acrylic tapes retain superior adhesion strength for years. Rigorous durability tests have been developed to test tape against exposure to these factors. Accelerated aging tests simulate a “worst-case scenario” in terms of exposure to heat and UV over time. For example, some accelerated aging tests can be equivalent to 180 days initial exposure and then 30 years as a roof underlayment in Miami, Florida. Architects are well advised to consult the warranty terms for tape products. Some manufacturers are so confident in the long-term performance of their tape that they warrant it up to 30 years.

at a wide range of temperatures and even achieve adhesion to damp or wet substrates.” Without solvents, the tapes do not become brittle over time.

Advanced acrylic adhesive is made of highly polar molecules, meaning a magnetic-like attraction pulls the adhesive into the substrate. Some acrylic tapes are formulated to flow into every crevice, increasing total contact area. This helps the tape wet out well, flowing into surface inconsistencies to produce a permanent bond. The result is a superior, lasting seal that is considerably stronger than traditional asphalt and butyl tapes. With both robust adhesion and cohesion, advanced acrylic tapes are internally strong—intertwined polymer chains provide excellent internal strength, adding to the overall reliability of the seal.

Using acrylic tape to seal high-performance wall panels is gaining popularity in the building industry. Builder Paul Fournier of Lewiston, Maine, is enthusiastic about the convenience afforded by that scenario. “We built the walls on the floor, taped them, installed windows, and raised them and were ready for siding. No having to deal with housewrap that would blow away,” Fournier says. “Same with the roof, we installed it, taped it, and were ready to roof it without having to worry about underlayment.” Builder Miguel Hewett of Southport, North Carolina, had a similar experience. “The high-performance roof saved me so much time because you just put in the panels and tape and you’re done. There’s no felt or rework. It hardly took any time for my crew to learn how to use the tape, and it just gets easier every time they use it.”

#### ACRYLIC TAPE—WHY IT WORKS

Acrylic tapes perform well as a result of several contributing factors.

##### Viscoelasticity

This term refers to having viscous as well as elastic properties when deformed. Viscous

behavior of a material can be imagined as the way in which honey responds to stress from gravity. When honey is poured from a vessel, it moves slowly. That is because internal stresses between molecules increase with relative velocity between molecules. The faster the molecules move, the greater is the resistance to that movement. The less viscous the fluid is, like water, the greater its ease of movement. The reverse is true for thicker or more viscous materials. Elasticity is a property of materials that return to their original shape after deformation.

Because acrylic adhesive is viscoelastic, it acts simultaneously as both a liquid (viscous) and solid (elastic). Its viscous properties allow it to flow into small surface cracks and abnormalities to form a strong bond. Its elastic nature means it possesses the adhesive strength necessary to preserve the bond. In other words, viscoelastic materials exhibit traits of both liquids and solids and enable superior initial adhesion, as well as the ability to dissipate stresses and resist

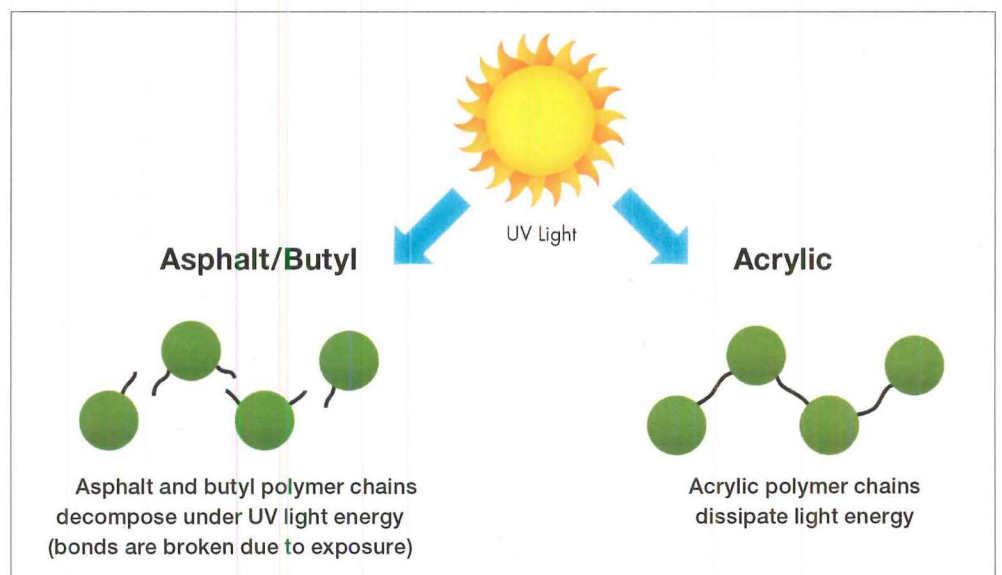


Illustration courtesy of Huber Engineered Woods

### Accommodation of Wall Characteristics

Some advanced acrylic tapes are designed to accommodate the normal expansion and contraction of walls. These acrylic tapes can adjust with a home over its lifetime, as some can flex and stretch up to 800 percent to accommodate the normal contraction and expansion of walls.

### TESTING—STANDARD AND “ABOVE AND BEYOND”

Architects should make sure that the tape they specify is code recognized as a flexible flashing tape and performs in accordance with the latest testing criteria and is recognized in an Evaluation Service Report. If so recognized, the tape has passed requirements of AC 148 (Acceptance Criteria for Flexible Flashing Materials). Architects should ensure that the tape intended for specification has passed these standards along with AAMA 711 test criteria for flashing materials. As flashings may be exposed for extended periods during building construction, resistance to weathering damage is critical.

### Rigorous Testing Methods

The more stringent tests conducted under the latest version of AC 148 include:

**Tensile strength testing.** After extreme UV exposure, tensile strength is tested to the point of product failure.

**Adhesion testing.** In order to prevent water infiltration, flashing must adhere to substrates even after exposure to water and heat. In this test, tape is adhered to various substrates and readings are taken on the force needed to peel the tape off of the substrate. In addition

to control flashing tape samples, testing was completed on samples subjected to accelerated aging with UV exposure, elevated temperature exposure, and freeze-thaw cycle exposure.

**Water resistance testing.** After prolonged exposure to UV light and 25 cycles of soaking and drying, flashing tape samples were subjected to standing water for five hours and observed for any water leakage.

**Cold temperature testing.** In this test, flashing tape samples are conditioned at freezing temperatures for 24 hours and then bent to an angle of 180 degrees. Specimens are examined for signs of cracking.

**Hot temperature testing.** Extreme heat can damage the integrity and adhesion of many tape products. In this test, strips of flashing tape are applied to OSB in an overlapping manner to simulate the intersection of jamb and head flashings and then exposed to extreme heat (175°) for 24 hours. The flashing samples are inspected for any peeling, buckling, rippling, or edge curl.

**Accelerated aging.** Specimens are cut from UV exposed flashing tape samples and subjected to 25 drying and soaking cycles. These cycles consist of oven drying at 120°F for three hours followed by immersion in room-temperature water for three hours and then air-dried for 18 hours at 75°F. Specimens are then examined for leakage.

**Water resistance test – ASTM E 331.** This test replicates rain that a roof and wall system must withstand during the construction phase where the product is exposed. In addition to applying water spray at 32 miles per hour, a vacuum is applied to the back side of the roof/wall to try to force a failure.

### Additional Level of Testing

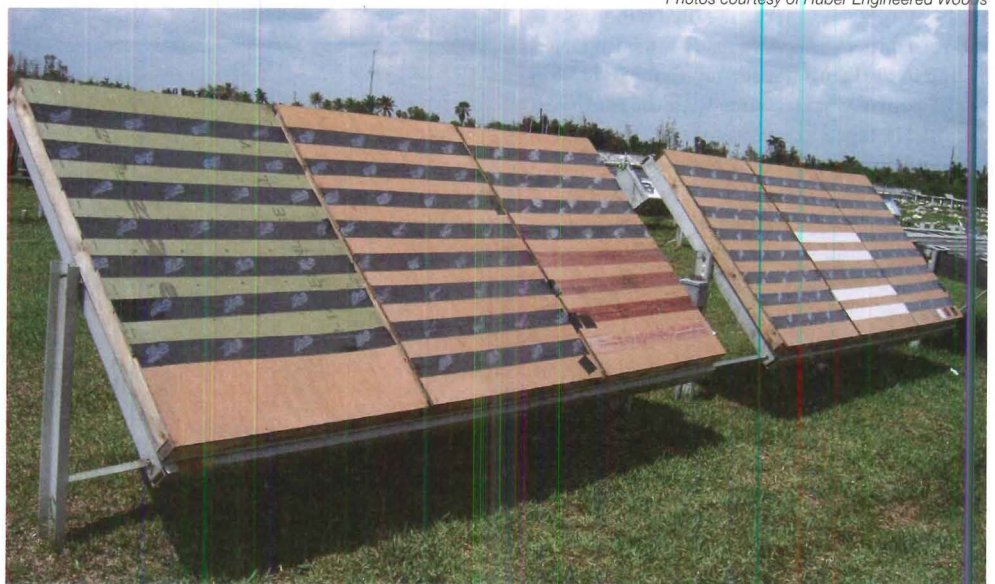
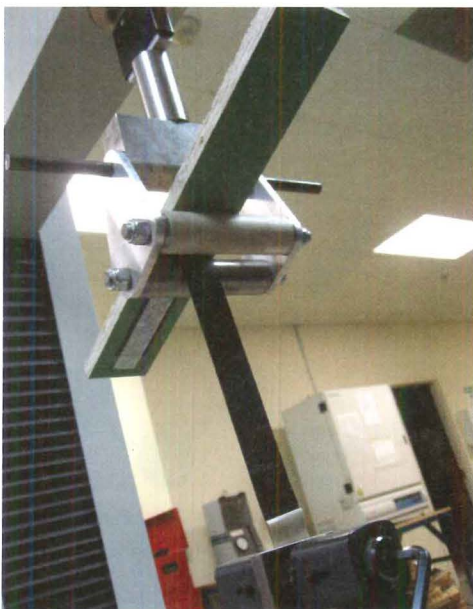
Some manufacturers have opted to distinguish their products by further testing with extended periods of exposure to extreme heat, cold, sun, rain, and ice to assure that the tape provides the adhesion, protection, and durability that will safeguard the life of the building. The most effective products on the market will have been subjected to the following types of tests, or similar examinations. In some cases manufacturers have subjected flashing tapes to standard tests meant to evaluate other materials.

**Acrylic tape in the rain.** In many cases, acrylic tape performed well in tests where extreme wind and rain situations were replicated. Some of these tests include:

**Wind-driven rain test – TAS 100.** High-performance panel seams sealed by acrylic tape exposed to 110 mph wind-driven rain to test the water protection properties of the system indicated superiority over traditional housewrap and felt systems, which are prone to ripping and blowing off in these extreme conditions. Tests on an assembly that had been exposed to the elements for 548 days, showed that assemblies secured by acrylic tape stood up to these extremes.

**Advanced water resistance test.** Some manufacturers used the ASTM-331 test and increased the pressure level and required duration to determine how acrylic tapes would perform under extreme conditions. Some acrylic tapes in high-performance assemblies showed more than double the required pressure for five times the required duration.

*Photos courtesy of Huber Engineered Woods*



Left: 90-degree peel test. Above: Long-term outdoor exposure monitoring.



## Above and Beyond

In addition, some manufacturers have developed their own testing mechanisms to evaluate acrylic tapes. For example:

**Water ponding test.** To demonstrate the ability of the acrylic tape and high-performance panels to hold out moisture, the

## ACRYLIC TAPE MAKES IT TO HGTV DREAM HOME 2013

Building codes don't get much more stringent than on Kiawah Island, which sits on a flood plain, hurricane alley, and earthquake zone, and is located just south of Charleston, South Carolina. "Our seismic rating is the same as California," says Chris Rose, AIA, HGTV Dream Home 2013 lead architect. "And the entire building was required to sit at least 8 feet above ground level because of potential flooding."

HGTV Dream Home 2013 offers a lesson in state-of-the-art construction technology. The house is air- and water-tight, thanks to its unusual sheathing, which consists of wood panels that are manufactured with a water-resistive overlay. The crew installed the panels as they would plywood, and sealed the joints with the manufacturer's acrylic tape to prevent drafts or potential moisture intrusion. The house's ventilation system will constantly exchange stale indoor air for fresh outdoor air, thereby eliminating any chance of indoor air pollution.

This home achieved LEED Platinum certification, and the taped joints significantly added to the stringent ACH requirement.

*Photo courtesy of Huber Engineered Woods*



Acrylic tape helps prevent drafts and potential moisture intrusion in the above project, similar to HGTV's Dream Home 2013.

water ponding test was developed to simulate extreme exposure to water. High-performance panels and tape were subjected to a constant head of water for over 20 hours. Both seams and fastener penetrations were monitored for water leakage. Even with this extreme exposure, a tight seal was maintained to achieve moisture resistance.

**Rail car.** A rail car full of flashing tape was monitored as it traveled through the Arizona desert in mid-summer to assure optimum performance of tape even after being exposed to the most extreme of shipping conditions.

**"Black box."** A black metal box filled with tape was placed in an asphalt parking lot and left exposed to the extreme heat of a southern summer, providing further proof the tape can handle extreme shipping and handling conditions

**Test hut walls.** Cladding was removed from walls (including stucco) after five years of service and the tape examined for any deterioration. The tape showed no negative effects from its entire five years of use.

**Accelerated aging.** In addition to pertinent code required testing, some manufacturers have conducted tests in which tape has also been exposed to 336 hours in a UV testing chamber (equivalent to 180 days exposure in Miami, Florida) followed by 190 days in an oven at 225°F (equivalent to 30 years exposure as underlayment in Miami).

**Long-term outdoor exposure.** Tape has been monitored during long-term exposure and durability testing in extreme environments such as Miami, Minneapolis, Australia, and Canada.

## AIR BARRIERS AND THE ROLE OF SELF-ADHERED MATERIALS

Experts state that while heating and cooling account for 50 percent to 70 percent of the total energy used in the average home, air leaks can account for nearly half of those costs. Since heating and cooling accounts for the majority of utility costs in a typical home, stopping energy loss from air leakage offers the best opportunity for saving money and conserving resources. According to the U. S. Department of Energy, the recommended strategy in both new and old homes is to reduce air leakage as much as possible and to provide controlled ventilation as needed.

Air leakage is defined as the uncontrollable flow of air in and out of a building. It diminishes the insulating properties of a structure, and requires more energy to heat and cool a leaky building. There are two types of air leakage. Infiltration is the uncontrollable flow of outside air to the interior of the building. Exfiltration is the uncontrollable flow of inside air to the exterior of the building. In buildings, infiltration and exfiltration of air can have important implications, largely due to the unpredictable and unregulated nature of the air exchange and the possibility of admitting pollutants, allergens, and bacteria into buildings. In addition, the associated air pressure changes can impact the pressure equilibrium created by HVAC systems and work to move pollutants from certain places, say storage areas or garages, to the living space.

Exfiltration can cause moisture during the winter months when trying to heat a structure; this is seen predominantly in the northern climates. Infiltration can cause moisture during the warmer months as the hot, humid air is trying to get into the structure; this happens predominantly in the southern climates. As compared with diffusion, a type of passive transport in which molecules move from a higher to a lower concentration, the differentials in air pressure may act to move significantly more water vapor through building envelope leaks. Some experts say that hundreds of times more water vapor is moved by air pressure differentials than diffusion.<sup>1</sup>

The types of air pressure that cause infiltration and exfiltration include wind, stack pressure, and HVAC fan pressure.

**Wind.** Wind pressurizes a building positively on windward side, and accelerates as it goes around the building, creating negative pressure on the sides, especially the corners. Negative pressure is created on the leeward side as wind moves past the building.

**Stack pressure.** Also called "buoyancy" or "chimney effect," stack pressure is the movement of air in and out of a building caused by differences in exterior and interior air pressures resulting from temperature and moisture differences. The severity of stack pressure is dependent on height of the building and thermal difference.

*See endnote in the online version of this article.*

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Photo courtesy of Klein USA, Inc.



Interior sliding glass doors add to a building's sustainability and contribute to LEED points.

# Interior Sliding Frameless Glass Doors Make a Clear Contribution to LEED

Style and sustainability for today's interiors

Sponsored by Klein USA, Inc.

**T**here is nothing like glass to give a clean, crisp, contemporary visual experience to a building and to raise its sustainability quotient. Increasingly, interior glass doors are part of the picture, as they create a distinctly modern look while allowing visibility and natural daylight to flow through the space, promoting a sense of openness and connection with the surroundings. New-generation frameless and sliding glass doors are particularly popular in Europe and are now gaining traction in the U.S. Architects are finding that in offices, hotels, and other commercial settings, these glass sliding door options offer a host of benefits not only in achieving good design consistent with today's flexible work and life styles, but in meeting advanced green building goals. This article will discuss the latest in interior sliding glass door technology in terms of its contribution to the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) ratings and the other advantages it offers both users and owners of commercial properties.

## INTERIOR SLIDING FRAMELESS GLASS DOOR OPTIONS

In the past few years, there has been both a great demand for frameless sliding glass doors in commercial projects and a large number of offerings for sliding glass door systems. Today, architects can choose from a variety of applications from a single sliding door to specialized systems such as self-closing, telescopic, or corner simultaneous opening doors to enhance the working or living environment in spaces both large and small.

### Single Sliding Glass Doors Along Existing Wall

Options here include barn doors with surface-mounted or recessed tracks. The tracks can be recessed into the ceiling for a clean-looking application, or left exposed for a more contemporary look. Pocket doors are also very popular for a more conventional design. Nowadays, tracks can not only be easily recessed and still allow access to the system

without disruption to ceiling or finished soffit but also be left exposed with a compact 2-inch track that contributes to a minimalist design.

A self-closing feature can be added, allowing the door to slowly close by itself after opening it manually. This helps prevent strong glass impact and thus glass breakage when the doors are closed or opened with force.

### Glass Walls

Sliding doors with glass sidelights add more glass to the project while helping to divide interiors with elegance and transparency. Some systems allow minimum hardware presence as tracks can be recessed and no jamb is required between the panels. Although the design features frameless glass doors, the gap between sliders and fixed panels is typically 3/8 inch for a better integration of the system.

Sliding doors with a glass transom-mounted track is a popular choice in creating a modern design aesthetic while fitting a sliding door in an opening over 10 feet.

Photo courtesy of Klein USA, Inc.

### Telescopic Glass Doors

Telescopic glass doors are no longer a succession of tracks mounted next to each other by an inventive glass contractor but a sophisticated, ingenious, and well-developed system allowing the doors to slide simultaneously while operating only the lead door. Telescopic doors operate with two, three, or four frameless glass panels without any floor tracks, leaving a clear opening up to 16 feet. Many designers have already adopted this option in high-end settings for conference room entrances or hotel lobbies that provide an elegant reception area for their guests.

### Corner Glass Doors

An elegant private space can be easily created within an open concept environment. Non-conventional door enclosures and floor-to-ceiling glass panels make for a new and dramatic way of entering work or living areas. This new generation of corner doors enables designers to create a glass cube with the unique feature of allowing the doors to open at 90 degrees simultaneously. When one door is activated, the other slides open simultaneously along an existing wall or glass sidelight. This high-concept application is ideal for conference rooms, management offices, or corner bathroom entrances in a striking opening that frees up other passageways. This installation increases overall transfer of natural light and air circulation over conventional walls.

All the above-mentioned systems feature glass panels that can be installed free of floor tracks, achieving both minimalist design and a more convenient application for projects with Americans with Disabilities Act (ADA) requirements. Heavy glass panels are held by high-weight capacity pressure clamps, which avoid the need to drill holes in the glass. For best accessibility, sliding doors will have advanced ball-bearing technology that allows 400 pounds of doors to slide with less than 5 pounds of force, also an ADA stipulation.

### Glass Options

For many years, tempered glass panels have been selected exclusively for commercial interiors at the expense of laminated glass, which can actually offer significantly more design options at a reasonable price. Both glass types offer aftermarket recyclability.

**Tempered glass.** Tempered glass has high resistance to both impact and temperature changes. This is due to its fabrication process in which the glass, which has been previously cut and prepared with holes and edge finishes, is subjected to temperatures up to 1,540°F, and then suddenly cooled through air tubes. Although tempered glass is stronger than



The new generation of corner doors gives designers the option to create a clear tempered glass cube with the unique application of allowing the doors to open at 90 degrees simultaneously.

laminated against direct forces, its use in commercial interiors is sometimes being reconsidered, as it can fracture into many pieces as a result of slight contact to edges or corners. In a second safety process, known as the heat soak test, glass can be subjected to another controlled high-temperature oven to improve the glass quality.

Tempered glass design is also limited to clear or satin etching unless the project budget allows for an investment in a sophisticated new digital direct-to-glass printing technology that enables designs to be printed on glass quickly and permanently. That process begins with an image created by any current graphics design program. Once the electronic file is created, technicians match colors, scale the image, determine the proper panel layout, create printing files, and finally print edge-to-edge creative designs while permanently fusing the image into the glass. Images can be printed on glass panels up to 110 inches x 169 inches in thicknesses ranging from 3/16 inch to 1 inch.

**Laminated glass.** Currently regarded as “safety” glass, laminated glass consists of multiple (usually two) glass panels, each divided by a layer of PVB (polyvinyl butiral) and connected through high-temperature and high-pressure processes. In the event of glass breakage, the glass pieces are adhered to the PVB layer, making the site safer for passersby. One drawback is that if holes are drilled in the glass, the glass is weakened. Tempering the glass and then laminating it makes the glass both stronger and safer.

Laminated glass is a good choice in terms of increased acoustics and privacy through use of interior films including PVB, which is used for applications that require strong binding, optical clarity, and adhesion to many surfaces. The clear and clean glass facings offer a consistent finish that can be tempered with etching to change the panel’s surface texture. Manufacturers offer a wide color range and designs can be printed

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#### Learning Objectives

After reading this article, you should be able to:

1. Discuss the latest technology in interior sliding glass doors and partitions and their relation to green building.
2. Compare tempered and laminated glass in terms of safety and sustainable design.
3. Identify where interior glass doors contribute to LEED points.
4. Explain how interior glass can increase human productivity and well-being while reducing energy consumption.

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on the film through elements in the glass such as tree leaves. Laminated glass also allows designers to use the switchable “intelligent” glass technology in which the glass finishes go from clear to opaque.

### The Right Glass for Interior Sliding Doors

While many architects believe holes must be drilled to hold glass panels, this is a misconception. Many systems are available that do not require holes. The top-hung pressure clamps used by some European manufacturers hold glass doors up to 400 pounds without requiring holes in the glass. An alternative is ultra-strong double-face tape that allows the glass contractor to easily surface mount elegant handles. As a result, both tempered and laminated glass can be used in sliding doors, leaving the choice dependent upon the desired design.

There is also confusion in the industry in terms of the required glass thickness in commercial applications. The glass industry usually recommends 3/8-inch-thick glass for doors below 8 feet high and 1/2-inch-thick glass for doors between 8 and 10 feet high, in order to prevent bending of the glass in the taller panels. Although some glass contractors don't recommend panels over 10 feet high in commercial interiors, 5/8-inch- or 3/4-inch-

Photos courtesy of Shtiever



With switchable or “intelligent” glass technology, glass finishes go from clear to opaque.

thick glass can be used successfully for taller panels. Standard widths are 3 feet and 42 inches for either fixed or sliding interior glass panes. The panel weights are calculated as follows:

- ▶ 3/8” glass with dimensions in inches (36” x 96” x 3/8”):  $(36 \times 96) / 144 \times 5 = 120$  lb
- ▶ 3/8” glass with dimensions in feet (3' x 8' x 3/8”):  $3 \times 8 \times 5 = 120$  lb
- ▶ 1/2” glass with dimensions in inches (48” x 120” x 1/2”):  $(48 \times 120) / 144 \times 6.5 = 260$  lb
- ▶ 1/2” glass with dimensions in feet (4' x 10' x 1/2”):  $4 \times 10 \times 6.5 = 260$  lb

Weight/square foot is 5 lb using 3/8” glass and 6.5 lb using 1/2” glass.

### Frame Components

If a large expanse of glass is the desired aesthetic, frames can be minimal. In fact, in the latest sliding glass door and moveable partition options, frame components consist of only 4 percent of the overall material used in the opening, which can be important to daylighting goals and other LEED criteria. The main upper extrusion that holds the glass panels is mainly made of aluminum with manufacturers offering a large range of finishes from clear anodized to any RAL color finishes to match the look and feel of the interior design scheme. This minimum framing provides aesthetics, durability, light weight, and ease of recyclability.

## GLASS DOORS HELP ACHIEVE LEED GOLD AT THE SAN DIEGO NATIONAL WILDLIFE REFUGE

Light and open was the design rationale for the recently constructed \$4.9-million, 8,000-square-foot San Diego National Wildlife Refuge—an approach that helped earn LEED Gold status.

The center provides Fish and Wildlife Service staff with offices



Photo courtesy of Klein USA, Inc.

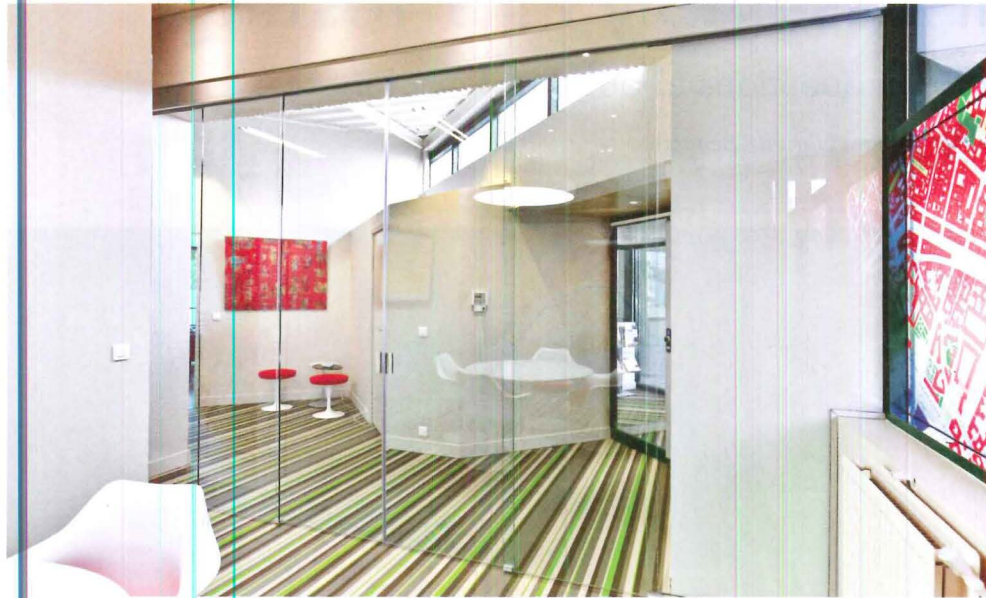
and collaboration areas in which they can now perform their work within the marsh. “We wanted to give both staff and visitors a strong connection to the landscape by providing plenty of light and openness within the facility,” says SD Wildlife National Refuge Design Rationale Project architect Johnny Birkinbine, AIA, of Line and Space, LLC. One way the design team achieved its goal was the use of interior sliding glass door systems as partition walls between the staff offices and the corridors. The same system was also used on the conference room. “The use of floor-to-ceiling glass walls provided us with the transparency we wanted in order to provide the staff with views of the exterior,” Birkinbine says. “They also allow plenty of

natural daylight to penetrate the interior of the building, once again connecting the staff with the exterior.”

Birkinbine is enthusiastic about the use of the doors' frameless design. “We wanted as much natural light as possible to penetrate into the space,” he says. “This not only provided the feeling of openness we desired, but also minimized the need for conventional lighting, resulting in significant energy savings.” Birkinbine says the glass partition walls also helped the facility attain LEED Gold—New Construction certification. According to the architect, the ability of the glass walls to extend natural daylight deep into the interior of the space helped increase energy efficiency and contributed to the “Daylight and Views” credit.

Another design element that appealed to Birkinbine was the lack of a track on the doorway floor. The sliding panel is ceiling mounted, resulting in a clear passageway with no floor profile. “We were looking for the cleanest installation possible,” the architect notes. “The use of glass offered us a clean, crisp, contemporary visual that also provided transparency, views, and plenty of natural light.” He also notes the use of a short, 90-degree glass panel return between the glass office front and the drywall partition that separates offices. “If we had extended the drywall all the way out to the corridor wall, we would have broken the rhythm of the glass plane and also lost some of the transparency we were looking for,” he says.

Photo courtesy of Klein USA, Inc.



Interior sliding glass doors can help earn LEED points in several categories.

### GREEN BUILDING GOALS AND LEED

Most of the building industry is now concerned about sustainability. However, there is some question on the costs to achieve such green building goals. The World Business Council for Sustainable Development says that real estate and construction professionals overestimate the costs of green building by 300 percent—but experience does not bear that out. Going green shouldn't be considered an additional cost as it actually tends to be more cost effective with time. A report to California's Sustainable Building Task Force maintains that an upfront investment of 2 percent in green building design, on average, results in life-cycle savings of 20 percent of the total construction costs—more than 10 times the initial investment. *McGraw-Hill Construction Green Outlook 2011: Green Trends Driving Growth* details where building owners have realized cost benefits from sustainably designed and constructed facilities.

- ▶ Operating costs decrease 13.6 percent for new construction and 8.5 percent for existing building projects
- ▶ Building value increases 10.9 percent for new construction and 6.8 percent for existing building projects
- ▶ Return on investment improves 9.9 percent for new construction and 19.2 percent for existing building projects
- ▶ Occupancy increases 6.4 percent for new construction and 2.5 percent for existing building projects

- ▶ Rent increases 6.1 percent for new construction and 1 percent for existing building projects
- ▶ Owners of green projects report a 9.2 percent increase on average for retrofit/renovation green projects as compared to 9.9 percent on average for new projects

In addition, the U.S. General Services Administration's Public Buildings Service states that compared to the average commercial building, green buildings consume 26 percent less energy, have 13 percent lower maintenance costs, 27 percent higher occupant satisfaction, and 33 percent less greenhouse gas emissions.

### LEED—A Major Determinant of Green Building

Green building rating systems have been developed to assess a building's sustainability. The dominant system today in the U.S.—and increasingly outside the country—is LEED. Tailored to various market segments, LEED is a point-based system where building projects earn credits for satisfying specific green building criteria. There are 100 possible points spread across five major categories: Sustainable Sites (SS), Water Efficiency (WE), Energy and Atmosphere (EA), Materials and Resources (MR), and Indoor Environmental Quality (IEQ), plus an additional 6 points for Innovation in Design (ID) and an additional 4 points for Regional Priority (RP). The number of points the project earns determines the level of LEED certification as follows:

- Certified 40–49 points
- Silver 50–59 points
- Gold 60–79 points
- Platinum 80 points and above

LEED for Commercial Interiors (LEED-CI) is the recognized system for certifying high-performance, cost-effective green tenant spaces. It gives tenants and designers, who do not always have control over whole building operations, the power to make sustainable choices that can dramatically affect the indoor environment. LEED-CI was designed to work hand-in-hand with the LEED for Core & Shell certification system to prepare a building for environmentally conscious tenants. Individual tenants may seek LEED-CI for their spaces regardless of whether the building is LEED certified, provided it is a complete interior space distinct from other spaces within the same building in terms of at least one of the following characteristics: ownership, management, lease, or party wall separation. The candidate project must include a minimum of 250 square feet of gross floor area in a commercial interior and comply with environmental laws and minimum occupancy rates (50 percent for office interiors and 55 percent for hotel interiors based on time averaged over the performance period).

### Where Glass Doors Can Contribute to LEED

While the design community has long understood the importance of green building and delivered cost-effective, sustainable spaces, how interior glass contributes to a LEED rating has sometimes been unclear. To set the record straight, interior glass sliding doors can help earn points in several LEED categories.

**Energy and Atmosphere** (to promote better building energy performance through innovative strategies)

Optimize Energy Performance (EA 1.0). The use of glass minimizes the need for conventional lighting, resulting in significant energy savings. Points earned for reducing lighting power density below the standard:

- 15% => 1 point
- 20% => 2 points
- 25% => 3 points
- 30% => 4 points
- 35% => 5 points

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# Navigating Wall Assembly Fire Testing

NFPA 285 primer addresses burning questions about this important test

Sponsored by DuPont Building Innovations | By Barbara Horwitz-Bennett

**F**rom the popularity of building certification programs to net-zero energy building initiatives to the active building enclosure movement, expectations continue to increase for building performance, facility life, and occupant health and safety. Because two of the most critical aspects of high-performance buildings are air/water tightness and the enclosure's thermal performance, the necessity of using more insulation, and high-quality air/water barrier and flashing materials, will continue to increase as the industry trends toward highly energy-efficient building envelopes.

While market demand for insulations, dedicated air and water barriers, and other combustible envelope materials are at an all-time high, a little-known code-required fire test standard called National Fire Protection Association (NFPA) 285 has suddenly been cast into the spotlight. Truth be told, this *Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components* has been around for a couple of decades, but its relevance has significantly increased with additional combustible components included in more recent International Building Code (IBC) updates.

Consequently, it behooves architects to fully understand the history, relevance, and application of this important standard.

## THE HISTORY OF NFPA 285

Dating back to the 1970 energy crisis, the plastics industry began encouraging the building industry to start using foam plastic insulation on exterior walls to increase energy efficiency. However, four of the five types of construction listed in the building codes had noncombustible requirements, so the proposal was outright rejected.

Not willing to give up so quickly, the Society of the Plastics Industry (SPI) sat down with code and fire officials and asked what it would take to convince them that putting foam insulation in the walls would not present a fire hazard. The officials then responded with a challenge.

"The plastics group was charged to design a test which would show that if a wall was fully burning, that the flames would not travel a significant distance, vertically or laterally,



Now subject to NFPA 285 testing per the International Building Code, foam plastic insulation, combustible exterior claddings, and water-resistive barriers must demonstrate limited fire propagation.

because of the foam plastic,” explains Jesse J. Beitel, a senior scientist/principal with the Baltimore-based fire protection engineering and code consulting firm Hughes Associates. “That’s how the first, two-story outdoor test was developed, but it still took another eight years before the codes adopted it.”

Finally, in 1988, the Uniform Building Code (UBC) adopted the test method and allowed the use of foam plastics on the exterior walls of all construction types based upon the successful performance of several foam plastic insulated wall systems.

“However, it was an expensive test, plus one was at the mercy of the weather, so the plastics industry went about reducing the scale of the test and moving it indoors,” he continues. “That test was then adopted in the UBC in 1992.”

The test was then submitted to the NFPA Committee on Fire Tests and, in 1998, was published as the NFPA 285 fire test method that is used today.

### BEYOND FOAM PLASTIC

While the original push was to include foam plastic insulation in exterior walls, more recently, combustible exterior claddings and water-resistive barriers (WRB) have been incorporated into the codes. In particular, the International Building Code included exterior insulation finishing systems (EIFS) in 2000, metal composite materials (MCM) in 2003, fiber-reinforced plastics (FRP) in 2009, and high-pressure laminates (HPL) in 2012, as combustible components within noncombustible wall assemblies requiring NFPA 285 testing.

Also, in 2012, the IBC added WRBs as components requiring testing before their use would be permitted in Type I, II, III, and IV buildings over 40 feet above grade (see sidebar “International Building Code Construction Categories” on the next page). This provision was recently added in as testing discovered that assemblies which passed NFPA 285, later failed with the addition of a WRB.

It seems that these newer developments were, in part, driven by increasing concerns about life safety issues in high-rise structures. For example, according to NFPA research, from 2005 to 2009, an estimated 15,700 annually reported fires in high-rise buildings resulted in an average of 53 civilian deaths, 546 civilian injuries, and \$235 million in direct property damage per year.

In addition, a number of building fires in the U.S. and China in 2010 proved that a small ignition source can rapidly spread to engulf the entire exterior of a building. Of course, this is particularly dangerous in high-rise buildings with limited rescue and evacuation capabilities.

Although the process of states adopting the

History of NFPA 285				
<b>Energy Crisis:</b> Leads to increased exterior insulation applications	<b>1988:</b> Uniform Building Code adopts UBC 17-6	<b>1997:</b> Uniform Building Code adopts UBC 26-9	<b>2000:</b> IBC begins requiring NFPA 285 testing	
1970s	1980s	1990s	2000s	2010s
<b>Late 70s:</b> SPI develops full-scale test		<b>1998:</b> NFPA adopts UBC 26-9 as NFPA 285		<b>2012:</b> IBC expands NFPA 285 testing to WRB
<b>From its official adoption to the Uniform Building Code in 1988 to the 2012 International Building Code, fire testing is required for combustible components in wall assemblies.</b>				
<i>Source: DuPont Building Innovations</i>				

latest version of the IBC will take time, and often states and local jurisdictions choose not to adopt the model code in its entirety, but rather use it as a basis for developing their codes, experts anticipate that the issue of designing and specifying NFPA 285-compliant wall assemblies is becoming more critical.

### Buyer Beware

While some manufacturers and associations have been quite proactive in terms of testing their wall assemblies in-house to ensure NFPA 285 compliance, other products have only begun showing up in wall assemblies in recent years and have not been tested together with many component variations.

“So now NFPA 285 is rearing its ugly head for some, and architects are frustrated that they can’t always design wall assemblies the way they want to as not all products pass this test,” points out Beitel.

Furthermore, Tracy (Golinveaux) Vecchiarelli, associate fire protection engineer, National Fire Protection Association, Quincy, Massachusetts, points out that NFPA 285 is a full assembly test. “This means that all of the wall components need to be tested together and then the entire assembly is given credit for passing the test. However, the individual components of the wall cannot be considered ‘compliant’ just because they were part of a tested assembly,” she explains.

Consequently, NFPA 285 is proving to be quite a source of confusion among architects.

Earlier versions of the IBC contained ambiguous language, so it appeared that most construction types were exempted from NFPA 285, explains Richard Keleher, AIA, CSI, LEED AP, senior architect, Thompson & Lichtner, Cambridge, Massachusetts. But now that the language in the IBC has been clarified, and NFPA 285 compliance is anticipated to be more fully applied and enforced, architects have been

taken by surprise. “In fact, in my 45 years of professional practice. I have not seen a single issue that has given architects such uncertainty,” he states.

Offering his perspective, David W. Altenhofen, AIA, East Coast director, The Façade Group, Philadelphia, notes that for decades, so many buildings have been constructed, without question, with foam plastic insulation in the cavity behind brick veneer.

“As the construction industry incorporated more and more drained cavity rain screen wall systems with veneers of metal panels, aluminum composite materials, terra cotta, etc., it was a natural transition to just keep using the foam plastic insulation in the cavity,” he says. “At the same time, code officials did not seem to be

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#### Learning Objectives

After reading this article, you should be able to:

1. Recognize the impact of NFPA 285 test requirements in the context of the International Building Code.
2. Apply the NFPA 285 components and parameters for successful test performance.
3. Identify combustible components in a noncombustible wall assembly that requires NFPA 285 testing.
4. Design building envelope systems that are NFPA 285 compliant.

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## 2012 IBC NFPA 285 Testing Requirements

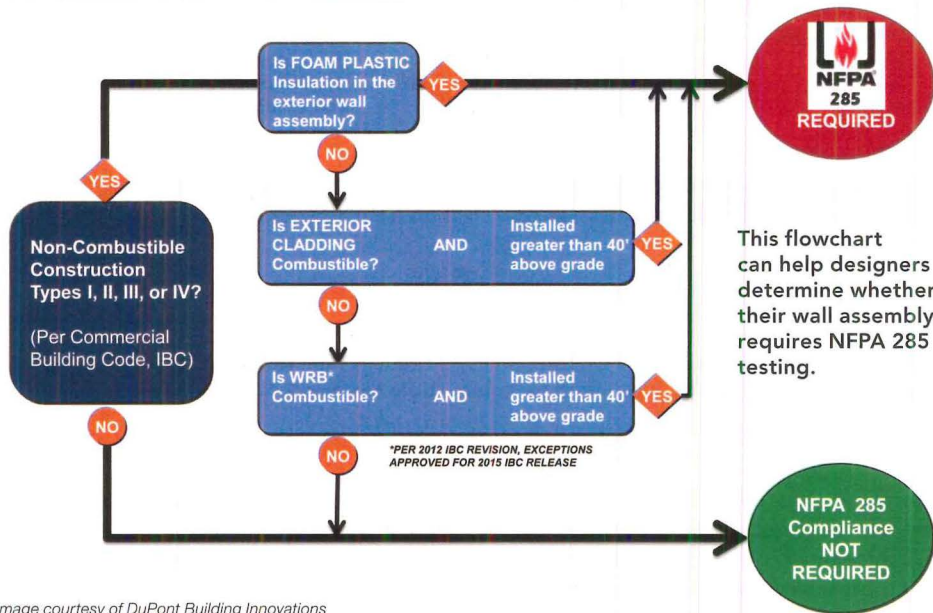


Image courtesy of DuPont Building Innovations

aware of the NFPA 285 requirements and weren't challenging architects. Now the industry is on a steep learning curve to catch up."

### PASSING NFPA 285

Of course, the first step in dealing with NFPA 285 is determining if, in fact, the specified assembly requires testing. For starters, the noncombustible components in the wall assembly—including the base wall structure, interior drywall, and exterior sheathing—are not test triggers, but they must be considered as part of the complete wall assembly. This is because the noncombustible members can influence the overall results by interacting with the combustible components in the test.

"The key thing to keep in mind is that the NFPA 285 test is not a material test. The intention of the test is to assess the fire performance of a specific wall assembly, as a system," explains Jason Martin, P.E., commercial building technical R&D leader, DuPont Building Innovations, Richmond, Virginia.

However, it's the foam plastic insulation on buildings of any height, other than construction type V, and air and water barriers and combustible claddings—EIFS, MCM, FRP, and HPL—on buildings taller than 40 feet above grade, which are categorized as construction types I-IV, that will subject an assembly to NFPA 285 testing.

Incidentally, it's important to note that the 2012 IBC also prescribes that these components meet the following ASTM requirements:

- ▶ Flame Spread Index  $\leq 25$  (ASTM E84)
- ▶ Smoke Development Index  $\leq 450$  (ASTM E84)
- ▶ Maintain assembly fire rating (ASTM E119/UL 263)

In terms of the NFPA 285 test itself, Vecchiarelli explains, "the intent of the test is to evaluate the fire propagation characteristics of exterior non-load-bearing wall assemblies. The two-story test involves two burners, one placed inside the first-story test room, and the other in a first-story window opening.

"The test runs for 35 minutes," she continues. "Test results include flame propagation measurements, thermocouple temperatures, and observations made during the test."

In order to pass the test, the wall assembly may not allow any flame propagation to the second-story room and none of the thermocouples, which are placed throughout the wall assembly, can exceed 1,000°F. Externally, the flames cannot propagate 10 feet above the top of the window, nor can they travel more than 5 feet laterally from the centerline of the window.

Some of the thermocouples are placed on the exterior wall surface, while others are positioned in the wall cavity air space or insulation, or both. Additional thermocouples are positioned in the insulation or the stud cavity, or both. As for the test specimen itself, the minimum height is 18 feet and the minimum width runs 13 feet, 4 inches.

### COMBUSTIBLE COMPONENTS IN A NONCOMBUSTIBLE WALL ASSEMBLY

While noncombustible cladding—including brick, masonry, stone, terra cotta, concrete,

## IBC CONSTRUCTION CATEGORIES

The International Building Code divides construction materials into five types as follows:

### Type V: Combustible Construction

Structural elements, exterior walls, and interior walls are made from any materials permitted by code. Wood-based framing and sheathing is common.

### Type IV: Heavy Timber Construction

Exterior walls consist of noncombustible materials and the interior building elements are solid or laminated wood without concealed spaces. Wood members have minimum dimensions for Heavy Timber classification.

### Type III: Noncombustible Exterior

Exterior walls are made from noncombustible materials and the interior building elements are constructed with any material permitted by code. Steel studs, fire-retardant-treated (FRT) wood framing, and gypsum sheathing are common.

### Type II: Noncombustible Exterior and Components

Exterior walls, floors, and roof are composed of noncombustible materials. Steel, masonry, and cementitious products are common.

### Type I: Noncombustible Materials and Structure

All exterior and structural components require fire-rated assemblies. Fire-protected steel and concrete assemblies are common.

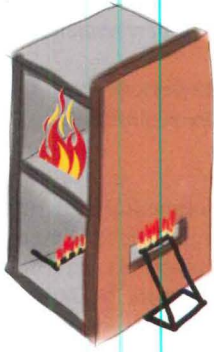
cementitious stucco, fiber cement boards and panels—do not alone trigger NFPA 285 testing, they are generally heavier, more expensive materials.

Taking a closer look at combustible cladding types, MCM cladding systems are available in open and closed joint systems and run between 3 millimeters and 25 millimeters in panel thickness. Factory bonded with a metal face and plastic core, the full system is made up of joints, a substructure, and an attachment mechanism. Because different manufacturers utilize different core materials, it's important to note that fire performance characteristics will vary. And even if the product looks the same as an NFPA 285-tested MCM and bears a similar product name, if a different core material is utilized, that specific product requires a separate NFPA 285 test within the wall assembly configuration.

Using MCM below 40 feet, while not triggering an NFPA 285 test, is limited to 10 percent of the wall area when the building



## NFPA 285 Fire Test Parameters



No flame propagation in second-floor room



Inside wall assembly, thermocouples shall not exceed 1,000°F during the 35-minute test.



Externally, flames shall not reach 10 feet above the window's top.

Externally, flames shall not reach 5 feet laterally from the window's centerline.

Images courtesy of DuPont Building Innovations

separation is less than 5 feet. MCM cladding use above 40 feet, but below 75 feet, may not require an NFPA 285 assembly test, depending on a complex assessment of: installation area, panel sizes, horizontal and vertical separations, presence of a whole-building sprinkler system, building separation distance, and whether the cladding self-ignites below 650°F, per ASTM D1929.

EIFS systems are regulated by the IBC under foam plastic requirements, and must meet ASTM E2568, which includes, but is not limited to: accelerated weathering, freeze/thaw, salt spray resistance, tensile bond adhesion, water penetration, and resistance testing.

Like EIFS, FRPs and MCMs with foam cores must also comply with IBC foam plastic requirements. When FRPs are installed in a condition not requiring an NFPA 285 assembly test, the cladding's flame spread index must be no more than 200, per ASTM E84, and prescribed cavity fireblocking is required. In this case, FRPs—which are composite materials made from reinforcing fibers impregnated with a polymer, molded into the desired shape and laminated onto a wood or plastic core—are limited to 10 percent of the surface area when the building separation is less than 10 feet.

HPLs also come as open and closed joint systems and run between 4 millimeters and 15 millimeters in panel thickness. In conditions not requiring an NFPA 285 assembly test, they are limited to a 10 percent area when the building separation is less than 5 feet, and similar to MCMs, the different core materials which different products are made from will have varying fire performance characteristics. HPLs are decorative exterior grade panels with cellulose fibrous material bonded with a thermosetting resin by a high-pressure process.

One noted exception for HPLs with regards to NFPA 285 is the cladding is allowed to rise up to 50 feet in areas of 300 square feet or less, per 4-foot vertical separation, and does not require NFPA 285 testing as long as the cladding doesn't self-ignite below 650°F, per ASTM D1929.

As for air and water barriers, referred to in the IBC as WRBs, generally all product types are considered combustible including: building wraps, self-adhered building wraps, self-adhered membranes, and fluid-applied membranes. Although the 2012 IBC does require that all WRBs go through testing, significant revisions and exceptions, based on material properties and fuel load potential, have been included in the 2015 IBC.

Because WRBs are a new NFPA 285 assembly test trigger in 2012, this means that the vast majority of products have not been tested. And although some manufacturers may claim that they have an NFPA 285 test report, buyer beware that the product may have only passed one test in one specific wall assembly configuration, which significantly limits designers.

It's also important to keep in mind that WRBs can be installed both under the insulation and over the insulation, and each positioning of the barrier requires a separate test.

For example, specifiers often choose to place the barrier under the insulation in order to increase the product's durability and longevity because it is protected by the foam. Also, in cases where the finish system is applied directly to the outside of the foam, the WRB must be located under the insulation. One other advantage to this approach is the specifier's ability to provide a drainage plane behind the foam for better moisture/condensation management.

On the other hand, some reasons why the architects may choose to install mechanically fastened building wraps over the exterior insulation are: ease of installation, lack of blind penetrations behind the insulation, and the protection of the insulation seams from air/water exposure. Also, when fluid-applied or self-adhered membrane products are installed on the exterior face of the continuous insulation, it is important that they have adequate adhesion to the surface of the insulation and that the insulation facer is sufficiently bonded to the insulation.

As mentioned, insulation levels in building enclosures have been steadily rising thanks to the green building movement and the energy codes. For example, in the 2012 IECC and ASHRAE 90.1 2012, the mandated use of continuous insulation (c.i.) increased for every climate zone. Insulation is considered continuous when it is installed on the exterior side of the base wall in order to reduce the effect of thermal bridging on the overall R-value of the wall assembly.

### ADDITIONAL TOPICS COVERED ONLINE

- ▶ Combustible Components in a Noncombustible Wall Assembly, *continued*
- ▶ Designing NFPA 285-Compliant Building Envelope Systems
- ▶ Designing Without NFPA 285
- ▶ A New Reality
- ▶ IBC Fire-Related Test and Reports

▶ Continues at [ce.architecturalrecord.com](http://ce.architecturalrecord.com)

*Barbara Horwitz-Bennett is a trade press journalist who regularly contributes to several publications in the design and construction industry. [www.BHBennett.com](http://www.BHBennett.com)*



DuPont Building Innovations brings dynamic science to the development of innovative products and services for commercial construction. DuPont helps architects and their teams determine the best air and water barrier solutions that meet the unique needs of their projects and increase the performance of building systems and create more sustainable structures. [www.weatherization.tyvek.com](http://www.weatherization.tyvek.com)

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CIRCLE 71

## Ongoing Exhibitions

### Traces of Peter Rice

London

Through April 5, 2013

Marking 20 years since his death, this exhibition at Arup Phase 2 focuses on structural engineer Peter Rice's contribution to five significant design projects: the Centre Pompidou and the Cité des Sciences et de l'Industrie, Paris; the Menil Collection, Houston; the Full-Moon Theatre, Gourgoubès; and a proposal for the Groningen Museum in the Netherlands in collaboration with artist Frank Stella. The

exhibition features prototypes, maquettes, drawings, paintings, photography, and a new documentary film. For more information, visit [arup.com](http://arup.com).

### The Way We Live: Iwan Baan

Los Angeles

Through April 13, 2013

Architecture photographer Iwan Baan's aerial image of a post-hurricane Manhattan became a viral sensation following its publication on the cover of *New York* magazine. This work will be a centerpiece in Baan's first exhibition with the Perry Rubenstein Gallery in Los Angeles.

Baan's artistic practice examines how we live and interact with architecture, focusing on the human element, which brings buildings, interiors, and public gathering places to life. For more information, visit [perryrubenstein.com](http://perryrubenstein.com).

### Deborah Berke: 2012 Berkeley-Rupp Professorship and Prize Exhibition

Berkeley, California

Through April 26, 2013

The College of Environmental Design at the University of California is hosting an exhibit by Deborah Berke, inaugural recipient of the Berkeley-Rupp Architecture Professorship and Prize. The exhibit partially recreates Berke's New York work space, while also serving as an active work environment for the architect. For more information, visit [ced.berkeley.edu](http://ced.berkeley.edu).

### White Cube, Green Maze: New Art Landscapes

New Haven, Connecticut

Through May 4, 2013

By examining emerging trends in museum design, this exhibition at the Yale School of Architecture presents six new art sites that share the common thread of moving beyond the traditional "white cube" gallery space and juxtaposing the experience of culture, art, architecture, and landscape. The exhibition features newly commissioned photography of these sites by Iwan Baan. The architects range from such established masters as Tadao Ando and Álvaro Siza Vieira, to such emerging practitioners as Tatiana Bilbao and Johnston Marklee. For more information, visit [architecture.yale.edu](http://architecture.yale.edu).

### Seismic Shifts: 10 Visionaries in Contemporary Art and Architecture

New York City

Through May 5, 2013

Artists and architects whose work challenges disciplinary boundaries and raises critical social, environmental, and political issues are recognized in this special exhibition at the National Academy. *Seismic Shifts* showcases seminal work by Nick Cave, Thornton Dial, Tom Friedman, Vik Muniz, Wangechi Mutu, Betye Saar, and Bill Viola, as well as recent projects by architects Greg Lynn, Kate Orff, and Moshe Safdie. For more information, visit [nationalacademy.org](http://nationalacademy.org).

### Voices of Design: 25 Years of Architalx

Portland, Maine

Through May 19, 2013

This interactive exhibition at the Portland Museum of Art celebrates the 25th anniversary of Architalx, a nonprofit organization that hosts talks and other educational programming

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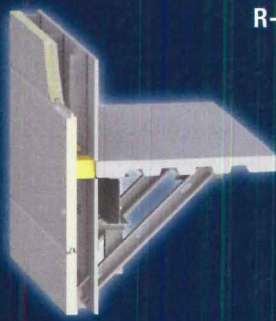
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#### **Lebbeus Woods, Architect**

San Francisco  
Through June 2, 2013  
This exhibition at the San Francisco Museum of Modern Art brings together 75 works from the past 35 years by one of the most influential architects working in the field. Recognized beyond architecture, Woods (1940–2012) has been hailed by leading designers, filmmakers, writers, and artists alike as a significant voice in recent decades. His works resonate across many disciplines for their conceptual potency, imaginative breadth, jarring poetry, and ethical depth. For more information, visit [sfmoma.org](http://sfmoma.org).

#### **Green Schools**

Washington, D.C.  
Through January 5, 2014  
The National Building Museum is hosting the first-ever museum exhibition dedicated to the greening of American schools. Featuring more than 40 exemplary projects from new construction to rehabs to modular classrooms, the exhibition will survey the breadth of green school design in the United States through sample building materials, photographs, video, and green products. For more information, visit [nbm.org](http://nbm.org).

### **Lectures, Conferences, and Symposia**

#### **Sharjah Biennial 11**

Sharjah, United Arab Emirates  
March 13–May 13, 2013  
For Sharjah Biennial 11, curator Yuko Hasegawa has solicited a selection of artworks that reassess the Western-centrism of knowledge in modern times. A selection of architects and cultural practitioners from Lebanon, India, Belgium, Japan, Spain, and elsewhere have

been asked to create temporary architectural interventions that connect Sharjah's historic area and its courtyard typology with the larger city. For more information, visit [sharjahart.org](http://sharjahart.org).

#### **Public Interest Design Week Minneapolis**

March 19–24, 2013  
The College of Design at the University of Minnesota and [PublicInterestDesign.org](http://PublicInterestDesign.org) are hosting the first Public Interest Design Week. Public-interest design lies at the intersection of design and public service and aims to help people live better lives, regardless of their socioeconomic background. Speakers include *New York Times* architecture critic Michael Kimmelman, D-Rev: Design Revolution CEO Krista Donaldson, and filmmakers Richard Neill and Lee Schneider. For more information, visit [design.umn.edu](http://design.umn.edu).

#### **International Design Festival**

Washington, D.C.  
Through May 19, 2013  
What makes an object useful, engaging, and beautiful? What is it about a distinct design that conveys calm, wonder, and excitement in the user and helps us recall a moment in time? This free, three-month-long multidisciplinary celebration of design at Artisphere features *The Next Wave: Industrial Design Innovation in the 21st Century*, a 4,000-square-foot exhibition exploring innovation in product design from Spain, Italy, Belgium, the U.K., Scandinavia, and the United States over the last 13 years. For more information, visit [artisphere.com](http://artisphere.com).

### **Competitions**

#### **International Research Seed Funding Initiative**

Submission Deadline: March 31, 2013  
The Council on Tall Buildings and Urban Habitat is awarding \$20,000 in seed funding for research that pertains to tall buildings and/or urban habitats. Proposals can cover any topic/discipline, including architecture, construction,



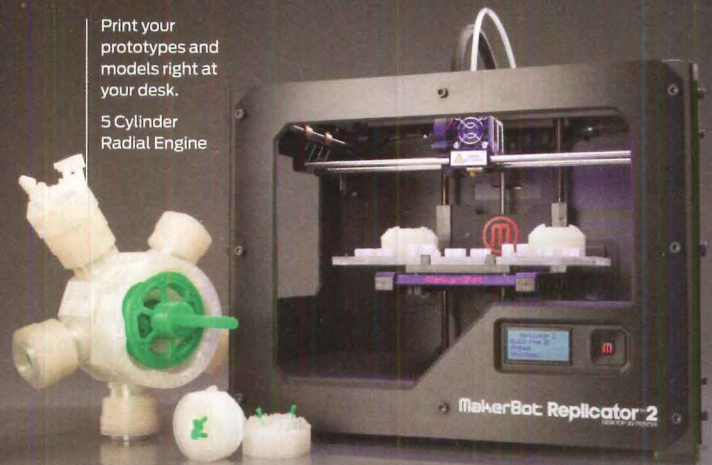
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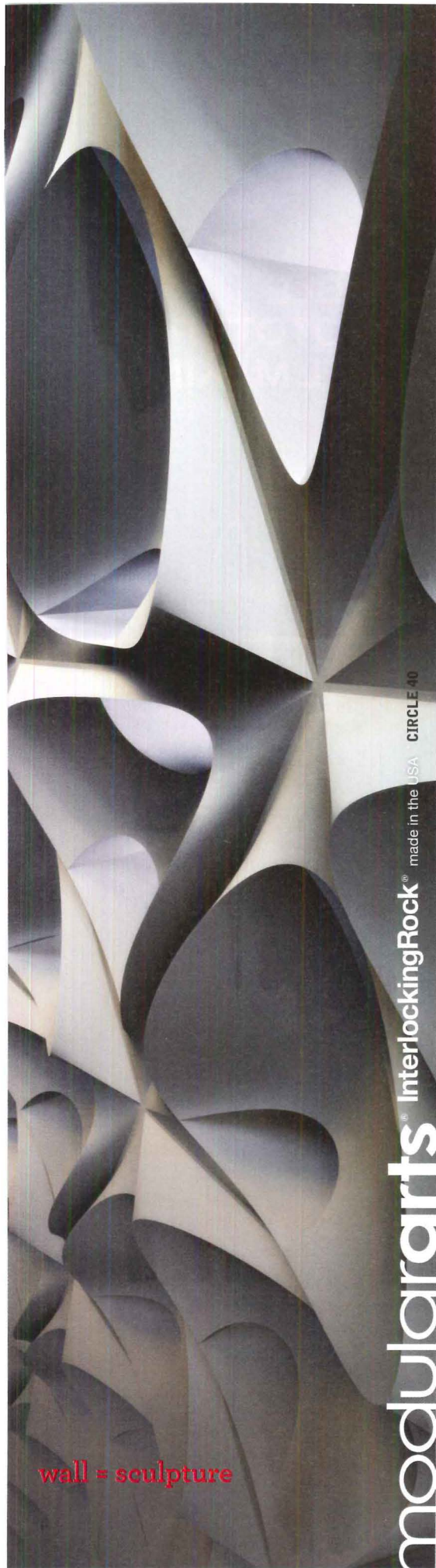
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## dates&events

engineering, energy issues, and urban planning. Applicants must be affiliated with a research institution. For more information, visit [ctbuh.org](http://ctbuh.org).

### Interface Reconnect Your Space Competition

*Submission Deadline: April 1, 2013*

Interface's Reconnect Your Space competition invites architects, designers, and students of these disciplines to submit their visions for how biophilia can influence the design of a new or existing space, either inside within built environments or outside in cities. Entrants must upload an image (sketch, drawing, or rendering) of their vision and a written description in 500 words or fewer. For more information, visit [interfacereconnect.com](http://interfacereconnect.com).

### I-Park 2013 Architects-in-Residence Program

*Application Deadline: April 1, 2013*

The I-Park Foundation, Inc., located in East Haddam, CT, is offering a multidisciplinary artists-in-residence program for architects. The program is designed for those looking to expand and enrich their creative practice in a retreatlike, collegial setting—in the company of visual artists, composers, writers, and landscape/garden designers. Self-directed residencies will be offered from May through November 2013, and most residencies last four weeks. For more information, visit [i-park.org](http://i-park.org).

### Bentley System's 2013 Design Competition

*Submission Deadline: April 5, 2013*

University, college, high school, and technical-school students must submit projects designed using Bentley software, along with a short essay describing their work. Project submissions will be judged by an independent panel of educators and industry professionals from around the world. The judges will assess creativity and skill in applying design and engineering principles. For more information, visit [bentley.com](http://bentley.com).

### Public Space for Urban Art and Sound

*Registration Deadline: April 30, 2013*

This competition organized by Opengap seeks innovative, cutting-edge proposals for a new kind of public space to house street art. Applicants may choose the site of their project, but they must address the issue of artistic expression in an urban context. Submissions can be made individually or in teams of up to five people, and the competition is open to all architects, designers, architecture students, and others interested in the topic. For more information, visit [opengap.net](http://opengap.net).

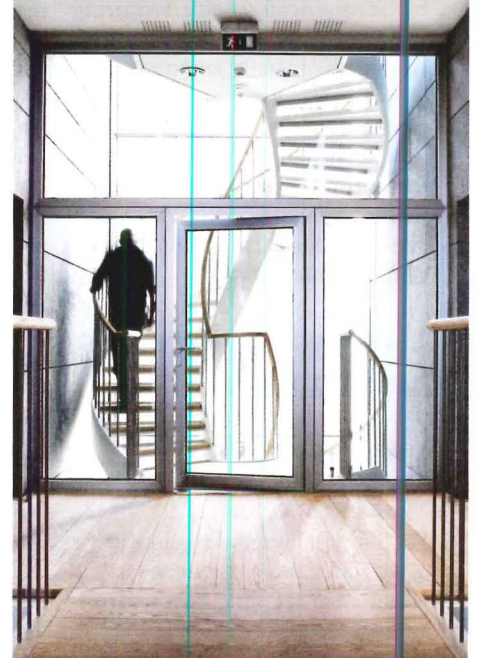
E-mail information two months in advance to [recordevents@mcgraw-hill.com](mailto:recordevents@mcgraw-hill.com).

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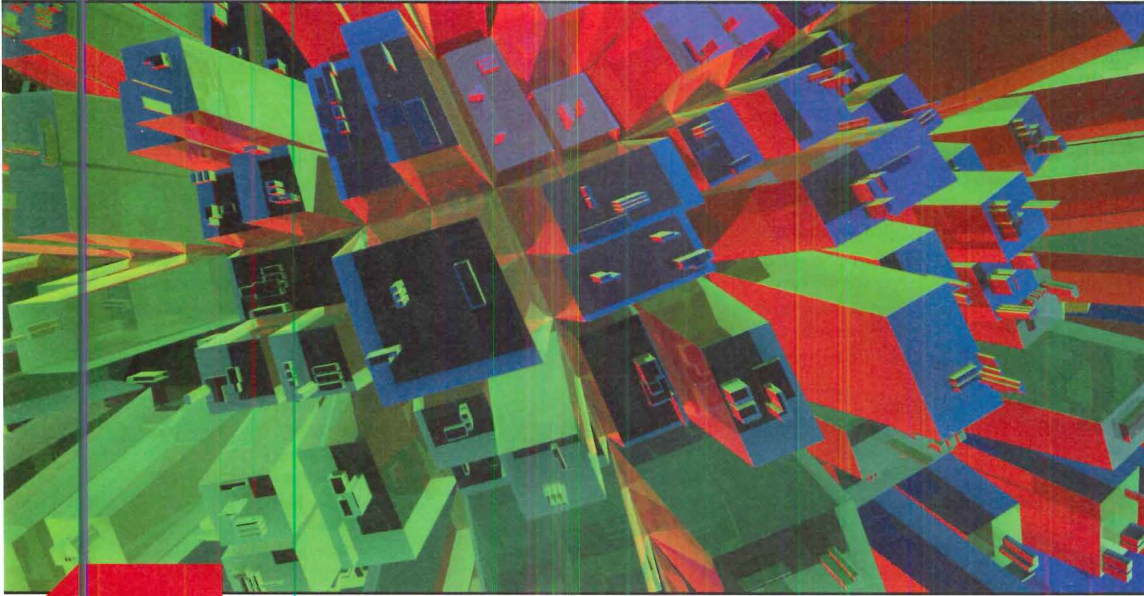


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83	AISC <a href="http://aisc.org">aisc.org</a>	72	90	Florida Tile <a href="http://floridatile.com">floridatile.com</a>	43	33	Metl-Span <a href="http://metlspan.com/hpci">metlspan.com/hpci</a>	54
89	Alcoa Architectural Products <a href="http://reynobond.com/DesignLine">reynobond.com/DesignLine</a>	48	94	Focal Point143		40	modularArts <a href="http://modulararts.com">modulararts.com</a>	186
39	ALPOLIC/Mitsubishi Plastics Composites America, Inc. <a href="http://alpolic-northamerica.com/case-studies">alpolic-northamerica.com/case-studies</a>	80	65	Forms+Surfaces <a href="http://forms-surfaces.com">forms-surfaces.com</a>	25		National Building Museum <a href="http://nbmshop.org">nbmshop.org</a>	161
88	Aluflam USA <a href="http://aluflam-usa.com">aluflam-usa.com</a>	186	61	Georgia-Pacific Gypsum LLC <a href="http://densglass.com">densglass.com</a>	33	37	NCCRC <a href="http://norcalcarpenters.org">norcalcarpenters.org</a>	148
	American Architectural Foundation <a href="http://archfoundation.org">archfoundation.org</a>	147	96	GKD-USA, Inc. <a href="http://gkdmetailfabrics.com">gkdmetailfabrics.com</a>	69	34	Nichiha USA, Inc. <a href="http://nichiha.com/projectgallery">nichiha.com/projectgallery</a>	65
	Architectural Record	154	23	Glen-Gery Brick <a href="http://glengerybrick.com">glengerybrick.com</a>	63	86	Oldcastle BuildingEnvelope® <a href="http://oldcastlebe.com">oldcastlebe.com</a>	2-3
	Continuing Education App <a href="http://archrecord.com">archrecord.com</a>		52	Gordon Incorporated <a href="http://gordon-inc.com">gordon-inc.com</a>	129	27	Oldcastle® Architectural <a href="http://oldcastleapq.com/ceubim.html">oldcastleapq.com/ceubim.html</a>	16
81	Armstrong <a href="http://armstrong.com/radial">armstrong.com/radial</a>	cv2-1	55	Guardian Industries Corp. <a href="http://sunguardglass.com">sunguardglass.com</a>	53	18	Ornamental Metal Institute of New York <a href="http://ominy.org">ominy.org</a>	12
82	Armstrong <a href="http://armstrong.com/striations">armstrong.com/striations</a>	130	59	Harmonic Environments <a href="http://HarmonicEnvironments.com">HarmonicEnvironments.com</a>	128	31	Parklex <a href="http://parklex.com">parklex.com</a>	73
79	Autodesk <a href="http://autodesk.com">autodesk.com</a>	76-77	56	Holcim <a href="http://holcim.us">holcim.us</a>	75	29	Petersen Aluminum <a href="http://pac-clad.com">pac-clad.com</a>	42
73	BEGA <a href="http://bega-us.com">bega-us.com</a>	10	53	Horton Automatics <a href="http://hortondoors.com">hortondoors.com</a>	126	25	PPG IdeaScapes <a href="http://PPGIdeaScapes.com/SBr100">PPGIdeaScapes.com/SBr100</a>	8-9
76	Belden Brick <a href="http://beldenbrick.com">beldenbrick.com</a>	28	68	Huber Engineered Woods <a href="http://ZIPSystem.com/record2">ZIPSystem.com/record2</a>	170		Regenerative Network <a href="http://regen-net.com">regen-net.com</a>	1-10
78	Bluebeam Software, Inc. <a href="http://bluebeam.com/newview">bluebeam.com/newview</a>	17	60	Huber Engineered Woods <a href="http://huberarchitectlibrary.com">huberarchitectlibrary.com</a>	171-175	30	Rocky Mountain Hardware <a href="http://rockymountainhardware.com">rockymountainhardware.com</a>	13
80	Bobrick Washroom Equipment, Inc. <a href="http://bobrick.com">bobrick.com</a>	35	54	Huntco Supply LLC <a href="http://huntco.com">huntco.com</a>	149	26	Roxul Inc. <a href="http://roxul.com">roxul.com</a>	1-6
85	Bradley Corporation <a href="http://bradleycorp.com">bradleycorp.com</a>	30	12	Hunter Douglas Contract <a href="http://HunterDouglasContract.com/RB500">HunterDouglasContract.com/RB500</a>	6-7	28	Rulon International <a href="http://rulonco.com">rulonco.com</a>	71
58	C.R. Laurence Company <a href="http://crlaurence.com">crlaurence.com</a>	58	14	Hunter Douglas Contract <a href="http://HunterDouglasContract/Woodwright">HunterDouglasContract/Woodwright</a>	156	24	SAFTI/FIRST Fire Rated Glazing Solutions <a href="http://safti.com/ar">safti.com/ar</a>	23
74	Cascade Coil Drapery <a href="http://cascadecoil.com">cascadecoil.com</a>	191	51	Hunter Douglas Contract <a href="http://hunterdouglascontract.com">hunterdouglascontract.com</a>	157-160	17	Sage <a href="http://sageglass.com">sageglass.com</a>	4-5
77	CENTRIA <a href="http://CENTRIA.com/reimaginemetal">CENTRIA.com/reimaginemetal</a>	61	50	Icynene Inc. <a href="http://icynene.com">icynene.com</a>	29	19	Skyline Design <a href="http://skydesign.com">skydesign.com</a>	34
75	CertainTeed Saint-Gobain <a href="http://certainteed.com/Ceilings">certainteed.com/Ceilings</a>	cv3	43	Invisible Structures Inc. <a href="http://invisiblestructures.com">invisiblestructures.com</a>	191		Skyscraper Museum, The <a href="http://skyscraper.org">skyscraper.org</a>	1-11
70	Construction Specialties Acrovyn 4000 <a href="http://transparency.c-sgroup.com">transparency.c-sgroup.com</a>	37	46	Johnsonite, A Tarkett Company <a href="http://johnsonite.com">johnsonite.com</a>	47	84	SlipNOT® <a href="http://slipnot.com">slipnot.com</a>	1-2-165
72	Construction Specialties Acrovyn Door <a href="http://c-sgroup.com/door">c-sgroup.com/door</a>	39	87	Kawneer <a href="http://kawneer.com">kawneer.com</a>	45		SNAP <a href="http://sweets.com">sweets.com</a>	1-4
69	Cosella-Dörken Products, Inc. <a href="http://delta-ventsa.com">delta-ventsa.com</a>	74	49	Klein USA, Inc. <a href="http://klein-usa.com">klein-usa.com</a>	176-179	21	Softwood Lumber <a href="http://rethinkwood.com">rethinkwood.com</a>	15
	Dodge International <a href="http://DodgeNetworkInternational.com">DodgeNetworkInternational.com</a>	192-193	47	Lamin-Art <a href="http://laminart.com">laminart.com</a>	50	22	Sound Solutions <a href="http://soundsolutions.ca">soundsolutions.ca</a>	56
62	DORMA Americas <a href="http://dorma-usa.com">dorma-usa.com</a>	151	44	Landscape Forms <a href="http://landscapeforms.com">landscapeforms.com</a>	40		Sweets Mobile App	1-10
66	Doug Mockett & Company, Inc. <a href="http://mockett.com">mockett.com</a>	32	48	Louis Poulsen <a href="http://louispoulsen.com">louispoulsen.com</a>	57	92	TAKTL <a href="http://taktl-lic.com">taktl-lic.com</a>	66
64	Dri-Design <a href="http://dri-design.com">dri-design.com</a>	11	45	Lutron <a href="http://lutron.com">lutron.com</a>	cv4	93	Technical Glass Products <a href="http://tgpamerica.com">tgpamerica.com</a>	13-19
71	DuPont Building Innovations <a href="http://weatherization.tyvek.com">weatherization.tyvek.com</a>	180-183	42	MakerBot <a href="http://makerbot.com/ar">makerbot.com/ar</a>	185	91	ThyssenKrupp Elevator Corporation <a href="http://thyssenkruppelevator.com">thyssenkruppelevator.com</a>	125
20	Duravit <a href="http://duravit.us">duravit.us</a>	27	32	Marvin Windows & Doors <a href="http://pros.marvin.com/inspired">pros.marvin.com/inspired</a>	149	16	Tile of Spain <a href="http://tilesofspainusa.com">tilesofspainusa.com</a>	14
95	E. Dillon & Company <a href="http://edillon.com">edillon.com</a>	20	35	MBCI <a href="http://mbci.com">mbci.com</a>	127	98	VT Industries, Inc. <a href="http://vtindustries.com">vtindustries.com</a>	162-163
63	Easi-Set Industries <a href="http://slenderwall.com">slenderwall.com</a>	26	57	McNichols Co. <a href="http://mcnichols.com">mcnichols.com</a>	64	15	Western Red Cedar Lumber Association <a href="http://wrcla.org">wrcla.org</a>	73-79
67	Engineered Lighting Products <a href="http://elighting.com">elighting.com</a>	151	41	MechoSystems <a href="http://mechosystems.com">mechosystems.com</a>	55			
	ENR FutureTech Conference <a href="http://enrfuturetech.com">enrfuturetech.com</a>	187	38	MechoSystems <a href="http://mechosystems.com/automation">mechosystems.com/automation</a>	166-169			

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Circle 150

### DOORS, WINDOWS

#### DOOR CLOSER WITH HIDDEN BENEFITS

S\$

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- Godolphin and Latymer School

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www.perkopower.com  
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Circle 151

### INTERIOR FINISHES, FURNISHINGS

#### DESIGN HEALTHIER SPACES

S\$ | G | NEW

##### CertainTeed Ceilings

VOC Compliant Symphony® ceilings let you create a healthier, more sustainable environment and are third-party tested for emissions compliance.

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- Offices
- Healthcare

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Intex Expo Booth #501

Circle 152

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#### LINEAR DRAIN SYSTEMS

WR

##### Infinity Drain

Infinity Drain's Site Sizeable linear drain systems are ideal for zero-threshold showers.

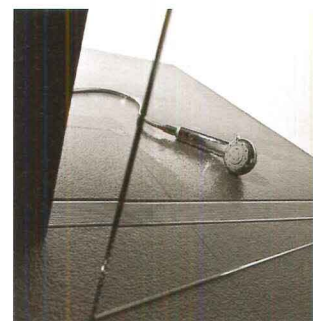
##### Product Application:

- Adjust the length and outlet placement on-site for a perfect wall-to-wall installation
- Works with any type of waterproofing
- Suited for both residential and hospitality and healthcare

##### Performance Data:

- Add outlets on-site to increase drain capacity
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www.InfinityDrain.com  
516.767.6786 | Contact: info@InfinityDrain.com



ICFF Booth #1339

Circle 153

### ROOFING, SIDING, THERMAL & MOISTURE PROTECTION

#### METAL ROOFING—LOW-SLOPE APPLICATION

S\$ | G

##### Petersen Aluminum Corporation

TITE-LOC Panels combine structural panel performance with architectural aesthetics, corrective leveled to provide superior flatness. A factory-applied sealant bead gives added weather resistance.

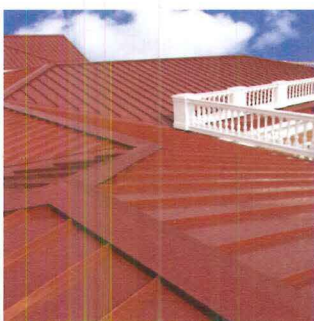
##### Product Application:

Ruffner Hall, Longwood University, Farmville, VA; Gaylord Texan, Grapevine, TX; East Grand Rapids Community Center, East Grand Rapids, MI

##### Performance Data:

Concealed-fastener floating clip system designed to allow for thermal expansion/contraction

www.pac-clad.com  
800.PAC.CLAD | Contact: Blake Batkoff



Circle 154

### SPECIALTY PRODUCTS

#### RAILING INFILL CABLES

WR | G

##### Feeney, Inc. (CableRail®)

CableRail® stainless steel cables enhance any railing: durable, aesthetic, easy to install, low maintenance, 70% recycled content, and beautifully unobtrusive.

##### Product Application:

- Railings, fences, trellises
- Residential, commercial, institutional, industrial
- Interiors and exteriors

##### Performance Data:

- Wide selection of cable and hardware options
- Weather-tough 316-grade stainless steel

www.feeney10.com  
800.888.2418 | Contact: Andrew Penny



Circle 155

### SPECIALTY PRODUCTS

#### FALL PROTECTION, STAIRS

S

##### Wooster Products, Inc.

Anti-slip stair nosings and treads.

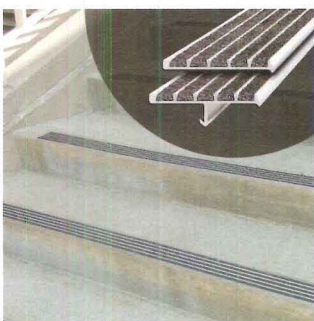
##### Product Application:

- Prevent slips and falls
- Photoluminescent materials
- Anti-slip stair products

##### Performance Data:

Meets ADA, OSHA, IBC, and IFC requirements  
Long lasting, high quality

www.wooster-products.com  
800.321.4936 | Contact: Sales



National Concrete Show

Circle 156

### SPECIALTY PRODUCTS

#### DOOR CANOPIES

WR

##### Feeney, Inc. (Lightline®)

Lightline® door canopy kits with acrylic visor panes, stainless steel support arms, integrated aluminum rain gutters, and patented Click-Lock installation feature.

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- Protects doorways, entrance areas, windows, and walkways

##### Performance Data:

- Variety of styles, sizes, and finishes
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www.feeney6.com  
800.888.2418 | Contact: Andrew Penny



Circle 157

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CIRCLE 74

# The Woolworth Building @ 100

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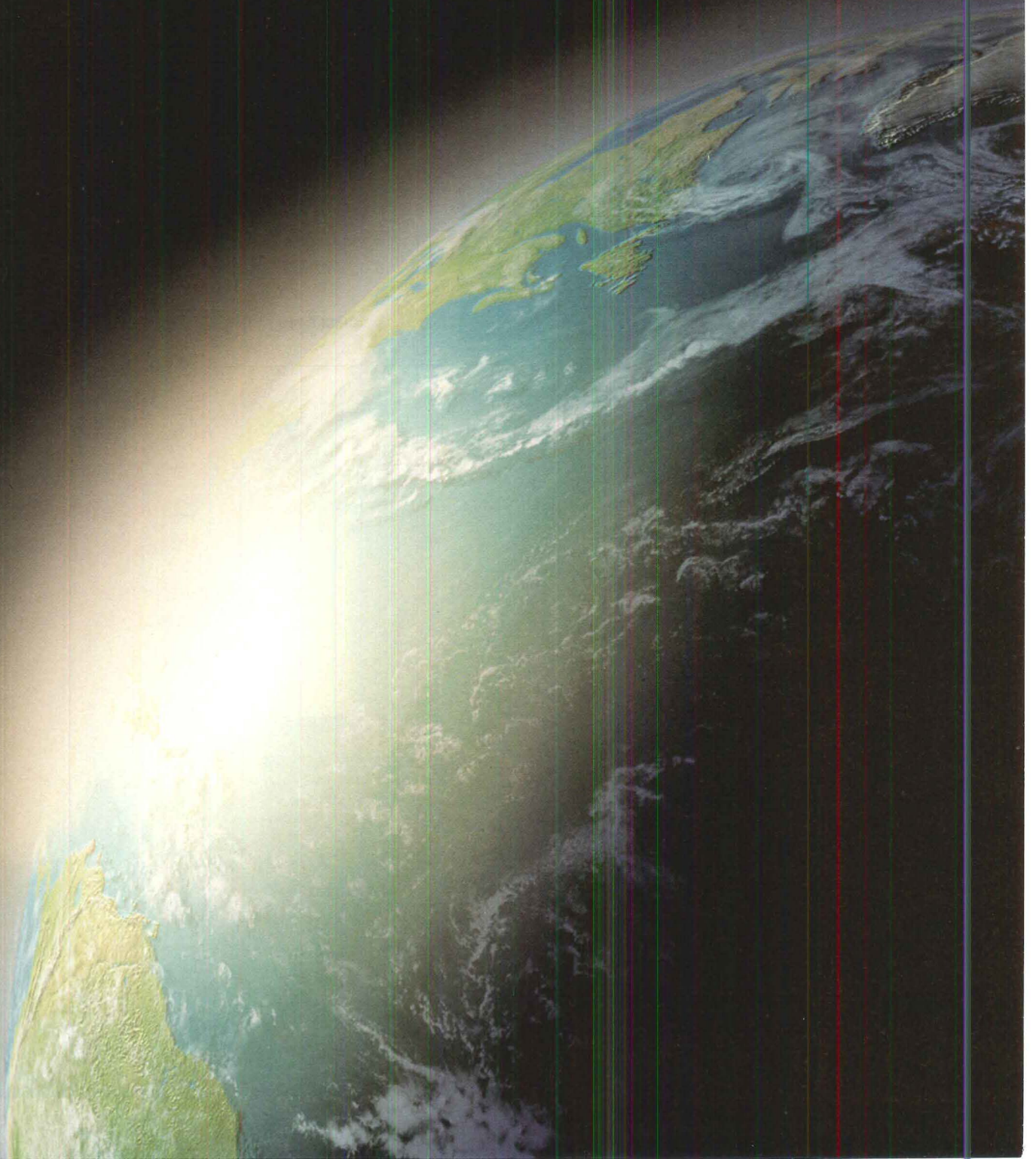
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Image: Library of Congress

# Dodge



# Territory

Introducing

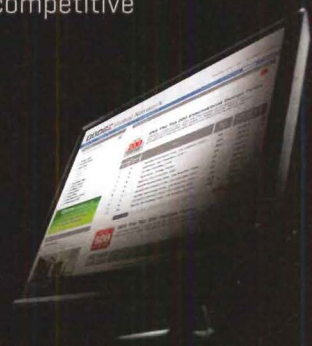
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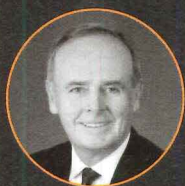
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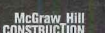
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PROJECT HOME-FOR-ALL  
 LOCATION RIKUZENTAKATA, JAPAN  
 DESIGNERS TOYO ITO, KUMIKO INUI,  
 SOU FUJIMOTO, AKIHISA HIRATA

**IN THE** wake of the massive earthquake and tsunami that devastated the eastern coast of Japan two years ago this month, the small town of Rikuzentakata has looked to the ruins for renewal. Led by Toyo Ito, a team of young Japanese designers has created a modest community center out of the wreckage using saltwater-soaked trees wiped out in the storm. For months volunteers came daily to help build the project, using the wood columns as structural supports. The town, which lost an estimated 1,800 residents and where 5,000 still live in temporary housing, has been vocal about perceived government inertia that continues on the second anniversary of the disaster. The Home-for-All project has become a beacon for the community, where the pangs of the storm remain sharp. Wrapped with wood balconies and raised on stilts, the structure looks out to the detritus and stalled construction beyond. *Laura Mirviss*





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CIRCLE 75

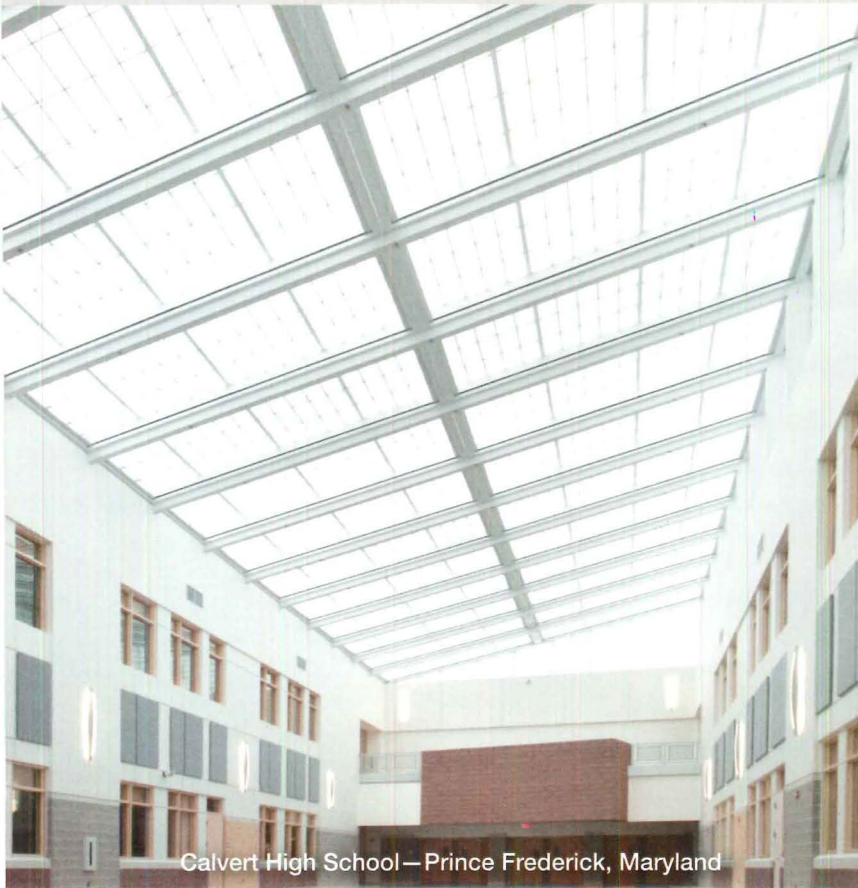
# Redefine what's possible with Lutron shading solutions

## Challenge

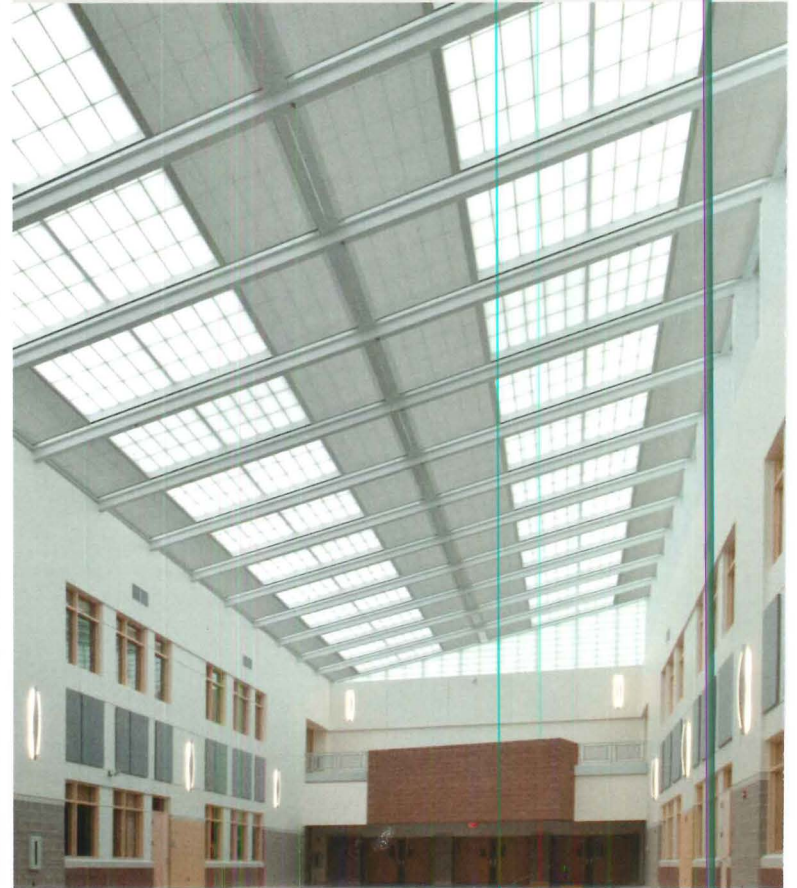
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## Solution

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## To meet the needs of this unique space:

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"It's awe-inspiring. When the shades move, you completely change the experience of the space."

Ran Ilkovitch, NCARB, AIA  
Principal, Smolen Emr Ilkovitch Architects

