McGRAW HILL

ARCHITECTURAL RECORD

SCHOOLS OF THE 21ST CENTURY

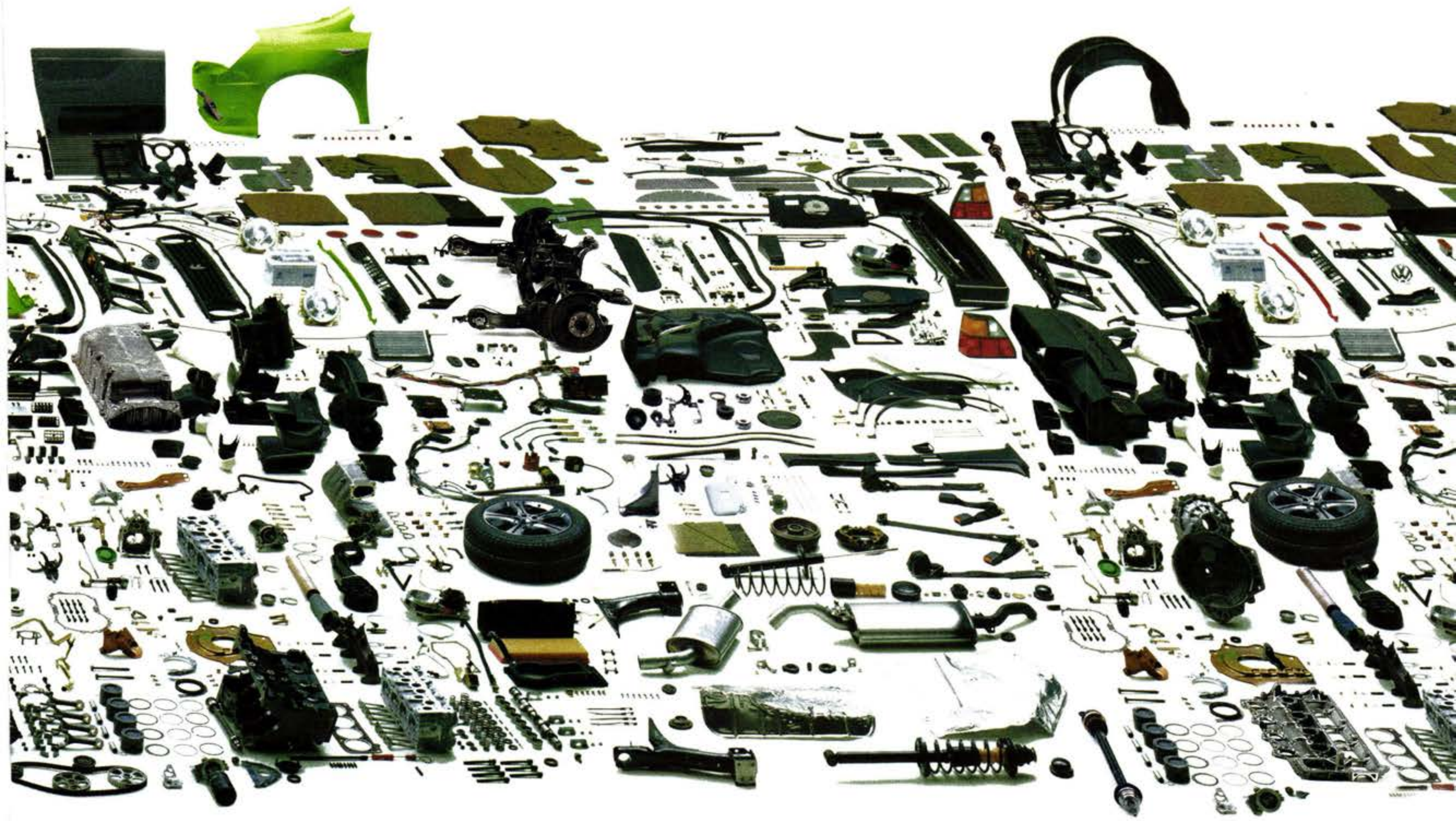
- STUDIO GANG'S CHICAGO BOATHOUSE
- H3'S BROOKLYN THEATER
- ROJKIND'S MEXICO CITY CINETECA

Still buying building

Only one company can provide fully-integrated building envelopes.

An automobile is a complex machine made up of thousands of parts. You would never order an automobile one part at a time, so why specify a building envelope that way? We are the only manufacturer that designs, engineers, tests and manufactures curtain wall, windows, storefronts, skylights and glass seamlessly from one source. So let's build better, faster, with less risk, more reward—we're The Building Envelope Company.™ Call 1-866-Oldcastle (653-2278) or visit oldcastlebe.com.

CIRCLE 49




PRITCHETT
PRITCHETT

ARCHITECTURAL RECORD

ARCHITECTURAL RECORD: (ISSN 0003-858X) January 2014. Vol. 202, No. 1. Published monthly by McGraw Hill Financial, 1221 Avenue of the Americas, New York, NY 10020. **FOUNDER:** James H. McGraw (1860-1948). Periodicals postage paid at New York, NY, and additional mailing offices. Canada Post International Publications Mail Product Sales Agreement No. 40012501. E-mail: arhcustserv@cdsfulfillment.com. Registered for GST as McGraw Hill Financial. GST No. R123075673. **POSTMASTER:** *Please send address changes to* ARCHITECTURAL RECORD, Fulfillment Manager, P.O. Box 5732, Harlan, IA 51593. **SUBSCRIPTION:** Rates are as follows: U.S. and Possessions $72.00; Canada and Mexico $79 (payment in U.S. currency, GST included); outside North America $199 (air freight delivery). Single copy price $9.95; for foreign $11. Subscriber Services: 877/876-8093 (U.S. only); 515/237-3681 (outside the U.S.); fax: 712/755-7423. **SUBMISSIONS:** Every effort will be made to return material submitted for possible publication (if accompanied by stamped, self-addressed envelope), but the editors and the corporation will not be responsible for loss or damage. **SUBSCRIPTION LIST USAGE:** Advertisers may use our list to mail information to readers. To be excluded from such mailings, send a request to ARCHITECTURAL RECORD, Mailing List Manager, P.O. Box 555, Hightstown, NJ 08520. **OFFICERS OF MCGRAW HILL FINANCIAL, INC.:** Harold W. McGraw III, Chairman, *President and Chief Executive Officer*; Kenneth M. Vittor, *Executive Vice President and General Counsel*; Robert J. Bahash, *Executive Vice President and Chief Financial Officer*; Elizabeth O'Melia, *Senior Vice President, Treasury Operations.*

EDITORIAL OFFICES: 212/904-6229. Editorial fax: 212/904-4256. E-mail: *monique.francis@mhfi.com.* Two Penn Plaza, New York, NY 10121-2298. **WEBSITE:** ArchitecturalRecord.com.

McGRAW HILL CONSTRUCTION
McGRAW HILL FINANCIAL
ABC
MPA

PRINTED IN USA

ARCHITECTURAL
RECORD

VICE PRESIDENT, PUBLISHER	Laura Viscusi, *laura.viscusi@mhfi.com*
SENIOR DIRECTOR, MEDIA OPERATIONS	Brenda Griffin, *brenda.griffin@mhfi.com*
SENIOR DIRECTOR, HEAD OF MARKETING	William Taylor, *william.taylor@mhfi.com*
PRODUCTION MANAGER	Marilyn DeMilta, *marilyn.demilta@mhfi.com*
MANAGER, MARKETING COMMUNICATIONS	Michael Nass, *michael.nass@mhfi.com*
FINANCE DIRECTOR	Ike Chong, *ike.chong@mhfi.com*
FINANCE MANAGER	Tom Maley, *tom.maley@mhfi.com*
ASSISTANT TO MEDIA DEPARTMENT	Pina Del Genio, *pina.delgenio@mhfi.com*

ADVERTISING SALES

NEW ENGLAND AND PA: Joseph Sosnowski
(610) 278-7829 Fax: (610) 278-0936, *joseph.sosnowski@mhfi.com*
SOUTHEAST/MID-ATLANTIC: Susan Shepherd
(859) 987-9913 Fax: (404) 252-4056, *susan.shepherd@mhfi.com*
MIDWEST (IA, IL, MN, MO, WI): Martin McClellan
(312) 233-7402 Fax: (312) 233-7430, *martin.mcclellan@mhfi.com*
MIDWEST (IN, MI, OH, EASTERN CANADA): Lisa Zurick
(513) 345-8210 Fax: (513) 345-8250, *lisa.zurick@mhfi.com*
NORTHWEST: Bill Madden
(503) 557-9000 Fax: (503) 557-9002, *bill.madden@mhfi.com*
PACIFIC/TEXAS: Sherylen Yoak
(760) 568-0465 Fax: (720) 559-9818, *sherylen.yoak@mhfi.com*
KS, NE, ND, NY, SD: Risa Serin
(212) 904-6041 Fax: (212) 904-4652, *risa.serin@mhfi.com*

SPOTLIGHT SALES: Risa Serin
(212) 904-6041 Fax: (212) 904-4652, *risa.serin@mhfi.com*
WORKFORCE/ RECRUITMENT: Diane Soister
(212) 904-2021 Fax: (212) 904-2074, *diane.soister@mhfi.com*

INTERNATIONAL

GERMANY: Uwe Riemeyer
(49) 202-27169-0 Fax: (49) 202-27169-20, *riemeyer@intermediapartners.de*
ITALY: Ferruccio Silvera
(39) 022-846716 Fax: (39) 022-893849, *ferruccio@silvera.it*
JAPAN: Katsuhiro Ishii
(03) 5691-3335 Fax: (03) 5691-3336, *amkatsu@dream.com*
KOREA: Young-Seoh Chin
(822) 481-3411/3 Fax: (822) 481-3414

MCGRAW HILL CONSTRUCTION

PRESIDENT	Keith Fox
VICE PRESIDENT, OPERATIONS	Linda Brennan, *linda.brennan@mhfi.com*
VICE PRESIDENT, MHC PRODUCT DEVELOPMENT	Kathryn E. Cassino, *kate.cassino@mhfi.com*
VICE PRESIDENT, TECHNOLOGY	Isaac Sacolick, *isaac.sacolick@mhfi.com*
VICE PRESIDENT, FINANCE	John Murphy, *john.murphy@mhfi.com*

WEBSITE: ArchitecturalRecord.com. **SUBSCRIBER SERVICE:** 877/876-8093 (U.S. only); 515/237-3681 (outside the U.S.). Subscriber fax: 712/755-7423. E-mail: *arhcustserv@cdsfulfillment.com.* If the Post Office alerts us that your magazine is undeliverable, we have no further obligation unless we receive a corrected address within one year. **INQUIRIES AND SUBMISSIONS:** Letters, Beth Broome; Practice, Suzanne Stephens; Books, Clifford A. Pearson; Products, Sheila Kim; Lighting and Interiors, Linda C. Lentz; Residential, Laura Raskin; Architectural Technology, Joann Gonchar; Web Editorial, William Hanley. **REPRINT:** *architecturalrecord@theygsgroup.com.* **BACK ISSUES:** Call 877/876-8093, or go to *archrecord.com/backissues.*

McGRAW HILL CONSTRUCTION
McGRAW HILL FINANCIAL

ABC

MPA

PRINTED IN USA


if you can imagine it, you can
create it.
sunbrella
COMMERCIAL
The versatility of Sunbrella® fabric opens new opportunities to let your imagination roam.
To be further inspired go to **futureofshade.com**.
CIRCLE 70

ARCHITECTURAL RECORD

01 2014

NEWS

DEPARTMENTS

PROJECTS: ARTS AND RECREATION

BUILDING TYPES STUDY 942
SCHOOLS OF THE 21ST CENTURY

ARCHITECTURAL TECHNOLOGY

THIS PAGE: WMS BOATHOUSE AT CLARK PARK, BY STUDIO GANG ARCHITECTS. PHOTO BY STEVE HALL/HEDRICH BLESSING

ON THE COVER: HUNTER'S POINT CAMPUS, BY FXFOWLE. PHOTO BY DAVID SUNDBERG/ESTO

See expanded coverage of Projects and Building Types Studies as well as web-only features at architecturalrecord.com.

This symbol denotes that enhanced content is available in our iPad edition.

Visit us at facebook.com/architecturalrecord

Follow us on Twitter at @archrecord

LEARN & EARN

Earn all your continuing education credits free online or at Architectural Record's Continuing Education App!*

IN THIS ISSUE

Photo courtesy of VS America, Inc.

School Standards and Designs Advance

Credit: 1 HSW

Sponsored by AGC Glass Company North America, Bonded Logic, CENTRIA, ClimateMaster, ELP, Guardian Industries Corp., Miele Professional, The National Terrazzo & Mosaic Association, Inc., Nichiha USA, Inc., *Slip*NOT® Metal Safety Flooring, Space Plus, VS America, Inc., and Wenger Corporation

Page 146

Photo by David Lena; courtesy of HMC Architects

Wood Scores A+ for Schools & Student Housing

Credit: 1 HSW, 1 GBCI CE Hour

Sponsored by reThink Wood and WoodWorks

Page 171

Stone Wool Roof Insulation—A Climate Driven Choice

Credit: 1 HSW, 1 GBCI CE Hour

Sponsored by ROXUL, Inc.

Page 182

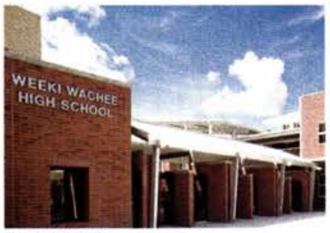


Photo by Mike Butler

Quality Masonry

Credit: 1 HSW

Sponsored by Oldcastle Architectural

Page 177

Conforming to Code

Credit: 1 HSW, 1 GBCI CE Hour

Sponsored by Knight Wall Systems

Page 186

NEW ONLINE AT ARCHRECORD.COM

Touchless Dispensers for Sustainable Healthcare Facilities

Sponsored by Georgia-Pacific Professional

Credit: 1 HSW

Drainage and Drying in Low- and Mid-Rise External Walls

Sponsored by Benjamin Obdyke and R.H. Tamlyn

Credit: 1 HSW

Aluminum Covers

Sponsored by CST Covers Industries, Inc.

Credit: 1 HSW

Satisfying New Model Codes for Illuminating Steps, Ramps, and Paths of Egress

Sponsored by Intense Lighting

Credit: 1 HSW

Appliance Performance Beyond ENERGY STAR®

Sponsored by Whirlpool Corporation

Credit: 1 HSW

ALSO ONLINE AT ARCHRECORD.COM

Cool Roofs in Perspective: Not Just Black and White
Sponsored by Carlisle SynTec

Style and Sustainability of Precast Concrete
Sponsored by Holcim (US) Inc.

Moisture Management in Masonry Buildings
Sponsored by Mortar Net® USA, Ltd.

Noise Reduction in HVAC Duct Systems
Sponsored by Kinetics Noise Control, Inc.

Understanding Seismic and Wind Restraints
Sponsored by Kinetics Noise Control

Noise Control and Room Acoustics in Building Design
Sponsored by Kinetics Noise Control

Insulated Metal Panels: Uniting Energy Efficiency with Design Versatility
Sponsored by All Weather Insulated Panels

The Makings of a Great Subfloor
Sponsored by Huber Engineered Woods

What Makes a Paint Sustainable: VOCs and Beyond
Sponsored by Glidden Professional

Color in the Built Environment: Past, Present, and Future
Sponsored by Glidden Professional

Functional Color and Design in Education Environments
Sponsored by Glidden Professional

An Ecological Basis for Selecting Ceramic Tile
Sponsored by Tile of Spain

Acoustical Basics for Design Professionals
Sponsored by Armstrong Ceiling Systems

Advances in Internally Cured Concrete
Sponsored by Trinity Expanded Shale and Clay

Designing and Specifying Architectural Columns
Sponsored by Crown Column and Millwork, LLC

Earn Free Health Safety Welfare (HSW) and Green Building Certification Institute (GBCI) credits with Architectural Record

*All Architectural Record articles and presentations count toward the annual AIA continuing education requirement. All exams are available at no charge and are instantly processed.

Shouting the Praises of Quiet Design

Not every work of architecture has to compete for our attention

BUILDING A NEW museum is like making a movie with a big cast of characters. There's the architect as director, the board of trustees (the producers), the curators with a story to tell in the galleries (the screenwriters), and a horde of technical consultants. Looming in the background is the reality of the budget—if value engineering is too severe, it's like canceling an Alpine location to shoot on a soundstage with fake snow. And just as Hollywood rushes to release movies before the end of the year—to be eligible for the Oscars—museum construction tends to finish with a frantic sprint to an opening-night gala.

In the waning days of last year, two high-profile American museums hurried to completion: the addition to Louis Kahn's 1972 Kimbell Art Museum in Fort Worth (RECORD, December 2013, page 54), designed by Renzo Piano Building Workshop, and the Pérez Art Museum Miami, by Herzog & de Meuron (this issue, page 21). Both are glass pavilions with a disarming outward simplicity; both were designed to modestly defer to the art and the public they will serve; and both—in vastly different ways—create a sense of place.

But quiet architecture disappoints some critics, a few of whom have chided Piano for bowing so deeply to Kahn's masterpiece, which sits magisterially across an expanse of lawn from the new addition. In Miami, one observer commented privately that Herzog & de Meuron's building was so uncharacteristically tame that it looked like a museum designed by . . . Renzo Piano.

Yet both buildings create the potential for rich experience, an under-rated value in a world that privileges innovative form. In Fort Worth—where the Kimbell board seems so delighted with the addition that they've officially named it the Piano Pavilion—Piano indeed deferred to Kahn's gem. As you enter the pavilion or move through its expansive glass lobby, you can't help but be drawn to the view of the Kahn building 65 yards away, seductively hovering over its reflecting pool. Originally, the site for the addition was not in such close relation to the Kimbell (see the letter to RECORD from the architect's daughter Sue Ann Kahn at archrecord.com). But Piano embraced the proximity and a dialogue with the venerable museum. "The most important thing is readdressing Kahn," he said at the opening.

Piano hasn't built his own masterpiece, but with his mastery of materials, proportion, detailing, and light, he has created a quietly elegant and serene atmosphere in which to engage the extraordinary artworks in the Kimbell collection.

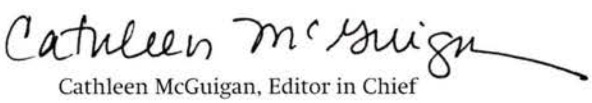
In Miami, the art is not the main attraction—the museum's own holdings so far are modest. But with Herzog & de Meuron's design, the Pérez museum is aiming for something else, to become a civic heart in this fast-growing metropolis. "Architecture is like cooking," said Jacques Herzog at the press preview. "You cook in winter, you have certain ingredients; in summer it is different." And in Miami, the design that Herzog & de Meuron has cooked up deploys the following elements: a downtown site on Biscayne Bay, vast expanses of high-performance glass, deep roof overhangs to shelter verandas and terraces, a tropical garden. Inside the lofty spaces, you look out as much as in—to the boats on the water and swaths of blue sky, to a sprouting green park, to cars streaming over the curving causeway to South Beach.

You could argue not only that making a museum is like producing a film but that the finished building is like a movie. So says Renzo Piano, who expresses the metaphor this way: "Like a movie, a building is a simple thing—you go home with one good, clear emotion."

If I had to distill the essence of his addition to the Kimbell, it would be how surprisingly fresh a painting such as Caravaggio's *The Cardsharps*, in its heavy gilded frame, looks hanging on Piano's sublimely refined concrete gallery walls, all silvery-gray silkiness, and washed in the softest light.

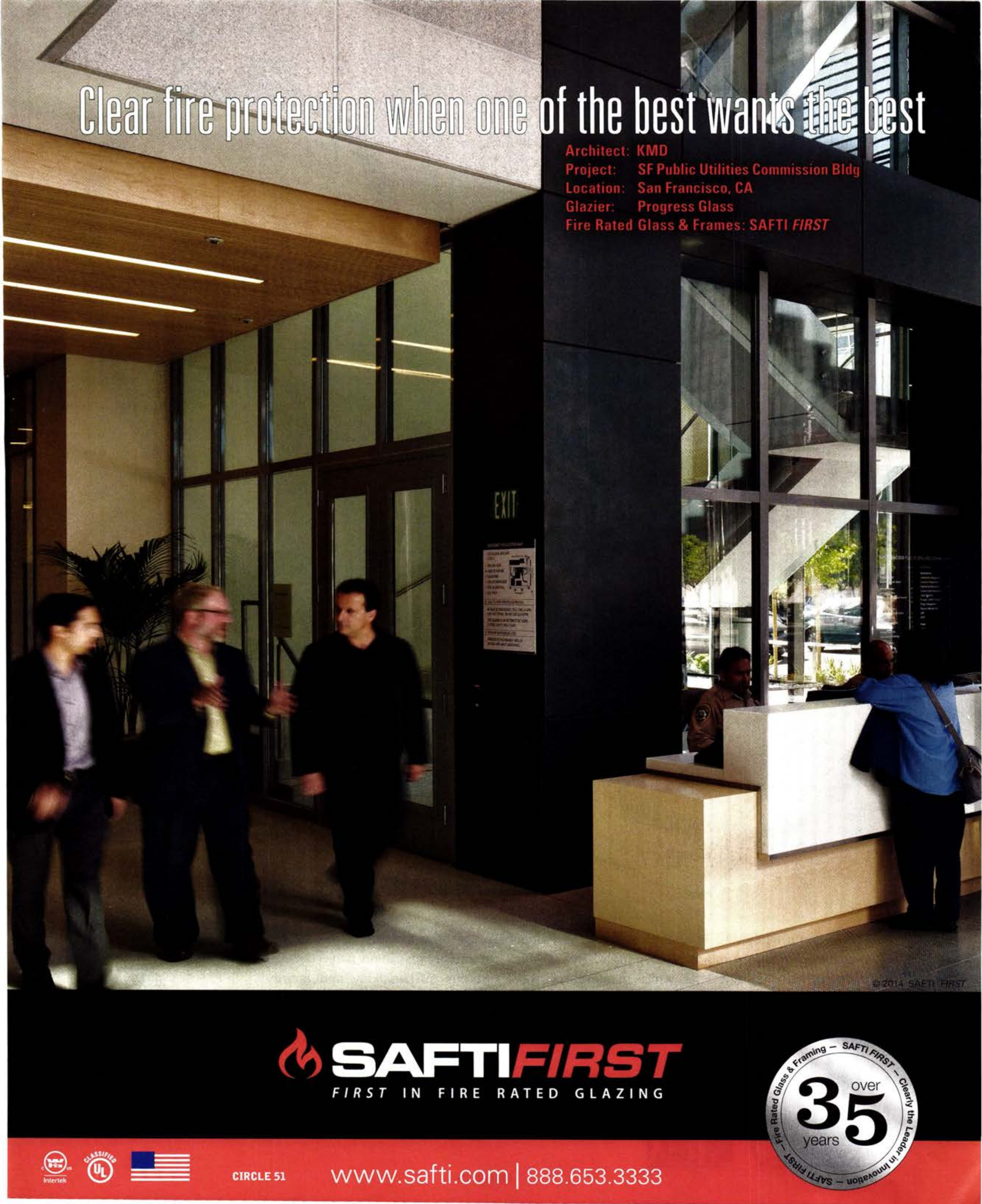
If I had one cinematic takeaway from the Pérez museum, it would be the pulsating impression of hundreds of people crowding the opening who could flow easily through the generous galleries or spill out onto the terraces filled with music in the subtropical night. This is a place not only for art but for people, for colors, for exuberance, for fun.

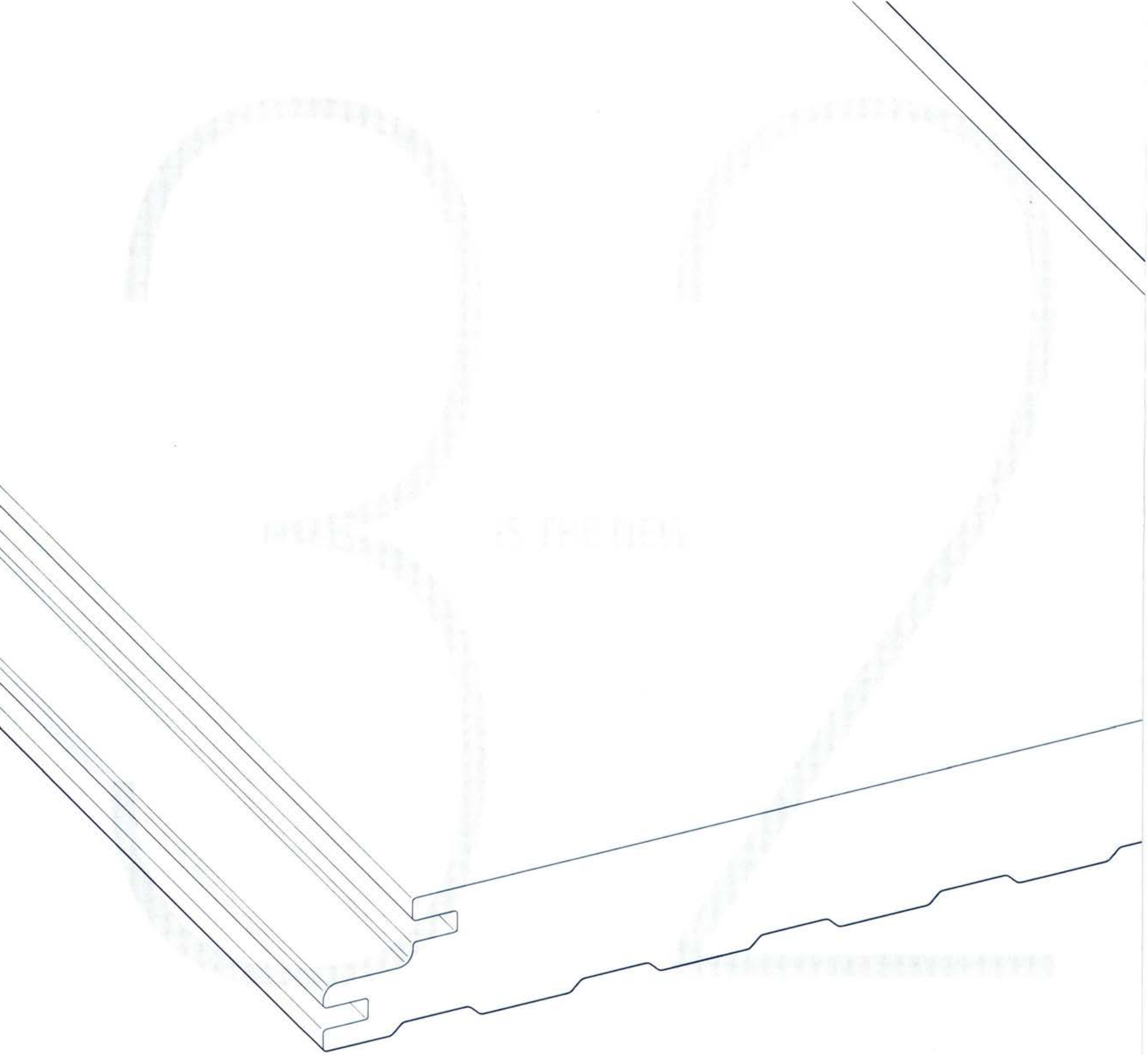
Here is first-rate architecture that doesn't shout for attention. What a radical idea. ■

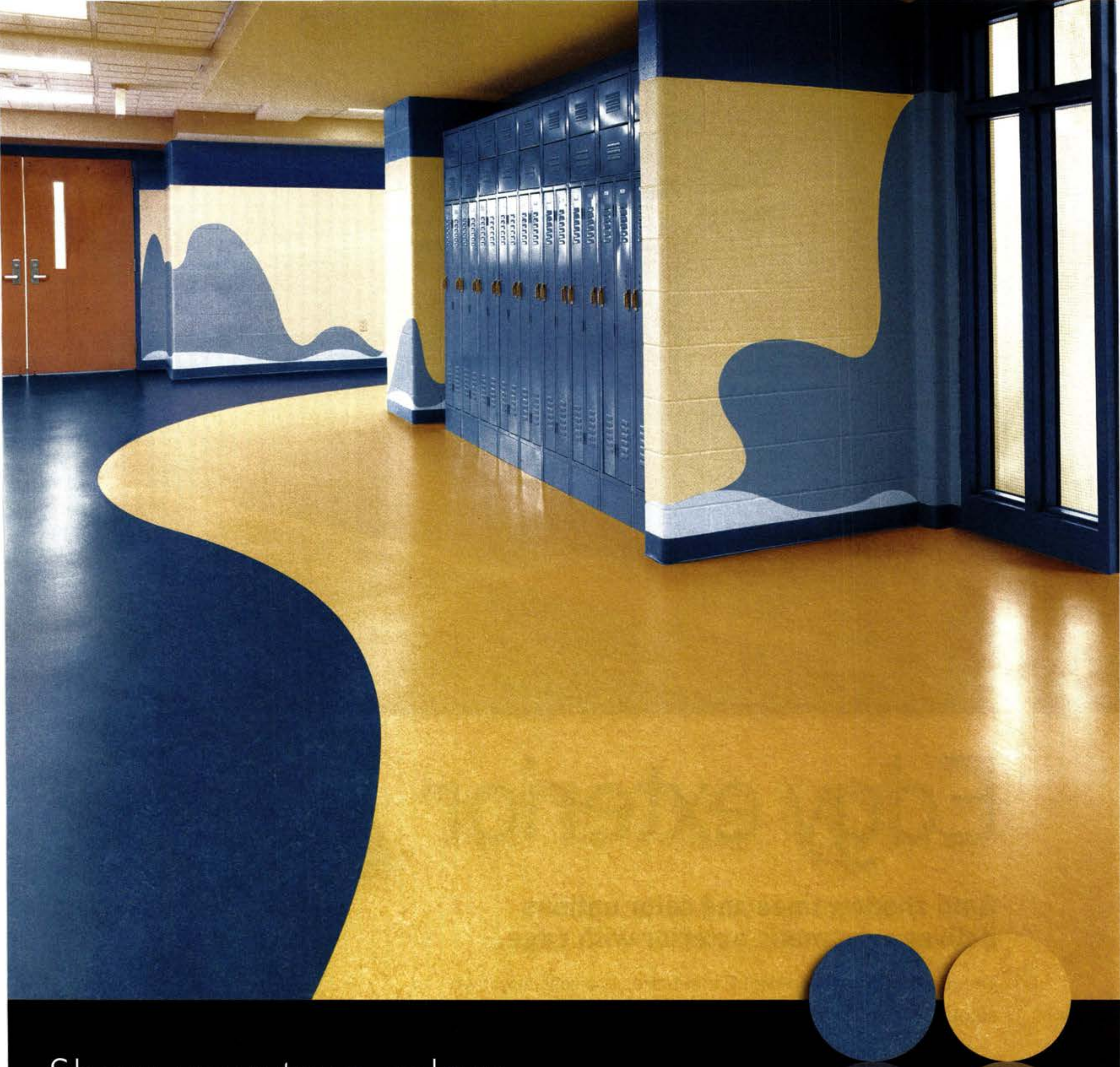


Cathleen McGuigan, Editor in Chief

PHOTOGRAPHY: © MICHAEL ARNAUD


Clear fire protection when one of the best wants the best
Architect: KMD
Project: SF Public Utilities Commission Bldg
Location: San Francisco, CA
Glazier: Progress Glass
Fire Rated Glass & Frames: SAFTI FIRST
EXIT
© 2014 SAFTI FIRST
SAFTIFIRST
FIRST IN FIRE RATED GLAZING
Fire Rated Glass & Framing – SAFTI FIRST – Clearly the Leader in Innovation – SAFTI FIRST –
over 35 years
Intertek
CLASSIFIED UL
CIRCLE 51
www.safti.com | 888.653.3333




MARMORETTE™
bluebird
MARMORETTE™
goldenrod

DAILY UPDATES
archrecord.com/news
twitter.com/archrecord

perspective

Tonight, this show, if you come see it – um, I'm a bit self-conscious, because I'm showing it to architects. [LAUGHTER] The stage does have flaws in it. [LAUGHTER] It's an expression of emotion, so give me a pass on that. – *Kanye West, speaking to students at the Harvard Graduate School of Design, November 17, 2013*

Designed by Herzog & de Meuron, the 200,000-square-foot Pérez Art Museum Miami (formerly the Miami Art Museum) opened to the public in December on Biscayne Boulevard.

PHOTOGRAPHY: © IWAN BAAN

New Miami Museum Strikes a Contrarian, Contextual Note

BY WILLIAM HANLEY

AT A PREVIEW in early December of his firm's new building for the Pérez Art Museum Miami (PAMM), Jacques Herzog sat in a window seat in a second-floor gallery and discussed what the building lacked. "It doesn't really have a form," he said, looking out at Biscayne Bay past rows of thin concrete columns supporting a trellis overhead. "It's more about its permeability. There is so much form in Miami. We wanted to do something that shows the potential in this city to let in sun and vegetation." In a town where form is often everything and ornament is the vernacular–from Deco buildings in South Beach to Arquitectonica's Atlantis Condominium (the square donut of a building seen in the *Miami Vice* credits) to the Zaha Hadid–designed residential tower rising yards from the museum–Herzog has a point. The museum reads as a bit contrarian.

Tucked between Biscayne Boulevard and a causeway that connects the mainland city to Miami Beach, the museum sits like a pavilion in what will eventually be a bay-side park. A raised plaza conceals parking, while the three-story, 200,000-square-foot structure is stacked above in a series of alternately protruding and recessed rectangular blocks. The trellis, a canopy of naturally finished wood, soars overhead, supported by the concrete columns, reinforced with steel plates to keep them as skinny as a South Beach sunbather. It shades the plaza and a series of decks, with enviable views, that surround the top-floor administrative, education, and event spaces.

The canopy gives the building a Classical profile, but its structure eschews symmetry. Instead, the building owes a lot to a tropical vernacular, and the clusters of cylindrical planting sleeves that dangle

Visit our online section at architecturalrecord.com/news

perspective**news**

Thin concrete columns support a wood canopy hung with strands of vegetation.

from the trellis–only a few have grown in so far–give it a sense of being reclaimed by nature, like a temple stumbled on in an overgrown jungle or even the feral Modernism of Hilario Candela's Miami Marine stadium across the bay in Key Biscayne.

Inside, on two floors of gallery space, Herzog says the firm's idea was to create a continuous path through larger exhibitions of work from the museum's modest (though growing) collection supplemented with loans. But the designers also wanted to "anchor" the progression in spaces for one-off projects. The opening exhibitions include a show of familiar work by Ai Weiwei, with whom Herzog & de Meuron collaborated on the Bird's Nest stadium for the 2008 Beijing Olympics–on this particular afternoon, his Chinese zodiac heads had just been installed on the plaza in front of the museum–as well as single-note but striking installations by Hew Locke and Monika Sosnowska, among others.

The firm treated the interiors with their signature simplicity. "The building shows everything that it has–everything is exposed," said Herzog. "It's almost naked." Concrete lends mass to the walls, while wood warms up thresholds. Along the ceilings, rows of fluorescent lights follow seams in the concrete beams. The most unusual space is a performance hall that doubles as a grand stair connecting the first and second floors. While the bleacher-turned-stair is nothing new, its use in the heart of a museum is, and it could prove either distracting or enlivening–a human-activated counterpoint to the sterile atrium at the Museum of Modern Art in New York–when programming begins.

During an early walk-through, the architects and museum officials all expressed desires for PAMM to become an important civic amenity in a city with many important private art collections but comparatively few public museums. It's a self-conscious preoccupation, given that PAMM was formerly the Miami Art Museum before being renamed after a major donor, but it's a move Herzog & de Meuron pulled off on a smaller scale with their parking garage at 1111 Lincoln Road in South Beach, turning a workaday building type into a semi-public plaza. With the first parcels of landscaping nearing completion and the public opening a few days away, Herzog was confident that the same thing will happen here. "I think this building can be a model for how to build in this city," he said. ■


selux
M36 LED
Elegant. Intelligent. Versatile
selux.us
CIRCLE 72

Store Site for SHoP

BY JOHN GALLAGHER

ONE OF DETROIT'S most iconic sites will be the subject of an intense design concept study in coming months, headed by New York's SHoP Architects. The focus will be on the site of the old Hudson's department store, which for decades in the mid-20th century reigned as Detroit's most important shopping locale. The store dated to 1891 and was built in multiple stages, reaching 25 stories and 2.2 million square feet before it closed in 1983. The structure was imploded in 1998, and since then the site has held an underground parking garage.

Rock Ventures, the umbrella entity for billionaire businessman Dan Gilbert, founder and chair of Quicken Loans, hired SHoP to work jointly with Detroit-based Hamilton Anderson Associates (HAA) to conduct an intensive study of concepts for a new signature building on the site (most likely mixed-use commercial and residential). Given its central downtown location in the heart of Woodward Avenue, the project could result in a new postcard image for the Motor City.

SHoP has designed dozens of signature projects, including the Barclays Center in Brooklyn, New York, where the world's tallest modular housing towers—also designed by SHoP—are currently under construction. HAA has worked on numerous Detroit projects, including the Tech One Building at the TechTown Research and Technology Park at Wayne State University. "In visiting Detroit, we've experienced the zeal and sense of entrepreneurship that underpins a vibrant urban environment. Through our inclusive design process and engagement with academia, we look forward to becoming part of the local culture and conducting a dialogue about the future of downtown," says William Sharples, a SHoP principal.

In the coming month, SHoP and HAA will meet with local stakeholders and host a lecture series for the community to learn more about the architects, the site, and what it will take to get a project of this magnitude under way. "Designing a signature architectural project from the ground up in downtown Detroit—or any great city—is an opportunity of a lifetime, and we are committed to getting it right," says Gilbert. "Our goal is that this project will become not only a symbol of Detroit's past and present but, more importantly, highlight the high-tech future creative opportunities for Detroiters and visitors from around the world." ■

The former Hudson's department store (above) and the site as it looks today (right).

PHOTOGRAPHY: COURTESY HISTORICDETROIT.ORG/DETROIT FREE PRESS ARCHIVES (FAR LEFT); COURTESY HUDSONS.OPPORTUNITYDETROIT.COM (NEAR LEFT)

[NEWSMAKER]

Zoë Ryan

BY JENNIFER KRICHELS

WITH HER appointment as curator of the second Istanbul Design Biennial, set to take place from October 18 to December 14, 2014, British-born, U.S.-based Zoë Ryan is helping shape one of the most important new design events even as she approaches her third year as chair and curator of architecture and design at the Art Institute of Chicago.

Launched in 2012 with curator Joseph Grima and director Özlem Yalım Özkaraoğlu, Istanbul's first Design Biennial made a splash, yet left room to unite a broader segment of Turkey's architecture community and further solidify the country's role on the international design stage. Under new director Deniz Ova, Ryan has rallied a team, including associate curator Meredith Carruthers and Turkish design studio Superpool, that will help transform Istanbul's Galata Greek Primary School into the epicenter of the event and develop a visual identity along with New York–based Project Projects. Ryan spoke with RECORD on the heels of announcing the 2014 biennial's theme.

2014 Instanbul Design Biennial curator Zoë Ryan.

What perspective do you want to bring to the event?

This is an opportunity to get beyond the walls of a museum and do a project in a different kind of space and use the city as a platform. I'm interested in the biennial showing the rest of the world what Turkey has to offer. This is a culturally savvy society whose members are working in all different ways, but there are few forums for them such as the biennial. We also want to rethink the Greek school and use it more as a hub. It's on a busy public thoroughfare with multiple floors and a great rooftop. We're going to have an active program of workshops, where every week different university groups have a pinup space where they can present their findings to each other and the general public. Often these biennials become so disparate. There are thousands of things going on throughout the city, but so few feel connected. We don't want people to feel like they're working in isolation.

Can you explain how you arrived at the theme of the biennial, The Future Is Not What It Used To Be? What does it mean?

At the museum I make the team revisit what has become the absolute truth of modern design and architecture and try to get us to think about the people who have been left out of those stories. This summer, I came across a quote from the poet Paul Valéry that said, to paraphrase, "The future is not what it used to be; neither is the past. Both are in need of reconstruction if we are to have a livable present." I think of it as very optimistic. We can revisit those 20th-century ideas; we've come past moments like *2001: A Space Odyssey*. We are living in that future now.

The biennial has issued an open call for design manifestos. What do you hope to accomplish with this format?

We think a manifesto can be a provocation, an object, a piece of furniture, or a building; it can be a system or a network.

Istanbul's Taksim Square protests have thrust issues of public space into the spotlight in Turkey. This is an international event, but how has the political environment influenced your curatorial process?

The first time I went to Istanbul it was during the political protests, so the energy was really focused on that moment. We're inspired by beautiful illustrations by a group called Architecture for All. They have been documenting the temporary libraries, medical facilities, and kids' play spaces that became part of Gezi Park's mini-city. Those have become inspirational for how you document projects from a time that was so fraught and that could have been lost. Those things become their own manifesto from a specific point in time. We have to take control of the negative impact we're having on life. No day goes by without us hearing about some horrific incident, like the typhoon in the Philippines. These kinds of things are so tragic that you don't know where to start, but there are people already making changes, and I think many of them are designers.

I do feel optimistic, hopefully not naively, that design can be an active change agent. Those [designers] are the people we're hoping to highlight—but it's not necessarily about who's doing it. We're hoping new collectives will be formed. People have come to us to ask if they can work on this in groups, and of course it's the best possible outcome when you pool resources. For me, that's what the biennial is really about. ■

noted

Pier Carlo Bontempi Named 2014 Driehaus Prize Recipient

Italian architect Pier Carlo Bontempi was awarded the 2014 Richard H. Driehaus Prize from the University of Notre Dame. His projects include a block-recovery plan in Parma's historic center, as well as the Place de Toscane and the Quartier du Lac resort near Paris.

National Trust Moves to the Watergate Complex

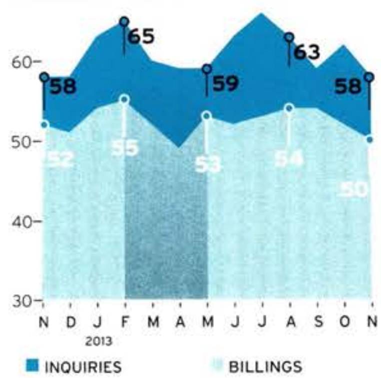
In December the National Trust for Historic Preservation moved from the Washington, D.C., Dupont Circle neighborhood to its new digs in the Watergate, designed by Italian architect Luigi Moretti. The five structures were built between 1965 and 1971, and all are on the National Register of Historic Places.

Phyllis Lambert Steps Down from the CCA

Phyllis Lambert announced in December that she is retiring as chair of the board of trustees of the Canadian Centre for Architecture, the Montreal-based research facility she founded in 1979 (it opened to the public in 1989). Toronto architect Bruce Kuwabara will replace Lambert.

Dubai Wins 2020 World Expo Bid with HOK Master Plan

Dubai beat out Turkey, Russia, and Brazil in its bid to host the six-month 2020 World Expo. The HOK-designed master plan (with help from Populous and Arup) will feature three main pavilions surrounding a central plaza for smaller exhibitions. Walkways will be shaded by a structure made of photovoltaics.



ABI Dips into Negative Territory

The American Institute of Architects (AIA) reports that the November Architecture Billings Index (ABI) score was 49.8—the first time the index has dipped below 50 since April's score of 48.6 (any score below 50 indicates a decrease in billings). The Inquiries Index dropped from 61.5 to 57.8.

PHOTOGRAPHY: © KYLE LAMERE

Acrovyn® 4000 is designed with human health in mind.

We can prove it!

Americans spend about 90% of their time indoors. That makes the products you put into your buildings as important as what you put in your mouth. You wouldn't dream of eating something unless you knew what it contained, so why choose a building product without the same information? You no longer have to because **we disclose what Acrovyn® 4000 is made of—right on the product.** An industry first, our labeling program was developed with Perkins + Will and is supported by a multi-attribute, third-party certification. It is reassurance that **Acrovyn 4000 is designed with human health in mind.** To learn more, call 800-233-8493 or visit transparency.c-sgroup.com. Find Construction Specialties on f®, in® or twitter.com/acrovyn.

CERTIFIED cradle to cradle GOLD & SILVER

CS Acrovyn® *Protection for tomorrow's environment*

CIRCLE 34

perspective**stats**

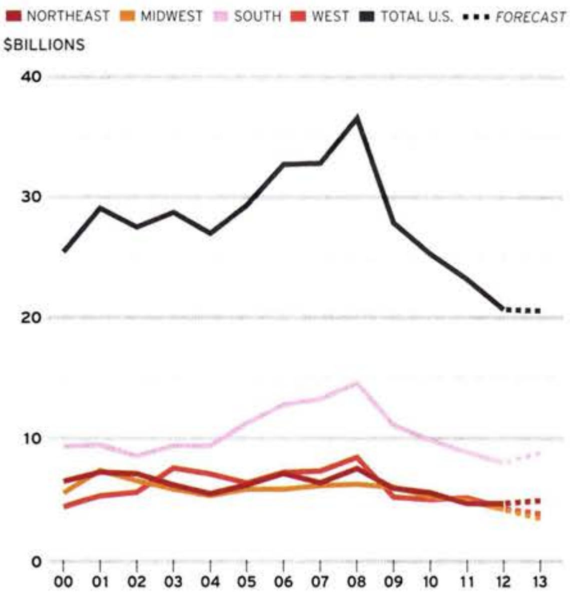
Data from McGraw Hill Dodge Analytics

MARKET FOCUS
K–12 CONSTRUCTION

School starts, which had been hit hard by the fiscal condition of state and municipal governments, should rebound in the coming year as the country recovers from the recession and voters approve new bond measures to fund construction.

K-12 Starts by Region

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



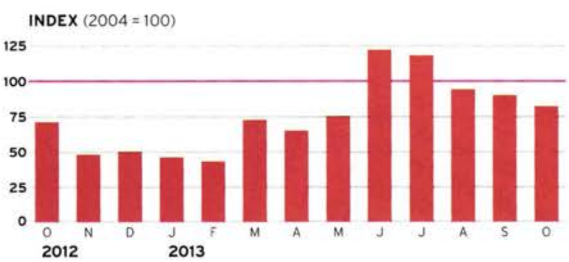
Top Metro-Area Markets

Ranked by total K–12 starts 1/2012 through 9/2013

	REGION	$MILLIONS
1	NEW YORK CITY	2,632
2	WASHINGTON, D.C.	1,626
3	DALLAS	1,543
4	BOSTON	1,485
5	CHICAGO	1,013

Dunbar Senior High School, Washington, D.C., Perkins Eastman and Moody Nolan, page 124.

The Dodge Index for K-12 Construction 10/2012–10/2013



The index is based on data for K-12 construction starts that have not been seasonally adjusted. The average dollar value of projects in 2004 serves as the index baseline.

Top 5 Design Firms

Ranked by K–12 construction starts 1/2011 through 10/2013

1. **Ai3 Architects**
2. **PBK**
3. **Perkins+Will**
4. **SHW Group**
5. **Gignac Architects**

Top 5 Projects

Ranked by K–12 construction starts 1/2012 through 10/2013

$136 MILLION

PROJECT: San Marcos High School Reconstruction
ARCHITECT: LPA
LOCATION: San Marcos, CA

$105 MILLION

PROJECT: New Duxbury Middle/High School
ARCHITECT: Mount Vernon Group Architects
LOCATION: Duxbury, MA

$101 MILLION

PROJECT: Essex North Shore Agricultural and Technical High School
ARCHITECTS: Design Partnership of Cambridge; Wiles Architects
LOCATION: Danvers, MA

$100 MILLION

PROJECT: Ballou Senior High School
ARCHITECT: Bowie Gridley Architects/Perkins+Will Joint Venture
LOCATION: Washington, D.C.

$100 MILLION

PROJECT: Lake Central High School Addition/Renovation
ARCHITECT: Schmidt Associates
LOCATION: Saint John, IN

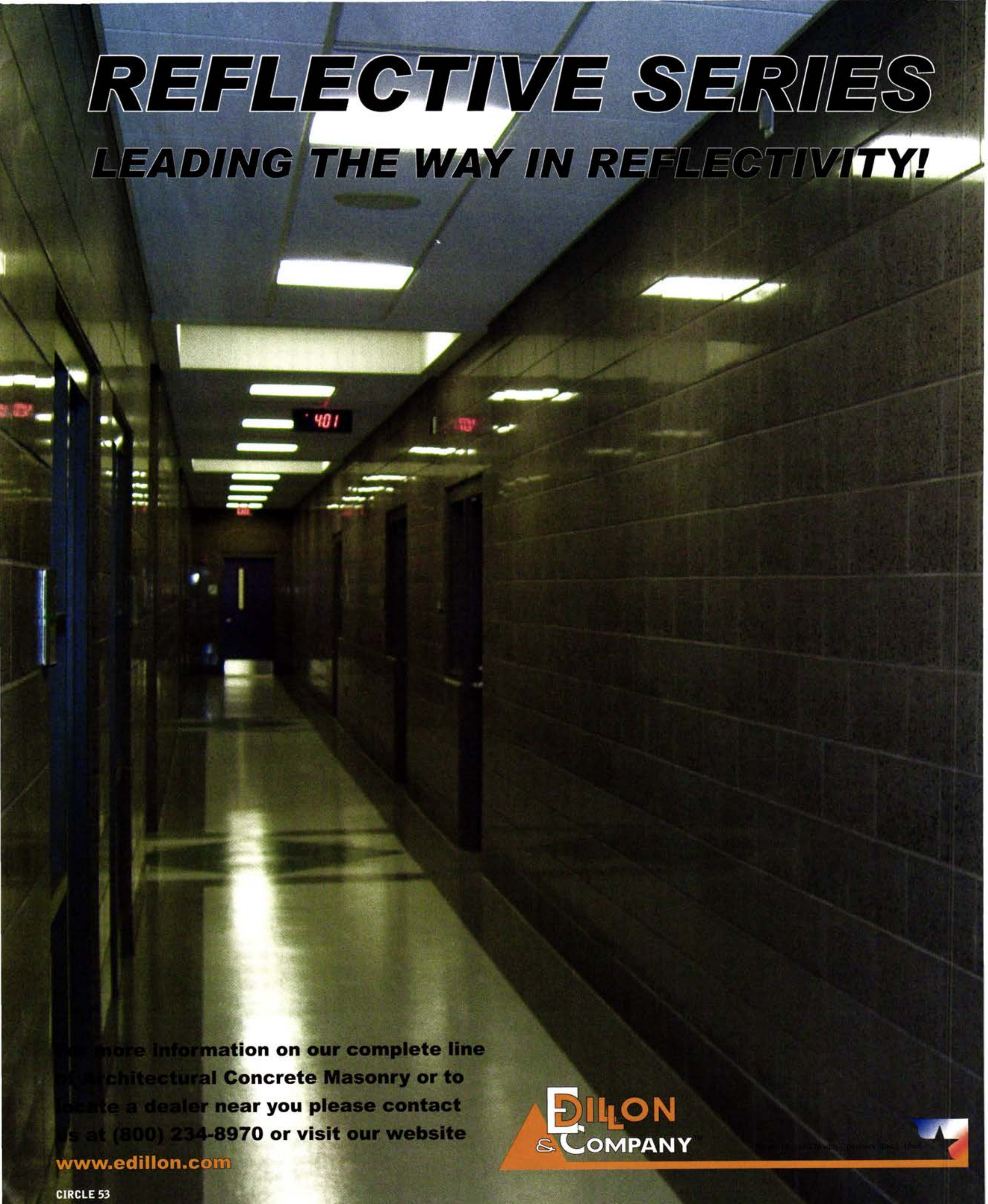
MOMENTUM INDEX RESUMES UPWARD TREND

After slipping in October, the Dodge Momentum Index continued its recent growth, rising 2.8% in November. Now at 117.9, the index is at its highest level since March 2009.

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 lead the U.S. Commerce Department's nonresidential spending by a full year. In the graph to the right, the index has been shifted forward 12 months to reflect its relationship with the Commerce data.

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

PHOTOGRAPHY: © JOSEPH ROMEO


REFLECTIVE SERIES
LEADING THE WAY IN REFLECTIVITY!
401
For more information on our complete line of Architectural Concrete Masonry or to locate a dealer near you please contact us at (800) 234-8970 or visit our website
www.edillon.com
DILLON & COMPANY

CIRCLE 53


If your walls
could talk...


FACEBRICK
THIN BRICK
PAVERS
Diversity of products for amazing results
GLAZED & KLAYCOAT
SHAPES, SIZES COLORS & TEXTURES
Make the most of diversity in brick from Glen-Gery. Free your imagination to take full advantage of an architectural resource that truly defies limitations.
Glen-Gery Brick
An Oldcastle® Company
610.374.4011 • www.glengerybrick.com

CIRCLE 74

Bridge Over Troubled Waters

It's time for New York and other cities to connect urban planning to social equity.

BY MICHAEL SORKIN

DEAR MAYOR BILL DE BLASIO:

Along with many other architects and urbanists, I'm looking forward to your taking office this month as mayor of New York City, and working to implement the theme of your campaign, the elimination of the increasingly radical disparities that underlie that "tale of two cities" you so frequently spoke about—a tale, increasingly, about two nations. While this program of social equity must operate in many spheres—from the creation of jobs to the provision of services, to the fight for environmental and social justice—planning the physical city in its growth and transformation is one of the most important powers of municipal government, one that the Bloomberg administration has deployed with stark effectiveness.

Perhaps the most disingenuous remark of the campaign was Mayor Bloomberg's comment that our obscene income gap was the product not of a rise in poverty but of a wave of immigrant billionaires, and the more the better. As he put it, "The reason it's so big is, at the higher end, we've been able to do something that none of these other cities can do, and that is attract a lot of the very wealthy from around the country and around the world." While hospitality to strivers is a hallmark of New York's greatness, we've been too long governed by a theory that has trickle-down as its normative center. Indeed, if all wealth descends from the top, the logic of development must have as its predicate making the rich as rich as can be—and much of the planning process in recent years has sought to do precisely that. From corporatist development priorities to sweepingly reconfigured zoning, a mind-set that filters urban construction through the ideals of the real-estate industry has ruled.

Bloomberg's massive rezoning—his biggest planning move—is a form of urban stop and frisk falling disproportionately on minorities. According to the Furman Center at New York University, under the new regulations "up-zoned lots tended to be located in census tracts with a higher proportion of nonwhite residents than the median tract in the city. Down-zoned lots, on the other hand, were more likely to be located in tracts with a higher share of non-Hispanic white residents

IMAGES: COURTESY REBUILD BY DESIGN (BELOW); RELATED COMPANIES (RIGHT)

than the city median, and contextual-only rezoned lots were located in areas with still higher shares of non-Hispanic white residents."

Selling off libraries on valuable property, commercializing parks by demanding they be self-financing, building "market rate" projects on Housing Authority lots, and zoning distorted by race and class, all speak to a triumph of means over ends, touted as a great public-private "partnership": all symptoms of the great national post-Reagan turn against government. While Bloomberg has done many worthy things—for the environment, for transportation, for parks—his signature will indelibly be a vision of the luxurious center, Hudson Yards mixed-use development in the West Midtown area of Manhattan or the "Billionaires Row" rising around 57th Street, where sky-high condos are selling for $50 million a pop. It is not a vision of our complex, often struggling fringe.

It's time to reintroduce communities into the planning process. New York must move beyond the oppositional model of planning that has too long dominated, best exemplified by our beloved Manichean struggle between cardboard versions of Robert Moses and Jane Jacobs. Although there is no contradiction in planning both inductively and deductively, our process is too skewed toward money and away from people: the capacity of neighborhoods to meaningfully participate in planning their own destinies—and that of the larger realms we all

The 26-acre Hudson Yards development, above, envisions 13 million square feet of commercial and residential space, plus shops, restaurants, a luxury hotel, a cultural venue, and a park on Manhattan's west side. An OMA proposal (left) suggests that JFK Airport will play a critical role in post-Sandy flood-mitigation planning in Jamaica Bay.

share—is fundamental. Wisdom doesn't belong to any particular group (although needs are best assessed locally), and a mayor must empower everyone. For this, we look to you with high hopes.

When the New York City charter was revised in 1989, it created a system of community boards and a medium of participation (the 197-a plan) that promised a new way of making decisions that would channel ideas from the grassroots to the top. But, despite the completion of many such plans across the city (out of 59 community boards, only 11 plans have ever been adopted) and despite the deep engagement of citizens and neighborhood groups in working toward ameliorative transformation, these efforts have never had real legal standing and depend on the sanction of a recalcitrant planning department. Let the de Blasio planning department pay better attention, return to the task of physical planning attuned to local desires, and more aggressively pursue architecturally significant outcomes. Instead of simply being

(*continued from previous page*) the adjudicators of the circumstances for construction, our planners should produce more facts, more *designs*—and should set priorities that are both concrete and truly visionary.

This means displacing zoning as the primary instrument of planning. The logic of zoning—the idea that development best takes place "as of right," with clear rules, formulas, and frameworks—has a certain, nominally libertarian, appeal. What's concealed, though, is the structure of constraint that defines the territory in which those rules operate, whether via prescribed uses and densities or the smorgasbord of incentives and exceptions that a canny operator can call upon to enlarge a project in exchange for some marginal public benefit. We must ask as of *whose* rights all this complexity is designed to defend. In the postindustrial city, much of the basis for zoning is simply obsolete, and the 19th-century model of isolating obnoxious uses and classes from more privileged ones tends to make concrete exactly the kinds of differences you seek to erase.

For the past dozen years, the real power to plan has resided with the city's Economic Development Corporation, which, operating more like a private entity than a city agency, stands outside full scrutiny and control and acts as the mayor's creature. This tilt toward understanding government's role primarily as the facilitator of private initiatives has special consequences for the public realm—a space shared by the city's *many* publics—and it's time for a more transparent use of public money. There's something dispiriting about celebrating the fact that the beautiful Brooklyn Bridge Park was produced not by the Parks Department but by a special corporation financed by the inclusion of superluxe condos and a hipster hotel within it. Forcing the public realm to effectively produce its own revenues on the spot is a formula for assuring that the best public spaces will be in neighborhoods that can most afford them. The role of planning should be to equalize opportunity and community assets, and any system that either privatizes revenue collection or steers it too locally risks deepening the rift between our "two cities."

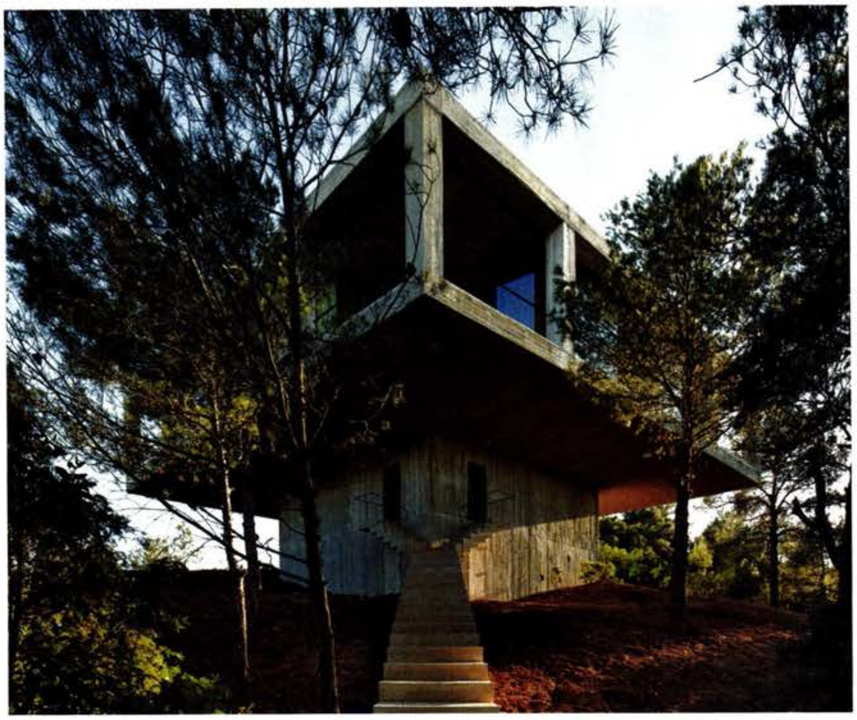
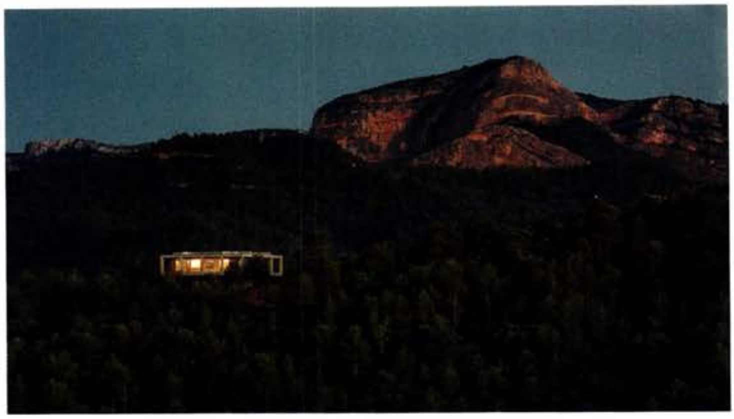
Since last year's Superstorm Sandy shut down the city, the idea of dramatically increasing New York's resiliency has been vigorously discussed; this is a project that engages everyone. Here's a point of entry to real planning that would serve all of the city and give municipal planners a truly comprehensive project for improving and strengthening both the social and the physical realms. The city must be dramatically reshaped in response to the planetary emergency of which Sandy was a symptom. We need to re-understand not just our coastlines, but our sewers, our energy supply, our ways of building. We need to rethink how we move, deal with our waste, and distribute our municipal assets, throughout the city. But resiliency is not simply a matter of the "environment": it's a human necessity. With homelessness at all-time highs and housing prices prohibitive, we must build massively for those in need.

Mayor de Blasio, your idea of a mandate for inclusionary zoning begins to address this crisis yet continues to depend on the tender mercies of private developers to actually produce the units. If you are going to tax them, why not collect the money, municipalize the program, and make gorgeous, genuinely affordable housing your greatest legacy, building it where it's most needed? We can do it! In the parlous interwar years in Vienna, that little metropolis constructed apartments for almost a quarter-million working-class people, housing them in some of the finest architecture of all time. Why can't the greatest, richest city in the world do the same? Your massive electoral majority suggests that New York is ready for a restoration of democratic ideals about the role of government in directly bettering the lives of citizens. That's the kind of public-private partnership I could get behind! ■

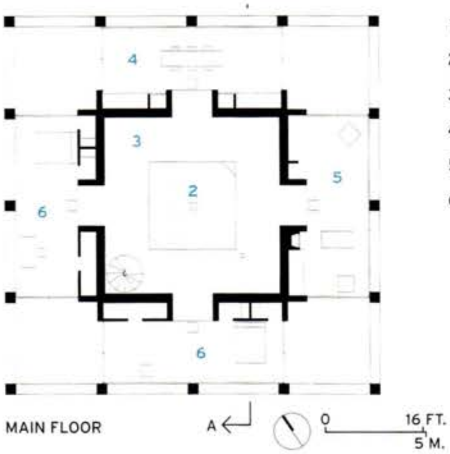

Flow >> Matte Nickel with Bamboo Blades
Cool by Design
THE MODERN FAN CO
A Collection of Ceiling Fans
Designed by Ron Rezek
Celebrating the modern idiom
modernfan.com
CIRCLE 8

house of the month

IN PEZO VON ELLRICHSHAUSEN'S MONOLITHIC MOUNTAIN RETREAT IN NORTHERN SPAIN, A PLATFORM FOR OUTDOOR LIVING FLOATS ABOVE A CONCRETE PODIUM. BY JOSEPHINE MINUTILLO

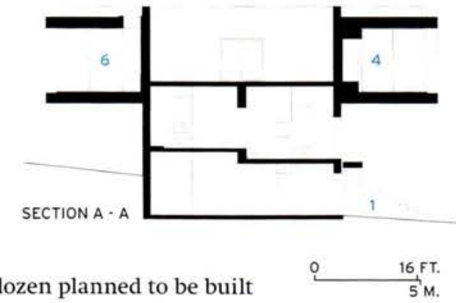



A bifurcated staircase marks the entrance (above). From a distance, the house appears to float among the treetops (top right). Living areas become verandas when the glass walls slide open (right). The central pool courtyard provides access to the rooms along the perimeter (left).



1 ENTRANCE
2 POOL
3 COURTYARD
4 KITCHEN/DINING
5 LIVING
6 BEDROOM

MAIN FLOOR



SECTION A - A

AT FIRST glance, the idiosyncratic form of Solo House bears a striking similarity to John Lautner's 1960 octagonal Chemosphere. In fact, the Chilean architecture duo of Sofia von Ellrichshausen and Mauricio Pezo was not even familiar with that iconic house–perched on a California hillside atop a concrete pedestal–when designing their top-heavy concrete structure.

Hidden away in the remote mountains of Spain's Matarranya region, south of Barcelona, the 3,370-square-foot Solo House is a study in contradictions. With no buildable ground to work with, the architects created some, raising the main floor for this off-the-grid–equipped with solar panels, water storage, a generator, and heating pellets–weekend retreat above the treetops. That open platform–punctuated only by 16 columns along the perimeter, where a series of rooms alternates with corner balconies–offers 360-degree views of the surrounding vineyards and olive groves and, in the distance, medieval towns.

Sliding floor-to-ceiling glass walls enclose the rooms but open completely, turning sleeping and dining areas into stately verandas. By contrast, one enters the house through the 31-square-foot cavelike podium, ascending a circular staircase to the elevated courtyard–the only living space enclosed by four walls, though it is open to the sky. At its center is a swimming pool–in essence, a giant void at the heart of the monolith.

The house "is about the elusive relationship between interior and exterior," says von Ellrichshausen. She and Pezo were given carte blanche for the design, the first of a dozen planned to be built on a 120-acre site. Other architects involved in this house project (initiated by developer and curator Christian Bourdais) include Sou Fujimoto, Johnston Marklee, and Studio Mumbai. ■

PHOTOGRAPHY: © CRISTÓBAL PALMA

View additional images at architecturalrecord.com.

Brave New World

Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia, *by Anthony M. Townsend. W.W. Norton, October 2013, 400 pages, $29.*

Reviewed by Nancy Scola

ANTHONY TOWNSEND started thinking about the intersection of technology and cities before the rest of us knew such a place existed. Back in 2002, when carrying a telephone in your pocket still felt slightly cutting-edge, Townsend, with the volunteer labor of civic hackers and donated equipment, was helping to blanket New York City's Bryant Park with 10 acres of free wireless Internet.

Today, Townsend is a research director at the Institute for the Future and a fellow at NYU's Rudin Center for Transportation, and the rest of us have caught up. "Smart cities" is a hot topic, and with good reason. Cities are awash in data. Our gadgets have grown incredibly small and cheap. Not only might a city tree be equipped with a sensor that knows when it needs watering, but it might connect to a software system that checks a summer concert schedule and beams a work order to a Parks Department truck.

Smart Cities is an often exhilarating romp through what is possible, from networked traffic signals that can be adjusted from afar to electric grids that respond to usage; from the location-aware Foursquare app to mashing up restaurant reviews with health-inspection data. It's so full a tour that you can get a long way through it before realizing that something is missing: people. There aren't many of them in Townsend's book, which means there is little consideration of why, exactly, people might want to live in the new digital city.

Townsend is savvy enough to know that, until now, the "smart city" conversation has been driven largely by companies like IBM and Cisco. You can hardly make it through an airport without seeing ads from the former saying things like, "In Singapore, smarter traffic systems can predict congestion with 90 percent accuracy." Efficiency has become the wired city's selling point. It's easy to measure, but it dodges messy questions about the wonderful complexities of city living.

"People are building smart cities much as we built the Web," writes Townsend, meaning bit by bit and bottom-up. But elsewhere he wonders, "How could a fully automated city respond to weather automatically as a system?" You needn't be an extreme individualist to contemplate the upside of being able to open your own window willy-nilly.

Midway through the book, Townsend describes a telling moment when he asked Red Burns, the director of NYU's Interactive Telecommunications Program (ground zero for the exploration of networked urban living) to predict what cities will look like after this stage of haphazard experimentation. Burns shrugged and said, "This is the time for people to throw their hats in the air and think." Townsend, to his credit, says that he'd hoped for "a more concrete vision" of the future of the digital city. It's also to his credit that his book makes readers hope for one too. ■


LIGHTVAULT 8
Bluetooth
Wireless Adjustable Aiming & Dimming.
This is Kim Lighting.
KIM LIGHTING
HUBBELL
HUBBELL Lighting

ARCHITECTURAL RECORD

Guess the Architect Contest

ENTER NOW!

A new monthly contest from the editors of RECORD asks you to guess the architect of a building of historical importance.

CLUE: A SCHOOL DESIGNED IN THE EARLY PART OF THE 20TH CENTURY BY AN ÉMIGRÉ ARCHITECT BECAME FAMOUS FOR ITS EDUCATIONAL PROGRAM.

The answer to the December issue's Guess the Architect is **RAYMOND HOOD** of Hood, Godley & Fouilhoux, who designed the McGraw-Hill Building on West 42nd Street in 1931. For more details, including the winner, go to archrecord.com.

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

PHOTOGRAPHY: © MARK SCHATZ, FAIA/FIELD PAOLI ARCHITECTS (RIGHT); CHRIS REINHART/ARTIFICE IMAGES (BOTTOM)


Some things in life just aren't worth rolling the dice on...

products**flooring**

THE LATEST COVERINGS RANGE FROM A BROADLOOM CARPET BY AN AWARD-WINNING ARCHITECT TO AN ENGINEERED WOOD FOR RESIDENTIAL MARKETS AND A RESILIENT COMMERCIAL FLOORING SYSTEM. **BY SHEILA KIM**

A Walk on the Luxe Side

DAVID ROCKWELL is no stranger to setting the mood in hotels or restaurants, and a robust list of accolades for his hospitality work is a testament to this. But his latest endeavor in this market tackles the challenge of supplying *other* architects and interior designers with the ingredients to produce such environments. Layered Luxe, a line that Rockwell created in collaboration with Shaw Hospitality Group, is the first broadloom carpet collection designed by the president of New York City–based Rockwell Group, and is aimed at evoking drama, serenity, or quiet elegance for hotel spaces.

The architect characterizes this line as something of a template for designers, with each color customizable in 270 hues and 17 patterns by Shaw's state-of-the-art looms. A carpet's highlights, for instance, can be specified in neutral taupe and gray, while midtones and shadows can be colored in gemlike emerald and dark violet.

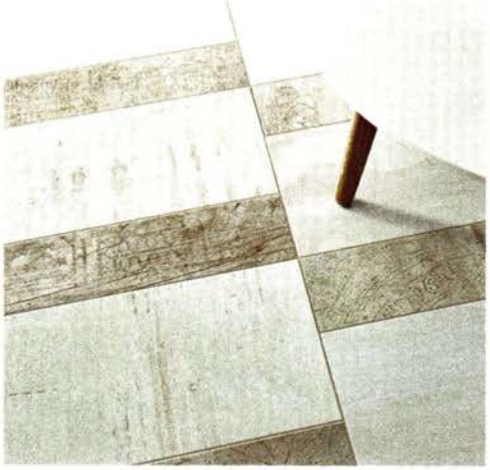
"Carpet is a singular medium with infinite varieties," Rockwell says. For the patterns themselves, "we were able to look at a range of things that are important in our architectural work: abstraction of nature, heirloom rugs, cracked pottery, and other textures and surfaces that could be woven into carpet." The look of random folds of distressed and aged textiles figures prominently in Crease; undulating layers found in mineral stones are mimicked in Geode; and fine striations shifting between light and dark inform the pattern Ombré. The entire line is produced with Eco Solution Q nylon, which contains 20% pre-consumer and 25% post-consumer recycled content and is Cradle to Cradle certified.

Asked if he has a particular favorite of the collection, Rockwell answers, "Watermark, because it has a kind of mystery to it–it pushes what can be done with broadloom to an extreme, and it's almost impossible to find a repeat in it, which I love." He promptly adds, "But I like my other kids also."

shawhospitalitygroup.com **CIRCLE 200**

PHOTOGRAPHY: COURTESY SHAW HOSPITALITY GROUP

PAINTERLY PATTERNS
Shaw Hospitality Group's first collaboration with an outside designer, Layered Luxe by David Rockwell, consists of 17 customizable styles that range from the subtle Watermark (above), which features traces of an elegant scroll pattern, to the crisp, undulating and striated Geode (left). Each design's color levels can be specified in a range of 270 hues to create a custom composition.



Reclamation Porcelain Tile

Crossville crossvilleinc.com

Crossville's first digitally produced line, Reclamation, is a collection of porcelain tiles that feature patterns and textures inspired by reclaimed materials, which continue to be popular design elements in interiors today. The line's 16 styles include weathered wood, concrete, and metal, and the 12" x 24" or 24"-square tiles are made in the U.S. using Crossville's EcoCycle manufacturing process and at least 4% recycled content. CIRCLE 204

Acromi e Origini Collection

Bisazza bisazza.com

New for 2014, this sophisticated porcelain tile collection for wall and floor applications was designed by Milan-based Antonio Citterio Patricia Viel Interiors. The series comprises two styles: Acromi features a smoother, more uniform appearance in eight neutral or earthy colors, while Origini (shown) is a black or white field with shimmery or contrasting flecks. Three sizes are available: 15¾" square; 15¾" x 31½"; and 31½" square. CIRCLE 206

Midtown Hardwood Floors

Armstrong armstrong.com

Geared toward the residential market, Midtown is an engineered-wood floor product that is manufactured by bonding together solid wood layers in a cross-ply construction over a high-density-fiberboard core for stability. It is offered as 5"-wide planks with oak-, maple-, or walnut-veneer faces and eight low-gloss color finishes. Midtown is made in the United States using domestically sourced woods and locally sourced fibers and carries a 25-year residential warranty. CIRCLE 202

I.D. Freedom Commercial Luxury Planks and Tiles

Tarkett johnsonite.com

Ideal for high-traffic areas, I.D. Freedom is a resilient commercial flooring system that offers more than 90 SKUs—ranging from woodgrain to stone patterning—in plank or tile format in a variety of sizes, giving designers more flexibility to create unique installations. The vinyl product contains 53% pre-consumer recycled content and is FloorScore certified for indoor air quality. CIRCLE 205

Dekton Ultracompact Surfacing

Cosentino dekton.com

By developing its own technology to mimic the process undergone by metamorphic rock, Cosentino has created a new ultracompact surfacing product made from inorganic raw materials found in quartz, glass, and porcelain. Called Dekton, it offers exceptional strength and UV resistance but also features low water absorption and good thermal shock resistance, making it applicable for flooring and exterior cladding too. Currently, Dekton is available in a range of stone styles. CIRCLE 203

Taralay Interior Concept 2.0

Gerflor gerflorusa.com

Two new graphic designs have been added to Gerflor's resilient flooring series Taralay Impression: Cubist (shown), a fragmented line pattern inspired by the modern-art movement of Cubism, and Labyrinth, which creates an optical illusion with an abstracted grid-and-dot pattern. Both are offered in neutral colorways and are 3/25"-thick sheet vinyl with a transparent wear layer treated with Sanasol anti-microbial solution. Optional acoustic backing is available to reduce noise by up to 18 decibels. CIRCLE 201

products briefs

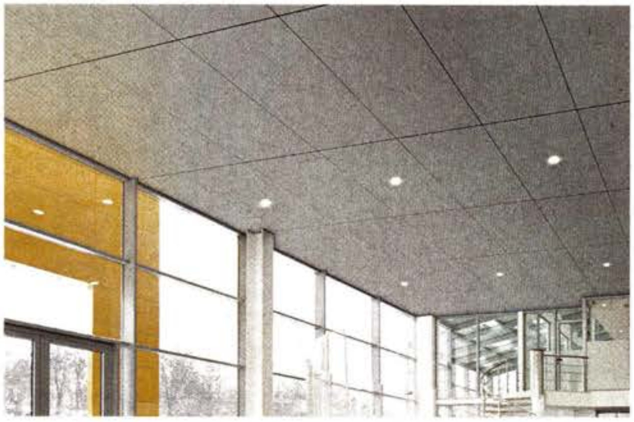
PLAIN AND PATTERNED SURFACES MINGLE WITH SIMPLE FORMS IN THIS ROUNDUP OF PRODUCTS FOR THE HOME AND OFFICE. BY SHEILA KIM

Domo S Pendant

Resembling an inverted tulip, the dome-shaped Domo S from Spanish manufacturer LZF is formed by curved birch-veneer "petals" fastened together with brushed-nickel hardware. The piece is available in 11 different colors ranging from vibrant oranges and reds to muted and natural wood tones. The shade has a 23½" diameter, and the pendant can be dropped up to 98½".
globallighting.com **CIRCLE 207**

Slant Stitch Tiles

Tile designer Erin Adams puts her patterned-fabric-inspired stamp on a ceramic series for Imagine Tile. The Slant Stitch by Erin Adams Collection features herringbone motifs with variegated spacing and widths. The VOC-free, UV- and stain-resistant tiles have white grounds printed with gray, teal, coral, or lime-green designs. Each measures 12" square, though custom sizes are also available.
imaginetile.com **CIRCLE 208**

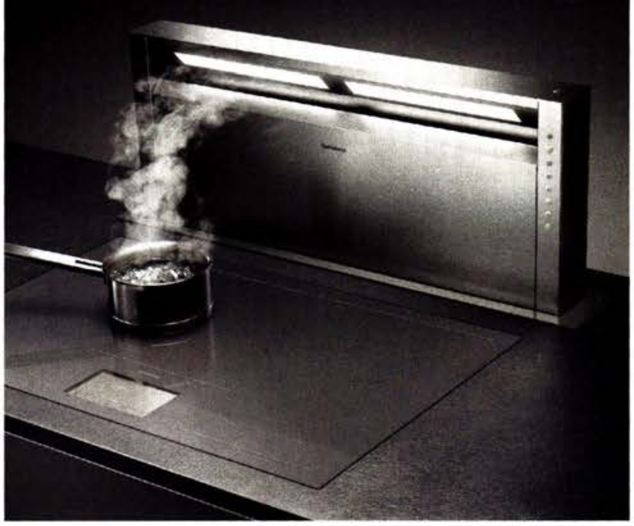


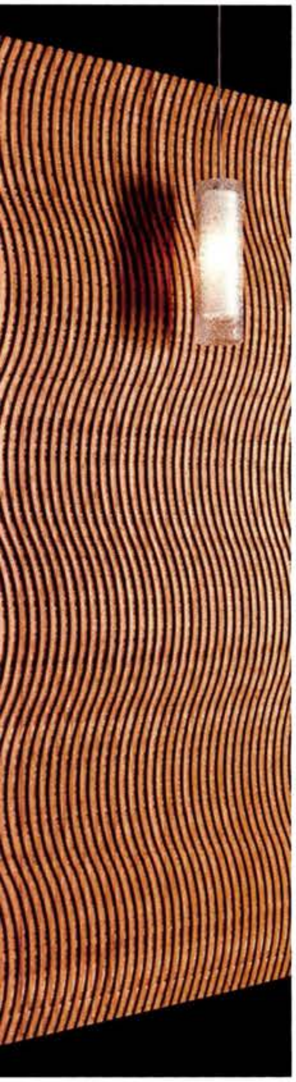
MetalWorks Concealed Ceilings

Armstrong Ceiling & Wall Systems has introduced its largest size metal ceiling panels for use in concealed suspension systems. Part of the MetalWorks line, the panels range in dimension from 2' x 8' to 4' x 10' with a narrow ¼" reveal, enabling architects and designers to create a cleaner, monolithic look. The aluminum units are offered in white, silver-gray, and gunmetal-gray powder-coated finishes, and are perforated for acoustical performance, possessing a noise-reduction coefficient of 0.80 that can be increased to 0.95 when combined with an acoustic infill behind them.
armstrong.com **CIRCLE 212**

AL 400 Ventilation System

A discreet alternative to the traditional range hood, the AL 400 downdraft ventilation system fully retracts into a countertop at the touch of a button when not in use. Ideal for island gas or induction cooktops, the stainless-steel unit features three power levels for extracting vapors and odors, as well as an integrated, dimmable LED work light, and measures 5½" deep.
gaggenau-usa.com **CIRCLE 209**



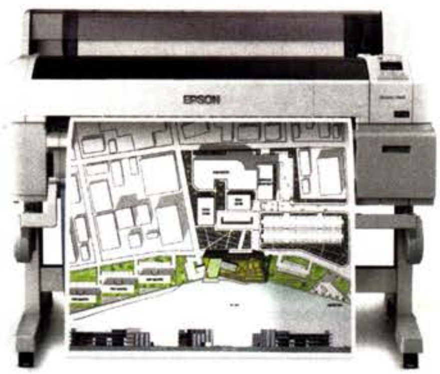


Reveal Collection

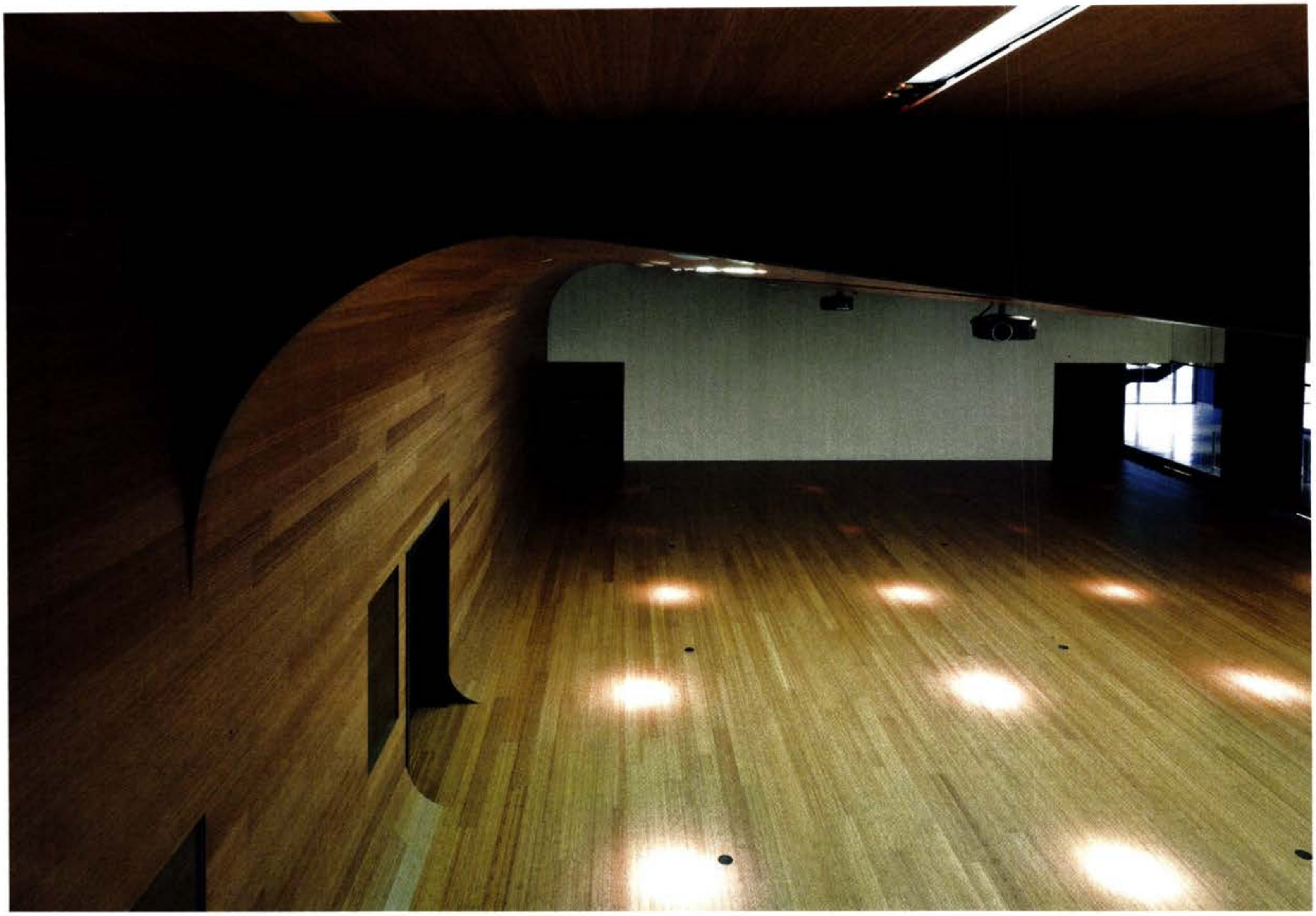
New from Smith & Fong, Reveal is a line of bamboo architectural panels in which eye-catching patterns are carved into the face. The negative space of each pattern "reveals" a core of bidirectional bamboo layers behind the carvings. Eight different designs, ranging from waves to a trellis, are offered in 4' x 8' panels, unfinished or pre-finished in amber or natural stains.
plyboo.com **CIRCLE 211**

Motek Chair

Inspired by origami forms, Motek chair by Luca Nichetto features a single-piece seat and back formed by pressure-molding felt into a rigid body. Without an internal structure, the seat is simply mounted onto a polished or painted cast-aluminum support and finished with walnut, ash-wood, or polished or varnished metal legs. A leather version with an internal frame is also available.
cassina.com **CIRCLE 210**




Cognetti
Mondo's new Artigo Collection of contract flooring is the smart choice for educational facilities.
MONDO® | SMART
HARMONI | NATURA | KAYAR
GRANITO | TERRANOVA | UNI | ZEUS
MONDO CONTRACT.FLOORING.
WWW.MONDOWORLDWIDE.COM
800 361 3747
mondo@mondousa.com
CIRCLE 56



IDOM Headquarters / Javier Pérez Uribarri (ACTX) / Bilbao, Spain **/** Application: Floors, Walls and Ceilings **/** Product: **Hy Tek, Dry Internal /** Finish: Bamboo Caramel

Floors.
Natural wood composite floors.

Floors are high-density timber composites designed to cover internal sub floors by way of controlled quality, comfort and beauty. Hy Tek presents a wide variety of natural wood finishes for extreme traffic environments, and Naturtek, an exquisite selection of hardwoods designed to enhance the natural look of timber. Both ranges offer a highly resilient floor solution processed with Gureprex® technology, which impregnates the natural wood surface with resins. It is designed for its continuous use, with no need for further treatment.

Hy Tek construction

A. **Gureprex*** processed natural timber veneer
B. Resin bonded WBP plywood core
C. HPL balancer

Walls and Ceilings.
Natural wood for internal cladding.

Dry Internal is the ideal wall and ceiling covering for high transit areas: conference rooms, auditoriums, offices, hotels, etc. The Woodskin® finish allows you to feel the nuances and grain of natural wood. The Walls and Ceilings range also counts with Wet Internal, perfect for bathrooms, gyms, saunas, swimming pools or porches. Acoustic is the solution for projects which may require a determined sonority. Our process removes any requirement for ongoing specific maintenance.

Dry Internal construction

A. **Gureprex*** processed natural timber veneer
B. Resin bonded WBP plywood core
C. HPL balancer

PEFC
PEFC/14-35-00042

www.parklex.com

COMPOSITES GUREA, S.A. Zalain Auzoa, 13 - 31780 Bera - Navarra (Spain) [t] +34 948 625 045 [f] +34 948 625 015 - parklex@parklex.com / **USA:** 7353 Pittsford-Victor Rd. (Rt. 96) Victor, NY 14564 - **Eastern USA / phone:** 585 924 1590 - delforte@parklex.com - **Western USA / phone:** 360 451 1130 johnson@parklex.com - **California / phone:** 310 396 9991 info@fcpcusa.com

CIRCLE 57

Parklex®

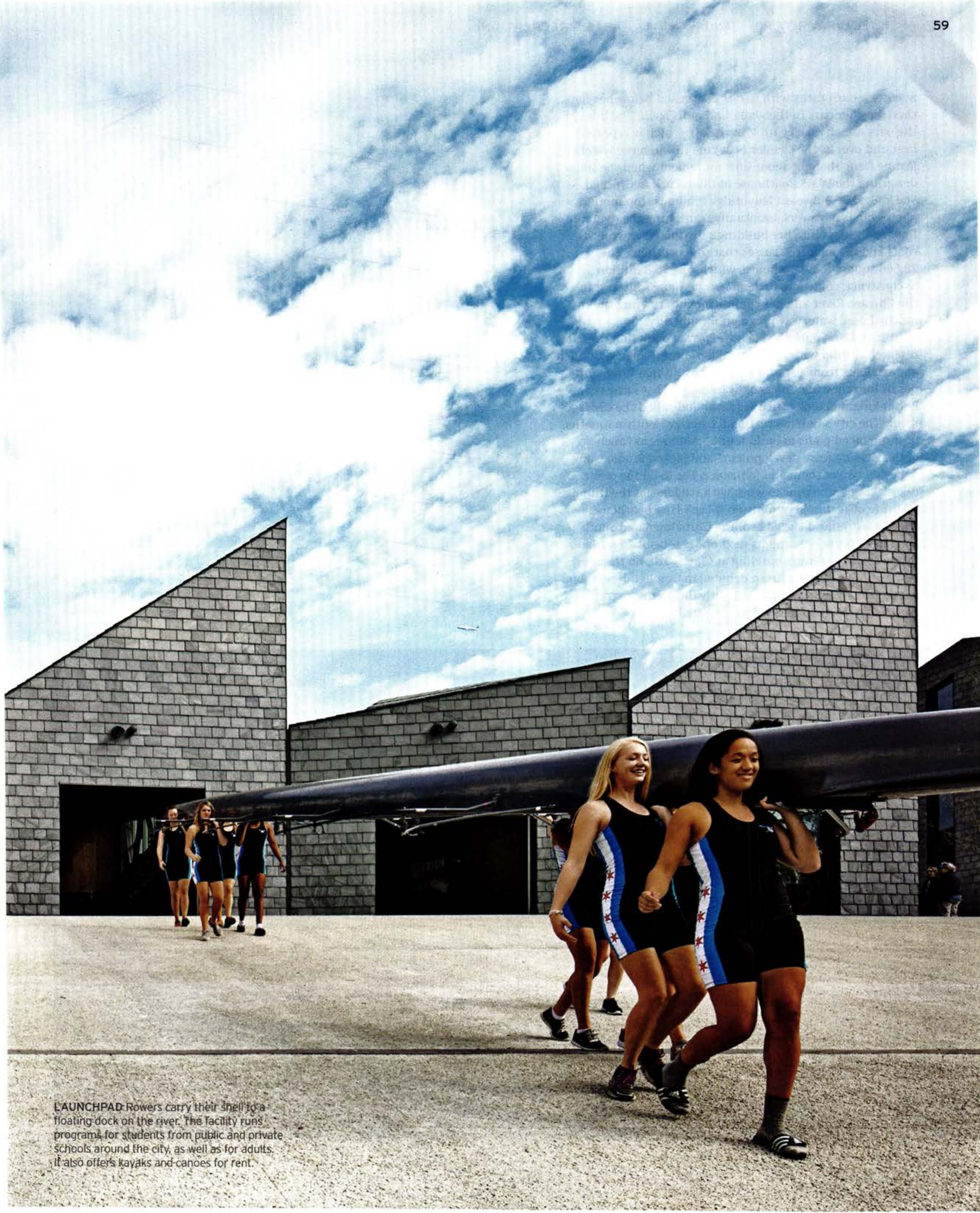
WMS Boathouse at Clark Park | Chicago | Studio Gang Architects

STROKE OF GENIUS

Part of a mayor's push to make the Chicago River a public asset, an energetic building turns structure and materials into a graceful expression of the activity it houses.

BY CLIFFORD A. PEARSON

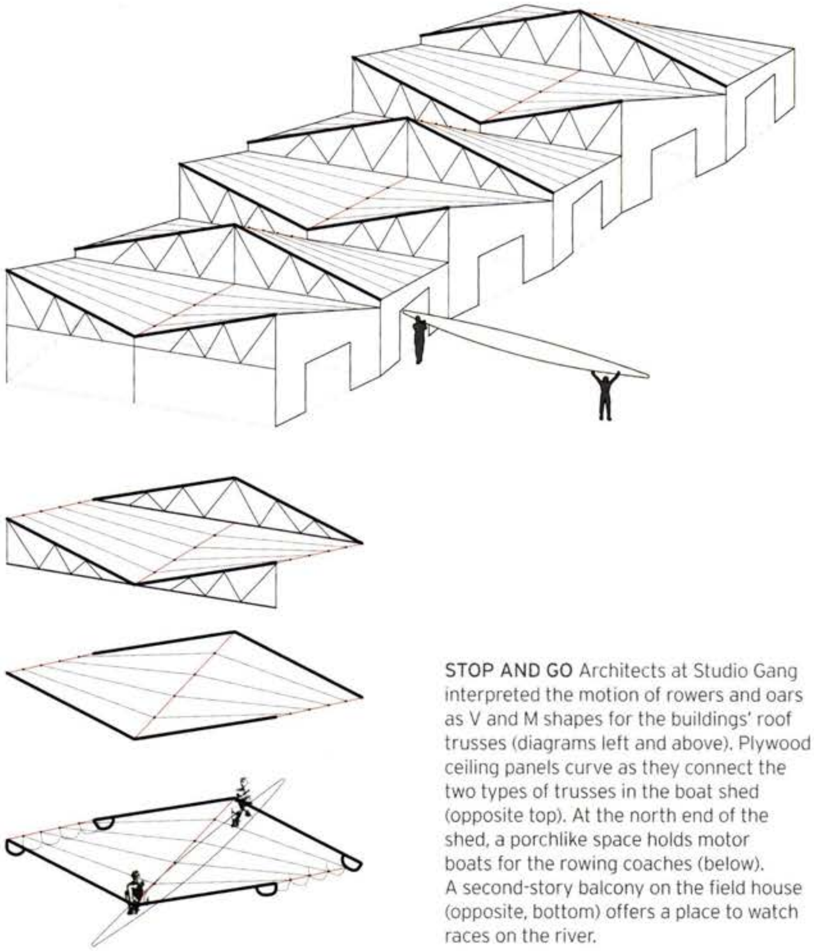
PHOTOGRAPHY BY STEVE HALL/HEDRICH BLESSING



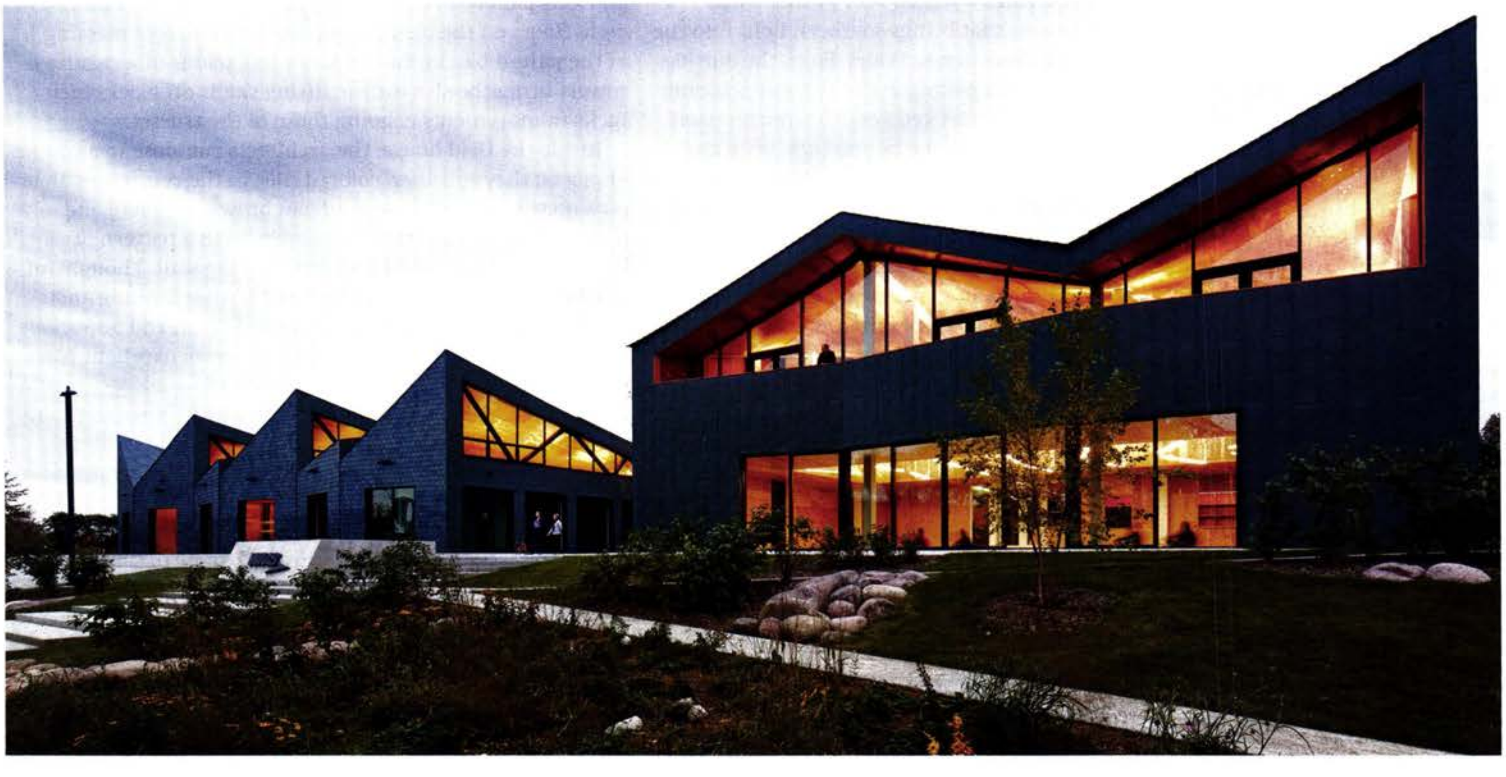
LAUNCHPAD Rowers carry their shell to a floating dock on the river. The facility runs programs for students from public and private schools around the city, as well as for adults. It also offers kayaks and canoes for rent.

A ROWER CROUCHES with her knees tucked below her fists, then dips her oars in the water and pulls back. The lines of the oars sketch an elegant V in the air, which is repeated over and over as the slender boat cuts through the water. Jeanne Gang thought about such movement when she started designing the WMS Boathouse at Clark Park in Chicago. She looked at Eadweard Muybridge's famous stop-motion photographs of rowers, eventually translating the dynamic lines of the oars into her building's distinctive sawtooth roofs and the exposed trusses that support them. The 22,600-square-foot boathouse, which cost $8.8 million to construct, continues to demonstrate Gang's interest in the Chicago River and her commitment to turning the much-abused waterway into a public amenity.

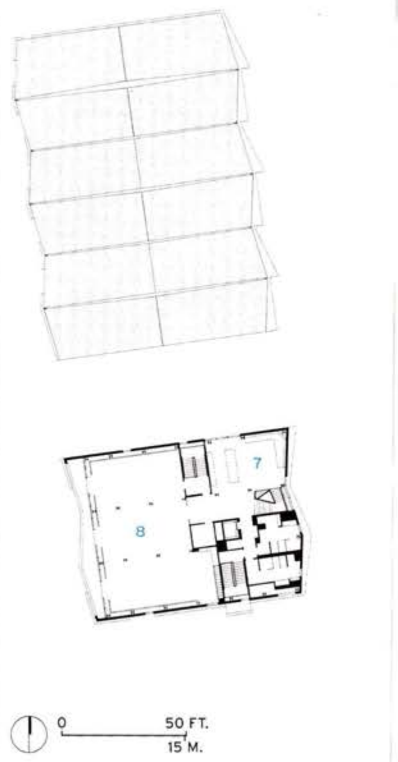
In 2011, Gang published *Reverse Effect*, a book that compiles research she did with the Natural Resources Defense Council and students from a studio at Harvard and that offers proposals for renewing Chicago's waterways. That same year, Rahm Emanuel took office as mayor and called the Chicago River "the city's next recreational frontier." Within months, he announced plans to build four boathouses as "anchors of the river's future development" and picked Studio Gang to design two of them and Johnson & Lee to do the other two, asking both firms to work with students at the Illinois Institute of Technology. Johnson & Lee's first boathouse opened last June at the edge of the Chinatown and South Loop neighborhoods, and its next one is scheduled for later this year, while Gang's building at Clark Park, on the north branch of the Chicago River, debuted in October. Her second boathouse, which will have a slightly different program and design, is scheduled to be completed in 2015.



STOP AND GO Architects at Studio Gang interpreted the motion of rowers and oars as V and M shapes for the buildings' roof trusses (diagrams left and above). Plywood ceiling panels curve as they connect the two types of trusses in the boat shed (opposite top). At the north end of the shed, a porchlike space holds motor boats for the rowing coaches (below). A second-story balcony on the field house (opposite, bottom) offers a place to watch races on the river.



SITE / FIRST FLOOR



SECOND FLOOR

RIVER VIEW
In the field house, rowers in the tank room (opposite top) can look out to the water. Pendant lights above them are angled like oars. In the "erg" room on the second floor (opposite bottom), athletes work out among the structural elements of the building's roof trusses.

With the Muybridge photographs in mind, Gang designed a structural system for the Clark Park buildings' roofs that alternates between trusses shaped like inverted V's and ones shaped like M's. The steel trusses trace a rhythmic up-and-down pattern, which creates a jagged roof profile while framing clerestory glazing that brings southern light into the spaces below, warming the concrete floors. From the outside, the roofs are all sharp angles poking at the sky and grabbing attention. Inside, though, a softer geometry insinuates itself as the connective tissue between the bones. Look up at the ceiling and you notice that the large, 4-by-8-foot plywood panels overhead curve gently as they negotiate the distance between the V and M trusses. The subtle arc of these transitional planes calms the visual composition and at the same time sets off a wonderful rippling motion on the ceiling.

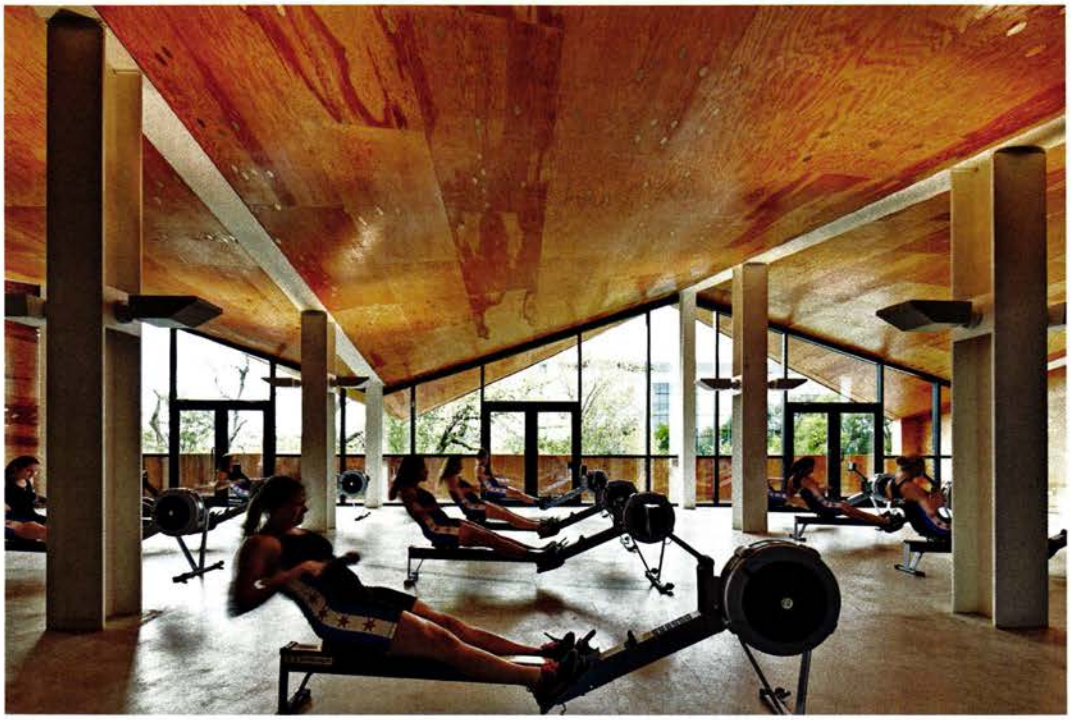
The boathouse is actually a pair of buildings: a one-story shed for storing rowing shells (as well as rental kayaks and canoes) and a two-story field house with a rowing tank, small offices for the Chicago Park District and the Chicago Rowing Foundation (CRF), a community room, and a space filled with ergometer exercise machines. Separating the functions in two buildings made sense because the boat storage area doesn't need to be heated or cooled, and a pair of structures could bracket a central plaza framing the view from the street to the river. The Park District was the client for the project, while CRF—a nonprofit that runs public programs for students and adults—is one of the main users.

Gang says that when she and her team started on the project, they tried applying oar-motion lines to the facades of the buildings. "It didn't work, so we used them for the roofs." But the ghost of that initial idea can be seen in the faceted exterior walls of the two structures, which not only animate the elevations but offer views up and down the river to the people inside. A palette of rugged materials—slate shingles and zinc panels on the outside, plywood surfaces and concrete floors on the inside—emphasize the simple massing of the paired blocks. In the boat shed, teams of wet-suited rowers bring the space alive, lifting shells off black-steel racks in movements echoing those of the trusses.

Inside the field house, the architects cut loose in a couple of places: they specified colored tiles in the rest rooms that pick up the hues of the river (from brown to green) and painted a two-story wall in the lobby with a pattern of bright-orange life preservers on white drywall. Thoughtful touches include built-in seating on the stair landing and in the community room on the second floor, and a spacious balcony off the "erg" room that serves as an excellent place to watch races on the river.

Sustainable-design strategies were woven in throughout the project—from planting a pair of small "rain gardens" and using permeable concrete on the plaza (so no rainwater runs off the site) to providing enough daylighting to reduce dependence on electric fixtures.

Water is a theme that runs through many of Gang's projects. For an 82-story apartment tower in Chicago, she created rippling balconies that inspired its name: Aqua. And even a marble wall she designed for an exhibition at the National Building Museum cascaded out like a stream of stone. Her first boathouse on the Chicago River contributes to this record, converting athleticism into architecture. ■



credits

ARCHITECT: Studio Gang Architects – Jeanne Gang, design principal; Mark Schendel, managing principal; William Emmick, project architect; John Castro, Juan de Mora, Jay Hoffman, Wei-Ju Lai, Angela Peckham, Christopher Vant Hoff, Michan Walker, Todd Zima, project team

ENGINEERS: Matrix Engineering (structural); Spaceco (civil); dbHMS Design Build Engineering (m/e/p); AECOM (river civil)

GENERAL CONTRACTOR: Schaefges Brothers

CLIENT: Chicago Park District

SIZE: 22,620 square feet

COST: $8.8 million (construction)

COMPLETION DATE: October 2013

SOURCES

ZINC PANELS: Rheinzink

CURTAIN WALL: Tubelite

SLATE: Vermont Structural Slate (Heathermoor)

GLASS: Guardian (SunGuard); Saint-Gobain

Polonsky Shakespeare Center | Brooklyn, New York | H3 Hardy Collaboration Architecture

A STAGE FOR EVERY PART

A sleek and seemingly simple glass and aluminum volume encloses a high-tech theater devoted to keeping classics current.

BY LAURA RASKIN

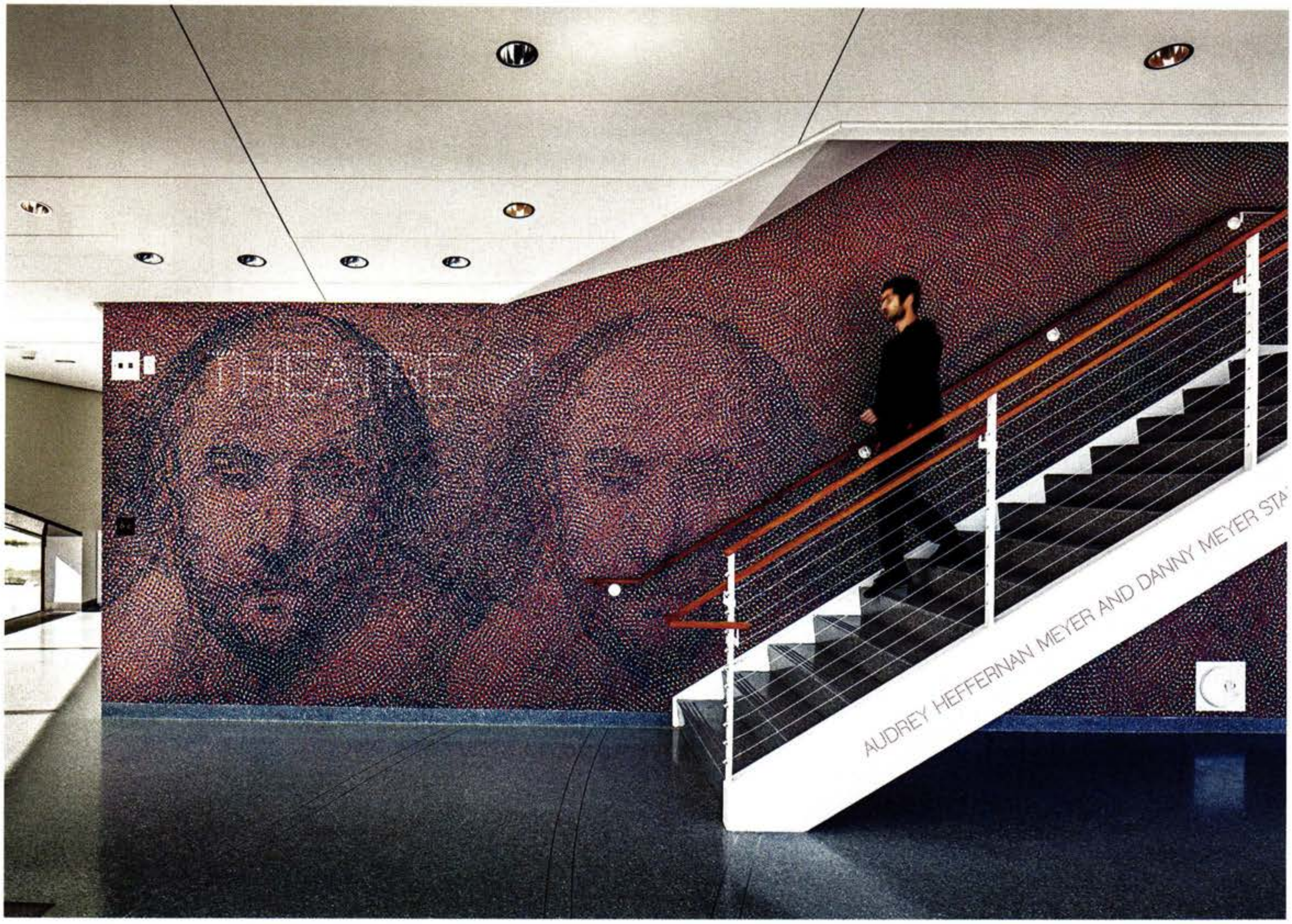
PHOTOGRAPHY BY FRANCIS DZIKOWSKI

DRAMATIC REFLECTION
The Polonsky Shakespeare Center in Brooklyn is a welcoming presence in a neighborhood that has been steadily undergoing a cultural revival for decades. Clad in aluminum composite panels, with a column-free glass curtain wall and a plaza designed by Ken Smith, it is the first theater built in New York for Shakespeare since Lincoln Center's 1965 Vivian Beaumont.

AT A RECENT performance of Shakespeare's *A Midsummer Night's Dream* at the Polonsky Shakespeare Center (PSC) in Brooklyn, New York, Titania, queen of the fairies, levitates into the heavens on a cloud of billowing white fabric while Puck descends into the underworld below the stage. It's a magical production, as tightly choreographed as a ballet.

Designed and reconceived over a 13-year period by master theater designers H3 Hardy Collaboration Architecture, the PSC is the first permanent home for Theatre for a New Audience (TFANA), a 30-year-old company dedicated to keeping Shakespeare and other classic dramas alive. But the athletic feats of the actors in Tony Award–winning director Julie Taymor's vision for *Midsummer* are anything but classical, nor is the laboratory-like theater, which stands apart in a city crowded with stages. "The idea that we wanted to explore, architecturally, was how to create something that's epic and intimate at the same time," says Jeffrey Horowitz, founding artistic director of TFANA. Shakespeare was a relentless inventor, and no two plays were alike, he adds, so a theater for his work must be as mutable. "Most theaters say, 'This is how you have to use me.' There is no fixed perspective in this room."

From the street, the Polonsky is the essence of a black box: gunmetal-hued and framing a public "stage"—a ground-floor lobby and two balconies, the top one stepped back—that is on display through a glass curtain wall. The architects clad the exterior in glossy dark-gray aluminum composite panels that reflect the sky and everything around it, a good trick for the nearly windowless facades required by a theater. It cuts a simple, strong profile in the Downtown Brooklyn Cultural District bordering Fort Greene, an area that has been the focus of a concerted renaissance since the late 1990s, when the Brooklyn Academy of Music began its own transformation, leading a movement to use cultural



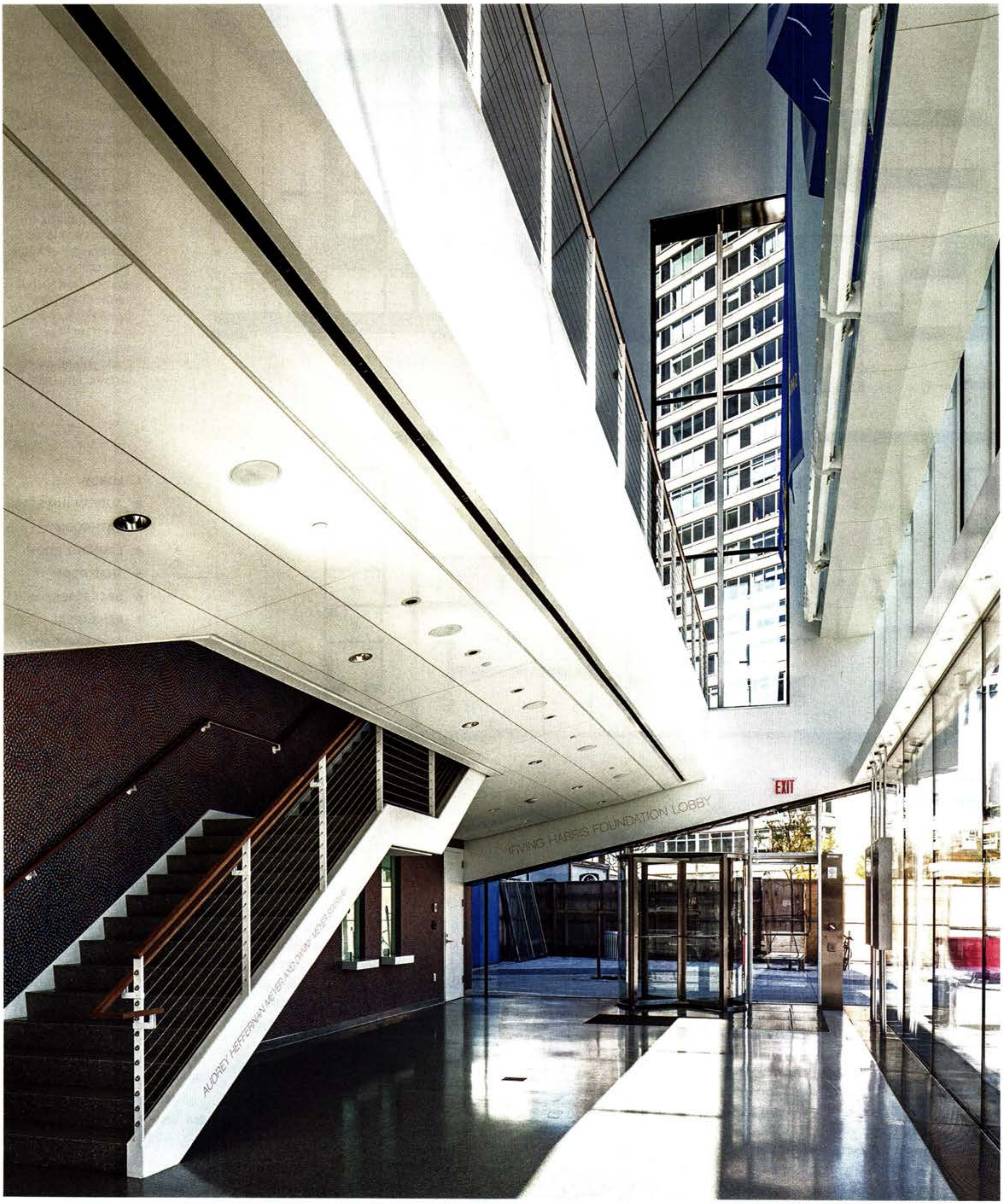
capital to create a more vibrant, mixed-use neighborhood. With the support of New York City's former mayor, Michael Bloomberg, and the Department of Cultural Affairs, the shift has been gaining momentum. Today there are approximately 29 real-estate developments in play in the area, including a residential tower under construction to the south of PSC by Enrique Norten, with a dedicated city-owned arts and culture space. Also to the south, developer Jonathan Rose is working with Dattner Architects, Bernheimer Architecture, and SCAPE Landscape Architects on the design of an apartment building that will also house Eyebeam, an art and technology organization.

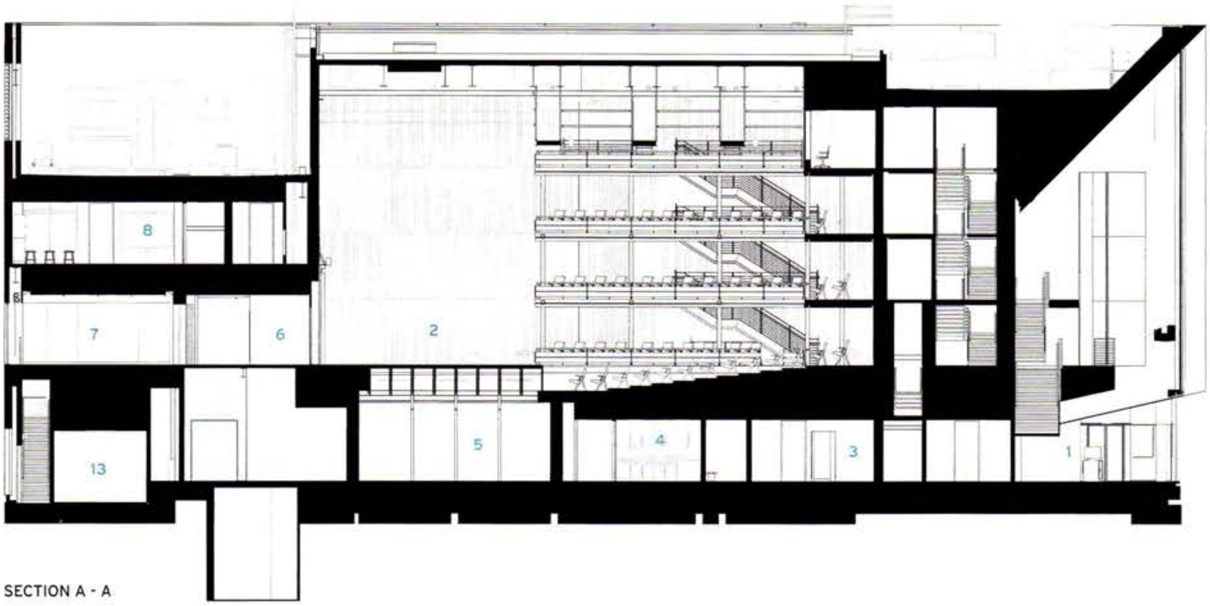
H3 wanted to make the theater welcoming to the community–Fort Greene has been home to artists and creative types long before this new wave of development–so they created a soaring triple-height lobby with a terrazzo floor that appears to flow out onto the concrete plaza beyond. Landscape architect Ken Smith designed a curving pattern of 4-inch-wide stainless-steel strips embedded in the outdoor plaza, and H3 carried his pattern inside, setting aluminum divider strips into the terrazzo–a beckoning gesture. "It's like, come on in, have a beer," says H3's Geoff Lynch, partner in charge. A bar and concession stand for the first floor is currently in fabrication and will be installed this month, to be operated by restaurateur Danny Meyer's Union Square Events.

But the black-box/courtyard theater inside is the real destination. A state-of-the-art and highly flexible take on the Cottesloe Theatre in London, it contains three tiers of seating surrounding three sides of the performance area, one at orchestra level, and two on balconies. From the stage to the grid above that contains lights and mechanical equipment, it's a soaring 35 feet (most off-Broadway theaters are 19). Rear stage doors that conceal the backstage and rehearsal room beyond it can be opened to, say, march an army from the back of the building to the back of the house–100 feet. A 20-foot trap exists below half of the stage. A Broadway theater might have these features, but it would also have 800 to 1,500 seats; the Polonsky has only 299. The seats on the balconies are freestanding, so audience members can pull them up close to the guardrails. (During *Midsummer*, these were a wing's distance from fairy children who often took up residence on the catwalks built for the production.) Depending on the play, the seats and stage can be reconfigured in many different combinations.

Though the mostly steel-frame theater sits above a subway, one doesn't hear or feel it. The front two thirds of the

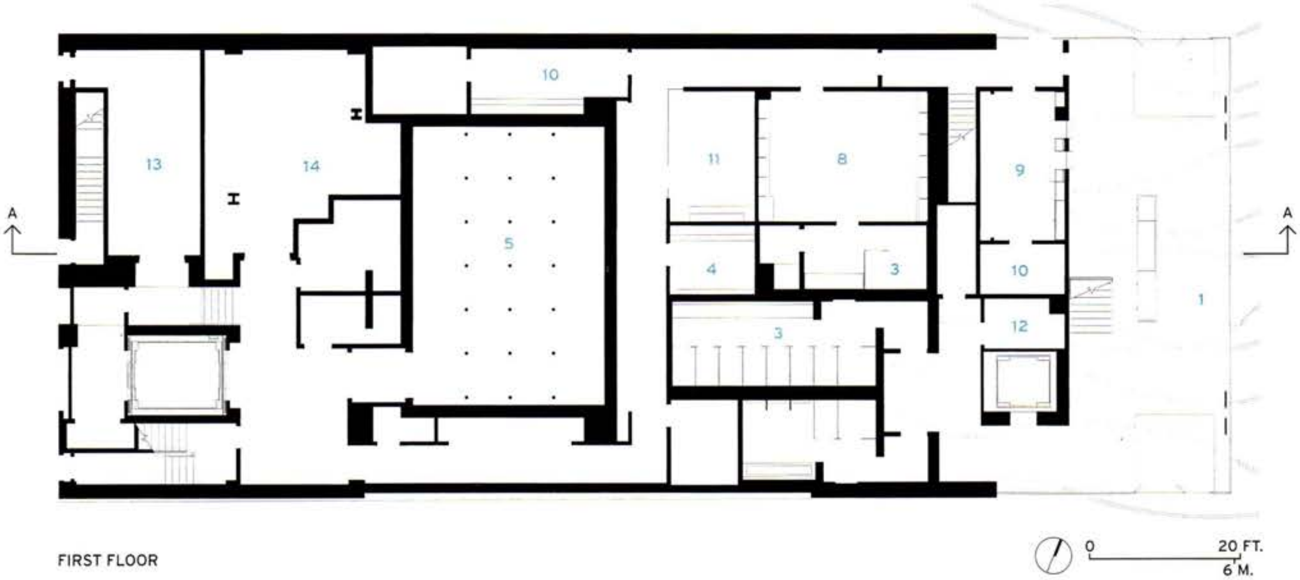
BARD OF BROOKLYN
Milton Glaser has been working with Theatre for a New Audience for two decades, and he designed the pixelated wall coverings and signage for the new building (above). The facade fronting the triple-height lobby invites the neighborhood to look (and wander) in (opposite).


IRVING HARRIS FOUNDATION LOBBY
EXIT
AUDREY HEFFERNAN MEYER



SECTION A - A

ACT I The theater (opposite) was designed for unamplified voices, so the architects worked with consultant Akustics to create the right distribution of reflective and absorptive surfaces. Matte-painted plywood boards of different widths are spaced two inches apart on top of fabric. "The wall panels couldn't be a sacred surface," explains David Haakenson, project architect, since set pieces could potentially be screwed into them.



FIRST FLOOR

1 LOBBY
2 AUDITORIUM STAGE
3 BATHROOM
4 LAUNDRY ROOM
5 TRAP ROOM
6 BACKSTAGE
7 REHEARSAL
8 DRESSING ROOM
9 TICKET BOOTH
10 OFFICE
11 GREEN ROOM
12 PANTRY
13 MAIN ELECTRICAL
14 MECHANICAL

building rest on a 12-inch concrete slab supported by 8-inch-thick steel-reinforced rubber pads that isolate vibrations. "The acoustic isolation was actually a far greater challenge than the acoustics in the auditorium," says Lynch. "It's very challenging to get a rubber that's hard enough to support a building and will last 100 years."

The PSC has all of the bells and whistles to satisfy a director who uses every inch of the theater, like Taymor, but it also honors the audience, making them privy to the mechanics of the production, without being overwhelming, and allowing them to observe each other across the stage—a constant reminder that theater is communal. Founding partner Hugh Hardy "knows how to make those rooms people love," says Lynch. "Architects take theaters too ideologically, so they are often too hard or too much about an architectural idea, and not about going to the theater." Horowitz is clearly thrilled with his company's new home, which switched sites three times in Brooklyn alone. Finally he has a place where "you can conjure dreams that are much larger than everyday realism," he says. ■

credits

ARCHITECT: H3 Hardy Collaboration Architecture – Geoff Lynch, partner in charge; Hugh Hardy, founding partner; David Haakenson, project architect; Margaret Sullivan, director of interior design

ENGINEERS: Robert Silman Associates (structural); Langan Engineering and Environmental Services (civil); WSP Flack+Kurtz (m/e/p, IT, security)

CONSULTANTS: Front (facade); Workshop: Ken Smith Landscape Architect (landscape); Fisher Marantz Stone (lighting); Akustiks (acoustical/AV); Theatre Projects Consultants (theater)

CLIENT: Theatre for a New Audience

SIZE: 27,500 square feet

COST: $47.4 million ($27 million construction)

COMPLETION DATE: October 2013

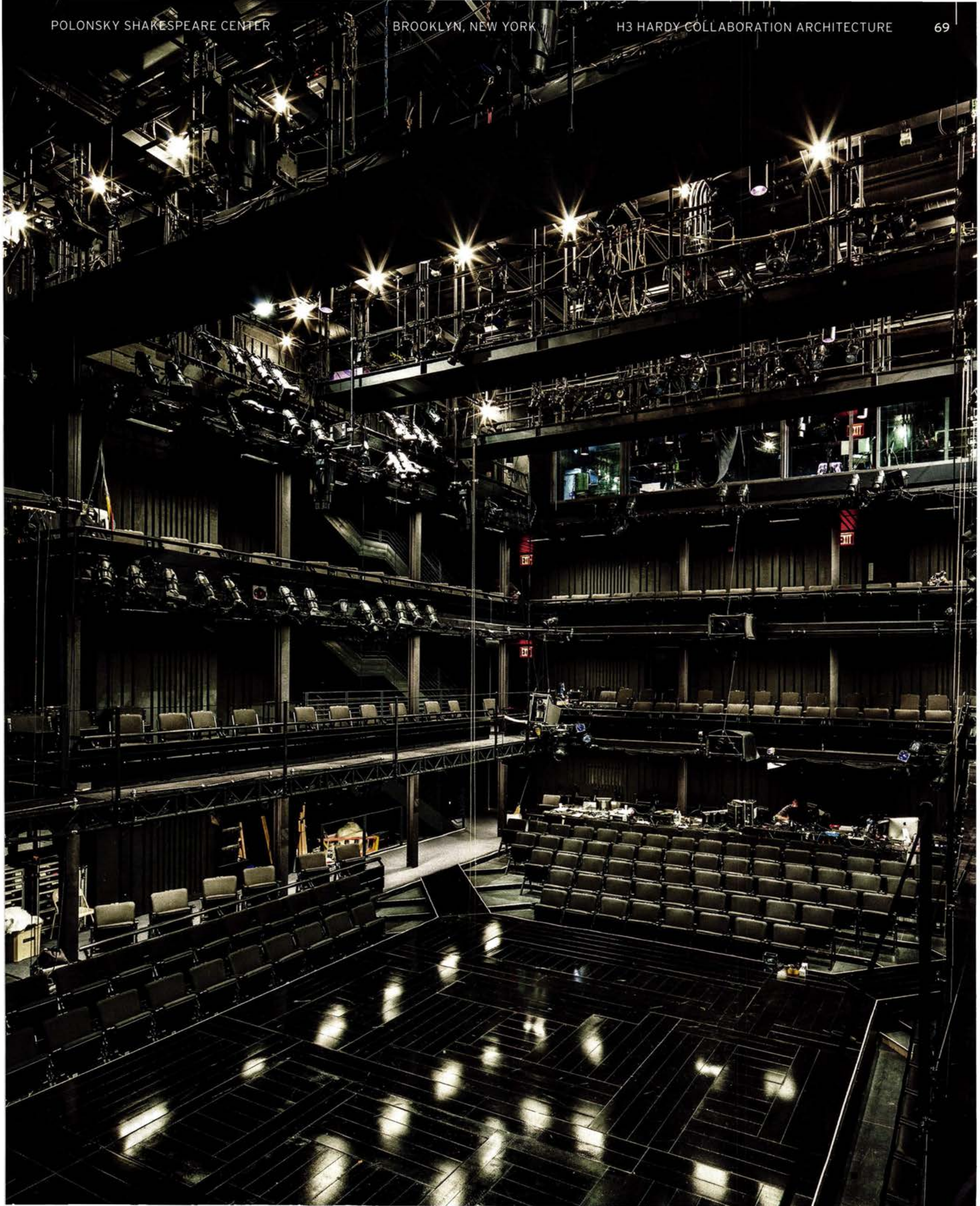
SOURCES

METAL PANELS: Alpolic

CURTAIN WALL: Gartner Steel and Glass

ACOUSTICAL CEILING: Armstrong, Ecophon

PANELING: Eastern Millwork

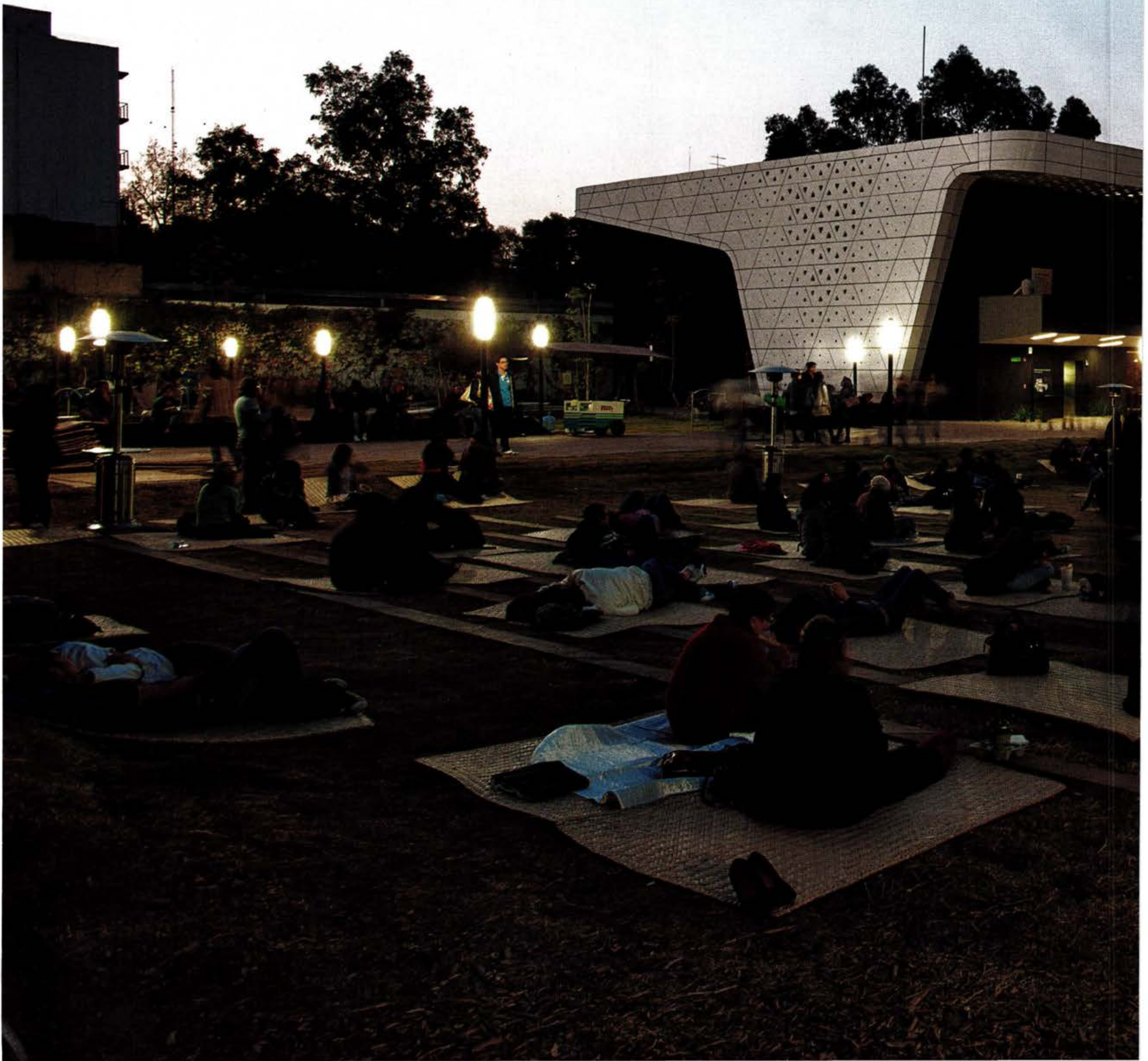


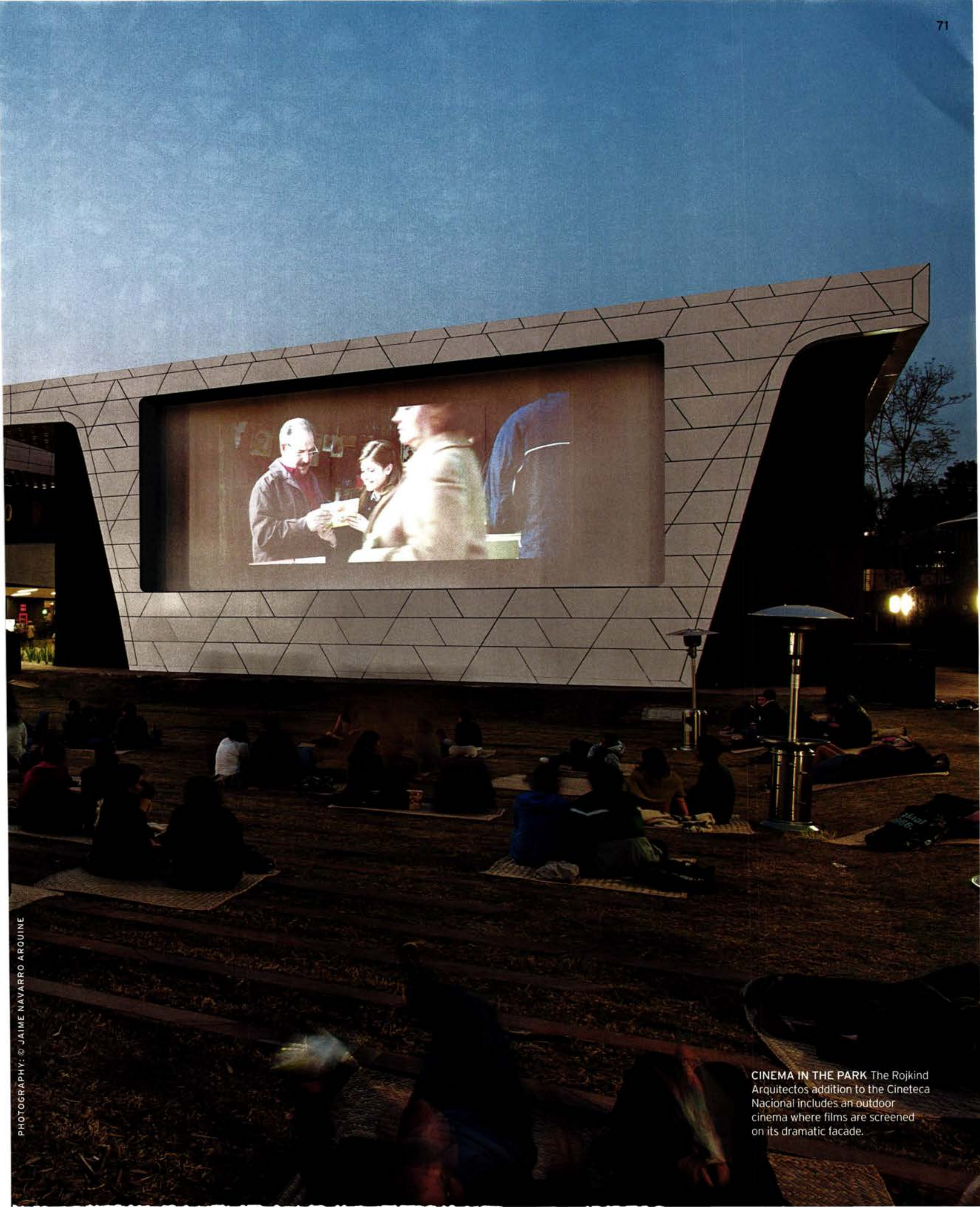
Cineteca Nacional Siglo XXI | Mexico City | Rojkind Arquitectos

THE URBAN THEATER

A firm transforms Mexico's national cinema into a bustling, sexy civic hub.

BY WILLIAM HANLEY





PHOTOGRAPHY: © JAIME NAVARRO ARQUINE

CINEMA IN THE PARK The Rojkind Arquitectos addition to the Cineteca Nacional includes an outdoor cinema where films are screened on its dramatic facade.

THE JOKE goes like this: the person handing out woven mats for visitors to sit on while watching outdoor film screenings on the lawn of Mexico City's Cineteca Nacional is said to ask young couples if they would like one mat, or–lilting into a suggestive tone–two. The first is to place over the sometimes damp grass as everyone does, but the second is to use as a blanket for concealing more serious make-out sessions. It may be a winking exaggeration of the teenage hijinks that go on at the Cineteca, but the joke is revealing. With an expansion of the institution, Rojkind Arquitectos has turned a repository for Mexico's cinematic history into a public space that welcomes the sometimes unruly life of this teeming city.

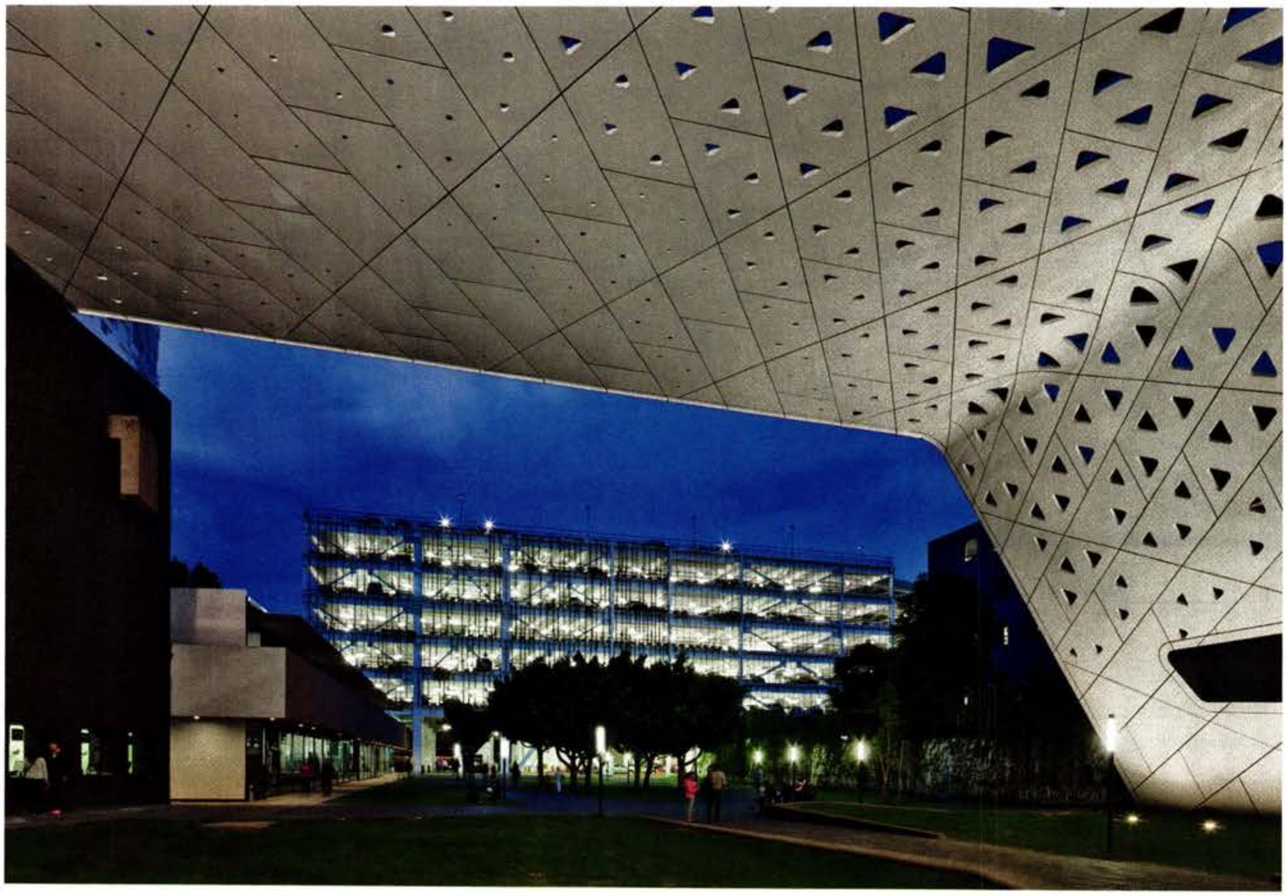
Commissioned by the National Council of Culture and the Arts (Conaculta), the firm proposed a master plan for the 311,000-square-foot complex that expanded the Cineteca's facilities and gave them the feeling of an urban park. In addition to four new 180-seat theaters and new archive buildings, the plan adds a bookstore, café, and restaurant, as well as a bar serving ice cream, all set around two grassy lawns. "We didn't want it to feel like you're in the lobby of a commercial cinema," says firm principal Michel Rojkind. "We wanted it to feel more like a university campus, with everything floating in a park."

The architects had their work cut out for them. Prior to the expansion, the site committed all the sins of 20th-century, car-centric planning. Designed by Manuel Rocha, the four charmingly dated theater buildings were completed in 1982 with sandpaper-like facades of rugged brown concrete. On one side of them, a cluster of rectangular buildings house vaults for the archive, while a long box on the other accommodated administrative offices. But the rest of the site was entirely taken up by acres of surface parking.

To turn the expanse into a more hospitable background for the new theaters and other amenities, Rojkind Arquitectos set out to soften the landscape. The firm consolidated parking on the east side with a six-story garage wrapped in a plant trellis. A new two-level, 16,000-square-foot theater building, two rectangular volumes bridged by a mezzanine, sits across from the existing screening rooms. After making those additions, the firm converted much of the remaining space into stylized lawns.

The architect tied together the new and old buildings as well as the green spaces with a big gesture. A gleaming, slightly *Star Wars*–looking white facade wraps around the new theaters and glides up as a continuous surface to

PHOTOGRAPHY: © PAÚL RIVERA, EXCEPT AS NOTED



GIMME SHELTER
Triangular openings let sunlight penetrate the Cineteca's canopy (opposite), while a glass roof provides protection from rain. The covering wraps new screening rooms and extends to the existing theater buildings (above, right). It partially encloses a plaza at one end of a lawn extending to a parking garage and east entrance (below, right). Temporary landscaping, installed for Cineteca's opening, has recently been replaced, with the topography now rising to meet boomerang-shaped concrete benches.

credits

ARCHITECT: Rojkind Arquitectos – Michel Rojkind, founding partner; Gerardo Salinas, partner; Gerardo Villanueva, project manager; Barbara Trujillo, project architect

INTERIOR DESIGNERS: Alberto Villareal Bello; Esrawe Studio

ENGINEERS: CTC Ingenieros (structural); Studio NYL (roof); IPDS (m/e/p)

CONSULTANTS: Ambiente Arquitectos (landscape); Auerbach Pollock Friedlander (theater/AV)

GENERAL CONTRACTOR: CICCSA

OWNER: Banobras – Fideicomiso para la Cineteca Nacional

SIZE: 530,000 square feet

COST: $30 million

COMPLETION DATE: ongoing

SOURCES

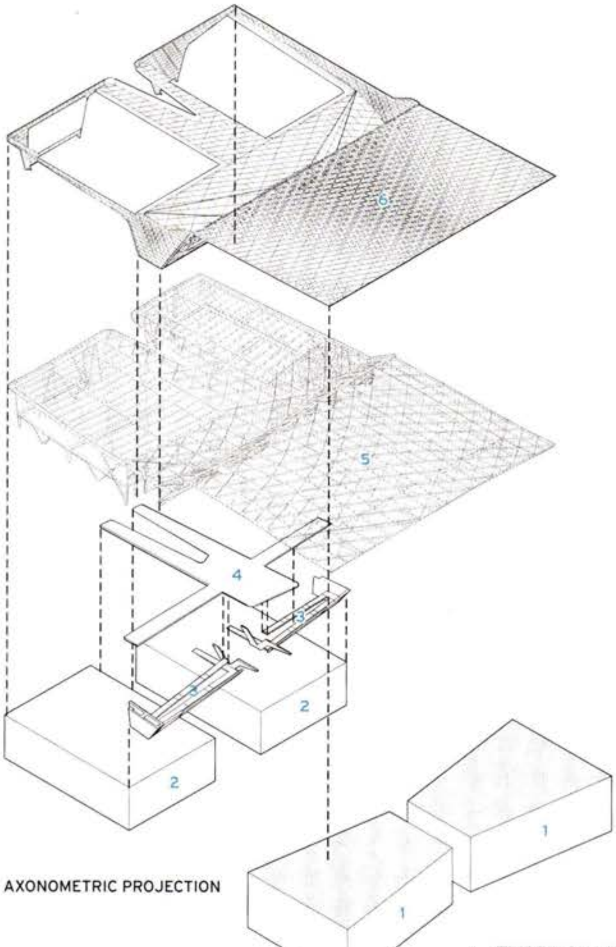
STEEL FRAME: Grupo Baysa

METAL PANELS: Vialdi

EXTERIOR PAVING: Basaltex + Stone

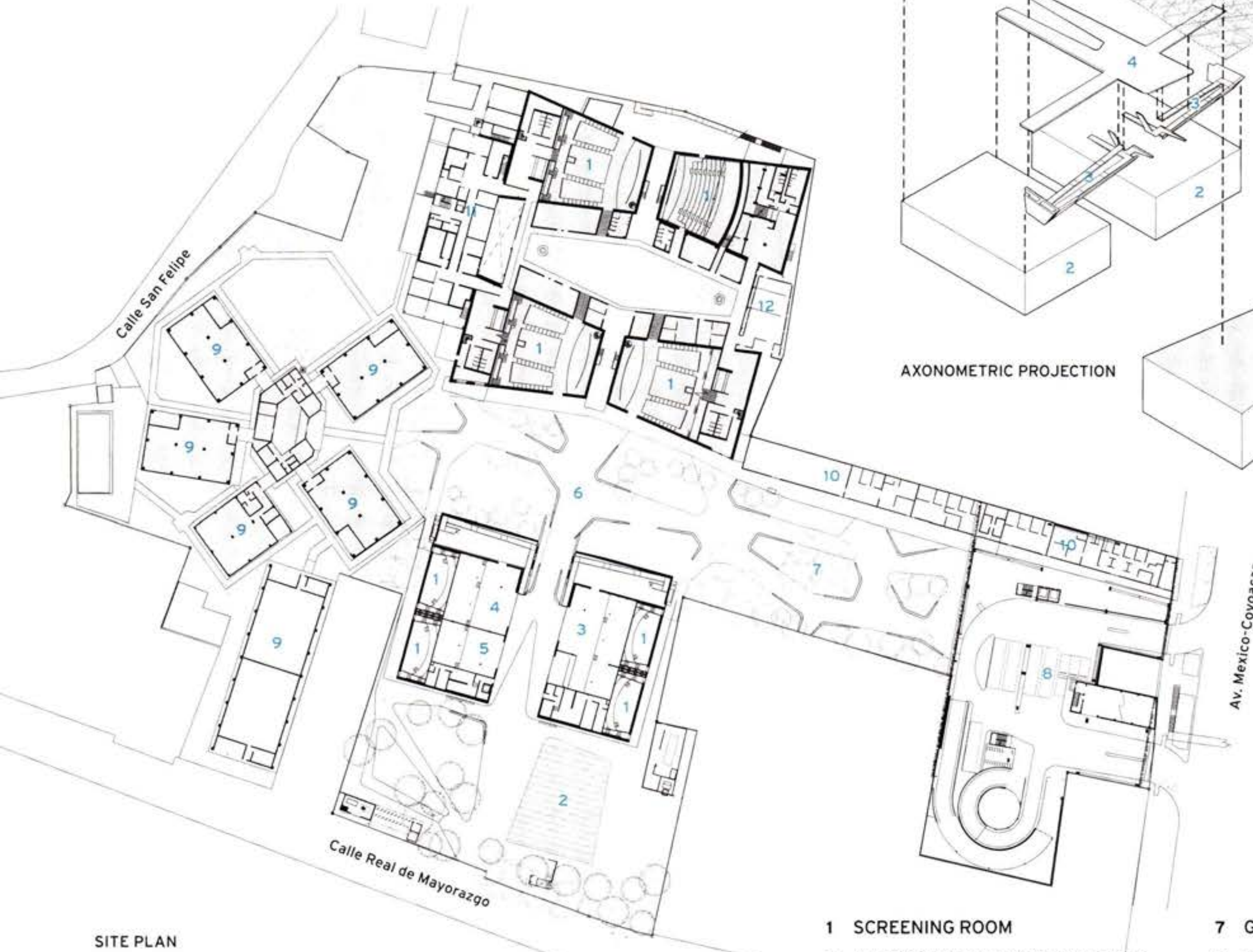
ACOUSTICAL CEILINGS: Roland

THEATER SEATING: Mobiliario



AXONOMETRIC PROJECTION

1 EXISTING THEATER
2 NEW THEATER
3 RAMP
4 MEZZANINE
5 CANOPY STRUCTURE
6 PANEL SYSTEM



SITE PLAN

☐ EXISTING BUILDINGS INDICATED IN GRAY

0 100 FT. 30 M.

1 SCREENING ROOM
2 OUTDOOR CINEMA/AMPITHEATER
3 BOOKSTORE
4 RESTAURANT
5 CAFÉ
6 PLAZA
7 GARDEN
8 PARKING GARAGE
9 VAULT
10 LIBRARY AND OFFICES
11 FILM MUSEUM
12 DIGITAL ARCHIVE SCREENING ROOM

PRESENTATION DRAWING SHOWING NEW THEATER BUILDING (LEFT) AND EXISTING SCREENING ROOMS (RIGHT)

become a 120-foot-long canopy. The span connects the new building to the existing theaters and creates a sheltered plaza below. The dramatic steel construction is clad in composite aluminum panels perforated with triangular openings that widen and narrow to control the amount of sunlight passing through the covering.

The canopy's bombastic shape gives the Cineteca a bold architectural identity and a new public profile—a symbol of the dynamic urban life it invites in. The sweeping form pulls you through the progression of spaces, but it also defines places to hang out, including the central plaza and the mezzanine, where the ice cream bar's wares come from the famed Roxy shop. "Before, you used to come here to see a film and then get out," says Rojkind. "But now you can make a day of it."

The appeal is borne out by attendance figures. The Cineteca sold 1.3 million tickets in the first year after its renovation, up from 650,000 in annual sales in the calendar year before the expansion. On a daytime visit last year, groups of non-ticket holders lingered in the parklike spaces on the way to a nearby metro station, even as construction continued on some forthcoming parts of the project. While Rojkind Arquitectos renovated the existing theaters, the client brought in Taller de Arquitectura (the firm run by Gabriela Carrillo and Mauricio Rocha, Manuel's son) to design a new film museum for the complex and to replace the administrative building with new offices and a library. Rocha has already finished renovating a black-box theater into a smartly detailed viewing room where visitors can screen digital transfers of films on private kiosks, but the pyramid-shaped museum is still several months from completion.

A few other components of the Cineteca are also works in progress. Officials put pressure on the construction team to open the national cinema before former president Felipe Calderón left office in December 2012. As a result, the cinema debuted with hasty finishes and incomplete components. But Rojkind and his firm have pushed the new administration to upgrade some of the materials and see the project to completion, and they have made significant progress over the last year. Now, there are plans to add more bike racks and a beer garden, among other new amenities.

The process has been slow going, but Rojkind is content with his compromise. "We sacrificed better details to have a better campus," he says. "The details can be improved, but this was our one shot to make a great public space." Finished or not, it's already an excellent place to bring a date. ■

MEMORABLE SCENES From the south lawn and outdoor cinema, an open-air concourse lined with a café, restaurant, bookstore, and ticket window leads into the Cineteca (above). The curving structure allows sight lines among the cinema's social spaces, creating a see-and-be-seen promenade toward the covered plaza at the heart of the campus.

Schools of the 21st Century

As U.S. educators and government officials continue to examine the quality of the nation's K–12 education, a growing number of astute communities and school boards are working with architects to develop improved learning environments. The "All American" review that follows explores eight of the country's most innovative projects, both public and private, ranging from a striking high-rise college-prep school in Chicago and a transformative factory-turned-design school in Baltimore, to a gently assertive elementary school building in Fayetteville, Arkansas (pictured). Light-filled and dynamic, each aims to raise the grade for a building type ready to graduate to a higher level.

PHOTOGRAPHY: © TIM HURSLEY

FAYETTEVILLE MONTESSORI ELEMENTARY SCHOOL BY MARLON BLACKWELL ARCHITECT

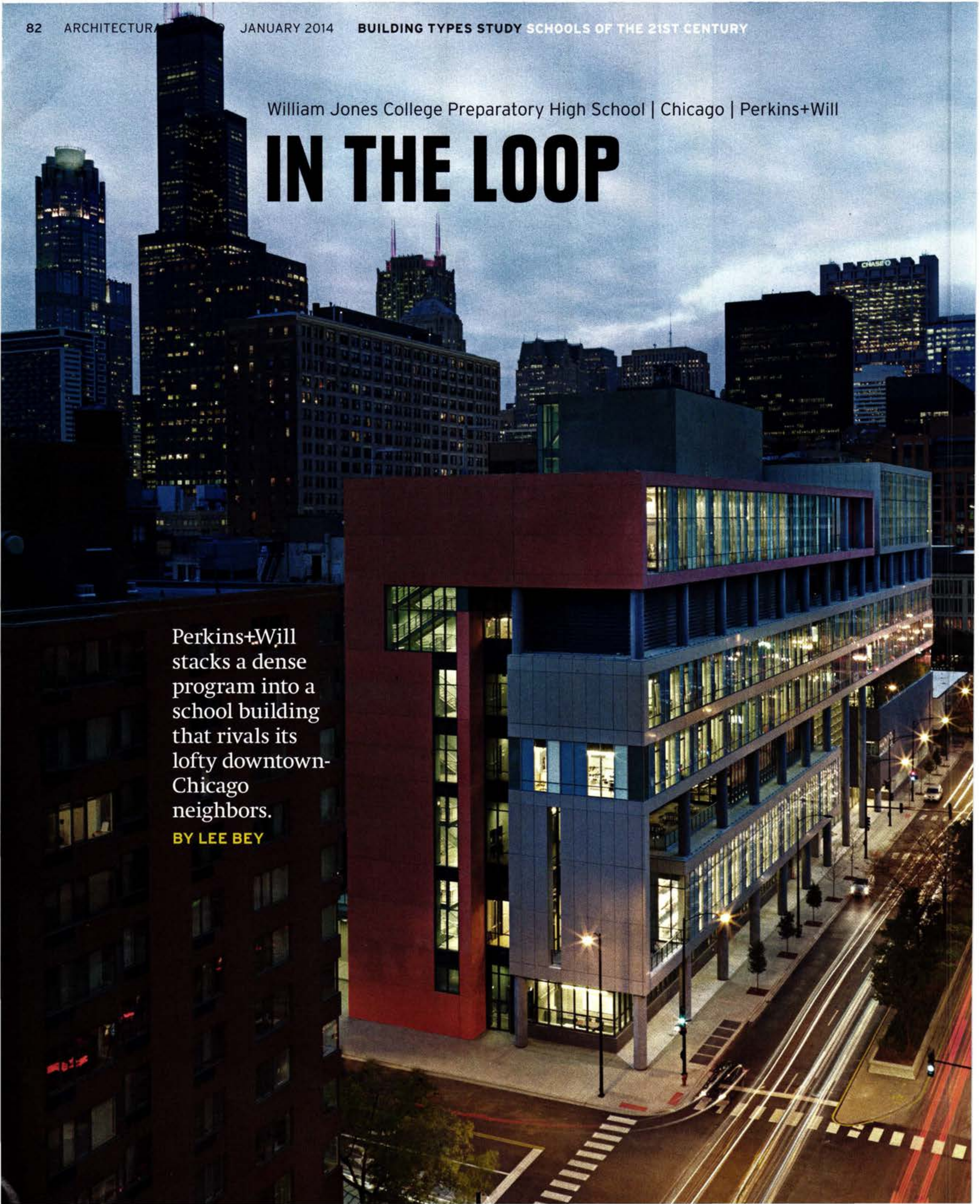
View additional school projects at architecturalrecord.com

William Jones College Preparatory High School | Chicago | Perkins+Will

IN THE LOOP

Perkins+Will stacks a dense program into a school building that rivals its lofty downtown-Chicago neighbors.

BY LEE BEY



PHOTOGRAPHY: © JAMES STEINKAMP

PICTURE THIS: in the shadow of Chicago's famously tall downtown, a public school for 1,200 students now stands to rival the towers around it. In certain ways, William Jones College Preparatory High School is like any typical new urban school: big, glassy, flexible, and colorful. But the similarities pretty much end there. As opposed to sprawled-out high schools built on enough horizontal real estate to provide space and parking for all, Jones College Prep is stacked on its site in Chicago's South Loop neighborhood. There's even an underground garage beneath the building. "It's an interesting example for the future, particularly as cities densify," says the school's lead architect, Ralph Johnson, global design director of Perkins+Will. "People are now living downtown."

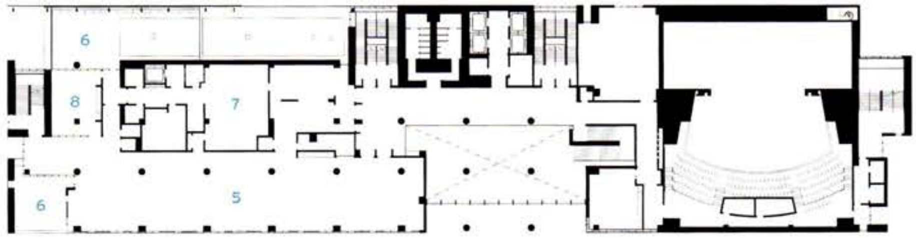
The $115 million Jones College Prep, which opened last August, is actually seven stories tall, but higher than normal ceilings give it the stature of a 10- or 11-story building. The first floor contains a spacious three-story lobby that doubles as the school's town square. It also serves as an overflow space for the adjacent auditorium. The city's Balbo Drive dead-ends at the lobby's glass curtain wall, providing views out to nearby 1920s buildings, the Elevated train across the street, and Grant Park, which is only about three blocks east. "Downtown is the school's campus," says Erin Lavin Cabonargi, executive director of the Public Building Commission (PBC) of Chicago, the agency that built the school. "The views are incredible."

The 278,000-square-foot school just about doubles the capacity of an existing facility located on the north end of the same block. Built in 1967 as Jones

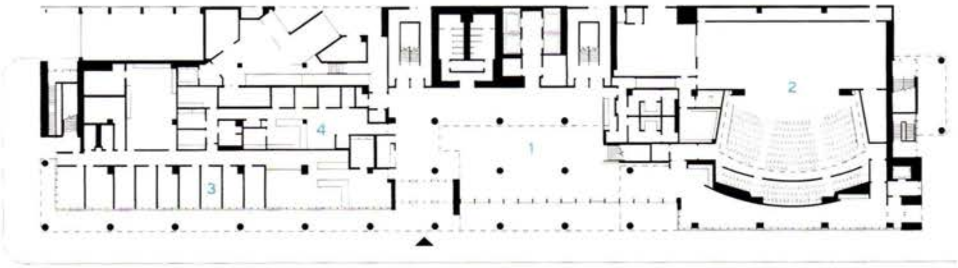
DOWNTOWN SHUFFLE
Higher than normal ceilings make this seven-story building appear much taller (opposite), while long classroom bays give the eastern facade a strong horizontal appearance (above).

SEVENTH FLOOR

FOURTH FLOOR



SECOND FLOOR



FIRST FLOOR

1 LOBBY
2 AUDITORIUM
3 ADMINISTRATION
4 NURSE/COUNSELING
5 CAFETERIA
6 DINING TERRACE
7 KITCHEN
8 TEACHERS' DINING
9 CLASSROOM
10 ART CLASSROOM
11 SCIENCE LAB
12 GYMNASIUM
13 NATATORIUM
14 TERRACE

SECTION-PERSPECTIVE

credits

ARCHITECT: Perkins+Will – Ralph Johnson, design principal; Michael Palmer, managing principal

ASSOCIATE ARCHITECT: The Architects Enterprise

ENGINEERS: Halvorson & Partners, Drucker Zajdel Structural Engineers (structural); Primera Engineering (m/e/p); Terra Engineering (civil)

GENERAL CONTRACTOR: Walsh Construction Company II

CLIENT: Chicago Public Schools

SIZE: 278,000 square feet

COST: $114.6 million (total); $90.9 million (construction)

COMPLETION DATE: August 2013

SOURCES

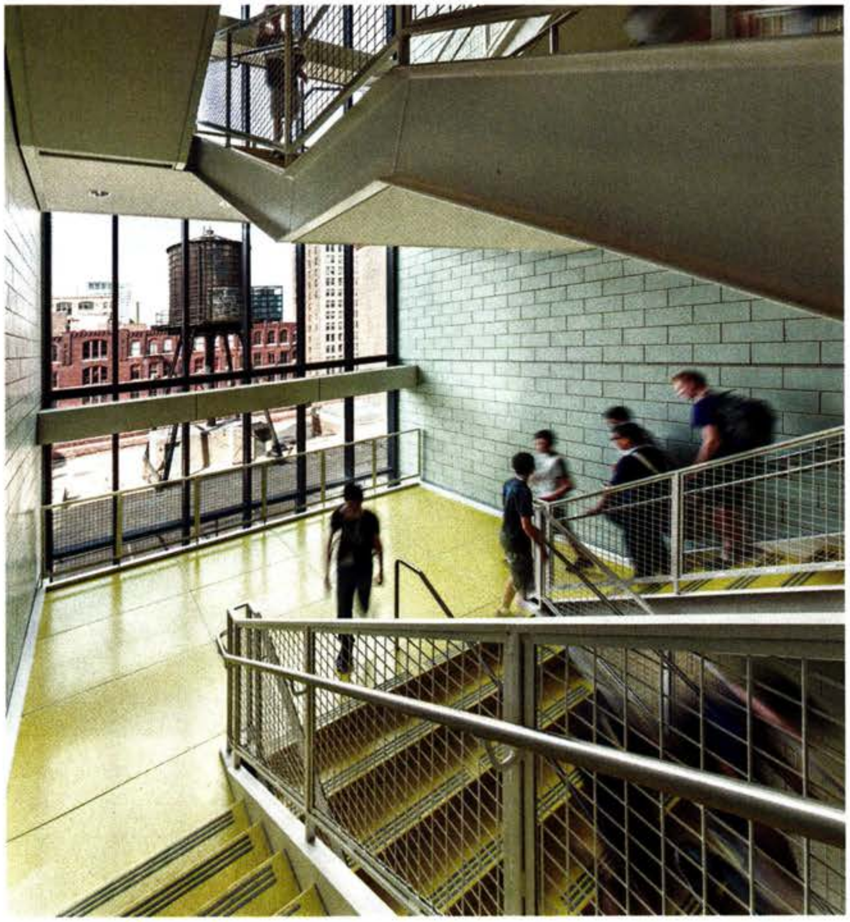
MASONRY: Sioux City Brick & Tile

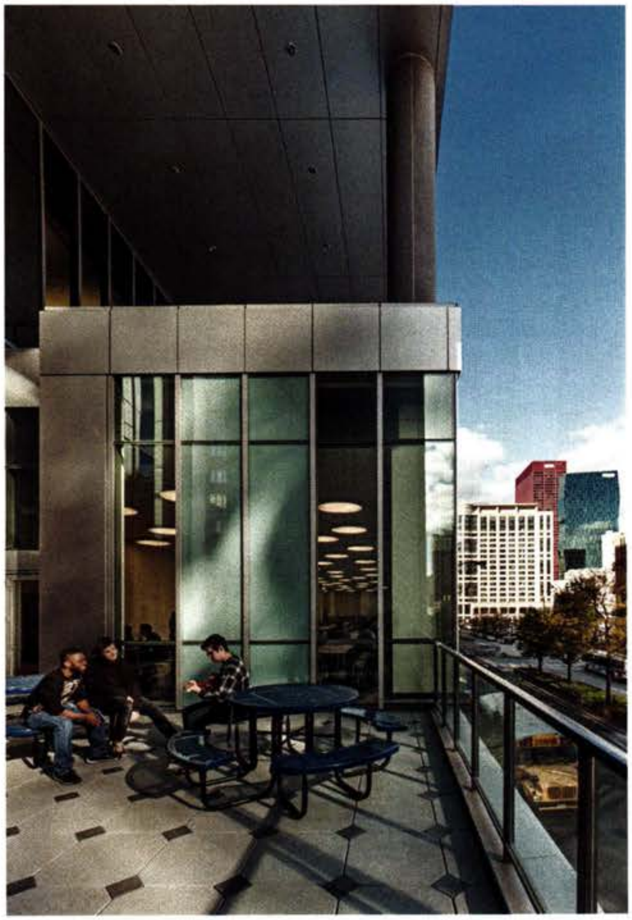
CURTAIN WALL: Crown Corr, Oldcastle BuildingEnvelope

SPECIAL SURFACING: 3Form

OPEN LEARNING Floor-to-ceiling windows extend along the entire eastern side of the building, flooding the interiors—including the three-story-tall lobby—with light (opposite and top). The school features wide hallways and staircases to create open spaces for learning and congregating (bottom).

ACTIVITY HUB
The architect used a "stacked" approach, placing classrooms, library, and media center on the middle floors (left). Staircases were designed for congregating (bottom left). Expansive terraces (bottom right) adjoin the library, cafeteria, and athletic facilities. A light-filled corridor and colorful tile ease way-finding (opposite top). Located on the top floor, the gymnasium offers views of the school's downtown neighbors (opposite bottom).





Commercial High School to train students to be secretarial and office workers, the main structure of that old campus—also designed by Perkins+Will—is a slit-windowed, six-story building. The school switched to an academic program in 1982, then a college-preparatory curriculum in 1998—and has since been named one of America's Best High Schools for four straight years by *U.S. News & World Report*. However, the building, which was originally programmed like an office complex, is still in use, and there are plans to restore the Modernist concrete structure and then link it to its larger sibling.

The new Jones is taller, broader, and more complex than its predecessor. The site, previously occupied by a parking lot and the city's historic Pacific Garden Mission (since relocated), is relatively small for a high school. And the Printer's Row neighborhood, which is listed on the National Register of Historic Places, abuts the site's western edge. So there was no place to build but up. "Most schools are horizontally communicating," Johnson says. "This one communicates vertically, which was a key strategy."

In addition to classrooms and offices, the school, which has selective enrollment, required long spans for large spaces that would typically go on a ground floor, such as its 475-seat auditorium, a gymnasium, and a competition-size swimming pool. According to Perkins+Will senior project architect Bryan Schabel, the challenge was arranging the big parts, the heights and weights, so that the overall design made sense structurally and economically.

The lobby, administrative area, and auditorium's main floor take up most of the school's first story. The auditorium, on the north end, has a balcony and a fly space, which gives it greater height. "Everything else in the building has to line up," notes Schabel. To balance the auditorium's height, the architect stacked a cafeteria and media center on the second and third floors of the building's south side. They configured long bands of classrooms, laboratories, and other instructional areas on the fourth and fifth floors, and placed the natatorium above them on the south end of the building, so that the pool's great weight is efficiently transferred downward through the classroom space beneath. The gym, which is at the opposite end of the hall on the school's north side, weighs less than the pool. "So it went over the auditorium and has a large transfer truss," says Schabel.

Together, the architects and PBC are seeking LEED Gold certification for the building, which has a green roof and a system that collects rain and releases it slowly into the city's stormwater system. Other sustainable measures include LED lighting and occupancy sensors.

Rather than hide the design and structural choices behind a monolithic facade, Johnson chose to express them. The exterior reads horizontally where long classroom bays are located, whereas terraces and reading gardens appear as recesses and voids, giving the facade depth. Acknowledging its historic neighbors, the south and west facades, which face Printers Row, feature terra-cotta-colored precast concrete panels to match the red-brick exteriors of nearby buildings. "We really wanted this building to be part of the fabric of the city," says Johnson. ■

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

Baltimore Design School | Baltimore | Ziger/Snead Architects

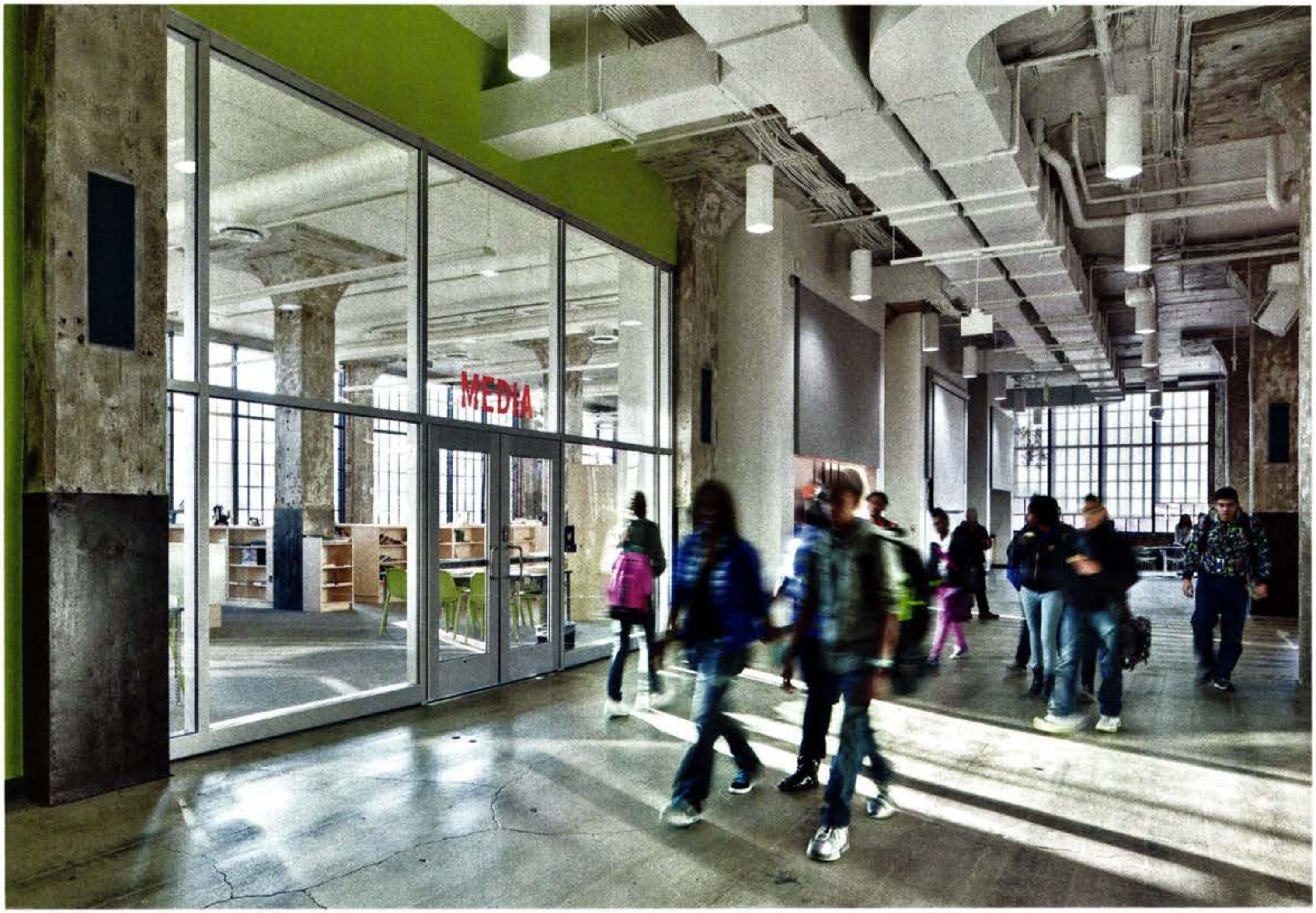
LEARNING BY DESIGN

An early-20th-century industrial building sets the scene for a dynamic public school model in the midst of a growing arts community.

BY SHARON MCHUGH

CLEAR VISION A resolute team of community leaders, residents, and professionals turned this former factory into a cutting-edge public design school for middle and high school students.

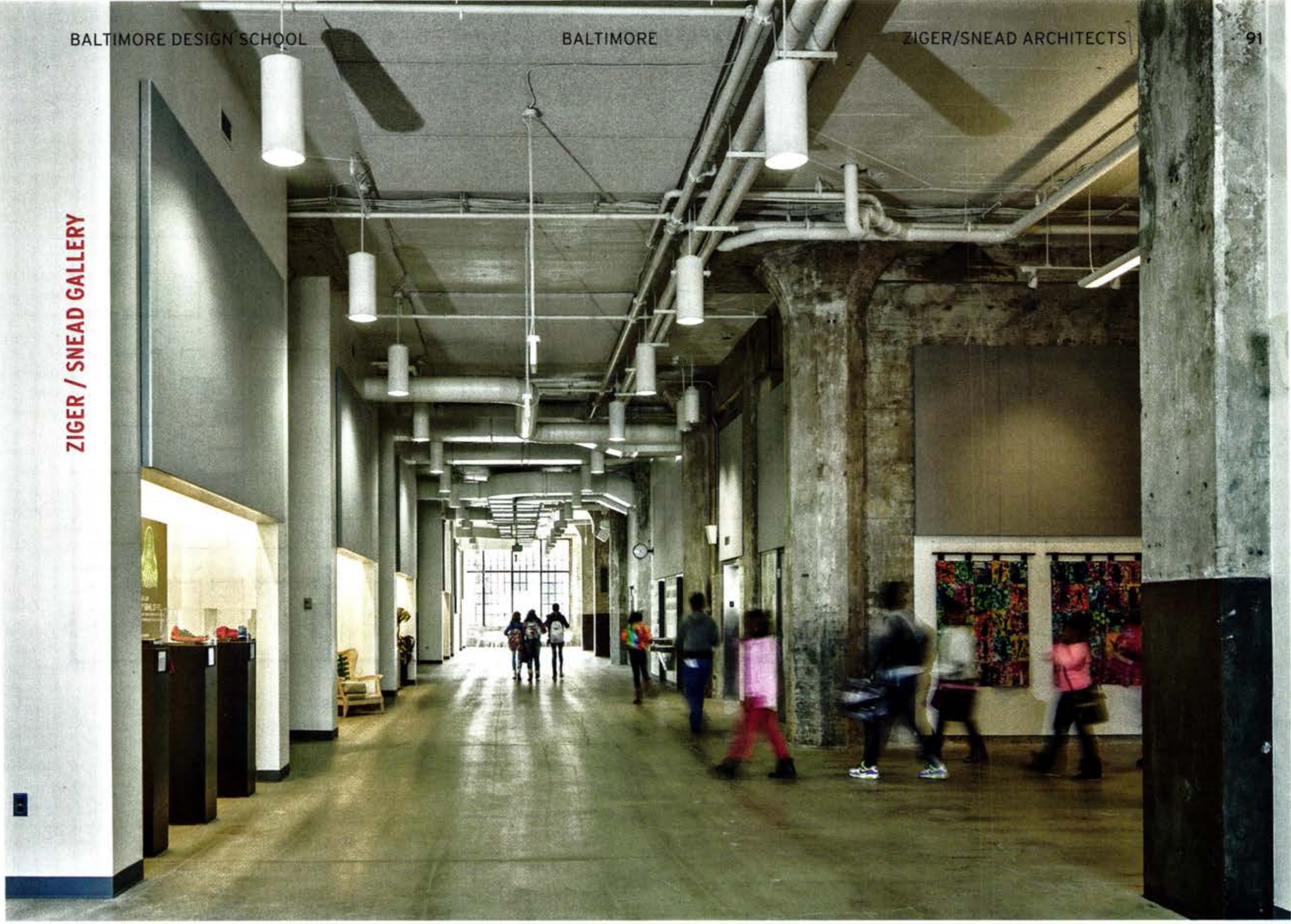
PHOTOGRAPHY: © KARL CONNOLLY



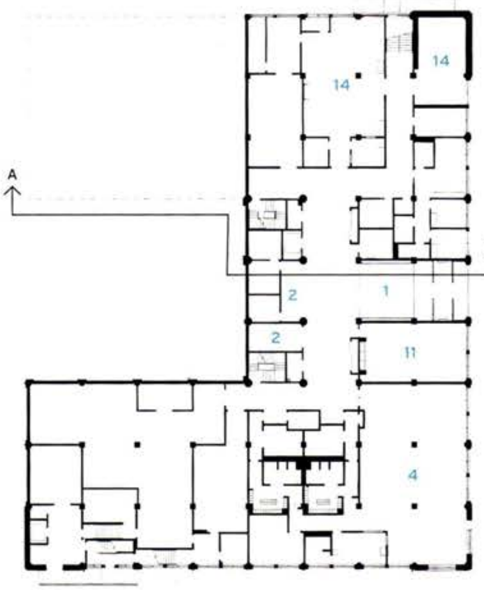
BUILT IN 1914, the four-story industrial building at 1500 Barclay Street in Baltimore's North Central Historic District was innovative for its time, with expanses of glass and a unique ventilation system designed by the architect, Otto G. Simonson, to improve working conditions. Nearly 100 years later, the masonry structure is again breaking new ground. Originally home of the Cork Crown & Seal Company, a bottle-cap manufacturer, and later occupied by the Lebow Brothers Clothing Company, a maker of men's suits, the building has been transformed into the dynamic Baltimore Design School (BDS) by the Baltimore-based architect Ziger/Snead.

The existing 115,000-square-foot building had a leaky roof, spalling concrete, and thick vegetation growing out of its walls. It needed structural repairs, new windows, and a complete systems overhaul. "It was in such bad shape that it was used as a set for the popular TV crime drama *The Wire*," says design principal Steve Ziger. There were still coat racks, sewing machines, and barrels of buttons from 1985 when the building was shuttered due to a labor dispute.

A gritty, formerly working-class neighborhood dotted with factories is not the first place you would think of locating a school for kids. Yet the founders of the BDS, a public school offering concentrations in fashion design, architecture, and graphic design to middle and high school students, knew it



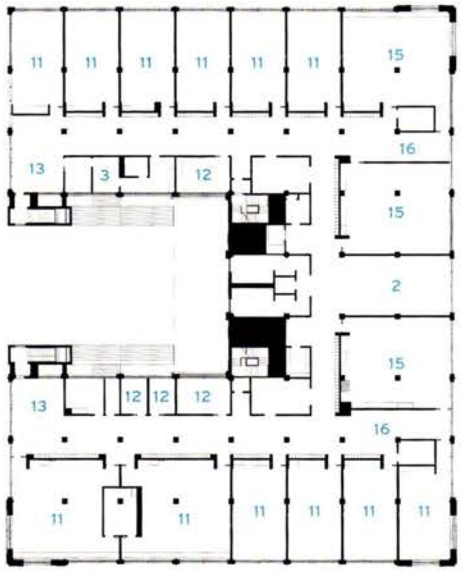
LAYERS OF TIME
The architects balanced new and old by maintaining as much of the existing structure as possible and exposing its rough elements so students could experience the power of design every day. Transparent sunlit studios and a media room (opposite, top) line the spacious corridors, surfaced with polished-concrete floors and dotted with newly installed galleries (above). A vibrant turquoise packs a punch (left), within one of two external corrugated-aluminum stairwells the architects installed along facing walls in the courtyard (opposite, bottom).



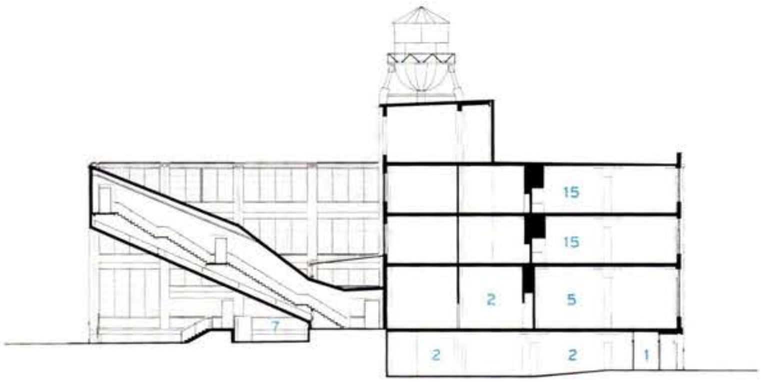
FIRST FLOOR

0 30 FT. 10 M.

SECOND FLOOR



FOURTH FLOOR



SECTION A - A

0 30 FT. 10 M.

1 ENTRY
2 GALLERY
3 OFFICES
4 GYMNASIUM
5 MEDIA CENTER
6 CAFETERIA/MULTIPURPOSE
7 OUTDOOR STAGE
8 FASHION LAB
9 FABRICATION LAB
10 ARCHITECTURE LAB
11 CLASSROOM
12 BREAKOUT/STUDY AREA
13 LOUNGE
14 METAL/WOOD SHOP
15 STUDIO
16 CRIT SPACE

credits

ARCHITECT: Ziger/Snead Architects – Steve Ziger, design partner; Hugh McCormick, managing partner; Katherine LePage, Matthew Rouse, Sukanya Walsh, Jonas Risén, Miharu Morimoto, project team

ENGINEERS: Henry Adams (m/e/p/fp); Gower Thompson (civil); Columbia Engineering (structural)

CONSULTANTS: Ashton Design (graphics); Lazarus Design Associates (landscape)

GENERAL CONTRACTOR: Southway Builders

CLIENT: Baltimore Design School/ Seawall Development Company

SIZE: 115,000 gross square feet

COST: $26.9 million

COMPLETION DATE: June 2013

SOURCES

CURTAIN WALL: Kawneer; EFCO

ALUMINUM WINDOWS: Seal Craft

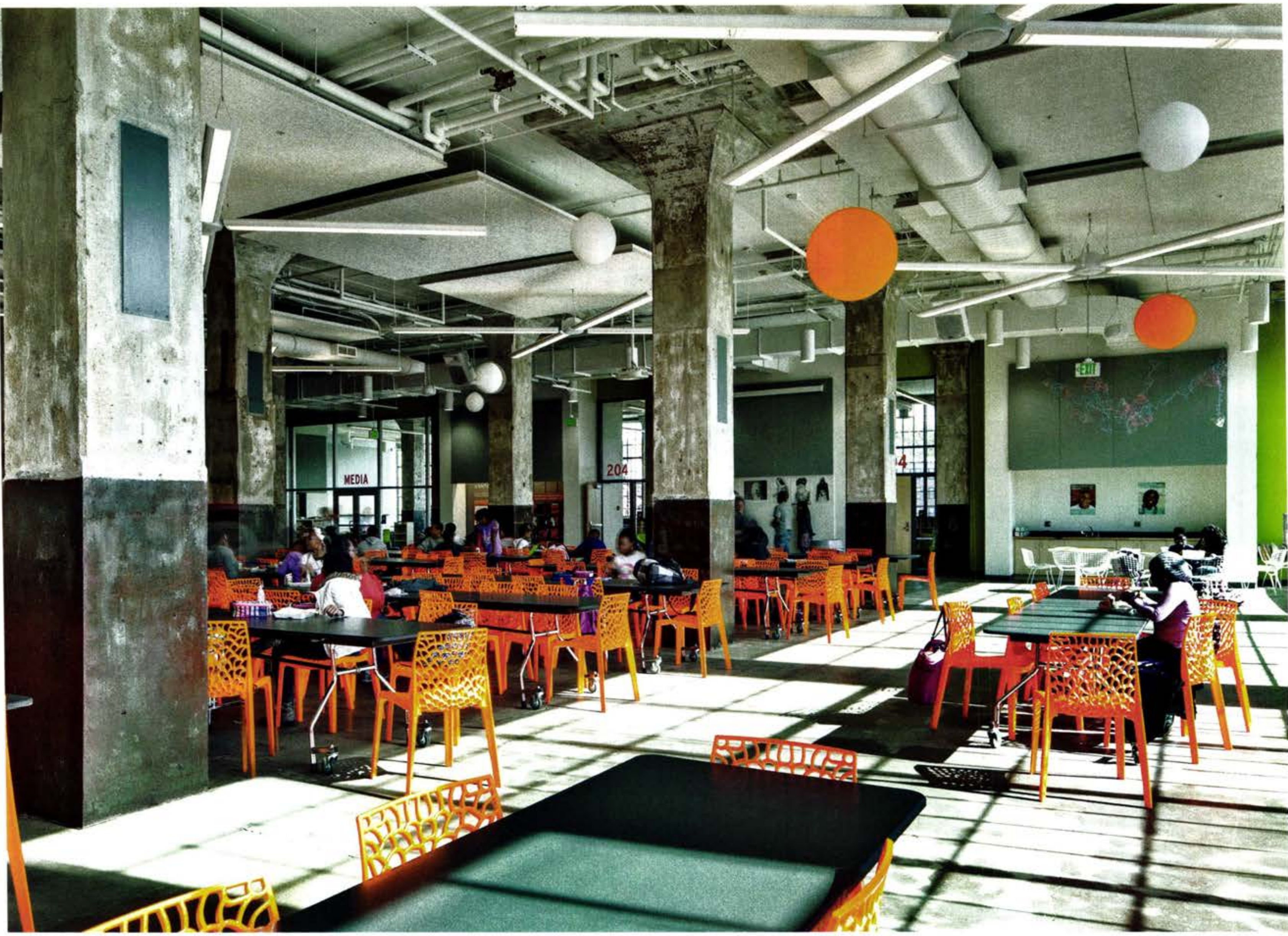
GLAZING: Cardinal Glass

DOORS: Assa Abloy

CEILINGS: USG Interiors

PAINT: Sherwin-Williams

STAINLESS-STEEL STAIR NET: Jakob



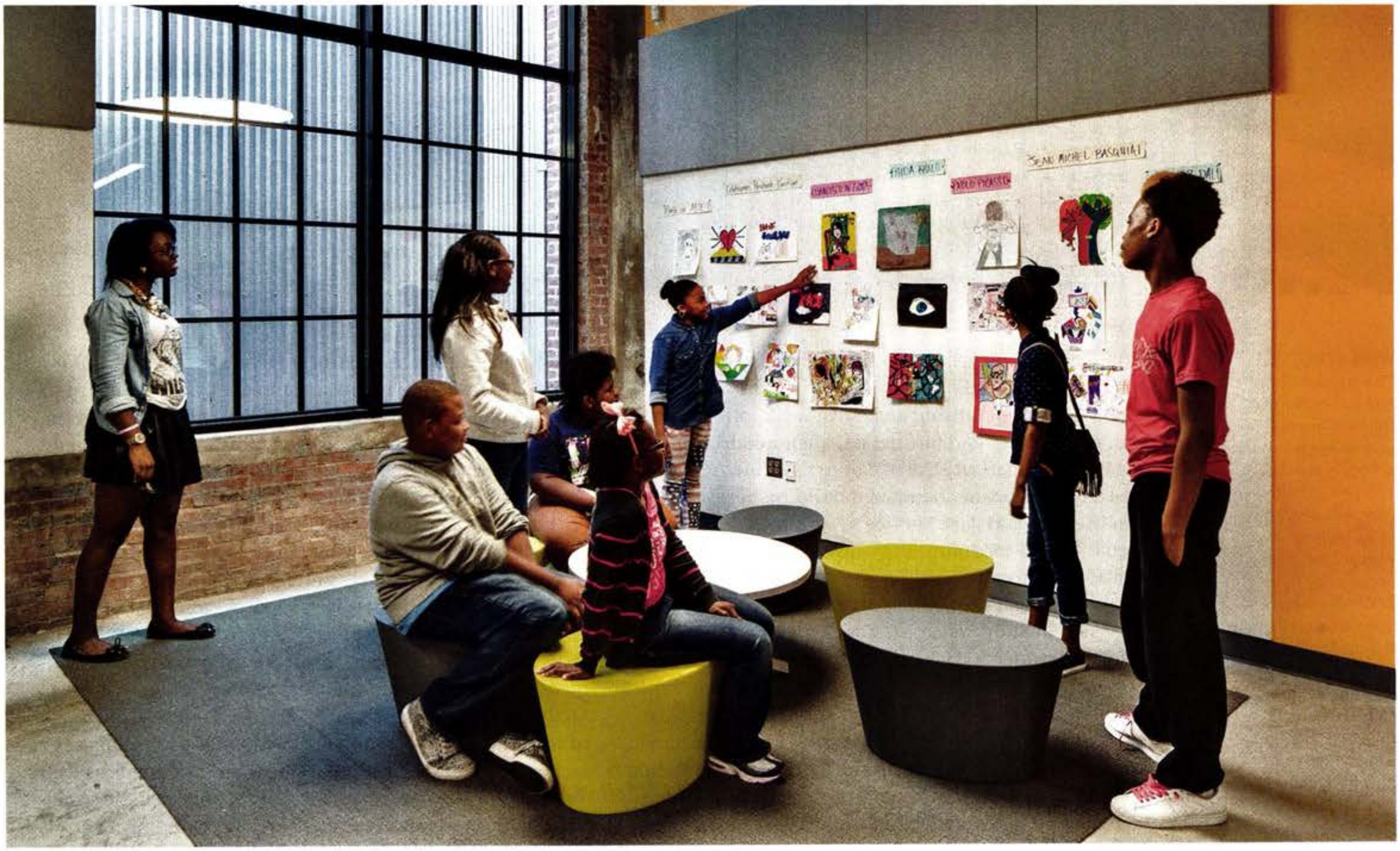
WOW EFFECTS
The interior fit-out and furnishings of the BDS are not your standard school-grade fare. The finely crafted, concrete restroom sinks (opposite) were designed and donated by the Baltimore-based Luke Works, while the orange Groovy chairs by Beaufurn that enliven the cafeteria (above) were purchased by the design team for only $70 apiece.

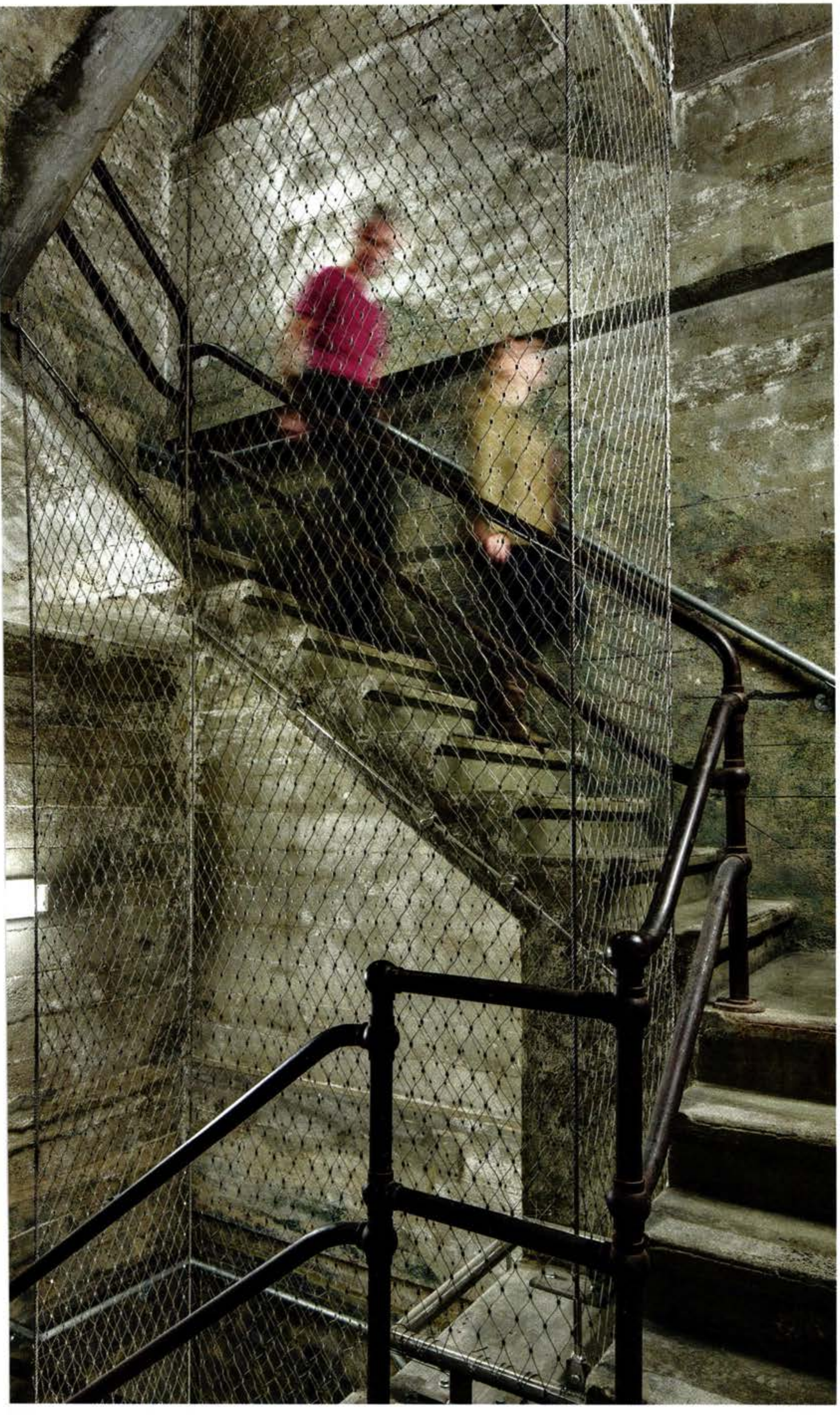
was right. Located near the city's Pennsylvania Station, the Station North Arts and Entertainment District is a gentrifying neighborhood containing artist live-work lofts, theaters, galleries, row houses, and businesses, anchored by the nearby Maryland Institute College of Art (MICA). Adapting a historically significant abandoned building here, a district listed on the National Park Service's National Register, would qualify BDS for community-investment and historic-preservation tax credits.

The school, which opened in 2011 at a temporary location, was the vision of State Senator Catherine Pugh, who pushed to provide the students with a new, state-of-the-art facility. In this endeavor, Pugh was assisted by a team of community leaders and professionals, including Ziger, MICA President Fred Lazarus (both on the school's Board of Directors), and Dr. Andrés Alonso, former CEO of the Baltimore City Public Schools (BCPS). The $26.9 million project is the result of a unique public-private partnership financed by public and developer funding, tax credits, private bonds, and fund-raising. A local developer was tapped by the BDS board to arrange and manage financing, design, and construction.

"The guiding architectural idea was to have a dialogue between the historic structure and the new work," explains Ziger. "We wanted the intervention to be clear and simple. And we wanted to keep those ideas throughout." To do this, Ziger/Snead maintained as much of the existing structure as possible. The architects gutted the building, cleaned the brick, and installed energy-efficient windows with profiles replicating the original ones. They created a series of loftlike spaces, configuring them to encourage collaboration, adding modular pods between the classrooms and the hallway to facilitate point-of-use storage and mechanical needs. Each of these discrete 5-by-16-foot units houses such elements as lockers, computer stations, and teachers' cabinets, as well Variable Air Volume boxes, air supply, and acoustic panels. "The pods were conceived as a way of organizing a variety


POP!





of program elements in a clearly new component," says Ziger. While standardized, the pods vary to suit programmatic needs.

One of the biggest challenges was to design code-compliant stairs within a tight budget. Taking their cues from Diller Scofidio + Renfro's High Line in New York, the architects filled the core of an existing interior stairwell with woven stainless-steel netting that stretches the full-height of the building. Outside, they suspended two corrugated-aluminum-wrapped stairways diagonally along facing walls of the courtyard, now used as a place to gather or watch fashion shows staged on the former loading dock.

Construction costs totaled $19 million, or $164 per square foot, which is lower then the $225 per square foot the BCPS typically budgets for this type of work. Dollars were further stretched through a number of pro-bono services and professional relationships. Adobe Foundation's Youth Voices Program sponsors a creative lab staffed by an Adobe instructor and equipped with computers loaded with the company's Creative Suite. Luke Works, a local designer of concrete surfaces and furnishings, gave sinks. Ziger/Snead, Gensler, and Ayers St. Gross donated interior-design services. Ashton Design pitched in with environmental graphics. Much of the furniture outside of classrooms was donated, and the bright-orange cafeteria chairs, discovered at NeoCon East, were purchased for under $70 apiece.

The raw look of the building, that of a "work in progress," is intended to inspire the students. "If you engage design thinking early enough in a kid's life, he or she can apply those skills to solving life's problems," says Ziger.

A fresh approach to school design—and community development—the Baltimore Design School's new home is exciting, open, and transparent, crafted largely through a thoughtful design process and goodwill. "To know that these kids can have a voice and make a difference is huge," says Ziger. "It's a message filled with hope." ■

Architect and writer Sharon McHugh, based in Princeton, New Jersey, and New York, is a correspondent for Abitare *and* World Architecture News.

RISING STARS Presently populated by 350 sixth-through ninth-grade students, the Baltimore Design School will eventually serve 670 students through 12th grade. To create an environment in which they would thrive, Ziger/Snead installed historically accurate energy-efficient replacement windows that filter copious amounts of daylight into the classrooms (opposite, top); they filled the core of an existing stairwell with stainless-steel netting (left) for both its safety and its sculptural qualities; and they created open, communal areas in the corridors, such as crit spaces (opposite, bottom), lounges, and galleries.

Fayetteville Montessori Elementary School | Fayetteville, Arkansas | Marlon Blackwell Architect

EVERYTHING IN ITS PLACE

In Northwest Arkansas, a design firm responds to a hemmed-in site for a Montessori elementary school with a playfully inventive plan.

BY WILLIAM HANLEY

AT THE BEGINNING of the 20th century, Maria Montessori wrote, "Education is a natural process carried out by the human individual, and is acquired not by listening to words, but by experiences in the environment." The line paints in broad strokes the educational philosophy that bears her name, with its emphasis on independent, creative, and hands-on learning over classical rigid instruction. But when Victoria Butler, owner of a thriving Montessori school in Northwest Arkansas, decided to add an elementary school to her primarily early-childhood program, she found that the city of Fayetteville had a more traditional, textbook-like approach to rules and regulations.

Butler's school occupies a cluster of five residential-scale buildings, hemmed in on one side by an aggressively bland shopping center but bounded on the other by a grassy field and a creek. She chose a lot in the middle of her existing buildings for the elementary school but discovered that in the decade or so since she acquired the property, a city ordinance had extended the boundary of the creek's floodplain to include nearly two thirds of the site, leaving only a triangular sliver of buildable area. The building code also required that, to avoid runoff's flowing directly into the stream, the small area had to retain and filter into the soil not only its own stormwater but also any that drained into the site from the neighboring parking lots. "It was a hell of a difficult site," says Marlon Blackwell, whom Butler hired to design the project, and whose two children attended her school. "We really only had a small triangle to build on."

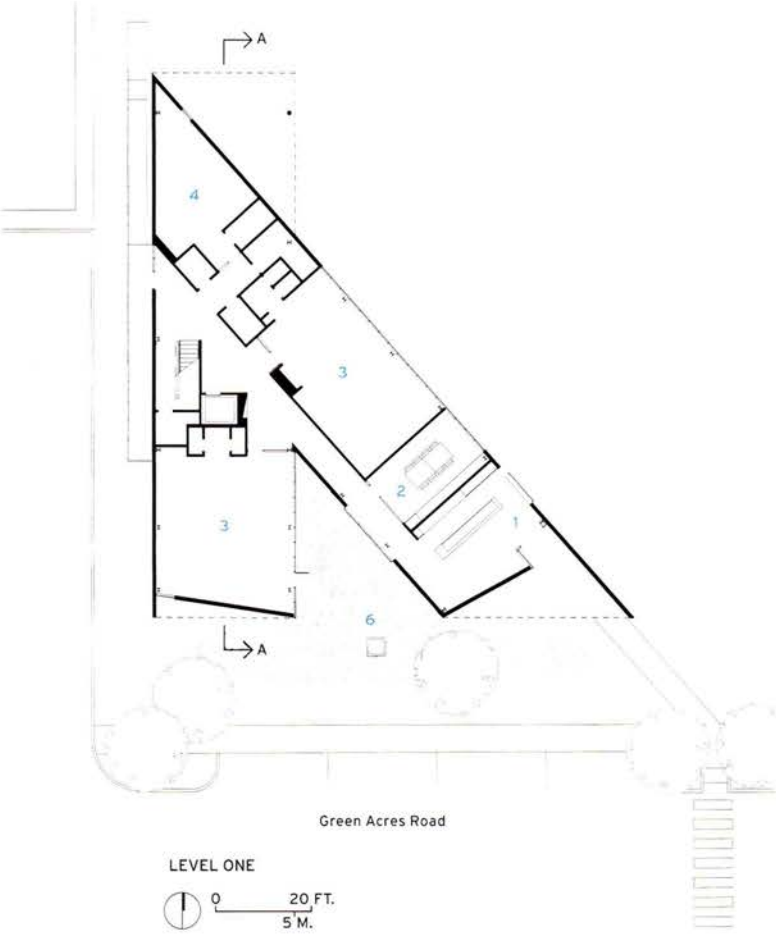
Blackwell and his firm responded to the site constraints by playing with blocks. They designed a 7,940-square-foot, steel-frame building with two simple geometric volumes. Following the line of the floodplain, the ground floor has a triangular plan with a cut into its south side that turns it into a V shape. The upper floor is a rectangular box stacked on one wing of the V. It juts out over the floodplain in the rear of the building to create a shaded play area below. A single column, the maximum allowed in the floodway, supports the protruding section of the structure. "We tried a doughnut, we tried a big box raised above the ground, we tried all kinds of forms," says Meryati Johari Blackwell, Marlon's wife and a member of the design team. "But basically these shapes are the ones that best served the client's needs."

To manage the stormwater, the firm planted a green roof on the single-story wing of the V and lined the south, street-facing side of the building with a rain garden that extends into the courtyard made by the cut-away section of the ground floor. Teachers frequently incorporate the verdant area into nature-focused classroom activities.

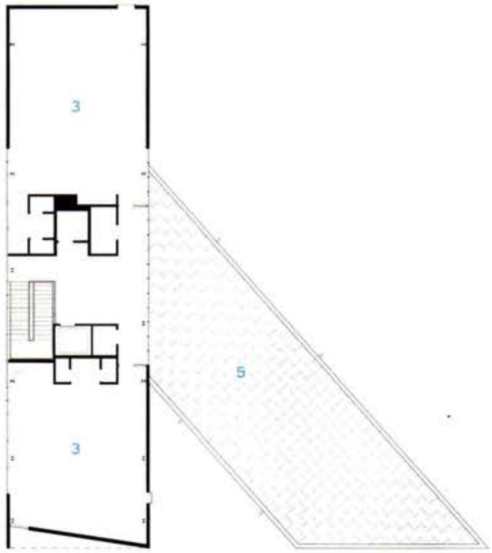
Set among the greenery, the building strikes a compromise between the inviting and the economical with its facades. The firm clad the two primary street-facing eleva-

PHOTOGRAPHY: © TIM HURSLEY

STACKING BLOCKS To accommodate four square classrooms on a wedge-shaped site bounded by a floodway, Marlon Blackwell and his design team placed a rectangular volume on top of a triangular one, allowing the upper floor to jut out above the restricted section of the site.

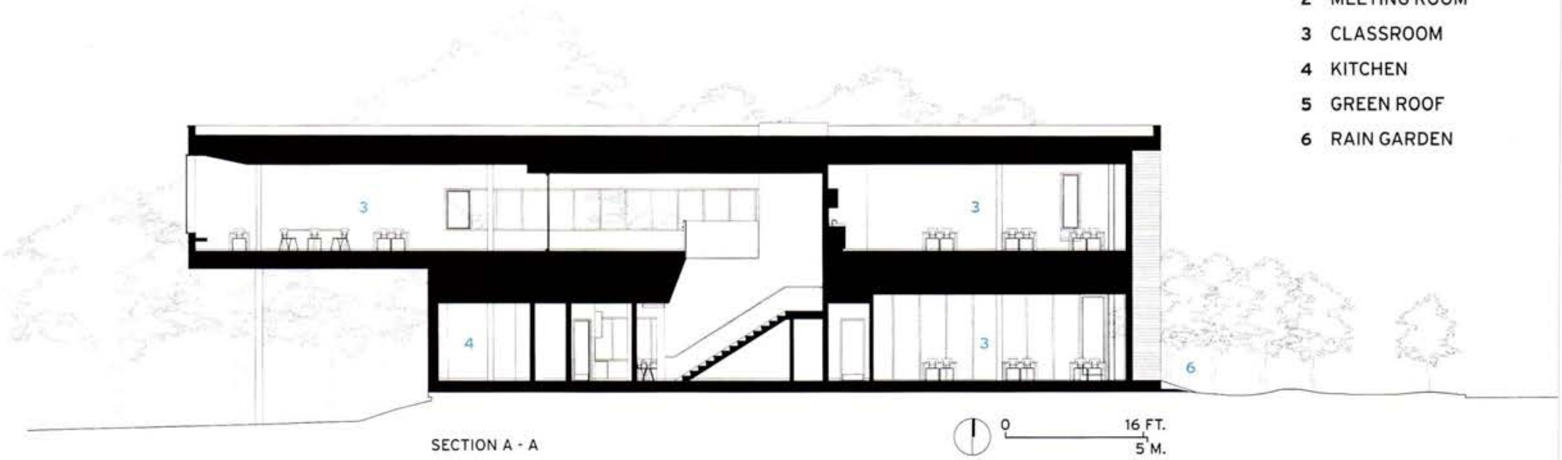


LEVEL ONE



LEVEL TWO

1 LOBBY
2 MEETING ROOM
3 CLASSROOM
4 KITCHEN
5 GREEN ROOF
6 RAIN GARDEN



SECTION A - A

credits

ARCHITECT: Marlon Blackwell Architect – Marlon Blackwell, principal; Bradford Payne, project manager; Meryati Johari Blackwell, Jonathan Boelkins, William Burks, Stephen Reyenga, Michael Pope, Justin Hershberger, project team

LANDSCAPE ARCHITECT: Appian

ENGINEERS: Myers-Beatty Engineering (structural); HP Engineering (m/e/p); Bates & Associates (civil)

GENERAL CONTRACTOR: Nabholz Construction Corporation

CLIENT: Victoria Butler, Director, Fayetteville Montessori School

SIZE: 7,940 square feet

COST: $1.4 million

COMPLETION DATE: August 2012

SOURCES

CURTAIN WALL: EFCO

WOOD SIDING: Estes Wood Designs

EPDM ROOFING AND GREEN ROOF: Firestone

ACOUSTIC CEILING: Armstrong

SHARP TAILORING To give workaday metal cladding a level of polish, the architects collaborated with fabricators to create custom cap pieces for the rear corner of the triangular first floor. The detail refines the building's geometry and adds a sense of seamlessness to the facade.

OUTSIDE IN

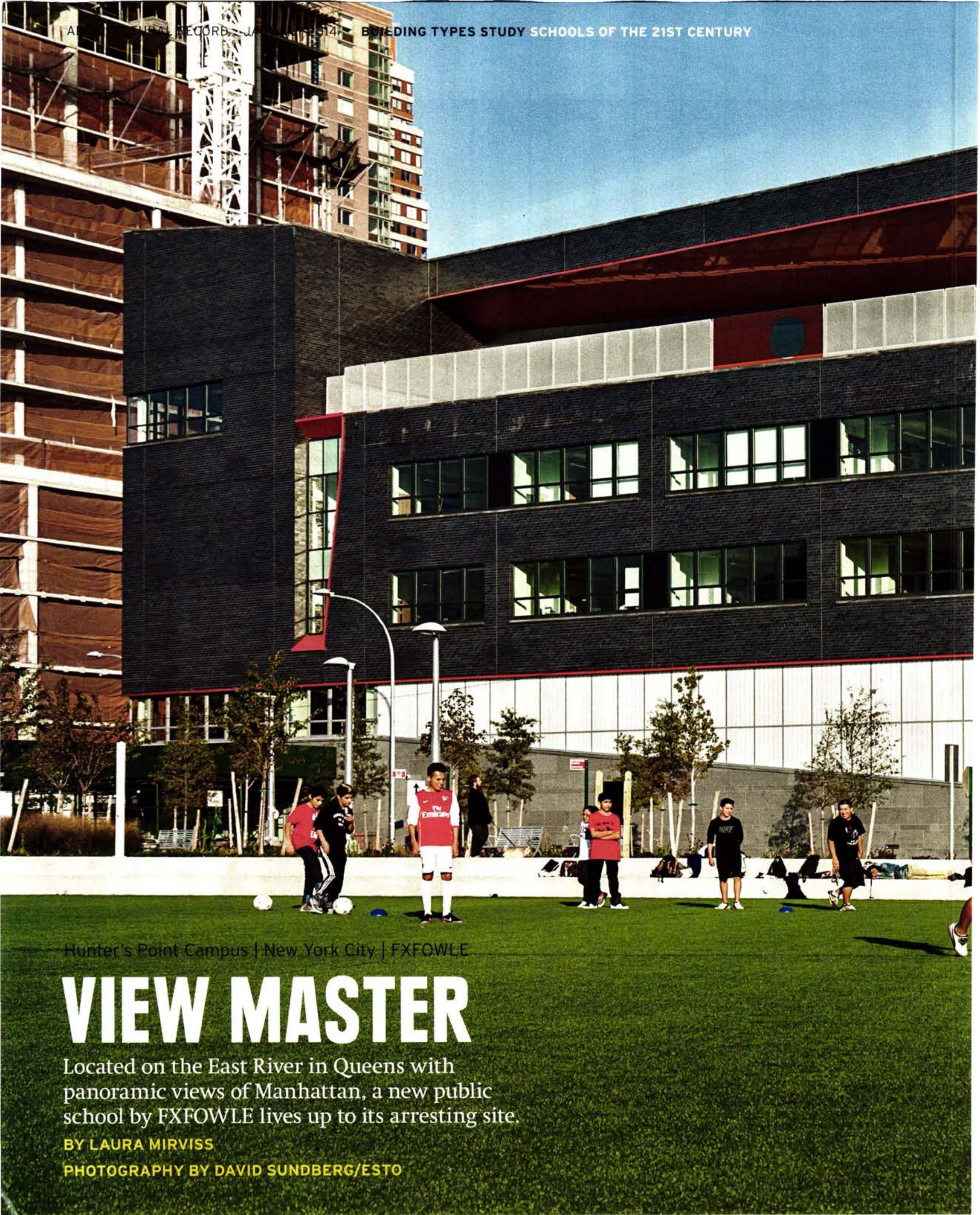
Tall operable windows allow natural light and ventilation to enter the classrooms, which look toward the creek or the rain garden (above) on the ground floor and over the green roof on the second (left). Circulation through the lower volume follows one wing of its V shape before turning up toward the stair (opposite). The plan gives each of the classroom spaces the the best views of the surrounding greenery.

tions in a clear-sealed cypress, and recessed the entry on one side and a row of windows on the other. "South-facing porches are a big part of our southern vernacular," explains project architect Bradford Payne. The rest of the building is sheathed in a dark bronze-colored corrugated metal, the type typically used for garages, sheds, or big-box stores.

The contrast between the warmth of the light wood and the chill of the dark metal allows the building to read as both welcoming and sophisticated, a move designed to appeal to the parents of older students. "The culture used to be that students remained here until kindergarten," says Butler. "I wanted to expand the elementary school, but I couldn't do that in a building that looked like a day-care center. It had to look like something parents could relate to as a school."

By stacking a box on top of a triangular volume, the firm fit four rectangular classrooms onto the building's footprint, which was essential, says Payne, for allowing standard Montessori furniture to be reconfigured easily for different activities. The interior finishes take a cue from the simplicity of the child-size bookshelves and other spare, wooden furnishings. White walls, light wood, and glass create a bright, neutral atmosphere interrupted only by the school's collection of corals, fossils, and other objects meant to spark students' curiosity (a buffalo skin hangs over the stairwell). The materials provide a platform for student art projects as well—on a recent visit, a class had made miniature versions of artist Roxy Paine's signature metal tree sculptures, one of which stands outside the Crystal Bridges Museum of American Art in nearby Bentonville.

Even for an adult, the school has an inspiring but calm air brought about by the building's creative response to the strictures of its location. "When we start a project, our design process begins with exploring what the site gives us," says Payne. Montessori would have approved of that discovery-focused approach. ■



Hunter's Point Campus | New York City | FXFOWLE

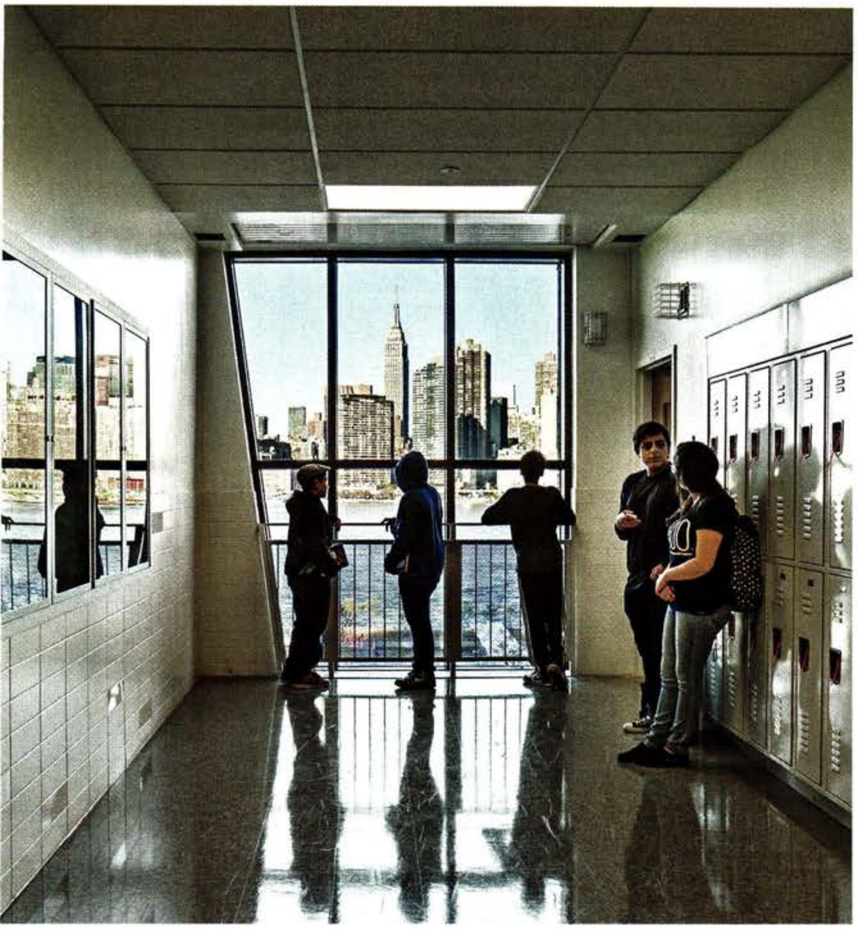
VIEW MASTER

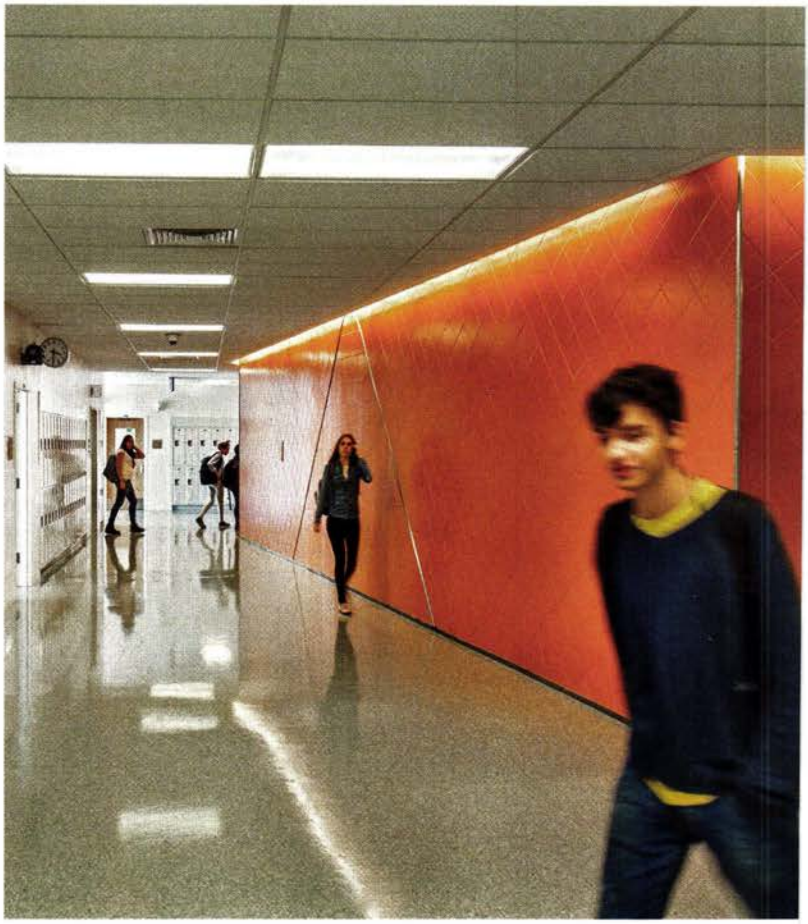
Located on the East River in Queens with panoramic views of Manhattan, a new public school by FXFOWLE lives up to its arresting site.

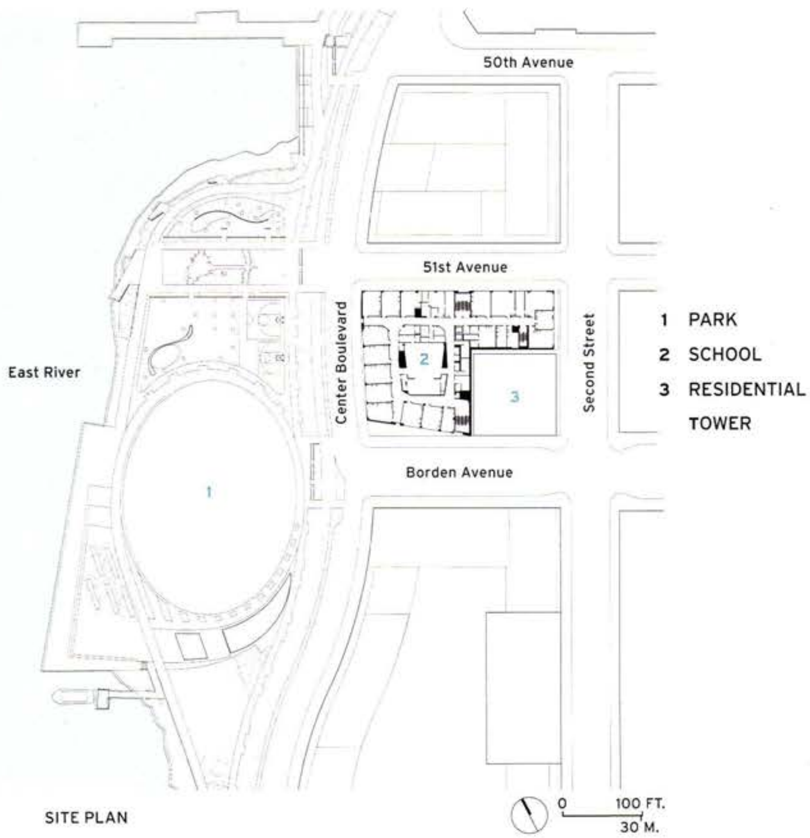
BY LAURA MIRVISS

PHOTOGRAPHY BY DAVID SUNDBERG/ESTO

SCHOOLHOUSE ROCK Conceived as a dark rock anchoring a developing neighborhood along the waterfront, the muscular school makes a strong statement and stands out when viewed from the United Nations headquarters across the river in Manhattan.







SITE PLAN

WHEN THE ACADEMY for Careers in Television & Film (ACTvF) learned it would be one of three schools coming into a brand-new facility with spectacular views of Manhattan, both students and staff felt as if they had won the lottery. At the time, the city public school was located in the basement of a rundown building in Astoria, Queens. "It's an extreme upgrade," says Alan Metzger, a former television director, who cofounded ACTvF in 2008. "We are the American Dream–we went from the basement to the penthouse in five years."

The new digs at the Hunter's Point Campus–a charcoal iron-spot-brick building, designed by FXFOWLE, on the East River waterfront–are particularly notable in light of the school's strong performance. (With a 96 percent graduation rate, among the highest in New York City, the school was No. 2 on a recent ranking of the more than 400 public high schools.) This relocation presents the successful program and the sparkling new building as a single package, a showpiece within a showpiece.

The facility can accommodate more than 1,000 students dispersed among the three schools. In addition to the high school, the building contains the newly created Hunter's Point Community Middle School, with an ecology focus, and the Riverview School for special-education students. Located on a former industrial site, most classrooms–along with the light-filled hallways, library, and cafeteria–treat students to a sweeping panorama of the Manhattan skyline. "Even though it's an urban school, we've tried to make it feel as if it's part of a dynamic landscape," says FXFOWLE senior

LONG VIEW On the terrace, a 10-by-20-foot installation by local artist Natasha Johns-Messenger frames orange-tinted views of the Manhattan skyline (below). The accent color continues indoors, where the auditorium is wrapped in orange tiles with a matte or gloss finish (opposite, left). Glazed cutouts fill the hallways with daylight (opposite, far left).

partner Sylvia Smith. "The challenge was creating a narrative that reflected this amazing site."

Just one subway stop from Grand Central Station in Manhattan, Hunter's Point South is a rapidly developing 30-acre neighborhood in the borough of Queens, where mixed-income residential towers are rising alongside retail shops and office spaces. The five-story, 145,000-square-foot school, which opened in the fall of 2013—along with a beautifully manicured 5.5-acre park designed by Weiss/Manfredi (RECORD, September 2013, page 30)—are two of the public amenities in the master plan meant to support the influx of new families to the area.

A bold move for the city's school system, the dynamic new building riffs on the traditional school box. FXFOWLE chipped away at the solid form to bring in daylight, carving a terrace across the top floor and slicing glazed wedges down through the brick to bring light into the corridors. For extra punch, Smith and her colleagues defined the voids, including the cantilevered roof canopy, with bright orange metal panels, and wrapped the ground-floor gymnasium with translucent fiberglass panels. Says Smith, "It needed to have muscle and weight, but we also wanted a certain sculptural, artistic quality."

The architect's chief goal was maximizing light and views, which was a challenge because of the idiosyncrasies of the L-shaped site, which hugs two sides of a residential tower (under construction). Working from the inside out, they inserted the auditorium into the core of the third and fourth floors and tucked many of the mechanical and storage spaces into the wedge occupied by the neighboring tower, allowing them to position the classrooms around the building's perimeter.

Metzger says this layout has been a tremendous success.

FIFTH FLOOR

THIRD FLOOR

GROUND FLOOR

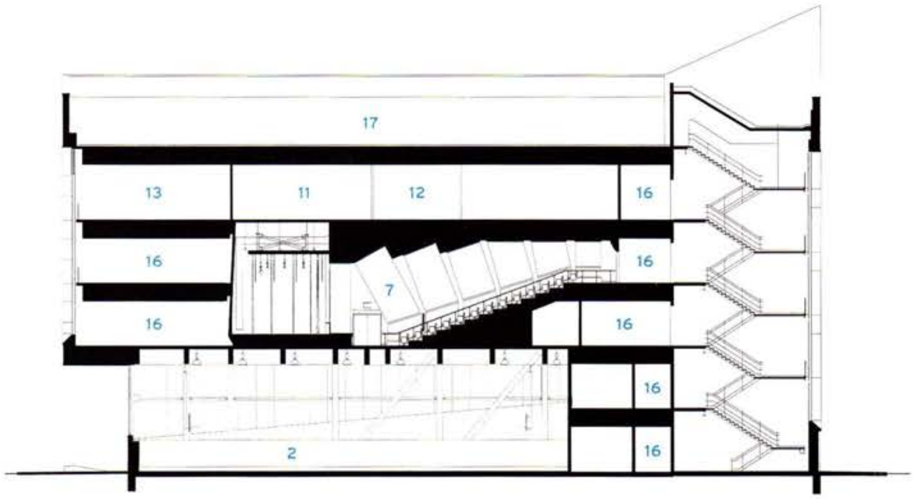
0 30 FT.
9 M.

1 LOBBY
2 GYMNASIUM
3 CLASSROOM
4 ADMINISTRATION
5 STORAGE
6 M/E/P SPACES
7 AUDITORIUM
8 DRESSING ROOMS
9 SCIENCE LAB
10 MUSIC ROOM
11 CAFETERIA
12 SERVERY & KITCHEN
13 ART ROOM
14 STAFF DINING
15 TERRACE
16 CORRIDOR
17 ROOFTOP/ MECHANICAL SPACE

"One thing that really works about this building is the flow patterns," he says. "In our old space, we had one central hallway, and it was so crowded–it was impossible for students not to run into each other." He says that in the new structure, the light and airy corridors act as small plazas where students can congregate without creating a bottleneck. Smith compares the auditorium to a rock in a stream, with circulation flowing around it.

The most daring aspect of the architect's scheme was bringing the cafeteria to the top of the building. With the terrace, it gives the students an uplifting place to have lunch and hang out, and the administration uses the space for parent meetings and events. "The idea of putting the gym on the ground floor and the cafeteria on the fifth floor was marvelous," says Edgar Rodriguez, the high school principal. "Instead of doing what was cheapest or most expedient, engineering-wise, they figured out how to best use this location. It's the signature of the building."

For a high-profile project on a coveted site, the school system took a risk and hired a top-flight architecture firm that had never built a public school in New York City from the ground up. "You can't even put a value on it, it's so fabulous," says Rodriguez. "We have the most beautiful school building in the whole city." ■



SECTION A - A

0 15 FT.
5 M.

credits

ARCHITECT: FXFOWLE – Sylvia Smith, Nicholas Garrison, Ann Rolland, project principals; Eric Van Der Sluys, Tim Macy, project managers; Jiyoung Lee, Scott Melching, Heng-Choong Leong, Mark Nusbaum, William Haskas, Violette de la Selle, Fernanda Freitas, project team

ENGINEERS: Ysreal A. Seinuk (structural); Kallen & Lemelson (m/e/p/fp); Langan (civil/landscape/geotechnical)

CONSULTANTS: Tillotson Design (lighting); Cerami (acoustical)

GENERAL CONTRACTOR: Skanska USA

CLIENT: City of New York/NYC School Construction Authority

SIZE: 145,000 square feet

COST: $61 million

COMPLETION DATE: August 2013

SOURCES

BRICK: Endicott Clay Products

GLASS: Guardian

LIGHT TOUCH The original scheme for the ground-floor gym (above) called for transparent glazing, which was later swapped for translucent fiberglass panels as a security and privacy precaution required by the NYC School Construction Authority. At the building's core, a 350-seat auditorium (left) has stadium seating, and bridges the third and fourth floors. Middle school students enter on the lower level, near the stage, while high schoolers enter from above.

Earl Shapiro Hall, University of Chicago Laboratory Schools | Chicago | Valerio Dewalt Train Associates

STARTING AT THE TOP

Carved masses and open spaces characterize the university-affiliated school for experimental education.

BY BLAIR KAMIN

LIKE THE institution it serves, the new early-childhood learning center of the University of Chicago Laboratory Schools is anything but ordinary. The $52 million, three-story Earl Shapiro Hall, designed by Joe Valerio of the Chicago firm Valerio Dewalt Train Associates, with FGM Architects, is as notable for its commodious, carefully conceived interior as for its exterior's exuberant expression.

The building for pre-kindergarteners through second graders belongs to a tradition of Chicago-area education design for progressive schools that stretches back to 1940 and the Crow Island Elementary School in Winnetka, Illinois, by Perkins, Wheeler & Will, with Eero and Eliel Saarinen. Though it doesn't match Crow Island's exemplary synthesis of civic presence and village-like intimacy, Earl Shapiro Hall still offers lessons for forward-thinking pedagogy.

The renowned educator John Dewey founded the Lab Schools in 1896, shaping a curriculum that emphasized "learning by doing" rather than relying on rote memorization. Before Barack and Michelle Obama became President and First Lady, they sent their daughters Malia and Sasha to Lab. For decades, Lab's early-childhood learning facilities were ensconced in and around this school's neo-Gothic enclave, about seven miles south of Chicago's Loop, which housed

PHOTOGRAPHY: © BARBARA KARANT, EXCEPT AS NOTED

pre-kindergarten to 12th grade classes. Placing Earl Shapiro Hall a few blocks east of these friendly confines challenged Valerio to devise a fresh architectural framework that would simultaneously foster the school's myriad traditions, such as piano-accompanied "sings" in the lobby, and open the door to even better education. That was a rare opportunity, and not just because the project had enlightened clients and a generous budget.

"Not many buildings have been built for our youngest children," said David Magill, the Lab Schools' director. "Usually, they're in homes or in other buildings that have been renovated. To build one from scratch . . . is something you could only dream about."

Valerio's solution pairs a steel-framed administrative wing–topped by a cantilevered, "look-at-me" library–with a restrained classroom wing that's mostly framed in precast concrete. These disparate parts are effectively tied together by an elegant cladding of oversized, cream-colored brick, energy-efficient glass, and perforated aluminum fins, arranged in a variation of the Fibonacci sequence. Confronted with a tight urban site, the architect transformed rooftops into outdoor "playscapes" and located small outdoor play areas directly outside first-floor classrooms, a feature reminiscent of Crow Island.

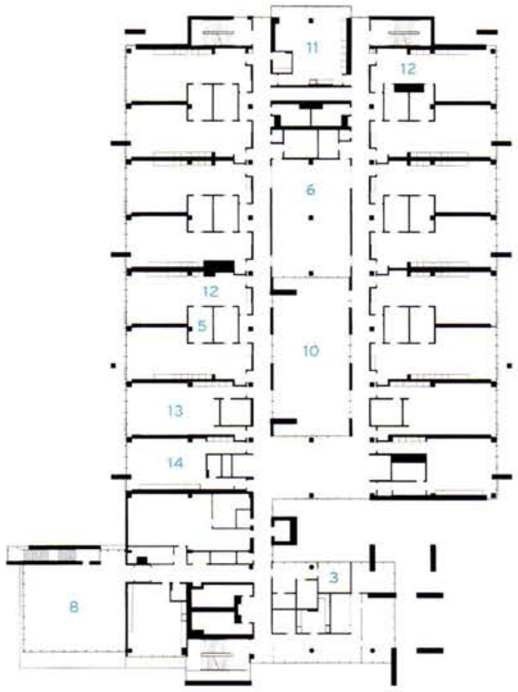
The outcome succeeds on several levels, the most important of which is that Earl Shapiro Hall's airy, chiseled volumes project a welcoming openness. The building is of the city, more town than gown, but it doesn't stray too far from the University of Chicago's architectural roots. While making a contemporary statement with its folded south-facing facade, the design achieves a subtle allegiance to the Collegiate Gothic in its asymmetrical massing, projecting piers, and tracery-like fins. And while the exterior can be justly criticized for lacking kid scale–it could be a corporate headquarters for one of Valerio's Silicon Valley clients–its boldness is not arbitrary. With the grandly scaled Museum of Science and Industry, a legacy of the 1893 World's Columbian Exposition, across the street, Valerio either had to go big or go home.

The container expresses the innovative arrangement and spirit of its contents. The 13-foot-high light-washed corridors, 7 foot 9 inches wide in contrast to the typical 6 feet, exude a sense of calm–an important feature for educators dealing with an age cohort that delivers the daily tumult of broken toys and spilled milk. The floor-to-ceiling glass that encloses classrooms opens the building to its surroundings, including verdant Jackson Park to the east. Lab administrators characterize the ever-changing views as being, rather than a distraction, a novelty that will stimulate young brains. "Dead, really controlled space is pretty deadening," said Valerio.

The most significant advance is the multiplicity of differently scaled learning spaces and their attendant flexibility. Paired classrooms share a small breakout room, where teachers can meet with small groups of students–or little builders can make wood blocks go clack-clack without disturbing a reading circle. Each classroom floor also has a glass-sheathed "learning lab," larger than a typical classroom, that can serve as an indoor play space or a spot for dancing or other activities involving two or more classes. The interior culminates in the expansive truss-supported library, a beacon of learning, which also functions as a kid-friendly academic tree house.

To be sure, there are faults. The building's glass-walled lobby lacks the old-shoe domestic scale of its counterpart in Blaine Hall, the James Gamble Rogers–designed Gothic Revival charmer that previously housed Lab's early grades. "You don't get that hugging space," Magill said, adding that art or banners may be introduced to break down the scale and add texture. Nevertheless, Earl Shapiro Hall earns high marks as a thoughtfully conceived, precisely executed model of early-childhood learning. Here, modernism isn't an aesthetic straitjacket but an enabling agent that gives a legendary institution new capacity to carry out its progressive mission. ■

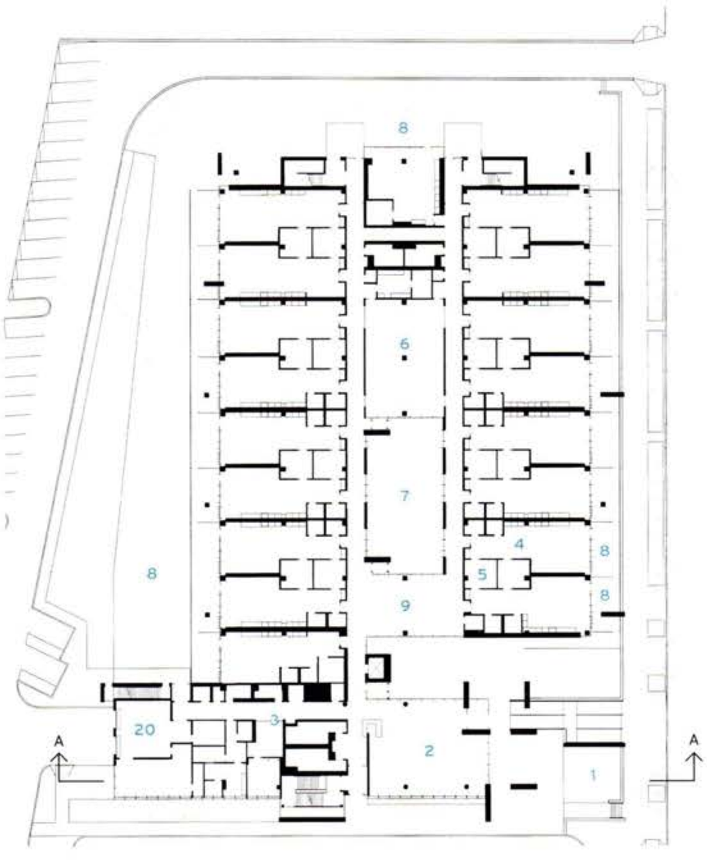
ELEVATED EDUCATION
The entrance is marked by a cantilevered library atop the wing for administration (above). Next door, aluminum fins shield the beige-brick-clad, steel-framed classroom block from the sun's glare and allude to the Collegiate Gothic tracery of the nearby university buildings. On the upper level, a high, glazed reading room (right) offers expansive views of the neighborhood.



SECOND FLOOR

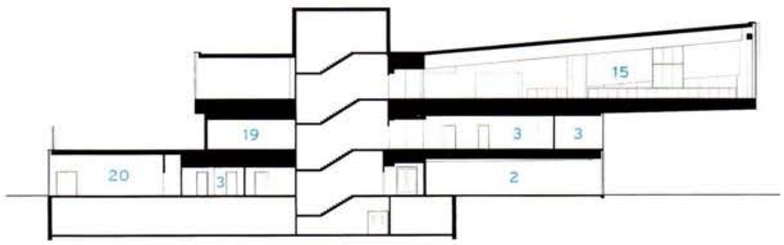
THIRD FLOOR

1. ENTRANCE
2. MAIN LOBBY
3. ADMINISTRATION
4. NURSERY
5. BREAKOUT ROOM
6. LEARNING LAB
7. COURTYARD
8. OUTDOOR PLAY SPACE
9. SOUTH LOBBY
10. OPEN TO BELOW
11. AFTER-SCHOOL SPACE
12. FIRST AND SECOND GRADE CLASSROOM
13. MUSIC CLASSROOM
14. ART CLASSROOM
15. LIBRARY
16. COMPUTER LAB
17. STORYTELLING ROOM
18. GYMNASIUM
19. TEACHER WORK ROOM
20. LOADING AREA



FIRST FLOOR

0 30 FT. 10 M.



SECTION A - A

0 30 FT. 10 M.

credits

DESIGN ARCHITECT: Valerio Dewalt Train Associates – Joseph Valerio, principal; Randy Matteis, Sheri Andrews, Robert Webber, Stephen Droll, team

ARCHITECT OF RECORD: FGM Architects

ENGINEERS: Rubinos & Mesia Engineers (structural); ARUP (m/e/fp); Primera (electrical)

SUSTAINABILITY: HJ Kessler Associates

CLIENT: The University of Chicago

SIZE: 128,000 square feet

COST: withheld

COMPLETION DATE: July 2013

SOURCES

MASONRY: Belden Brick

CURTAIN WALL: Innovation Glass

GLASS: Viracon

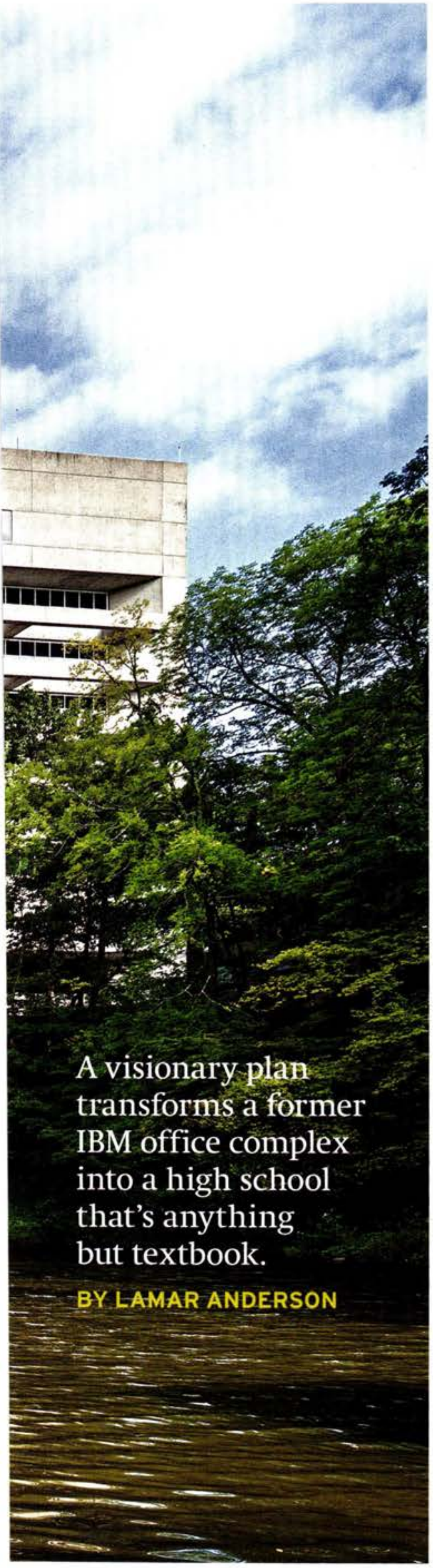
ENTRANCES: Kawneer

WORLD VIEWS
Along the glazed perimeter of the classroom block, the students on the first floor have access to the outdoors (above left), while the expanses of glass on both floors ensure that learning areas inside get plenty of natural light (above). An interior court brings more light and open space into the middle of the classroom wing, as the second floor hall (left) shows. The 13-foot-high ceilings of precast-concrete planks and precast concrete beams give the space a sense of solidity. Acoustic metal panels along the walls have magnetic properties for hanging displays.

PHOTOGRAPHY: © JACOB HAND (TOP RIGHT)

North Atlanta High School | Atlanta | Cooper Carry

OPEN FOR BUSINESS



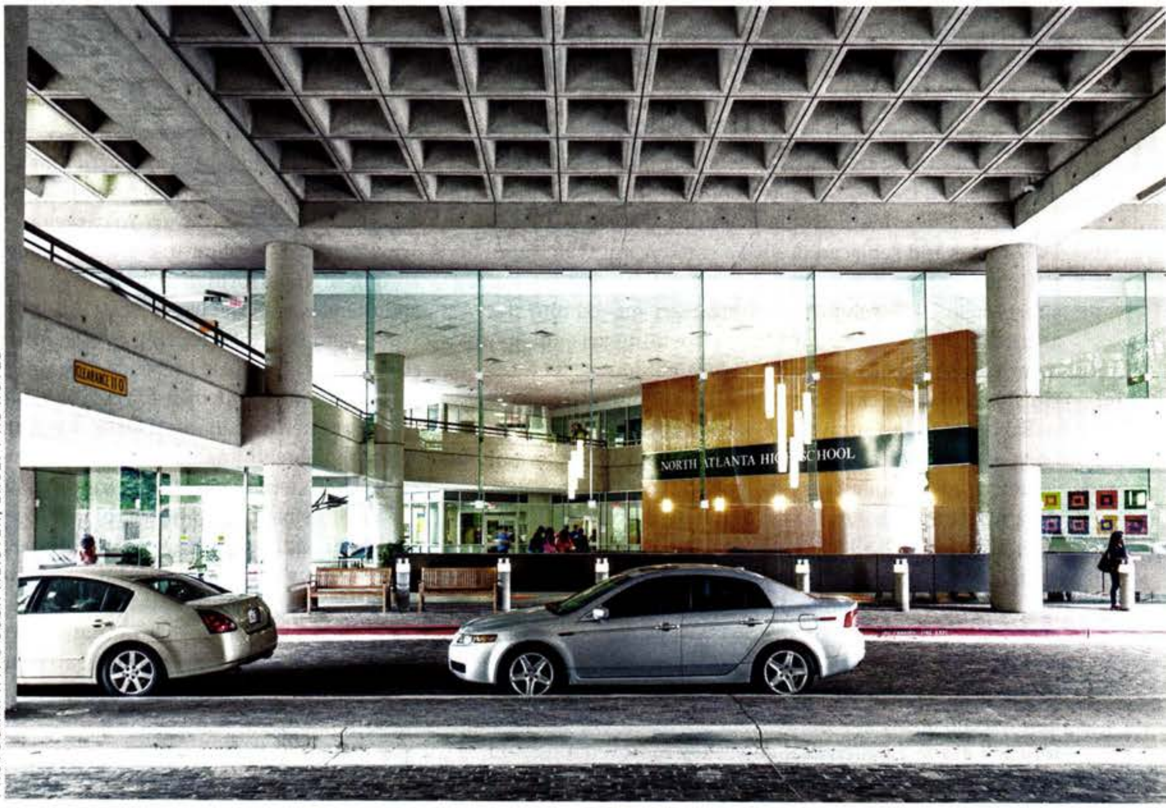
A visionary plan transforms a former IBM office complex into a high school that's anything but textbook.

BY LAMAR ANDERSON

AT A TIME when many K–12 architects are designing neighborly clusters of classrooms and modest buildings that open onto the landscape, the students at North Atlanta High School are pushing elevator buttons and riding to class in a concrete tower. From the top floor, eleven stories up, a bay of lockers overlooks the treetops and, in the distance, the Atlanta skyline. More floor-to-ceiling windows across the corridor command views down to the small lake this 1970s-era high rise straddles. Downstairs, parents drive through what is probably the city's most corporate-looking school drop-off loop, watching their teenagers disappear through glass doors, past a large spiral staircase and an imposing wood accent wall, where a North Atlanta High School sign has replaced the IBM logo that once hung there.

That structure—originally built in 1977 by Thompson, Ventulett, Stainback & Associates—and the rest of the 56-acre grounds became available when IBM decided to move during the depths of the recession, in 2010. At the same time, Atlanta Public Schools was preparing for a spike in the neighborhood population that promised to overwhelm existing high schools. With scant open real estate, the school district considered buying the IBM site—an unconventional idea spurred by the district's facilities department, which happens to be headed by two architects. "It takes someone with vision to look at this and say, 'Yeah, we can build a high school here,'" says Margarita Perez of Collins Cooper Carusi Architects. That firm served, with Paul Cheeks Architects, as associate architect on a design team led by Cooper Carry.

The Brutalist campus offered plenty of amenities: an L-shaped plan with two long, narrow towers (the second added in 1987, linked to the original by a glass atrium), a four-level garage, and a surfeit of surface parking. Leaving much of the



PHOTOGRAPHY: © JOSH MEISTER, EXCEPT AS NOTED

CORPORATE PERKS The main academic building of the new high school occupies an 11-story concrete tower, originally built in 1977 (left). In the lobby, a North Atlanta High School sign (above) replaces the IBM logo that once hung there.

hilly, forested site undisturbed, the architects shoehorned the school's functions into the existing built footprint. They adapted the 1977 post-tensioned, cast-in-place concrete structure as the main academic building, demolished the 1987 tower and replaced it with a smaller but wider gym and performing-arts center, and repurposed the parking lots as sports fields. The school's 1,520 students moved into the academic building this fall; the performing-arts and gymnasium wing opens this month. At 507,093 square feet, the finished complex can accommodate 2,400 students.

Schools tend to sprawl out as they grow, not up. "The trick was, how to adapt an office building for use as a public school," says Cooper Carry chairman Jerry Cooper. The design team needed to turn a high-rise defined by long, bland corridors—ideal for cubicles, not so much for social interaction—into a place where you'd want to show up every day without being paid to do so. "When we came in here, it was really austere," recalls Perez. "We wanted to introduce some energy while keeping it sophisticated." The architects concentrated the public spaces on the lower floors and divided the upper floors into four academies of two stories for each grade. In each academy, they removed a section of the top floor and inserted a broad staircase to open up the corridors and render activity more visible. Between classes, students making short trips scurry up and down the stairs to avoid piling into the elevator. Color schemes assigned to each grade enliven the hallways and make every floor recognizable for elevator passengers. To lessen gridlock, the design team used destination-elevator software, which prioritizes groups going to the same floor, directing passengers heading the same way to a particular car.

Beyond practical interventions—such as detensioning and retensioning the structure to carve out a central stair and replacing all the floor-to-ceiling windows with roughhousing-proof, high-performance laminated glazing—the architects let the views do the work. They lifted classroom ceilings 10 inches, to 9 feet, by routing ductwork through hallways. For Cooper, giving those breathtaking views to students represents an important shift for public school kids, who aren't often treated as clients. "The skyline is a visual gift," he says, though his team made the calculated move to turn the desks away from window walls to curb distraction.

With its base forming a bridge 30 feet over the lake, the academic building is largely cut off from the landscape. But the new wing, clad in white metal panels and wrapped with a poured-concrete trellis that echoes the tower's facade, opens onto an outdoor plaza that faces the lake. The architects used the existing glass-box atrium to link the academic wing's third floor with the main level of the addition, which is situated uphill from the original. "We wanted to make the transition seamless," says Perez, "so you don't feel as if you're stepping out of one building into another."

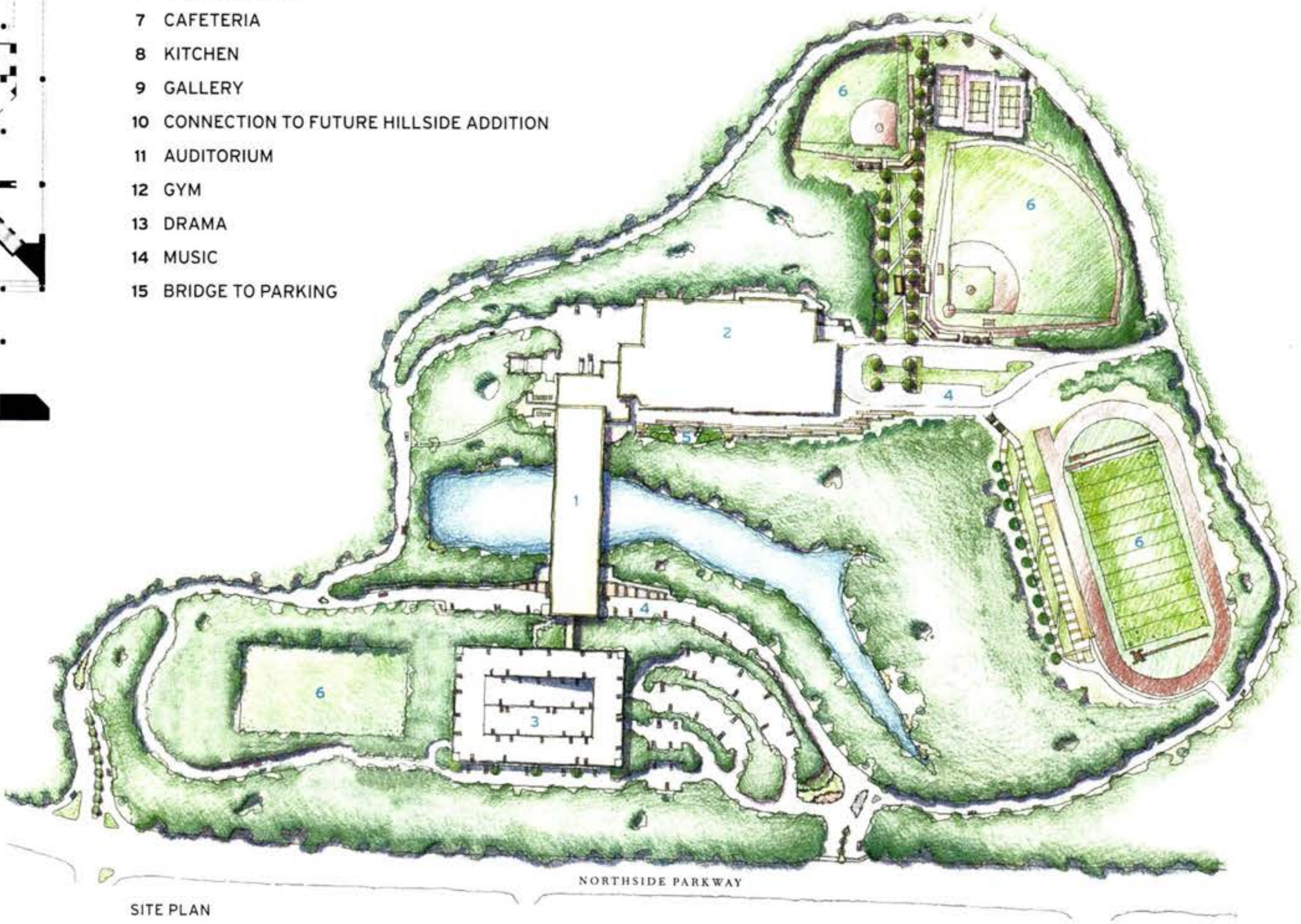
Despite the novelty of sending high schoolers to class in an office tower, it could be seen as doubly retrograde to insert a traditional classroom layout into an outmoded office template. But as an adaptive reuse that gives existing building stock new life, North Atlanta High School is as forward-looking as they come. ■

BIG MAN ON CAMPUS
Set on a 56-acre site, the top floors of the academic building offer views of the Atlanta skyline. It is linked via an existing glass atrium to a newly constructed addition that includes a gym and performing-arts center (above).

THIRD FLOOR PLAN WITH MAIN STREET CONNECTION TO HILLSIDE ADDITION

0 60 FT. 20 M.

1 EXISTING LAKESIDE BUILDING
2 NEW HILLSIDE ADDITION: GYMNASIUM AUDITORIUM
3 EXISTING PARKING
4 DROP-OFF AREA
5 ASSEMBLY PLAZA AND FIRE LANE
6 SPORTS FIELDS
7 CAFETERIA
8 KITCHEN
9 GALLERY
10 CONNECTION TO FUTURE HILLSIDE ADDITION
11 AUDITORIUM
12 GYM
13 DRAMA
14 MUSIC
15 BRIDGE TO PARKING



SITE PLAN

credits

ARCHITECT: Cooper Carry – Jerome M. Cooper, design principal in charge; Robert A. Just, project director, resources

ASSOCIATE ARCHITECTS: Collins Cooper Carusi Architects; Paul Cheeks Architects

ENGINEERS: Uzun & Case Engineers (structural); Barret, Woodyard & Associates (m/e/p); Eberly & Associates (civil)

GENERAL CONTRACTOR: JE Dunn Construction

CLIENT: Atlanta Public Schools

SIZE: 507,093 square feet

COST: $87 million (construction only)

COMPLETION DATE: August 2013

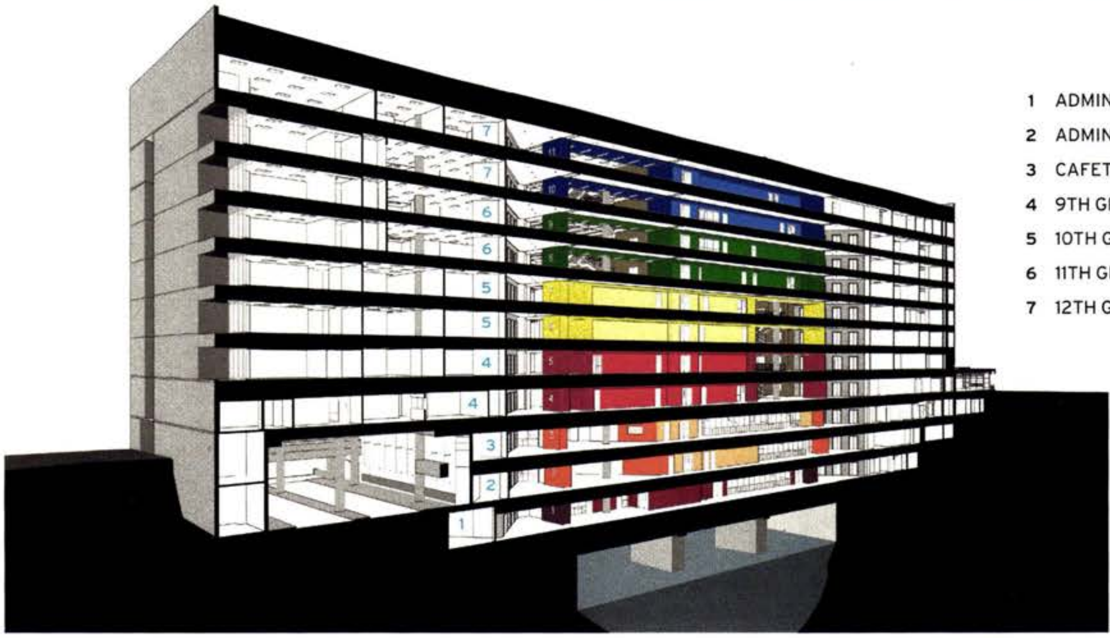
SOURCES

CURTAIN WALL: YKK AP America

METAL PANELS: Firestone Metal Products; Una-Clad Insulated Wall Panels

GLAZING: Viracon

ELEVATORS: ThyssenKrupp



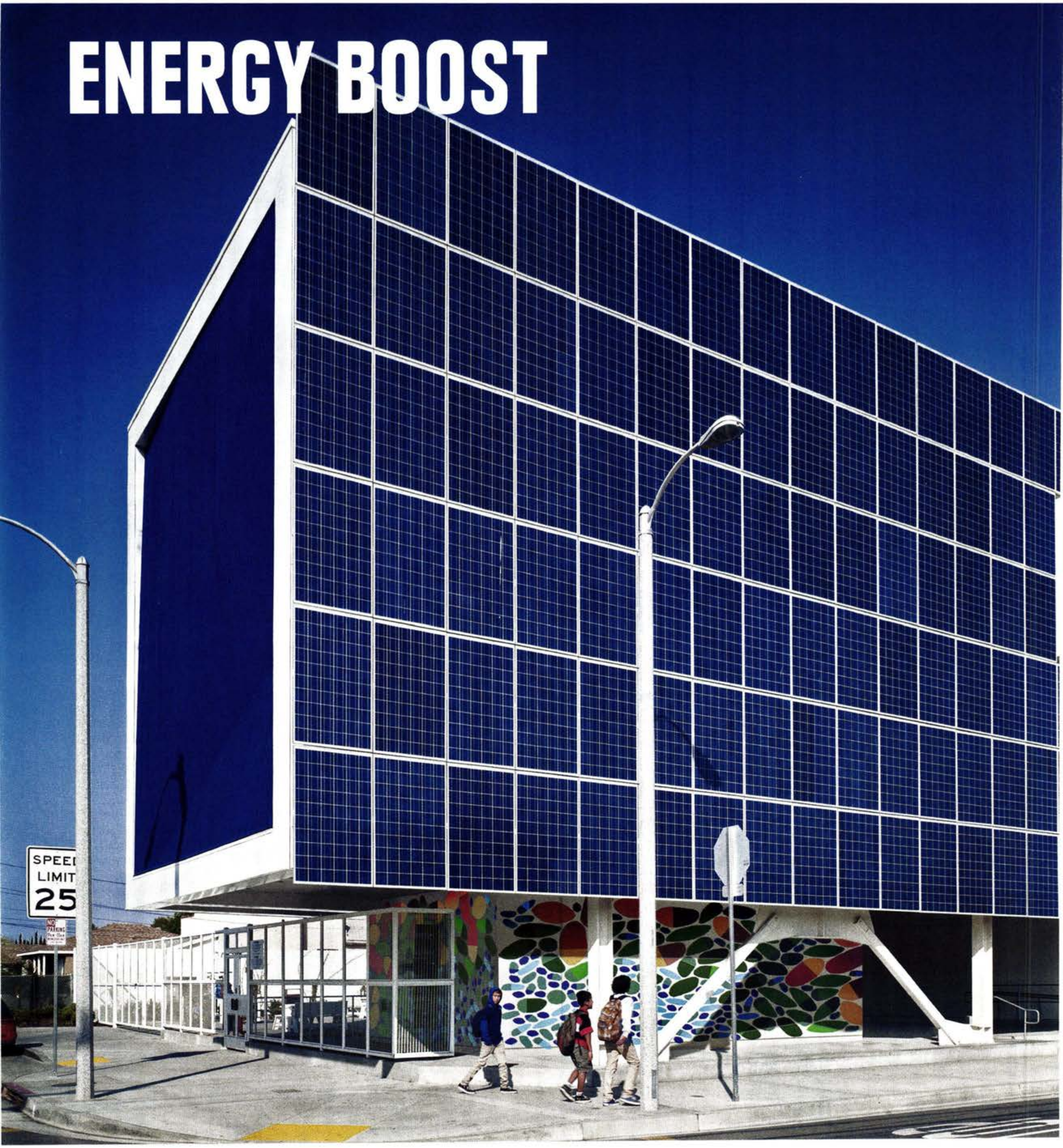
1 ADMINISTRATION AND PUBLIC GATHERING
2 ADMINISTRATION AND MEDIA CENTER
3 CAFETERIA
4 9TH GRADE ACADEMY
5 10TH GRADE ACADEMY
6 11TH GRADE ACADEMY
7 12TH GRADE ACADEMY

LAKESIDE SECTION-PERSPECTIVE

COLOR WAYS
A spiral staircase is a main feature of the glass-walled lobby (opposite). The architect connected the two floors of each separate academy (freshman, sophomore, junior, and senior) by removing a section of their upper floors to insert a staircase and open up corridors (above). Each academy has its own color scheme (left).

Green Dot Ánimo Leadership High School | Inglewood, California | Brooks + Scarpa Architects

ENERGY BOOST



On a tough site, a public school touts its forward-thinking mission with design, while providing a model for sustainability.

BY SARAH AMELAR

ABOVE THE door to every classroom at Ánimo Leadership Charter High School, in Inglewood, California, a glowing green sign reads: The Road to College Starts Here. Though the student population is mostly low-income, and the school occupies a tough site—near the 105 Freeway and the approach to Los Angeles International Airport—this is a place of soaring aspirations.

Overcoming obstacles to academic achievement and real-world success, this public school's core values have shaped everything from its personalized teaching approaches to the architecture. Here, the V-shaped new building encourages a sense of community, while also connecting with its neighbors. "In low-income areas, like this Latino neighborhood, people just hope for spaces that function, but I think it's unfair for them not to get beautiful places for learning," says Marco Petruzzi, CEO of Green Dot Public Schools, the nonprofit that founded and operates the school. His organization began in 1999 with a mission to transform public education in Greater Los Angeles, whose Unified School District (LAUSD) has seen staggering high school drop-out rates. In place of dysfunctional academic warehouses, Green Dot proposed small charter schools, "where everyone knows your name," says Petruzzi. Today, the organization's 19 schools across the county—some start-ups and others "turn-arounds" of existing troubled institutions—typically cap enrollment between 500 and 650 students each, with relatively small classes, a pervasive college-oriented culture, and emphasis on quantifiable, standardized test data. One essential factor is direct engagement of students' families and school administration in the learning process.

Yet when Petruzzi, a self-described architecture buff, approached various firms to design the 28-classroom Ánimo Leadership school, he got disheartening responses. Given the tight (30,300-square-foot) site, budgetary restrictions, and low-rise residential neighbors, "everyone said we could just do a 'shoebox' for classrooms, with a stair at either end. Period," he recalls. "They told us to forget about casual 'hangout' spaces, or even a lunch area."

But Los Angeles–based Brooks + Scarpa Architects (BSA) had a different idea—and it dovetailed with Petruzzi's ambitions to reverse the downward

BRIGHT IDEA
Nearly 500 PV panels across the south-facing entry facade (left) meet much of the school's energy needs. The mural at the building's base was the architects' temporary stand-in for the public art to be painted there in the future, with student participation. The east elevation (above) is more delicately detailed, responding to the surrounding modest single-family homes. Open-air stairways provide natural mingling places.

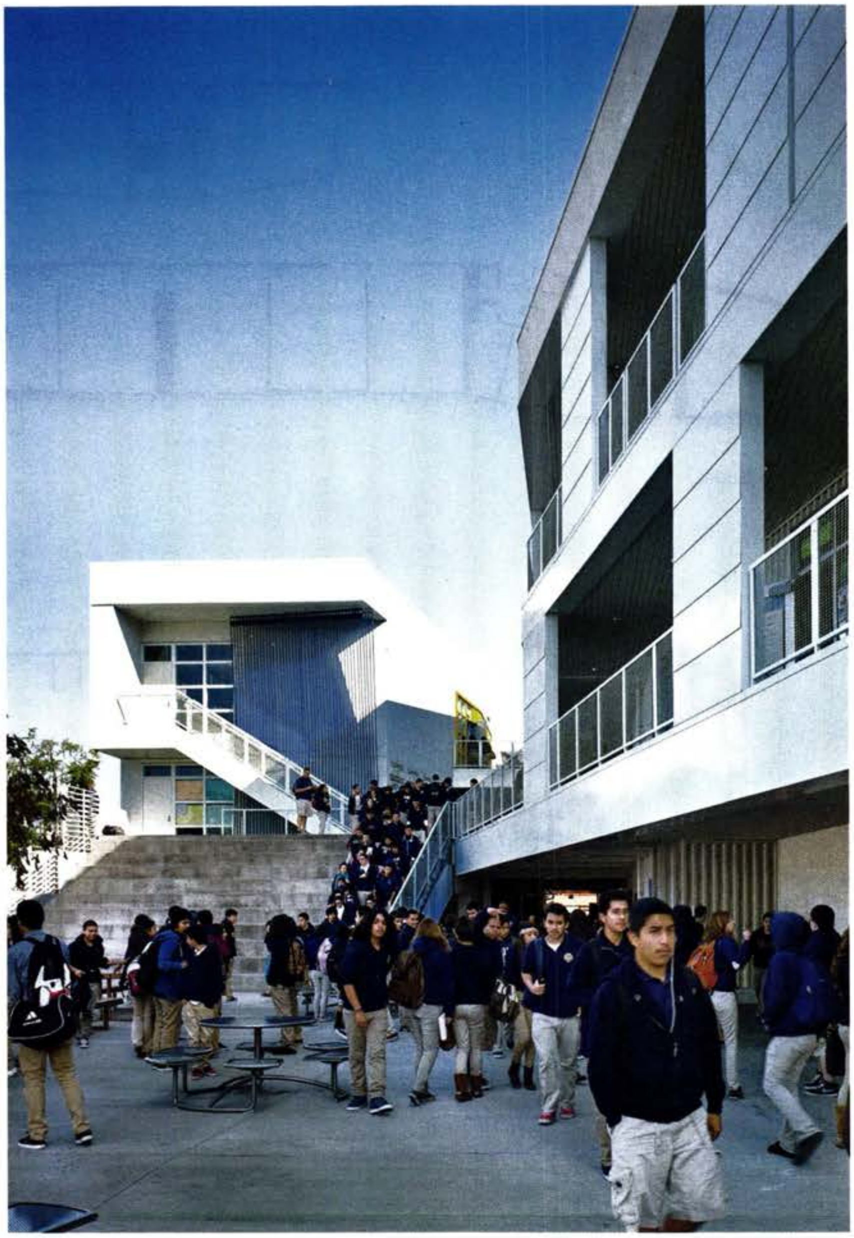
spiral of a rough neighborhood while providing a model of energy efficiency.

Certified by CA-CHPS (the environmentally focused California Collaborative for High Performance Schools), the 50,165-square-foot building BSA realized opens up the site at its core. Though the three-story structure is built out to the edges of its urban corner site, it ushers light and air into its center with a funnel-like courtyard, oriented to optimize passive shading and draw through-breezes. This outdoor room doubles as the lunch area, assembly hall, and prime mingling zone. Concrete stadium steps at one end serve as an amphitheater or perches for gatherings. "We wanted the five minutes between classes to be an important part of the experience," says BSA principal Larry Scarpa. "We actually created more stairways than required, to increase meet-up opportunities." Within this building–clad in white-pigmented cement plaster –wide open-air corridors embrace the temperate climate.

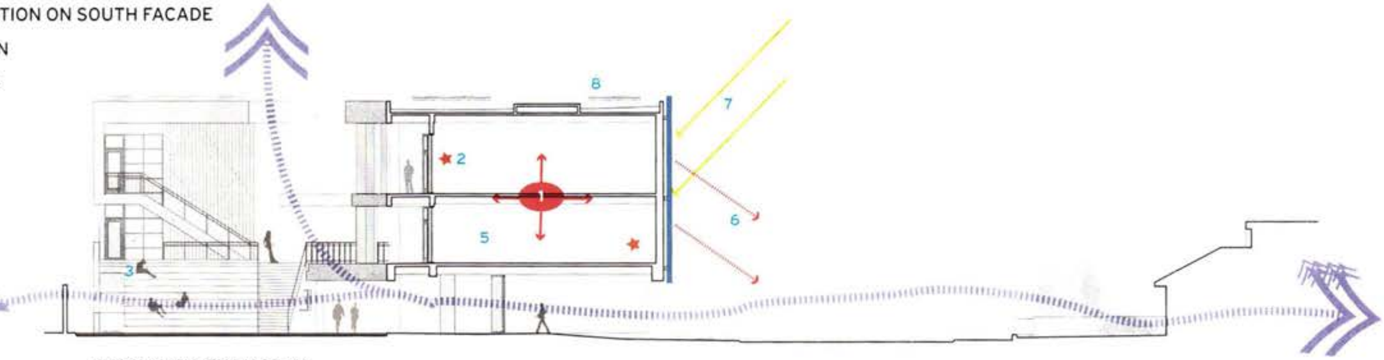
BSA sheathed the long south-facing front facade in nearly 500 PV panels. The feature's $688,000 price tag may seem like a big chunk of the building's $15.2 million cost. But Petruzzi says favorable financing made the array feasible and beneficial–in both the short- and long-term. As he explains, California Proposition 55, the Kindergarten–University Public Education Facilities Bond Act of 2004, covered half the project costs and gave Green Dot a long-term, low-interest loan for the remainder. With the PVs meeting 75 percent of the school's energy needs, Scarpa estimates an annual savings of $70,000. So, payback for the apparatus is modest and gradual, while the impact on operating costs is substantial.

Ánimo Leadership's other material components are humble: concrete floors, white-pigmented cement-plaster outer walls, exposed ductwork in classrooms, and white-painted metal railings and mesh along the staircases and the broad, single-loaded corridors. The building's tight V-plan–

BLUE RAYS
Sculpturally arrayed blue fins shade the western facade (above). With a sense of openness to the community, the courtyard (left side of above) serves as the lunch area, assembly hall, and principal social zone. Concrete bleacher steps at one end of this space (opposite) create a casual amphitheater.

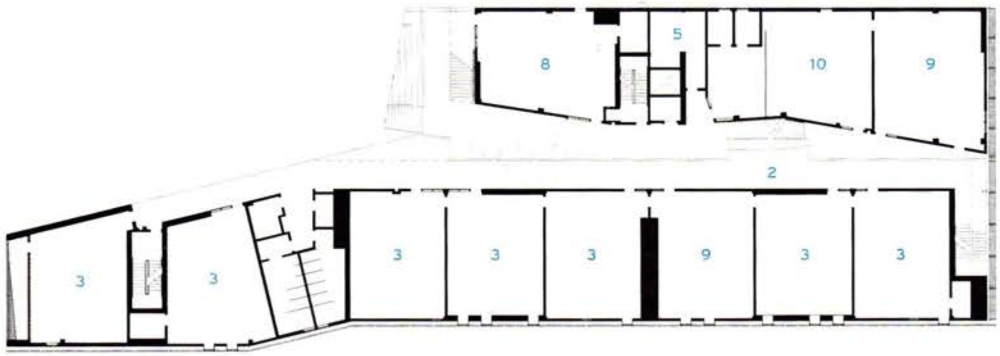


1 BUILDING MANAGEMENT SYSTEM ENSURES OPTIMUM PERFORMANCE OF ALL SYSTEMS
2 AUTOMATIC SENSORS AND INTELLIGENT THERMOSTATS
3 BUILDING CONFIGURATION ENCOURAGES USE OF STAIRS AND DE-EMPHASIZES ELEVATOR USAGE
4 BUILDING CONFIGURATION INDUCES AIR FLOW AND NATURAL VENTILATION
5 NARROW FLOOR PLATE INCREASES NATURAL DAYLIGHT, WHILE CROSS VENTILATION REDUCES COOLING LOADS AND ENERGY USAGE
6 THERMAL MODULATION ON SOUTH FACADE
7 SOLAR COLLECTION
8 SOLAR HOT WATER



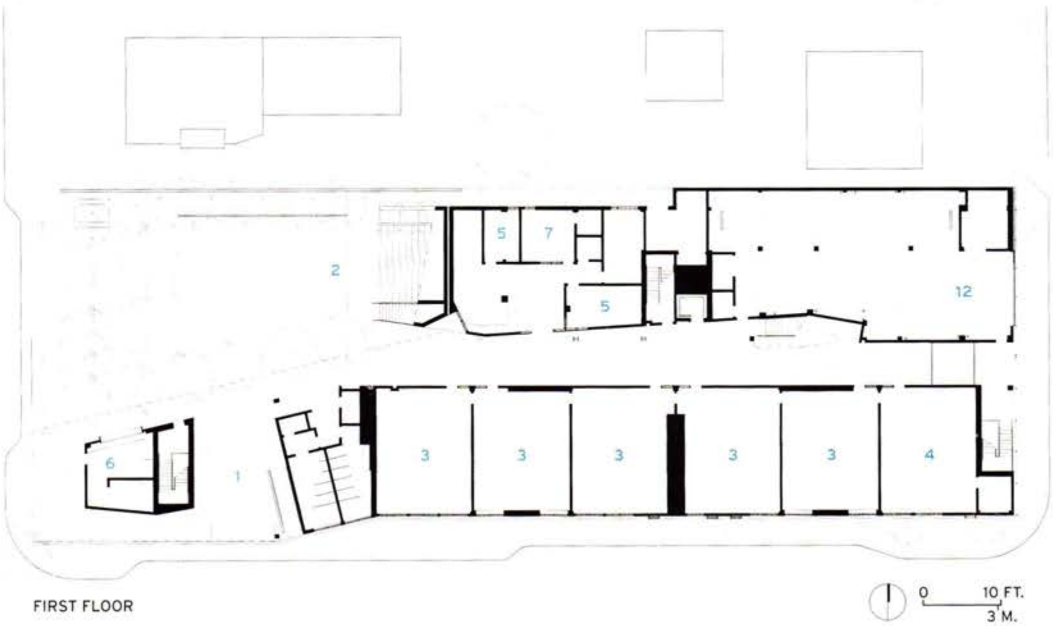
SUSTAINABILITY DIAGRAM

THIRD FLOOR



SECOND FLOOR

1 ENTRY COURT
2 TERRACE/OPEN-AIR CIRCULATION
3 CLASSROOM
4 MUSIC ROOM
5 OFFICE
6 FOOD SERVICE
7 NURSE
8 SCIENCE LAB
9 COMPUTER LAB
10 MEDIA LIBRARY/COLLEGE CENTER
11 CHEMISTRY LAB
12 PARKING



FIRST FLOOR

PHOTOGRAPHY: © TARA WUJCIK (OPPOSITE)

BUILDING BLOCKS The western facade's blue fins filter late-day sunlight into a classroom (left). On the building's southern side, however, photovoltaic panels block some of the windows (as in this room, facing the student), leaving other classrooms with sparse daylight, school officials report. Humble materials throughout the facility include polished concrete floors as well as exposed ductwork, and structural members sprayed with an acoustic coating.

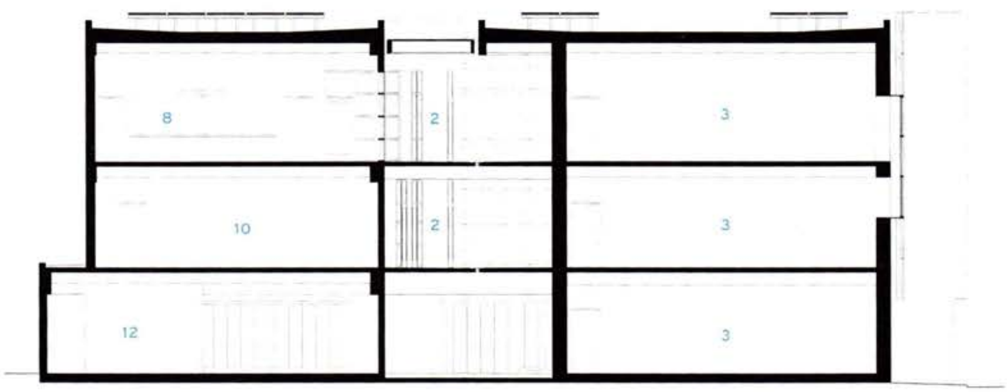
like a solid block with a jagged, converging chasm of circulation cut through it—invites views and social interaction across the central open space.

The building opened in 2012, and, so far, the results are encouraging. The school (begun in temporary quarters in 2000) currently boasts college admissions for 98 percent of its graduating class, with many the first in their families to achieve higher education. In 2013, *Newsweek* ranked it among the nation's 2,000 most effective public schools for producing college-ready graduates—and one of the country's "Top 25 Transformative High Schools" (or "game-changers" for youth below the federal poverty line).

But, like any ambitious undertaking, it has met bumps in the road. The gym BSA designed for a separate site nearby is not yet under construction. (The school has improvised by leasing local parks, playing fields, and gyms, and has already succeeded in winning some state championships.)

Among the features value-engineered out was courtyard landscaping. And the public art intended for the building's base—a mural to be painted with student participation—has not yet taken form. For the grand opening and photos shown here, BSA temporarily installed a mural of its own design. Without it, the entry area is currently a bit drab. But the litmus test: students seem to be thriving. On a recent visit, a small group of them worked intently after hours with a teacher in a chemistry lab. And after school lets out, they can be spotted throughout the neighborhood (most live within walking distance) proudly sporting their Ánimo Leadership sweatshirts.

"Larry Scarpa captured the essence of what we wanted," says Petruzzi, "a sense of openness and connection with the surrounding community, even on such a compact site. When everyone else said, 'Forget it,' we didn't give up." ■



SECTION A - A

credits

ARCHITECT: Brooks + Scarpa Architects – Lawrence Scarpa, principal in charge; Angela Brooks, Mark Buckland, Ching Luk, project architects; Brad Buter, Silke Clemens, Omar Bárcena, Emily Hodgdon, Gwynne Pugh, Sri Sumantri, project design team

ENGINEERS: Thornton Tomasetti (structural); Barbara L. Hall, P.E. (civil); E2DI (m/e/p)

CONSTRUCTION MANAGER: Telacu

CLIENT: Green Dot Public Schools

SIZE: 50,164 square feet

COST: $15.3 million

COMPLETION DATE: June 2012

SOURCES

METAL/GLASS CURTAIN WALL: U.S. Aluminum

BUILT-UP ROOFING: CertainTeed

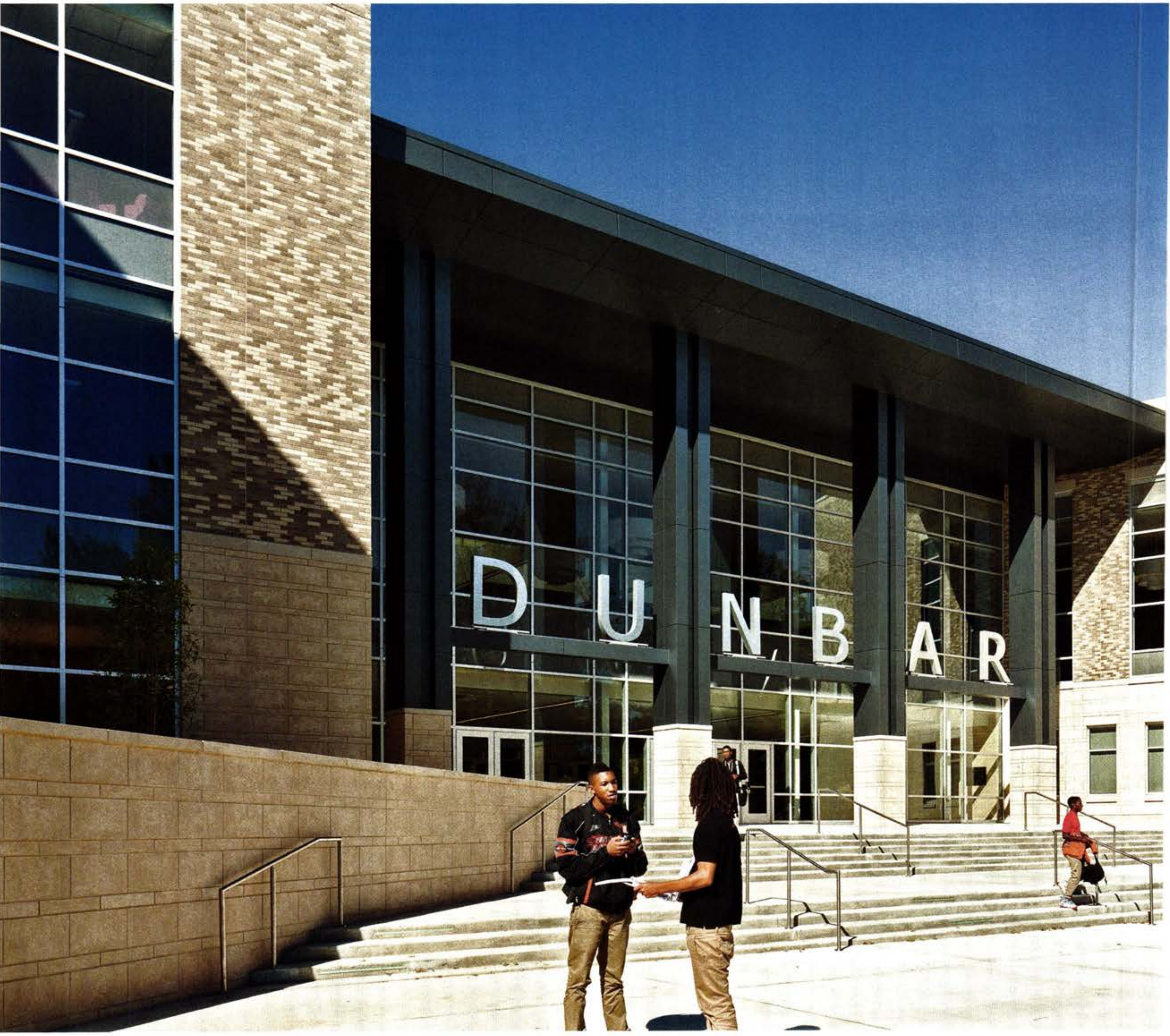
GLASS: PPG

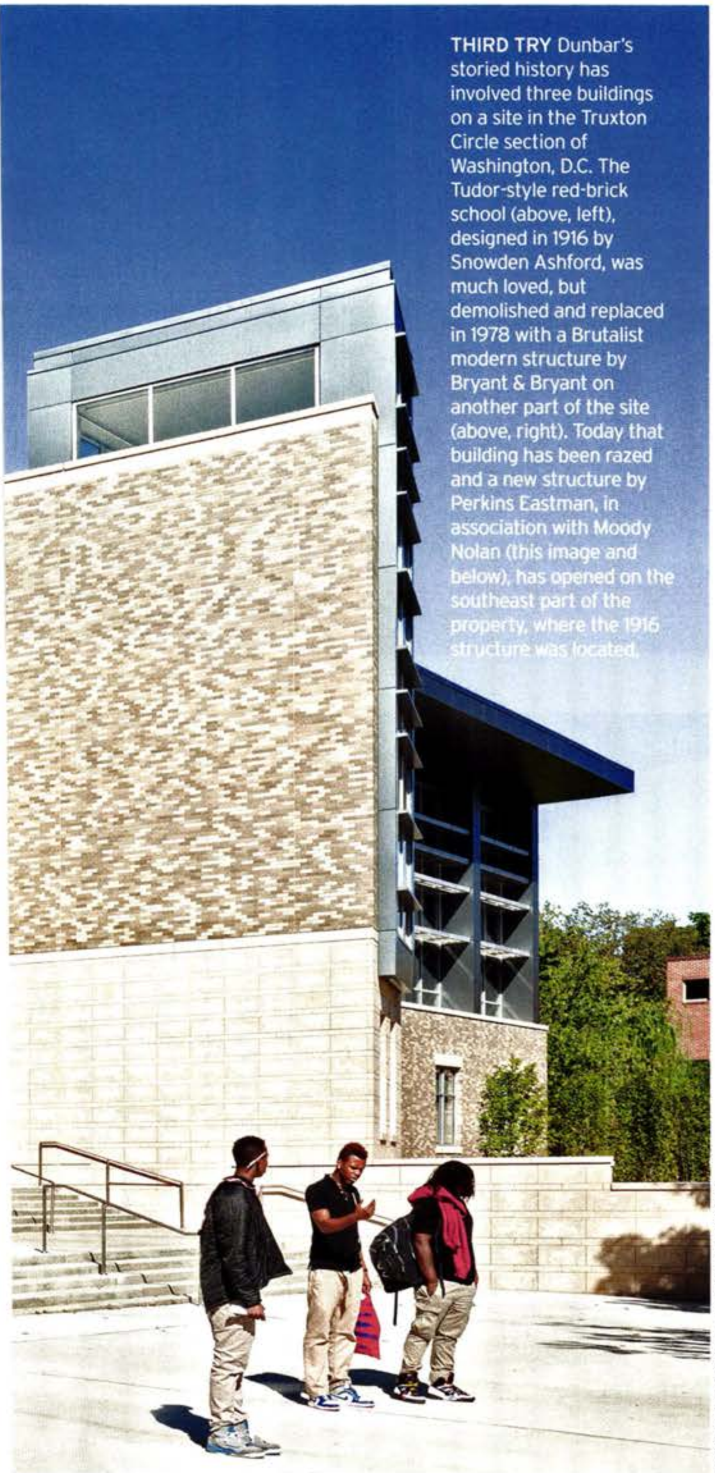
Dunbar Senior High School | Washington, D.C. | Perkins Eastman and Moody Nolan

HISTORY LESSON

A famous school gets back on track blending modern and traditional design elements.

BY SUZANNE STEPHENS





THIRD TRY Dunbar's storied history has involved three buildings on a site in the Truxton Circle section of Washington, D.C. The Tudor-style red-brick school (above, left), designed in 1916 by Snowden Ashford, was much loved, but demolished and replaced in 1978 with a Brutalist modern structure by Bryant & Bryant on another part of the site (above, right). Today that building has been razed and a new structure by Perkins Eastman, in association with Moody Nolan (this image and below), has opened on the southeast part of the property, where the 1916 structure was located.

PHOTOGRAPHY: © JOSEPH ROMEO

"**THIS BUILDING** has light, energy, and life!" exclaims Dunbar Senior High School's principal Stephen Jackson. "I love it, love it, love it!" Jackson is raving about the 280,000-square-foot brick, glass, and steel structure that opened in August in the Truxton Circle section of Northwest Washington, D.C. It will soon accommodate 1,100 students, but for now a few more than 600 are populating its halls. The public high school, designed by Perkins Eastman in association with Moody Nolan, is a four-story facility with an L-shaped plan (one wing for academics, the other—a chunkier block—for sports and arts), partly enclosing an athletic field.

Jackson's declaration bears up as you ascend the broad steps to the entrance. Walking into a large skylit atrium, you find floor-to-ceiling windows opening to vistas of the surrounding residential neighborhood. In the gym, a 29-foot-high glass wall overlooks the sports field to the west. Underneath the gym, an expansive clerestory brings daylight into the partially below-grade 75-foot-long swimming pool. Even the maple-paneled auditorium with 600 seats has a glass wall backing the stage—with access to a terrace.

The majestically modern edifice is the third incarnation of Dunbar on this site. In 1870, Dunbar was founded as the Preparatory High School for Colored Youth, the first of its kind in the United States, in a church basement at 15th and R streets. By 1916, the school took the name of the poet Paul Laurence Dunbar and moved into a new Tudor-style red-brick structure in the present spot. Recognized for its intense academic curriculum, Dunbar thrived. Its alumni include Congresswoman Eleanor Holmes Norton, Brigadier General Elmer Brooks, and current D.C. mayor, Vincent C. Gray.

"The 1916 school was a stately building, designed with a flair that enhanced its tremendous educational mission," says Mayor Gray. Eventually, however, the facility needed modernization. In spite of a lengthy battle fought by preservation-

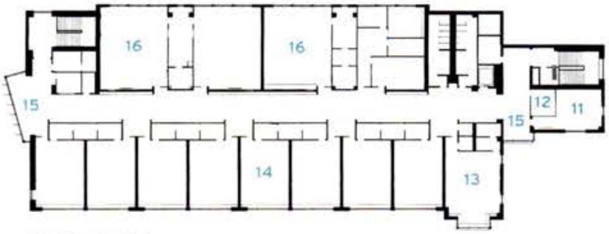
ists to keep the venerated structure, it was torn down in 1977. Its replacement, designed by a prominent local African American architectural firm, Bryant & Bryant, occupied the northwest corner of the site. Both its concrete Brutalist-modern style and the open-plan method of teaching reflected prevailing design and educational thinking of the time. The paucity of windows was also a response to the growing violence in the inner city. Says Gray, "This Dunbar looked like a prison." Jackson adds, "It had lots of hiding places, and it was cramped. As research shows, crowding people together creates tension and aggressive behavior."

Around 2000, it became clear that both architecture and education were suffering. The Dunbar Alumni Federation pressed for a brand-new facility–one that would incorporate features of the historic 1916 structure, including an "armory" like the one where high-school Reserve Officers Training Corps (ROTC) practice once was held and where students could hang out.

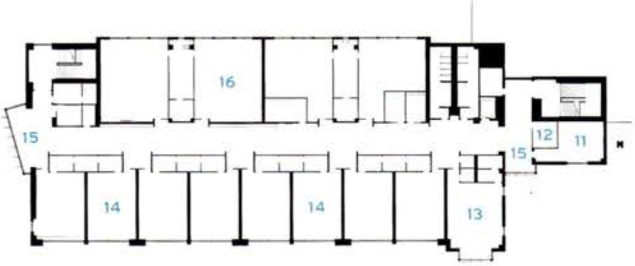
The architects responded with a design distinguished by articulated facades, deeply profiled mullions, louvers, cornice-like canopies, and statuesque piers. "We wanted to create a sense of scale, especially on the academic wing," says Sean O'Donnell, principal in charge at Perkins Eastman, "and express the structure's varying functions on the exterior."

The new school, built on the southeast corner of the site

HALLOWED HALLS
A sky-lit atrium called the "armory," after one in the revered 1916 school, has a food court on the east end (opposite, top) edged by a glass wall. Ample windows also bring light into classrooms and labs (opposite, bottom). On the second level, the generous proportions of the hall (above, left) and media center (above, right), along with Donald Deskey-style chairs and giant corkscrew pendant lamps, invoke the aura of Radio City Music Hall. The bridge leading to a senior lounge allows views of the activity in the atrium below (right).

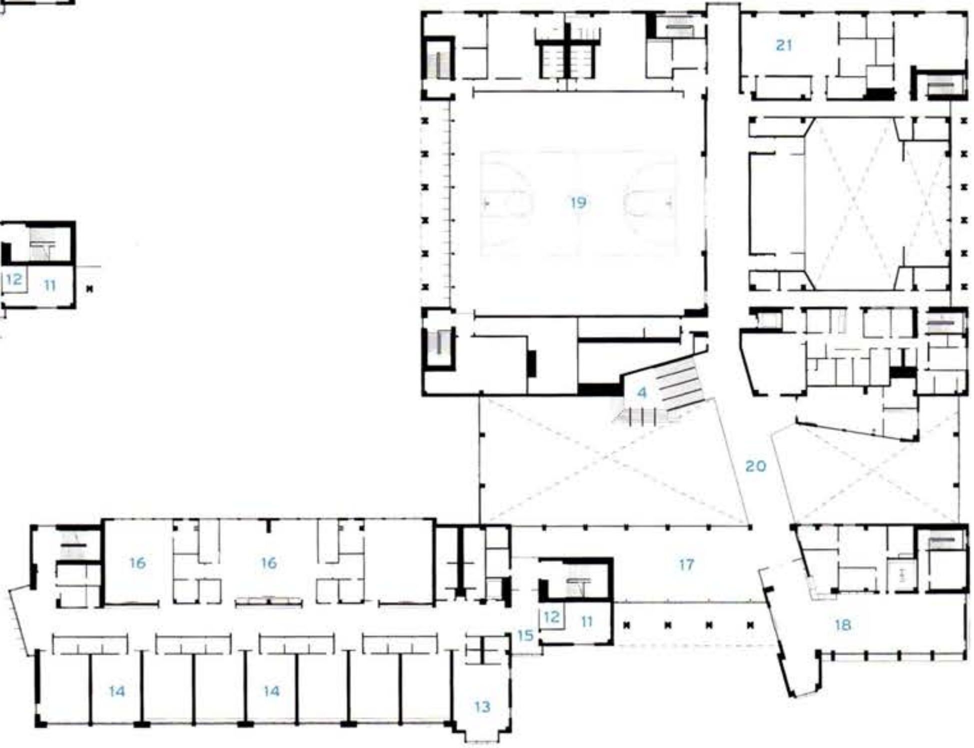


FOURTH FLOOR

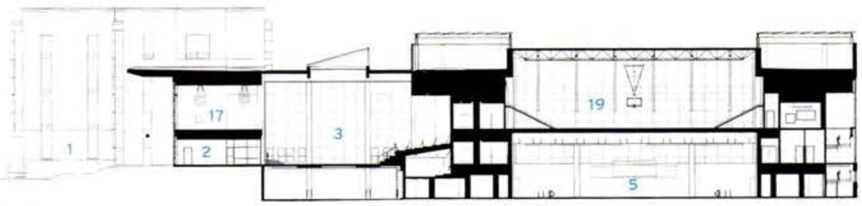


THIRD FLOOR

1 ENTRY
2 VESTIBULE
3 ARMORY
4 GRAND STAIR
5 POOL
6 CHORAL ROOM
7 AUDITORIUM
8 FOOD COURT
9 WELCOME CENTER
10 MUSEUM



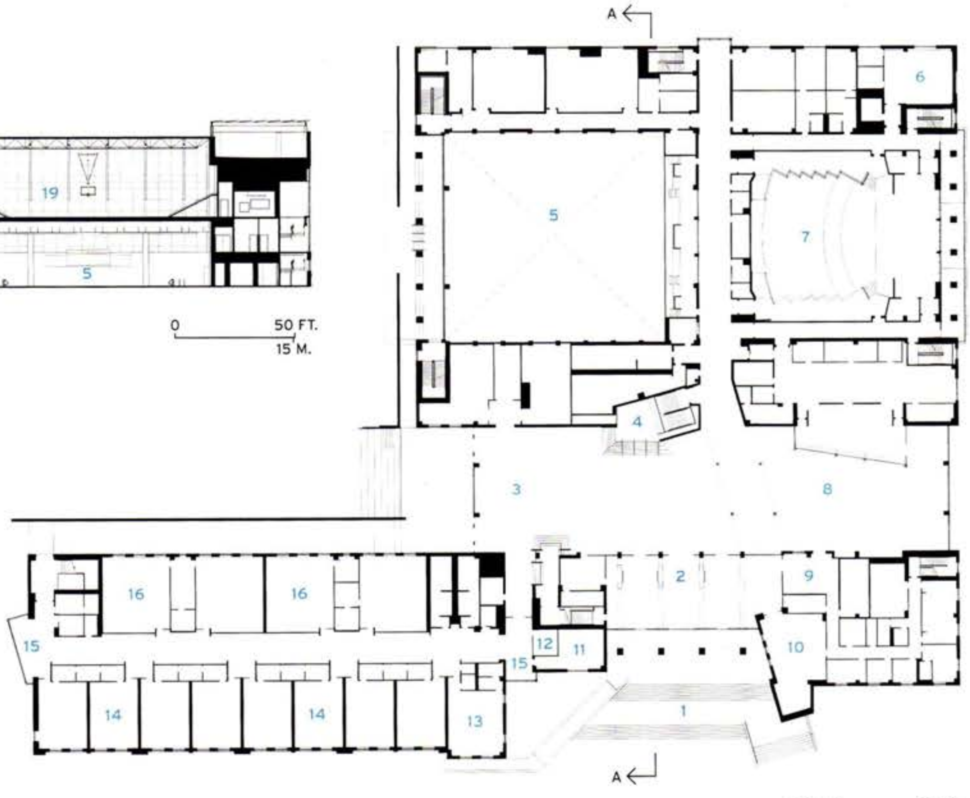
SECOND FLOOR



SECTION A - A

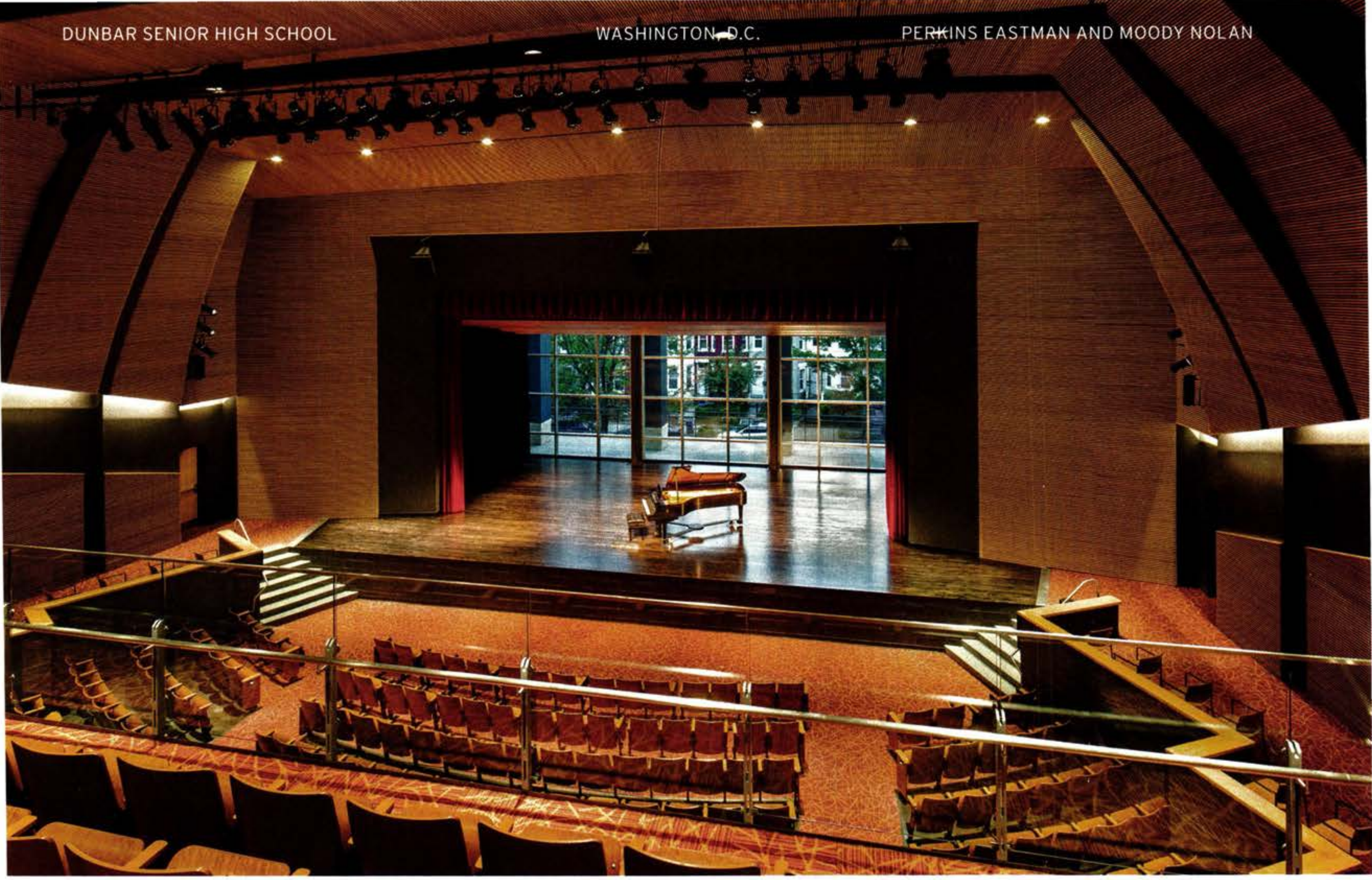
0 50 FT.
15 M.

11 TEACHERS' WORKROOM
12 OFFICE
13 SPECIAL NEEDS CLASSROOM
14 CLASSROOM
15 EXTENDED LEARNING
16 LABS
17 SENIOR LOUNGE
18 MEDIA ROOM/READING
19 GYM
20 BRIDGE
21 BAND ROOM
22 ART ROOM



FIRST FLOOR

0 50 FT.
15 M.



STAGE VIEW
The 600-seat auditorium is sheathed in maple panels and backed by a glass curtain wall behind the stage. There, a terrace overlooking a tree-lined street accommodates receptions before or after ceremonies and performances. As journalist Alison Stewart writes in *First Class: the Legacy of Dunbar, America's First Black Public High School* (2013), the design conveys a sense of "real romance."

formerly occupied by the 1916 building, does not feature its dark-red brick: instead, the architects devised a syncopated pattern of multitonal shades of beige. While this seems a bit jazzy, the mayor (who still has a brick from the 1916 school) calls it "aesthetically pleasing, with a dignified look."

The brick alternates on the exterior with a deep-blue-gray aluminum composite material for trim and panels, all of which continue into the atrium–or, as it is deferentially called, the "armory." The armory isn't what one might expect: a food court occupies its east end, and a wide stair leads to a bridge that diagonally crosses the main space to the south-side mezzanine. There, a sunlit senior lounge and an enclosed media room are endowed with the stately proportions and art deco aura reminiscent of Radio City Music Hall's ancillary spaces. Heightening its cultural image and connection to the community is a museum below, next to the entrance, where an exhibition proclaims the contributions of illustrious alumni.

In terms of its educational goals, Dunbar has created four "academies." After the ninth grade (the first academy), students choose among three, whose curricula are education; business, law, and public policy; or pre-engineering. Those involved in pre-engineering "will find features in the building that correlate with their studies," says O'Donnell, who is seeking a LEED Platinum rating for the new structure. So far, Dunbar has installed 372 geothermal wells under the football field, with more going below the just-demolished 1978 school. Photovoltaic panels (1,750) are being mounted on the new roof, and there are two 20,000-gallon cisterns for stormwater reclamation. Other green measures involve using low-E glass and low-VOC materials, plus recycling detritus from the 1978 building in off-site projects.

Now, only a few months after its opening, Dunbar appears phenomenally successful and, as Jackson proudly contends, filled with energy. Whether or not architecture can once again be seen as helping education may have to wait until the current crop of ninth graders graduates. For his part, Jackson predicts: "The students definitely will do better in this building." ■

credits

ARCHITECT: Perkins Eastman – Sean O'Donnell, principal in charge; Matthew Bell, design principal; William Griffin, senior project architect; David Shirey, project manager; Abbie Cronin, project architect

ASSOCIATE ARCHITECT: Moody Nolan – Patrick Williams, manager; Jon Guldenzopf, design architect

ENGINEERS: SK&A (structural); Setty & Associates (m/e/p/fp)

CLIENT: D.C. Department of General Services/D.C. Public Schools

SIZE: 280,000 square feet

COST: $128 million (total)

COMPLETION DATE: August 2013

SOURCES

METAL: Reynobond Aluminum Composite

LOW-IRON MASONRY: Taylor Clay; Arriscraft

GLASS: Viracon

SKYLIGHTS: Kalwall

products **education**

INNOVATIVE FURNISHINGS AND FINISHES, AS WELL AS SIMPLE EXTERIOR ELEMENTS AND EQUIPMENT, ENLIVEN NEW AND EXISTING K-12 SCHOOLS. **BY SHEILA KIM**

Designers and educators join forces to create a new classroom furniture system

WHEN A progressive middle school program called Teach to One: Math launched in 2011, it challenged a group of architects and designers not only to rethink the learning environment, but to develop a furniture system capable of supporting its education model. Devised by the nonprofit organization New Classrooms, the program proposes more effective instruction through a range of experiences within a single room: interactive group activities, peer-to-peer learning, independent study on computers or through printed lessons, and traditional live teacher instruction. With guidance from the American Architectural Foundation (AAF) and funding from the Target retail corporation, the team produced a design guide with floor plans and suggested furnishings, including a new core multifunctional furniture piece–the Learning Module.

Now available in conjunction with the program, the Module is a made-to-order birch plywood shelving system that doubles as a space divider, and each can be specified with varied open-cubby and door configurations in different widths and heights. "The furniture shapes the spaces, helping students focus but still maintaining sight lines for teachers," says Caroline Otto, a senior associate of Anderson Architects. Otto collaborated on both space and furniture development, along with Scott Lauer, an independent architect formerly with the AAF, and Jonas Milder, principal of furniture design company Milder Office and himself a teacher.

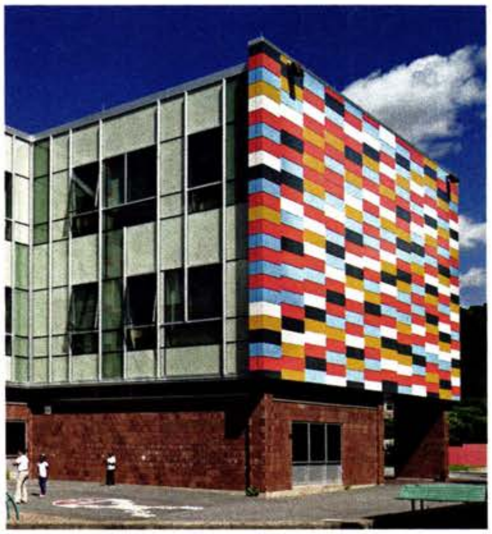
The system was designed to be flexible and easy to install without compromising stability and durability. Mounted to the floor, the units have fixed and removable shelves to meet changing storage needs for printed or object-based lesson materials, or to create more openness or a lower partition. Because the Learning Module defines space, schools implementing the program can quickly readjust their Teach to One: Math centers during the summer before the school year begins again, without the cost and complication of renovating a space.

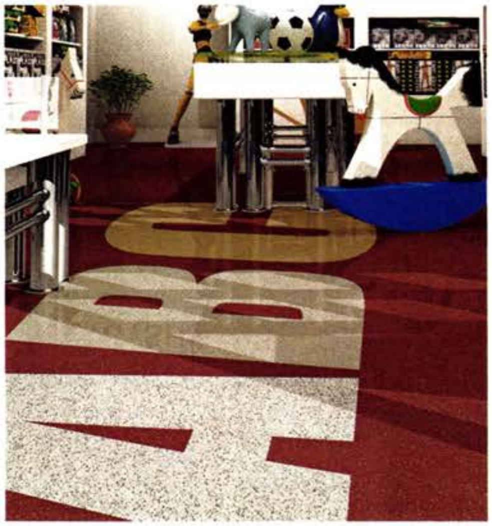
NEW CLASSROOMS At the William P. Gray School in Chicago, the first school to implement the Learning Module furniture system, the units feature a combination of open storage cubbies, cabinet doors, sliding whiteboards, and power/data poles, and partitions off the various learning zones.

The integrated solutions of the system eliminate the need for extraneous fixtures: the Modules can support the monitors that direct students to their assigned areas; poles can be inserted to provide power and data access points for computer equipment; and tracks can be installed for sliding whiteboards and interactive boards. Otto sums up, "Existing furniture pieces could do one or two functions, but not the six, seven, or eight that our pieces are actually doing."

newclassrooms.org **CIRCLE 213**

PHOTOGRAPHY: © DARRIS LEE HARRIS





Aluminum Wall Panel System

Dri-Design dri-design.com

Rainscreen systems can revitalize older school buildings while providing a sound, cost-effective envelope. In Boston, architecture firm Gale Associates replaced Mattahunt Elementary School's failing 40-year-old exterior while giving it a facelift using Dri-Design's aluminum-panel rainscreen system. The panels—specified here in six colors to add visual punch—are available in any Kynar color and also zinc, copper, or stainless steel, alternatively. CIRCLE 214

Grazie Seating Collection

KI ki.com

Designed by Giancarlo Piretti for Wisconsin furniture manufacturer KI, the Grazie seating collection is defined by a minimalist, ergonomic seat and back shells of injection-molded polypropylene. The backrest can flex up to 15°, while the seat is upholstered with a 1"-thick foam cushion. Grazie is offered as an armed or armless stacker with four legs or glides; tablet chair (shown) with four legs, glides, or casters; task chair with casters. CIRCLE 215

Natural Ventilation System

Big Ass Fans bigassfans.com

For the Oakland Unified School District's Downtown Educational Complex in California, new construction regulations prohibited installation of traditional HVAC systems (compressor-based refrigeration). Big Ass Fans worked with Taylor Engineering to develop a solution: thermal-mass walls absorb solar heat while central air-handling units bring in outdoor air to be circulated by large custom low-speed ceiling fans, maintaining comfort throughout the school. CIRCLE 216

Choices for Good Program for K–12

Mannington Commercial choicesforgood.com

Choices for Good is a pay-what-you-can program newly launched by Mannington Commercial to provide K–12 schools with high-performance flooring. Eligible schools can pay a greatly reduced price and choose from a selection of stocked carpet, resilient sheet (shown), vinyl-tile, and rubber-tile products. CIRCLE 218

Lamberts Linit Channel Glass in Enamel Colors

Bendheim Wall Systems bendheimwall.com

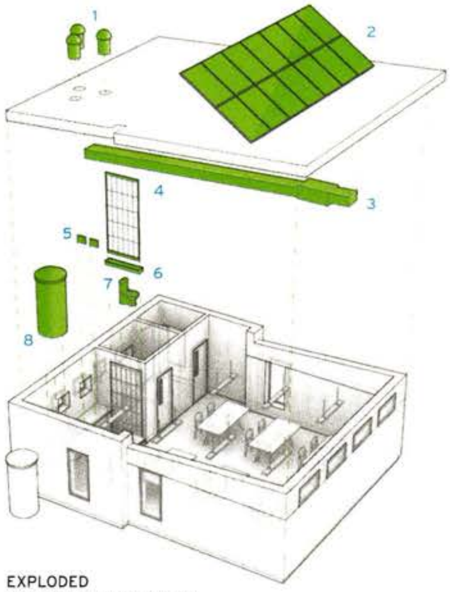
Linit channel glass by Lamberts can be specified in a range of hundreds of Pantone-like enamel colors to create dynamic facades, storefronts, or interior walls. Because the enamel is fused under high temperature onto the back, interior side of the U-shaped glass during the tempering process, it offers advantages over paint such as resistance to peeling, scratching, and cracking. The enameled channels, available in lengths of up to 23', appear completely opaque from the outside—as demonstrated at the Eppendorf school (above) in Hamburg, Germany—but still filter light to the interior. Linit by Lamberts is exclusively distributed in the United States through Bendheim Wall Systems. CIRCLE 217

PHOTOGRAPHY: © MARK KEMP, ST. LOUIS (TOP LEFT)


RSpec™ By ROXUL®
The Better Insulation™
Specifying Stone Wool just got Easier. Register for MY STUFF™ to Customize your Portfolio.
✔ Collect Available Documents from around the site
✔ Customize Your Own Virtual Portfolio
✔ Technical Data Sheets Automatically Archived and Updated
✔ Receive Information Tailored to your Needs
www.rspec.com
CIRCLE 79
Use RSPEC™ on your mobile devices to access information on the go!
Product Applications
Resource Library
Specifying Stone Wool in Commercial Projects
My Stuff
All My Stuff
ROCKBOARD® PG
COMFORTBOARD® CIS
About Us
Product Applications

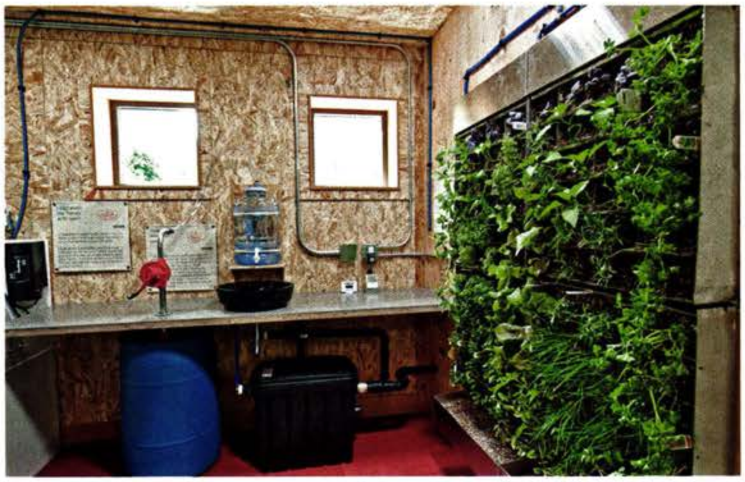
Modular Classroom Makeover

New designs for portable school buildings make improvements that are more than cosmetic. By Joann Gonchar, AIA



EXPLODED AXONOMETRIC DIAGRAM

1 TUBULAR SKYLIGHTS
2 PHOTOVOLTAIC ARRAY
3 ENERGY-RECOVERY VENTILATOR
4 GREEN WALL
5 ENERGY AND WATER MONITORS
6 HAND-PUMP SINK
7 COMPOSTING TOILET
8 CISTERN



SEED CLASSROOM The unit developed by the SEED Collaborative is made of structural insulated panels exposed on the interior (top) and clad with fiber cement on the exterior (above left). In addition to the clearly visible structure, its teaching tools include a living wall fed by treated graywater (above).

THE MENTION of "portable" classrooms—or any similar term—puts fear into the hearts of parents with school-age children. Regardless of whether you call them portable, modular, or temporary classrooms, they conjure up unwelcome images of shoebox-like structures with few windows, stuffy air, and noisy but ineffective mechanical systems.

Although there isn't much current literature addressing the performance of portable classrooms, older research supports this dubious reputation. One study conducted in 2004 by the California Air Resources Board and the state's Department of Health Services found a much higher instance of environmental problems in the relocatable units as compared with permanently built school buildings. The inves-

tigation documented conditions such as inadequate ventilation, excessive noise, poor thermal comfort, low lighting levels, and high concentrations of formaldehyde.

Despite these shortcomings, many school systems can't do without portable units. According to the trade association the Modular Building Institute (MBI), across the U.S. about 260,000 classrooms are in "relocatable" buildings—buildings that are designed to be reused multiple times on different sites and are partially or completely constructed in a manufacturing facility. The National Center for Education Statistics estimates that a third of American schools have such classrooms.

These classrooms exist because they fulfill critical needs. Districts can respond to fluctuations in enrollment quickly and cost-effectively. Since almost all of the construction occurs off-site, portables ordered in the spring can easily be built and installed over summer break. And because they are generally less expensive than traditionally constructed schools, the units can often be paid for with funds from operations and maintenance budgets, allowing districts to avoid the lengthy and uncertain bond-approval process. "There are many good reasons portable schools exist," says Margarette Leite, a principal at the Portland, Oregon–based architecture firm Palleroni Leite Design Partnership (PLDP). Leite and fellow PLDP principal Sergio Palleroni have designed (along with others, including architecture and engineering students at Portland State University, where both teach) a higher-performing alternative to the typical modular school.

SPROUT SPACE Designed by Perkins+Will, a Sprout Space (above) was installed last spring on the grounds of the National Building Museum in Washington, D.C., as part of a Green Schools exhibition. The building has ample glazing and a butterfly roof that directs rainwater to storage cisterns. Marker boards replace drywall on the interior (right) and—allowing teachers to bring the classroom outside—some of the exterior cladding panels.

Palleroni and Leite's classroom, which they have dubbed SAGE for "Smart Academic Green Environment," features an efficient mechanical system that depends on an energy-recovery ventilator, materials with no or very low levels of volatile organic compounds (VOCs), and ample daylighting through clerestory windows. Following the debut of a prototype in late 2012 at the U.S. Green Building Council's Greenbuild conference in San Francisco, the first SAGE classroom will be installed later this winter at a Waldorf School in Corvallis, Oregon. But it is not the only option for schools looking for ways to expand quickly and sustainably. Several design firms, nonprofit organizations, and prefab building companies are also developing improved portable classrooms that already have begun to attract orders from both independent schools and public school districts.

For example, a new charter school in Chattahoochee Hills, Georgia, is planning an entire campus made out of Sprout Space units. Designed by Perkins+Will, the Sprout includes elements intended to promote student health and productivity such as architectural-grade storefront glazing, dimmable LED lighting controlled by daylight and occupancy sensors, and marker boards and tack surfaces as substitutes for typical finishes.

And Project Frog, a San Francisco–based developer of component building systems established in 2006, is in the midst of fulfilling its largest contract to date—more than 250,000 square feet of educational facilities on 15 different campuses in the South San Francisco Unified School District (SSFUSD). The buildings are designed to perform 40 percent better than Title 24, California's strict energy code, mandates.

PHOTOGRAPHY: © SAM KITTNER (THIS PAGE); LAURELL MCCONNELL (OPPOSITE)

SAGE CLASSROOM A SAGE classroom clad in mostly yellow fiber-cement board was erected in front of San Francisco's Moscone Center during the Greenbuild conference in late 2012 (left). The classroom features clerestory windows to enhance daylighting, exposed ductwork, and a clearly evident flitch beam supporting the roof.

Project Frog developed the panelized system it is deploying at SSFUSD in collaboration with HMC Architects—a firm that specializes in education facilities, among other building types. The system relies on load-bearing wall sections with electrical chases included, laminated wood beams, and an acoustical metal ceiling and roof deck that acts as a structural diaphragm. These elements are fabricated in a factory and flat-packed for transport to the site, where they are erected on top of an on-grade slab. "This component assembly approach is derived from the lean manufacturing techniques used by companies like Boeing and Toyota," says Ash Notaney, Project Frog executive vice president of product and innovation.

Arguably, the portable classroom with the most ambitious set of performance goals is the one developed by the Seattle-based nonprofit SEED Collaborative. The SEED (Sustainable Education Every Day) is designed to meet the criteria of the Living Building Challenge—a "beyond LEED" building certification program administered by the International Living Future Institute (ILFI). In order to earn Living Building designation, a project must satisfy 20 tough-to-achieve "imperatives." Among these is a requirement for net zero energy: the building must produce enough renewable energy on-site to meet or exceed demand on an annual basis. It must also comply with the Challenge's materials standards prohibiting the use of 14 potentially toxic substances on the certification program's Red List. Many, such as formaldehyde and PVC, are commonplace in building materials and prevalent in conventional portable classrooms.

A prototype SEED manufactured by Method Prefab—an off-site builder of homes and commercial structures—was displayed as part of an ILFI conference held in Seattle last April. The 32-by-28-foot classroom has a durable building envelope with a high R-value (a measure of thermal resistance or insulating value). It is made of structural insulated panels exposed on the interior and clad on the exterior with a fiber-cement rainscreen. Additional features include triple-glazed windows, a photovoltaic (PV) array, and a composting toilet.

The prototype has been purchased by the Perkins School, an 80-student independent elementary school for children in kindergarten through fifth grade, located in Northeast Seattle. Once the permitting process is complete and the unit installed, Perkins plans to use it as a science classroom. Part of what made the SEED so attractive was the learning opportunity afforded by its clearly evident structure, visible electrical conduits, and a digital dashboard. This will allow students to track the electricity generated by a 6-kilowatt

PHOTOGRAPHY: COURTESY PLDP

PV array, to be mounted on the roof of an adjacent building, as well as energy consumption. "The classroom inspires kids to look around them and think about intelligent design," says school head Barry Wright. These features also made fundraising relatively easy: the school was able to raise $130,000, about half of what is needed to buy and install the SEED, in less than three weeks, "because the concept is so intriguing," explains Wright.

The SEED classroom isn't the only green modular conceived as a three-dimensional teaching aid. For instance, teachers can point to the butterfly roof that tops Perkins+Will's Sprout and describe how it funnels rainwater for irrigation to two 50-gallon storage cisterns. Similarly, the expansion and contraction of a fabric duct suspended just below the Sprout's ceiling helps students understand how their classroom is heated, cooled, and ventilated.

The recent crop of higher-performing modular classrooms share more than a pedagogical philosophy—in fact, these new portable schoolrooms have more similarities than differences. With the exception of the Project Frog buildings, which are made up of a panelized kit-of-parts, a single classroom is generally formed from two long and narrow units whose dimensions respond to the limitations of what can be hauled by a semi-truck over bridges and roadways. The portable classrooms typically have simple shed roofs, or a variation on a shed roof, tweaked to maximize the opportunities for windows and daylighting. Structural elements are often left exposed—a strategy that not only allows teachers to explain what is holding the building up but also eliminates unnecessary materials. This approach helps keep costs in check and reduces the number of potential sources of VOCs. Those basic finishes that are included, such as linoleum flooring or carpet tile, are carefully vetted so that they do not negatively affect indoor air quality.

In addition, the green portables are designed for much longer lifespans than the typical relocatable units, which are intended for only 5 or 10 years of use—though in reality they often stay in place much longer. The SAGE, for instance, is a 50-year building, according to its designers. And although its superstructure is wood, its floor framing is steel—a feature that should make the unit easy to move multiple times, enhancing its longevity.

Although the developers of the green portables try hard to keep costs down, features like high-performance glazing, ultra-efficient mechanical systems, and extra insulation typically make them more expensive than standard-issue modular units. Leite estimates that in Portland, a SAGE unit would be about $160,000, excluding foundations and site work, while a standard modular classroom would cost about $125,000 in the same market. The cost of the SEED is comparable to site-built construction, according to Stacy Smedley, the SEED Collaborative's executive director. (At Perkins, the 900-square foot SEED will cost about $260,000 installed.) However, the classroom should pay for itself in operation and maintenance savings in only 11 years, she says.

Project Frog would not disclose the construction budget for the classrooms it is erecting in South San Francisco. However, the company maintains that the buildings' cost is equal to permanent modular construction (factory-built units installed on permanent foundations). But it still has the advantage of being high in quality and fast to complete. The on-site work for the district's almost 200 Project Frog buildings will extend over three summer breaks but total only 8 or 9 months, estimates James "Larry" Scott, the SSFUSD bond manager. Conventional new construction would have required a year and a half, he says.

Whether a schoolroom is delivered to the site as an almost-complete modular unit or in smaller prefabricated components, the architect's role is different from that of traditional brick-and-mortar construction. In the case of the Sprout Space unit, for example, Perkins+Will has licensed the design to a distributor, Triumph Modular. An interested school would enter into a contract directly with Triumph, who would in turn subcontract with a fabricator close to the site. For each unit sold, Perkins+Will will earn a royalty, explains

SOUTH SAN FRANCISCO UNIFIED SCHOOL DISTRICT The component building system developed by Project Frog and HMC Architects is being installed at South San Francisco schools as permanent modular construction on top of on-grade concrete slabs. The buildings have a stucco exterior finish applied on-site.

PHOTOGRAPHY: © JACOB ELLIOTT

Monoglass Spray-on Insulation

Insulating your world *for over 30 years*

Monoglass spray-applied fiberglass insulation has been the first choice for cost-effective spray-on fiberglass insulation for over 30 years and used in countries around the globe. From New York to Melbourne to Dubai, Monoglass continues to be the choice of specifiers, designers and architects. Monoglass excels at both thermal and acoustic applications.

Just some of the reasons to choose Monoglass:

- High R-value of 4.0/inch which is easily installed to an R-20 thickness
- Non-combustible material with zero ratings for both smoke and flame
- Will not support mold growth
- Safe to use in plenum spaces and has a zero mass loss rating per ASTM E859
- Contains recycled glass
- Safely installed over most fire-proofing products without affecting their ratings or bond strength
- NRC of 0.95 @ 2" thick
- Cost-effective solution when compared to other products
- May contribute to LEED points with re-cycled content, low VOC content, and other available points

Monoglass is well recognized and has been used in prominent projects such as:

- Ferrari World Entertainment Complex – Dubai
- Melbourne Convention Center – Australia
- Yankee Stadium – New York, NY
- Citifield – New York, NY
- Hartsfield-Jackson International Airport – Atlanta, GA
- Love Field – Texas
- Children's Hospital – Pittsburgh, PA

Monoglass CEU Program:

Monoglass also offers the opportunity to continue your education through our CEU program which is available either online through our website or in person at your office.

Please visit our website www.monoglass.com or call us at 1-888-777-2966 for more information.

Acoustic Hallway, Miami

Ferrari World, Dubai U.A.E.

A.E. Woods Coliseum, Mississippi

MONOGLASS®
SPRAY-ON INSULATION

1-888-777-2966 • 604-261-7712 • info@monoglass.com • www.monoglass.com

CIRCLE 96

Allen Post, Perkins+Will's Sprout Space team leader. But the architects may not have any subsequent involvement with the project–unless the client wants the standard unit customized, or desires the firm to design the site surrounding the classroom. In both cases, Perkins+Will would perform these services under a separate contract.

Although the architect's responsibilities may be different when modular construction is involved, the goal is the same, says Post. "We are trying to up the game and improve both temporary and permanent classrooms," he says. The objective is to make them "healthy, sustainable, and flexible."

Perkins+Will's Sprout Space, along with SEED, SAGE, and Project Frog, all have shared constraints and common design goals. Although the results can't be described as iconic architecture, this new generation of portables provides energy-efficient and daylight-filled environments that are conducive to learning. "The goal was never to make the sexiest modular classroom," says Leite of the SAGE unit. "It was to make an alternative to the everyday modular classroom." Phil Harrison, Perkins+Will CEO, echoes Leite's sentiment when he characterizes the aim of the Sprout Space: "If you want to make a difference, you have to make something that will be viable in the marketplace–something extremely pragmatic." ■

SOUTH SAN FRANCISCO UNIFIED SCHOOL DISTRICT The components making up the buildings in South San Francisco rely on factory-assembled load-bearing wall panels, laminated wood beams, and an acoustical metal ceiling that acts as a structural diaphragm. The elements are flat packed for shipment to the site.

1 ENTRY ALCOVE
2 CLERESTORY WINDOWS
3 LED LUMINAIRE
4 ACOUSTICAL/STRUCTURAL DECK
5 LAMINATED WOOD BEAM
6 OPERABLE WINDOW
7 AUTOMATED SHADE

SECTION- PERSPECTIVE

Continuing Education

To earn one AIA learning unit (LU), including one hour of health, safety, and welfare (HSW) credit, read "Modular Classroom Makeover" and complete the test, at no charge, at architecturalrecord.com. Upon passing the test, you will receive a certificate of completion, and your credit will be automatically reported to the AIA. Additional information regarding credit-reporting and continuing-education requirements can be found online at ce.construction.com.

Learning Objectives

1 Discuss the reasons portable classroom buildings have proliferated at schools across the country and describe some of the environmental shortcomings of typical portable classrooms.

2 Explain how designers are improving portable classrooms' indoor air quality, lighting, acoustics, thermal comfort, and energy efficiency.

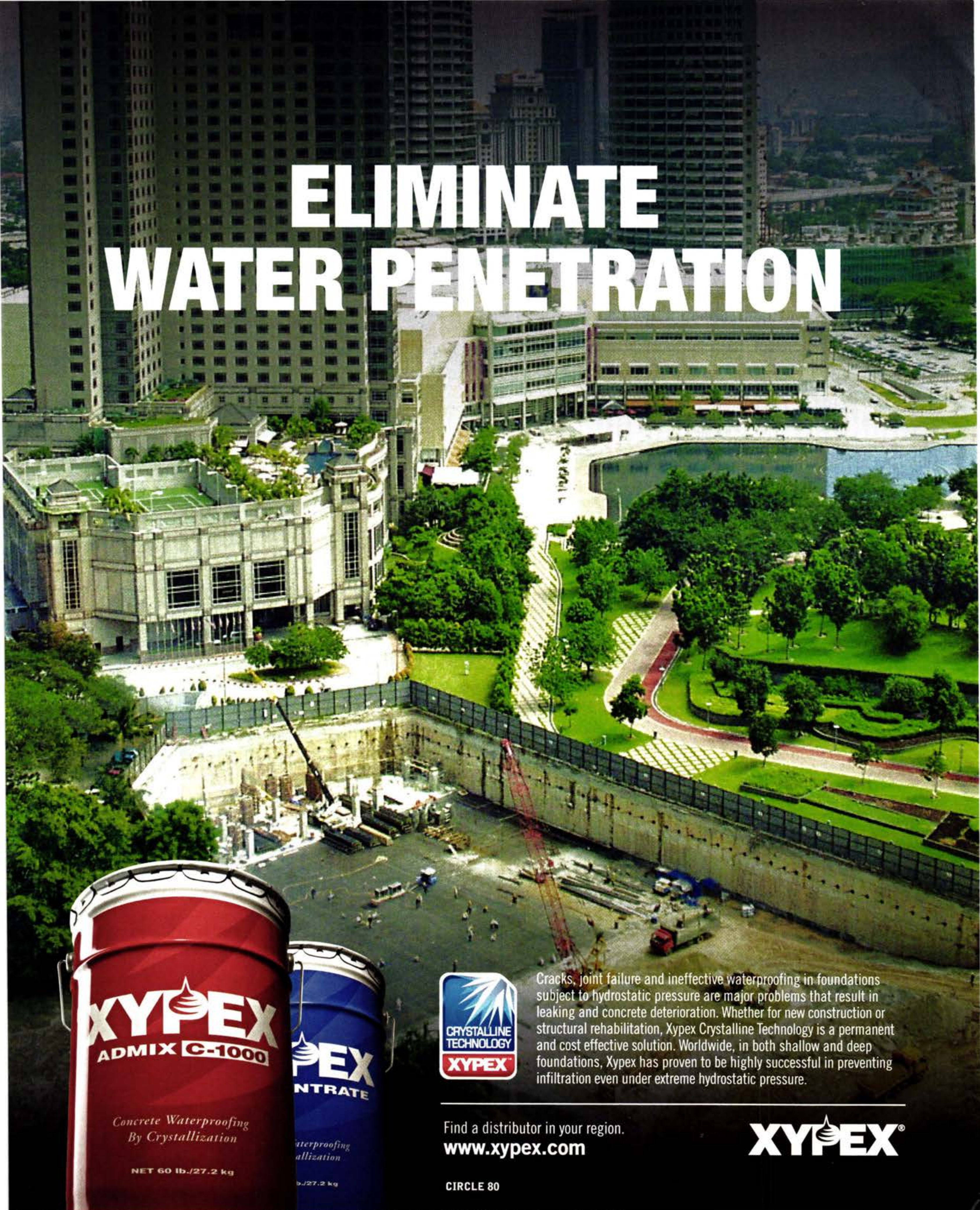
3 Explain how a classroom delivered with a component building approach differs from that of one made of larger modules.

4 Describe some of the contractual roles architects play in projects involving modular construction.

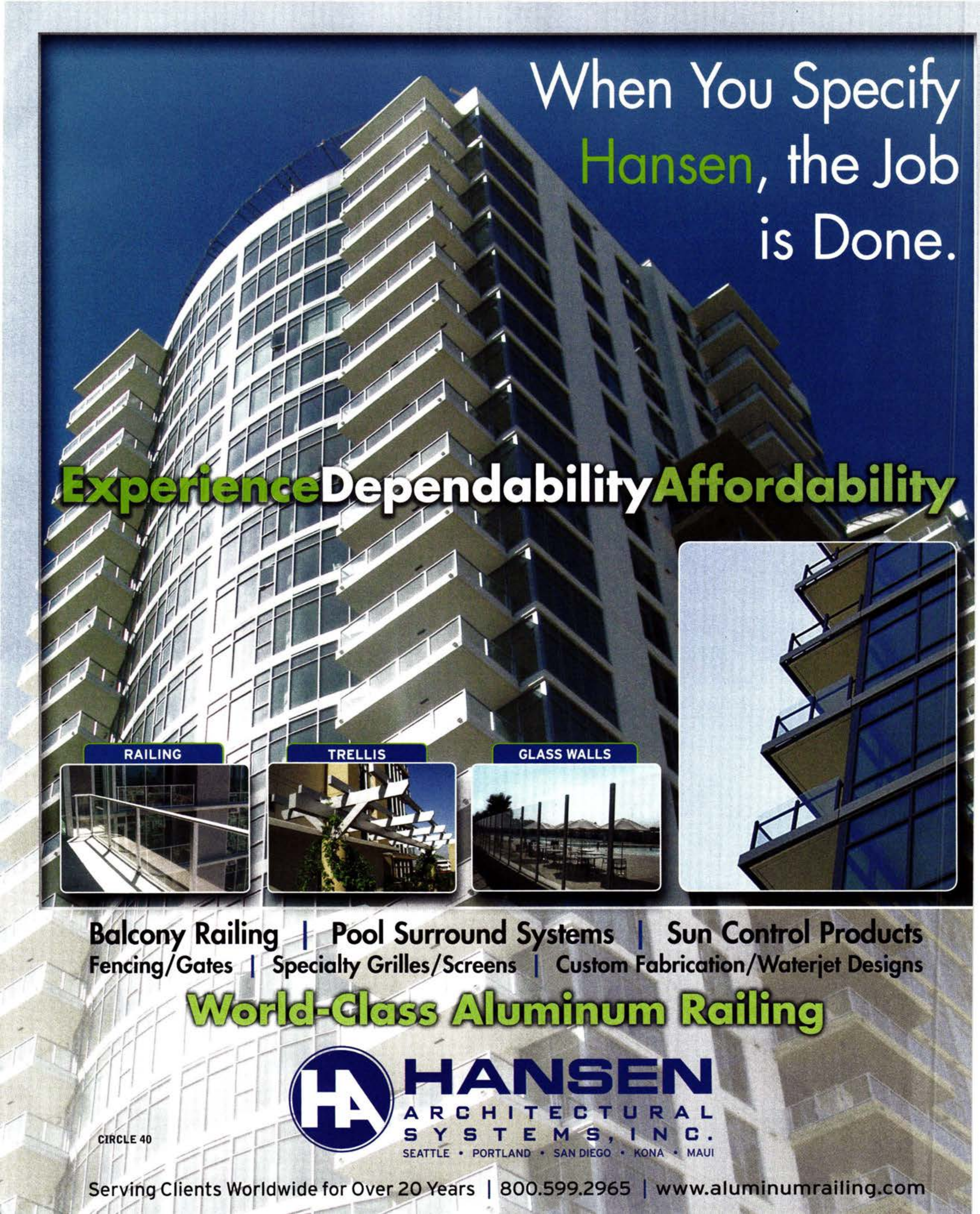
AIA/CES Course #K1401A

FOR CEU CREDIT, READ "MODULAR CLASSROOM MAKEOVER" AND TAKE THE QUIZ AT CE.CONSTRUCTION.COM, OR USE OUR FREE ARCHITECTURAL RECORD CONTINUING-EDUCATION APP, AVAILABLE IN THE ITUNES STORE.

PHOTOGRAPHY: © JACOB ELLIOTT



ELIMINATE
WATER PENETRATION
XYPEX
ADMIX C-1000
Concrete Waterproofing
By Crystallization
NET 60 lb./27.2 kg
CRYSTALLINE TECHNOLOGY
XYPEX
Cracks, joint failure and ineffective waterproofing in foundations subject to hydrostatic pressure are major problems that result in leaking and concrete deterioration. Whether for new construction or structural rehabilitation, Xypex Crystalline Technology is a permanent and cost effective solution. Worldwide, in both shallow and deep foundations, Xypex has proven to be highly successful in preventing infiltration even under extreme hydrostatic pressure.
Find a distributor in your region.
www.xypex.com
XYPEX®
CIRCLE 80


When You Specify
Hansen, the Job
is Done.
ExperienceDependabilityAffordability
RAILING
TRELLIS
GLASS WALLS
Balcony Railing | Pool Surround Systems | Sun Control Products
Fencing/Gates | Specialty Grilles/Screens | Custom Fabrication/Waterjet Designs
World-Class Aluminum Railing
HA
HANSEN
ARCHITECTURAL
SYSTEMS, INC.
SEATTLE • PORTLAND • SAN DIEGO • KONA • MAUI
CIRCLE 40
Serving Clients Worldwide for Over 20 Years | 800.599.2965 | www.aluminumrailing.com


600S20054 P 11'

Glass that restricts fire.
Not design.
AGC
BEYOND GLASS™
PYROSAFE™. Fire-Rated Glass and Framing Systems.
AGC's Pyrosafe™ family of fire-rated glass and framing systems offers the protection and code compliance your project demands—as well as the ability to bring inspired designs to life.
Ratings of up to 180 minutes can be achieved with glass that is wireless, colorless, and distortion-free, so you can be sure your design vision will always come through.
PYROBEL® 45-120 | PYROEDGE® | PYRAN® PLATINUM | STILELITE™ FRAMING
Visit pyrosafeglass.com or call 877.376.3343 to learn more. Visit us at us.agc.com or email us at info@us.agc.com
©2013 AGC Glass Company North America, Inc. All rights reserved
CIRCLE 60

BUILDING CREATIVE, EFFECTIVE LEARNING ENVIRONMENTS

There are several overarching needs for today's K-12 schools that are seen as essential for supporting student and teacher needs as well as new instructional methods.

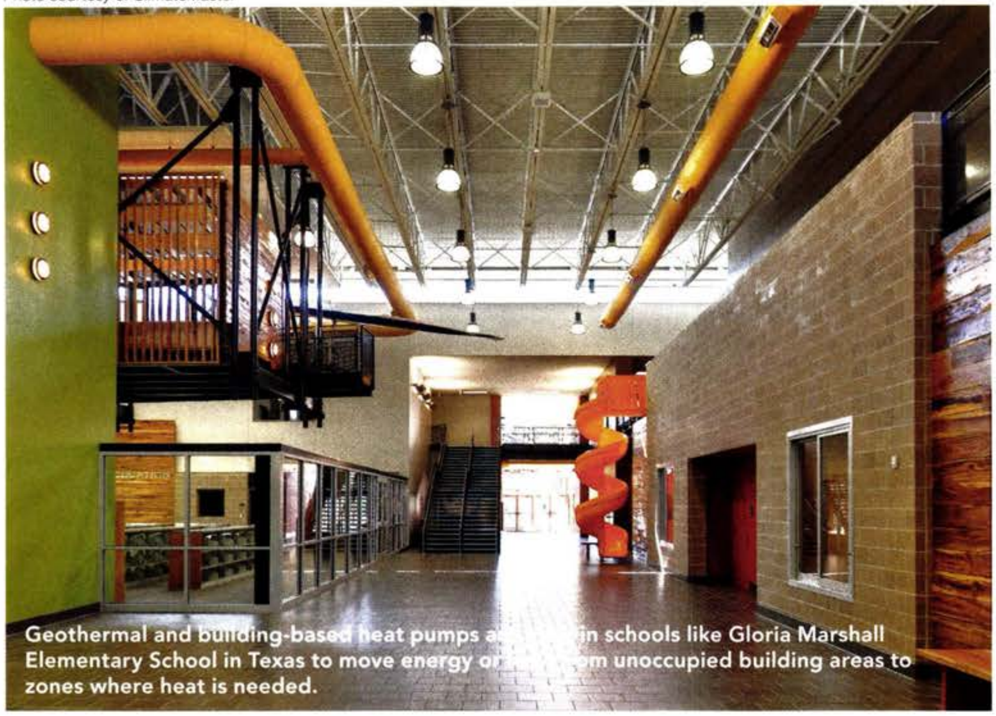
Flexibility

"School spaces and learning are more flexible today," says Sheryl Hai-Ami, president of Space Plus, which makes operable interior glass partitions for schools and other end users. These include converting classrooms "on the fly" from traditional lecture setups to group learning, as well as moveable walls and flex-spaces to increase or decrease room size or allow for multiple uses. "Also, teachers and administrators are moving from isolated functions into more flexible teams, with more need for common areas and open environments with multiple configurations," says Hai-Ami.

This thinking about adaptability and reconfigurability has seeped into the design of all building systems—even heating, ventilation and air-conditioning (HVAC)—that better reflect school use patterns, says Tony Landers, a mechanical engineer and director of marketing for ClimateMaster, which makes water-source heat pumps. "Increasingly, geothermal and building-based heat pumps are being used to reduce operating costs, because the systems can move energy or heat from one building area or room that's not occupied to another where the heat is needed," says Landers. "Some systems can also free up space on the grounds or rooftops, since fewer units may be needed."

The result is a more efficient school building that also flexes according to the curricular needs of Common Core standards and other new educational trends.

Photo courtesy of ClimateMaster



Geothermal and building-based heat pumps a[illegible] in schools like Gloria Marshall Elementary School in Texas to move energy o[illegible]m unoccupied building areas to zones where heat is needed.

Technology

The use of technology also affects school planning, floor layouts, and even furniture designs, says Carmen Klaus, business development manager with school furniture and ergonomics company VS America, Inc. "Being untethered is vital to the classroom of the future, and technology is changing so fast that some desks and tables that incorporate technology directly may be outdated in a few years," she explains. "We've also seen a number of media-geared furnishings with integral displays and cords for attaching tablets and laptops directly, but these permanently tether the students, limit the number of participants to the number of connections, and some have become so heavy they can't easily be moved. That's why we're introducing completely new and untethered concepts."

According to AAE, Common Core schools demand more integration of technology and learning, as students are required to communicate and collaborate with others using Twitter, blogs, web services like Google docs, and new hardware such as smartphones, tablet computers, and Internet-based laptops such as Chromebooks.

With this in mind, the future of U.S. education will include more wireless setups and furnishings that can be moved from room to room, including classrooms with video screens, online education, and distance learning, says Lee Hedberg, director of engineering for Engineered Lighting Products (ELP), a commercial lighting specialist. "These projectors and new multimedia tools help with the transmission and receiving of information, but they make lighting in the classroom a real challenge," he says. "Architects are assessing the various functions of learning spaces and how to adjust lighting for the use of smart whiteboards, for example, when they are both in use and powered down."

These variables—along with new teaching modalities—add complexity in designing not only lighting systems but also classrooms that have never been seen before. Other specialized design needs include renovating and retrofitting school areas for arts, music, and other non-technology uses. "Proper acoustics for music rehearsal spaces is increasingly a

Photo courtesy of Space Plus

School spaces and learning are more flexible, making operable interior glass partitions a helpful approach for converting classrooms "on the fly" from traditional lecture setups to group learning, as well as moveable walls and flex-spaces to increase or decrease room size or allow for multiple uses.

Photo by Ric Wolford, Douglas Photographic Imaging, courtesy of ELP

Continuous wall-wash fixtures specified by Greer S.J.C.F. for Derby High School in Derby, Kansas, illuminate the school's whiteboards and ensure consistent luminance levels within a 3-to-1 ratio between visual tasks at the desk and the front of the room.

challenge for schools now that the rooms are being used for various groups, not just band, orchestra, and choral uses," says Ron Freiheit, director of design engineering for Wenger Corporation in Owatonna, Minnesota. "There are new products that allow these spaces to be more flexible, including wall panels that convert from absorbers to diffusers, as needed, and digital sound systems."

Photo courtesy of Wenger Corporation

"Virtual acoustic environment" systems allow schools to customize the acoustics of their music rehearsal spaces by adjusting the panels as needed to act as diffusers or absorbers.

Durability

Underlying the new teaching tools and facilities is a built infrastructure that addresses basic issues of durability, life cycle, and resilience. For example, a multipurpose room that supports frequent reconfigurations and heavy traffic may require wainscoting, rail guards, and corner guards, as well as a long-lasting floor material such as terrazzo.

"When bond issues are passed, school districts are very closely evaluating the long-term use of the facility," says Richard Bruns, executive director of The National Terrazzo & Mosaic Association, Inc. (NTMA), a trade group based in Fredericksburg, Texas. "A lot of folks demand a greater life expectancy of the facility itself, and choices such as terrazzo floors are good for 30 years with minimal maintenance." Other durable products are also gaining traction, say architects.

In fact, a renewed focus on durability is one of the surprises of the latest wave of school design, says Deborah Ruriani, manager of projects and construction business with Miele Professional, which manufactures commercial laundry and dishwasher systems as well as laboratory glassware washers for school laboratories, gymnasiums, cafeterias, and other uses. "Architects and school districts are working to identify the sustainability features, end-user advantages, and life-cycle cost benefits of using premium fixtures and systems," says Ruriani. "The increased focus on science, technology, engineering, and mathematics or STEM programs has helped curtail the long-held practice of choosing cheap, sometimes substandard machines simply because they are the least-cost option."

Photo courtesy of Miele Professional

Schools often have special requirements such as ADA-compliant and NSF ANSI 3-approved equipment and look for durable products with longer life cycles.

Photo courtesy of SlipNOT® Metal Safety Flooring

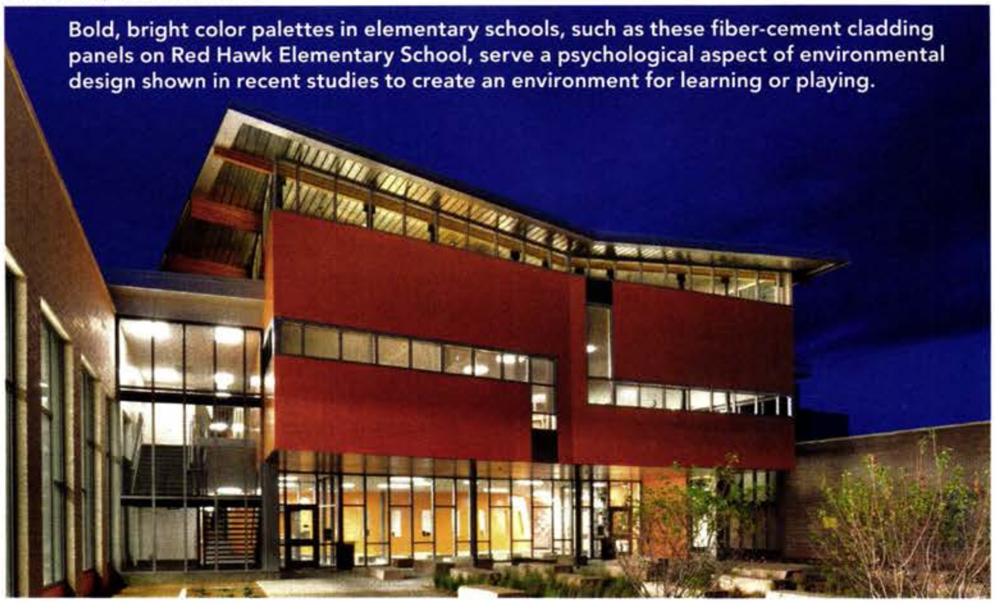
Architects specify slip-resistant metal floor components to eliminate hazards while still complying with ADA or OSHA requirements.

The same is true in the design of frequently used areas such as entryways or places where safety over time is a prime specification criterion, according to Jeff Baker, assistant general manager of *Slip*NOT® Metal Safety Flooring, which makes slip-resistant floor components such as plates, grating, stair treads, plank, and ladder rungs. "Schools are trying to eliminate slip-and-fall hazards while still maintaining compliance with the Americans with Disabilities Act," or ADA, Baker explains. "Using abrasive metal surfaces, schools have long-lasting, low-maintenance pedestrian areas that meet regulatory standards for the minimum required coefficient of friction."

Inspiration

Another aspect of newer school designs—whether they are designed for Common Core standards or other pedagogical needs—is the interest in introducing more color, daylight, plantings, and other ways to stimulate visual interest and provide *positive distraction*. According to the Clinical Solutions & Research team of the architecture firm HKS, a positive distraction is any environmental feature that both "holds attention without stressing the occupant" and "elicits positive feelings." The main goal? Stimulating, engaging, and inspiring students to work more productively and creatively.

Photo courtesy of Nichiha USA, Inc.



Bold, bright color palettes in elementary schools, such as these fiber-cement cladding panels on Red Hawk Elementary School, serve a psychological aspect of environmental design shown in recent studies to create an environment for learning or playing.

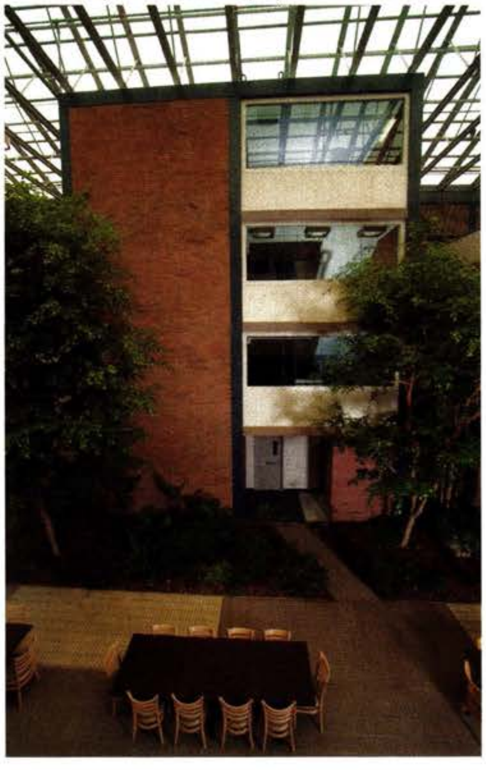
"The adaptation of bold, bright color palettes, especially for elementary schools, seems almost a requirement for school architecture now, based on interest we see from designers," says Michael Cobb, a construction industry veteran and vice president of sales and marketing for Nichiha USA, Inc., which manufactures fiber-cement cladding. "There is increased interest in custom colors that serve the psychological aspect of environmental design, and recent studies show how various hues create an environment for learning or playing, and how they can be used to further that intention." In a related trend, Cobb adds, some K-12 facilities are built with product finishes that match their school colors.

Like color, daylight and views to the outdoors are seen as conducive to better student performance. In addition to the classic 1999 Heschong-Mahone study that linked natural light with improved test scores, a 2003 study for the California Energy Commission[2] concluded that "student performance was higher in classrooms with a better, primarily larger, view to outdoors," according to Lawrence Berkeley National Laboratory's Indoor Environment Group.

Though not universally considered conclusive, these findings are leading to more architectural transparency and such solutions as increased use of fire-rated glazing in place of what have traditionally been opaque fire-rated separations. Not only do these glass walls invite more daylight into learning areas, they also improve visibility and safety, says Ken James, past president of the GANA fire-rated glazing council and sales and product manager for AGC Glass Company North America. "Glass wall products in entrance and egress areas, and their growing application to stairwells that traditionally are cinderblock walls, allow teachers and administrators increased visibility in stairwells and vestibules for the purpose of monitoring student activity," says James. "This results in a safer environment for the students and staff members."

James says that to design such applications, architects should carefully understand the differences between fire-resistive and fire-protective glass products and assemblies, including glazing and spacer requirements for insulated glass units (IGUs) and monolithic glazing. Fire-protective glazing is designed to contain fire, flames, and smoke to compartmentalize the building and keep the fire from spreading; fire-resistive glazing is also able to resist the transfer of heat through it. In the standard fire test, an assembly subject to 1,200°F fire for 10 minutes must allow a heat increase to the other side of the assembly of no more than 250°F above ambient temperature.

Photo courtesy of AGC Glass Company North America



Fire-resistive glass vision systems are being utilized effectively to block flames, smoke, and radiant heat for up to 2 hours, in lieu of traditional opaque walls or glass block.

Collaboration

Last, the Common Core standards also require the use of multiple learning methods and teaching modalities, not just the "sit and get" layouts associated with traditional lecture delivery. In particular, the Common Core favors collaborative learning techniques and student teamwork in addition to one-to-one and one-to-all instruction. "The key is to have both a collaborative product—to grade them on collaboration—and an individual product that holds students accountable to the other Common Core Standard," according to Andrew Miller, an educational consultant.[3] "Just remember you must teach your students how to collaborate before you can assess how well they do collaborate. This is good practice."

In practice, the need for collaborative learning implies either schools with shared spaces that allow for team-based work or learning environments with convertible furnishings, partitions, and openings. (They could also have a mix of the two.)

FLEXIBLE AND UNTETHERED

The idea of introducing "flexibility and untethered technology throughout a K-12 school facility" is one way to provide a collaborative learning platform, says VS America's Klaus, pointing to the "amazing work of project teams" like those at the Clarke County School District in Athens, Georgia, led by David A. Stubbs II, director of facilities planning and construction.

In a recent presentation to the Council of Educational Facility Planners International (CEFPI)[4], Stubbs described the overarching aim of the district's project—to give students and teachers the tools they need as a palette and blank canvas, so they can be used as needed. The three main goals include:

- "Integrating untethered technology into a learning environment [to] allow increased flexibility in a learning space," including the use of technology-enabled active learning, or TEAL, which is more common in higher-education settings.
- Using "elegant simplicity" to provide "multifunctional designs in a classroom to enhance the usefulness of a learning space."
- Employing more "baseline effective designs [that] respond and adapt to multiple learning and teaching styles."

Photo courtesy of Space Plus

Opening glass walls and retractable partitions help make educational spaces flexible and integral to the school's instructional vision, as applied to this school in Seattle.

The schools were interested in supporting both collaborative project-based learning as well as *problem-based learning*, which "simultaneously develops both problem-solving strategies and disciplinary knowledge bases and skills...by placing students in the active role of problem-solver confronted with an ill-structured problem that mirrors real-world problems," according to the researchers Finkle and Torp.[5] Some of the changes included using a *flipped classroom*, defined as putting the onus on the student to learn concepts first, such as through homework, and then to hone their knowledge in the classroom—the opposite of a traditional model.

For the Clarke County schools, the new designs introduced opening glass walls, flip-top tables and stacking desks on casters, adaptable storage modules, moveable soft furnishings, and low partitions, among other innovations. "The shapes all pair together, and 140 classrooms in this district, and there's no two that are the same," says Stubbs. Curves, colors, and figurative motifs were applied to formerly bland surfaces, with new nooks for study alone or collaborative work. Varied lighting schemes mix pendants, recessed fixtures, and focal points. Essential to the new learning spaces were the new desks, chairs, and TEAL furnishings: "When I hear the word adaptable, words like interchangeable and reconfigurable come to mind. Furniture must easily nest and pair into a multitude of configurations," says Stubbs. "And it's working: We are seeing 100 percent engagement of students because we allow them the opportunities to decide how they want to learn."

Opening glass walls and retractable partitions were also essential to making the spaces highly flexible and integral to the school's instructional vision—an approach that is seen more frequently in a range of educational spaces.

Common needs include separating a flexible classroom from a collaborative discussion space so that students can brainstorm ideas together, and the ability to hide displays and whiteboards when they are not in use. Examples are everywhere, says Hai-Ami of Space Plus, such as the recent renovation at California State University, Long Beach, where new frosted-glass partitions with whiteboards were added for visual privacy while also enhancing student collaboration. For another educational renovation in Galveston, Texas, sliding glass walls were added by the architect PGAL in Houston, to cover a whiteboard that could carry confidential messages or the answers to a pop quiz.

> The idea of introducing "flexibility and untethered technology throughout a K-12 school facility" is one way to provide a collaborative learning platform.

Less common but growing in appeal are specialized techniques for increasing the adaptability of art, music, and special-purpose rooms to allow for an expanded curriculum or broader use. At Wayzata High School in Plymouth, Minnesota, for example, the music program required a better rehearsal facility so that the band, orchestra, and other music groups would have proper acoustics and a way to simulate the specific acoustics of various performance settings. Mark Gitch, the school's director of orchestras, considered the retrofit of a digital acoustical rehearsal system including a central processor and wall- and ceiling-mounted speakers.

After upgrading the music rehearsal space, Gitch can now simulate the Wayzata High School auditorium and nine other preset acoustical settings that replicate performance venues. "We had a good rehearsal space, even before the rehearsal system was installed," Gitch says. "Now when we're physically rehearsing in our orchestra room, we can feel like we're really rehearsing on our stage or we can choose an acoustically drier environment if we like. The system gives us many options."

TRADEOFFS BENEFIT ENERGY USE

Clearly, the idea of a more flexible and adaptable K-12 environment is supported by a variety of products and technologies, from the architectural to the ergonomic to the digital. Yet cost and maintenance are as critical to product selection as innovation is. Schools are often compelled to procure the least-cost solutions rather than those that are best able to support the Common Core standards or other education initiatives. In addition, multiple regulatory regimes require school districts to adhere to such mandates as building codes, energy standards, ADA accommodations, union rules, and OSHA safety statutes.

"School lighting is subject to state energy codes such as Title 24 in California and in other jurisdictions by the International Energy Conservation Code and the ASHRAE/IESNA standard 90.1, which limit watt per square foot, also known as lighting power densities or LPDs," says ELP's Hedberg. While the energy codes provide reasonable limits on lighting energy used, they also challenge the design team to employ daylight and dimming controls as well as zone-based lighting with occupancy sensors, and a large variety of fixtures for special needs. "Yet you have to make the system very simple for easy operations at a K-12 school," adds Hedberg.

At the Derby High School in Derby, Kansas, the specifier Greer Stafford / S.J.C.F. dealt with a challenging condition for marker boards in classrooms where eyestrain and whiteboard reflective glare are often issues. The firm used linear wall-wash fixtures mounted end to end to ensure consistent luminance levels within a 3-to-1 ratio from one visual task to another, such as looking from notes on a desk surface up to the board at the front of the class. In another case, the LEED Silver-certified Oakton Library in Fairfax

Why hold back, when you don't have to...

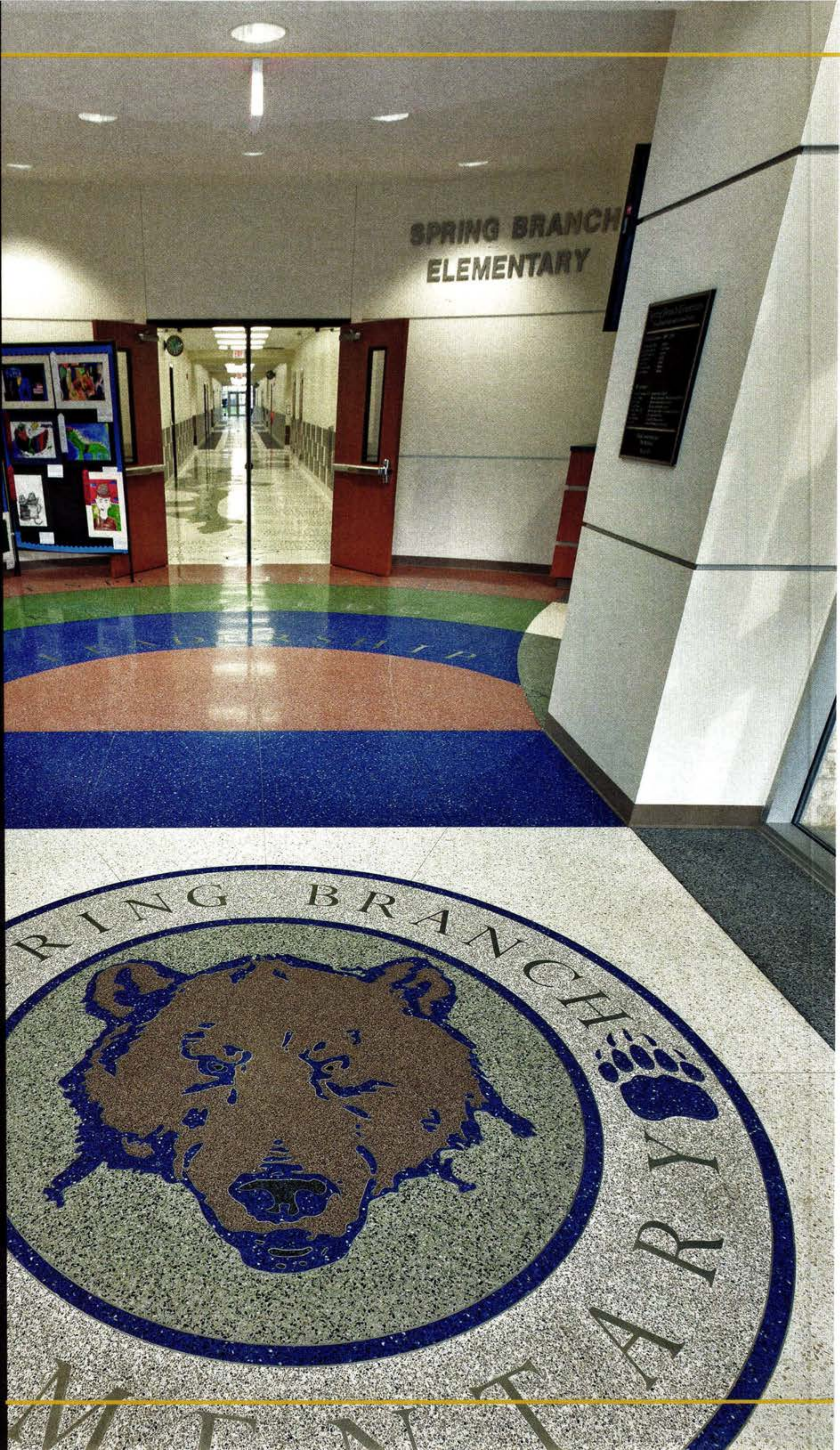
Let your creativity run free with a virtually limitless range of color options. At Nichiha we make an Architectural Wall Panel that you can color your way. Our Illumination Series panel delivers a sleek and modern appearance with ease. But don't let its colorful pretty face fool you; it's much more than meets the eye...

- ✓ DRAINED / BACK VENTILATED RAINSCREEN
- ✓ PATENTED CLIP INSTALLATION SYSTEM
- ✓ ENGINEERED FOR HIGH PERFORMANCE
- ✓ HIDDEN FASTENERS
- ✓ VIRTUALLY LIMITLESS COLOR OPTIONS

nichiha.com/possibilities

NICHIHA
fiber cement
the power of possibilities™

CIRCLE 81



SPRING BRANCH
ELEMENTARY

Photo courtesy of ClimateMaster

For the LEED Gold Gloria Marshall Elementary School, architects at SHW Group incorporated an on-site wind turbine and 10 kilowatts of roof-mounted photovoltaic cells in addition to a geothermal heating and cooling system.

County, Virginia, uses high levels of natural light and uplighting from wall-mounted overhead fixtures to reflect light into the library aisles.

According to Fairfax County officials, the Oakton facility cuts energy bills by 26 percent as "compared to a traditionally built library branch ... producing a savings of about $10,000 per year." The savings come from maximizing natural light through seven oversized windows and a raised clerestory, but also by using sensors to automatically dim the lights to the greatest degree possible.[6]

Energy savings—and the associated budgetary benefits—are also driving the use of geothermal energy and other low-cost and renewable energy sources, according to ClimateMaster's Landers. As a recent example, he points to the Spring Independent School District (ISD) in Texas, which achieved LEED Gold at Gloria Marshall Elementary School, a new facility completed last year. Architects at SHW Group and Spring ISD administrators conceived the two-story, 105,000-square-foot building with an on-site wind turbine and 10 kilowatts of roof-mounted photovoltaic cells. Passive solar features and a reflective white roof also reduce cooling loads.

A 275-ton geothermal-based HVAC system was also included to boost the renewable energy profile and energy-efficient design, estimated at about 25 percent better than that specified by code. A network of 180 vertical wells, bored about 300 feet underground, provide geothermal heating and cooling—a first in the Houston area, according to Mark Seibert, principal at CMTA Consulting Engineers. It is also one of many built elements integral to the school's successful pedagogical approach called *discovery learning*, says Kathy Morrison, principal of Gloria Marshall, a technique of inquiry-based instruction that originated in the 1960s and allows students to use problem-solving and experimentation to "discover" answers.

"Everywhere you look there are teaching tools incorporated into the campus. In fact, the building itself is a teaching tool," Morrison says. "Using discovery learning, our students are involved in engaging projects that incorporate core subjects and have been designed with the learner in mind."

MORE DURABLE AND RESILIENT

Other changes to architectural design are focused on the challenges of reducing maintenance and improving serviceability while also shoring up the facilities against frequent reconfigurations of interior spaces, long-term abuse challenges, and even severe weather events.

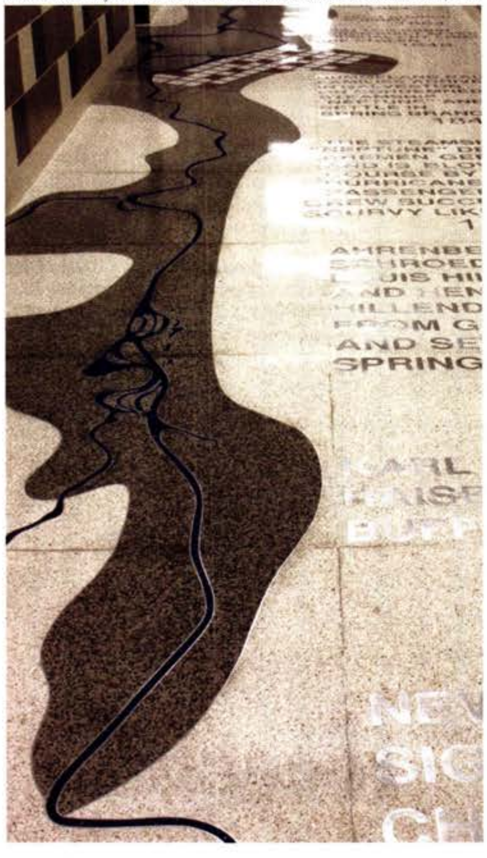
Many of these perennial issues are seeing subtle changes with the advent of new teaching techniques, according to NTMA's Bruns, such as the increased benefit of terrazzo in areas where classroom furnishings, moveable walls, and sliding doors can scuff and scratch softer floor materials. "In terms of ongoing maintenance and labor costs, terrazzo is among the easiest to maintain," says Bruns. "And when there is a need to renovate or retrofit, if there is existing terrazzo the schools only need to refinish and reseal the existing terrazzo to bring up the luster and gloss. In some cases, the architect will specify pouring additional terrazzo where walls have been moved, adding new colors or accent features to fill in the floor."

In many school districts, however, damage from recent storms such as Hurricane Sandy in the northeast and Katrina in the Gulf region have led to more careful specifications to limit losses due to flooding, high winds, and projectiles. At the Central Intermediate School in Ottawa, Illinois, for example, rains related to Hurricane Ike filled the Illinois River to overflowing in 2008, causing flooding inside the one-story, 90,000-square-foot structure. Boilers, insulation, wiring, furniture, and doors—many still intact and original to the 1947 building—were destroyed by the deep inundation. Original asbestos tiles were also detached from the floors, but the original terrazzo floors in the corridors were unaffected even though they were underwater for an extended period. Educators and architects took note: In some cases, the life-cycle benefits outweigh an initial cost premium.

"Often the schools affected by storms and flooding are not adequately prepared or budgeted to make repairs," says Andrew Franz, AIA, principal of New York City-based Andrew Franz Architect. "Working with Architecture for Humanity, we recently met with the principal and staff of PS 329-Surfside in New York and local families on a community design charrette. The goals was to design new sports and active learning spaces that not only meet their vision but also that are resilient enough to withstand water damage and minimize repairs."

A related example is the use of inherently slip-resistant materials in places where they have not traditionally been required or instead of applied protective coverings, such as doormats. The benefits run the gamut from lower accident rates and reduced liability to fewer absences and insurance claims for students, staff, and teachers.

Photo courtesy of The National Terrazzo & Mosaic Association, Inc.



At Houston's Spring Branch Elementary School, a terrazzo floor shows a timeline along the Buffalo Bayou for the movement of settlers.

According to the Bureau of Labor Statistics, injuries from slips, trips and falls number about 226,000 incidents across the country.

At Valley View Elementary in York, Pennsylvania, for example, recently made strategic upgrades to the school were designed to improve safety. As seen in the 290-student school's strategic plan, attention to the needs of the most at-risk students is a core tenet of its culture supportive of learning, as is the development of *differentiated instruction* methods for its new mathematics program. To keep staff and teachers safe, the renovation completed in 2011 included non-slip aluminum ladder rungs for mezzanine access in the school's kitchen and mechanical room. Both areas quickly become slippery due to dust, grease, and other substances, even when maintained carefully. Valley View Elementary selected a product designed to maximize traction in these slippery conditions.

The simple fix specified 24 custom aluminum tube sections coated in Grade 2 aluminum slip-resistant surface to match the ladder design. The aluminum alloy will not have the rust and corrosion concerns associated with steel alloys while the patented, hardened coating provides a coefficient of friction of at least 0.85, where greater than 0.6 is considered safe and less than 0.4 presents a dangerous condition. According to OSHA, fixed metal ladders should be "corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize slipping." OSHA also recommends a static coefficient of friction of at least 0.5 for walking surfaces, though the ADA Access Board has recommended a higher coefficient of friction of 0.6 for accessible routes and 0.8 for ramps. With this in mind, metal safety flooring is used increasingly in such educational settings as parking garages, performing art centers, pedestrian walkways, and at building entrances.

Photo courtesy of SlipNOT® Metal Safety Flooring

For schools like Valley View Elementary in York, Pennsylvania, some renovations include nonslip aluminum ladder rungs, especially in areas that may become slippery, even when maintained carefully.

Photo courtesy of The Adams Group

In this new renovation and addition designed by The Adams Group for the Garinger High School, new laboratory glassware washers were specified and installed.

LONG-LASTING PURCHASES

Treated metals using the anti-slip, primarily martensitic steel surface coverings or other random-hatch matrix substrates are also very durable and tend to last a long time with little maintenance. This quality is also being emulated in other procurement choices by school districts in recent years, as localities passing new school construction bond issues or capital project referenda seek to maximize their value, say observers like NTMA's Bruns and Miele Professional's Ruriani.

"Once the construction budget is depleted, schools rarely get enough money to repurchase products, and it is much too hard to get financing," Ruriani explains. "Architects and project teams today are reviewing equipment specifications to identify their life-cycle benefits and return on investment or ROI over the long term—not just the price tag to purchase." This is true of dishwashers used for special education rooms and science laboratory glassware washers: the appliances must be safe, easy-to-use, and automated whether to clean beakers and test tubes or simply lunch dishes.

With an increased focus on STEM programs at many schools, the investment in long-lasting lab equipment with a 10- to 20-year lifespan (about 15,000 operating hours) is seen as the baseline. Related benefits, such as water and energy savings, recyclability, and long-term cost advantages, help make the case for ROI.

This was true at the recent renovation of the 1957 Garinger High School in Charlotte, North Carolina, a modernist building originally designed by architect A.G. Odell, Jr., to fulfill city school superintendent Elmer Garinger's belief that nontraditional architecture could "stimulate student learning." The updates by Adams Group Architects added a new student lobby and administration building as the firm reworked the school's media center and refurbished the auditorium "to foster the predominant features of the existing campus while adding new functional and visual qualities." New lab glassware washers and other equipment types were also installed.

UNEQUIVOCALLY FUN AND FUNCTIONAL

As Garinger anticipated with the design of the original high school campus—a historic landmark with its courtyard design showcased in *National Geographic* in 1962—Adams Group could use a variety of techniques not simply to make the school more functional but to enliven and enhance the student experience to spark deeper learning. "Each classroom group or pod is multidisciplinary, like a school within a school, almost a standalone high school, and we've continued that today because it is still a current theme today," says Graham Adams, AIA. The firm added engaging shapes like new multicolored precast concrete panels in a weave pattern as well as a new, deep blue entrance floor echoing the original precast patterns, and a bright yellow feature wall punched with rectangular windows.

These colorful planes and patterned surfaces are inviting and stimulating, says Nichiha's Cobb, pointing to new studies on how colors create an environment for learning, creating, working, and playing. According to Pam Maynard, AIA, CID of HMC Architects, a seminal study by Richard Koller in 1976 used electrocardiogram (EKG) readings showing that human heart rates are slower in more colorful rooms, and faster in gray rooms. "A dull environment leads us to turn to our inner self, showing symptoms of restlessness, irritation, and difficulty in concentration," says Maynard, while "a white or neutral environment does not provide a neutral effect on the user."

That's why the new Goodwin College Early Childhood Magnet School and others are using color as an organizing tool and step toward self-direction. Visual themes in the interior finishes and architecturally integrated artwork, a specialty of the project's architect, Svigals + Partners, include floor tiles in earth tones of blue, green, orange, and yellow that lead children in the direction of corresponding color-coded pods. The strategy that instills a sense of continuity and independence in young children by helping them avoid becoming lost. Likewise, rectangular plaques with one of four leaf patterns adorn the walls, providing another visual cue for orientation, as each leaf tree species corresponds to one of the four pods.

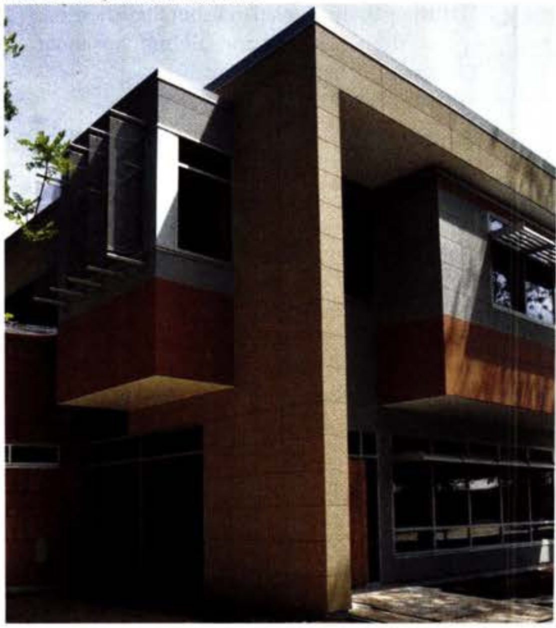
An example of the more audacious effects of color can be found in the high-performance addition to St. Francis High School in Wheaton, Illinois, designed by Serena Sturm Architects of Chicago and the architect-academic Keelan Kaiser, AIA. The new science and learning center consumes about one-third of the energy of a typical high school, with its "well-insulated building envelope, passive design, and high-performance mechanical systems" now tracking a rarity for high schools: LEED Platinum, according to Kaiser.[7]

Yet students won't immediately notice the sustainable qualities of the building. Instead, they will see the wide bands and scattered panels of bright orange, as well as a rounded projection, finished almost entirely in orange and punched with horizontal slit windows. Most of the new facility's exterior is clad in vibrant fiber-cement panels with a concealed fastener system and a backdrained, ventilated rainscreen. Further animating the composition are shading canopies and cantilevers to block the sun. Yet a walk through the new science center proves that ample daylight enters the spaces, such as the physics lab with its wide skylights.

As at the Wheaton prep school, other K-12 projects around the country are taking care to increase the amount of available daylight indoors. An important strategy is to open up interior walls with fire-rated glazing and framing products, which now allow increased freedom for architects, such as the construction of 60-minute-rated, butt-glazed glass separations. This type of assembly has been used at a number of schools including at the stairwell landings at the Houston Independent School District's new administration building and the mezzanine of the Lorry I. Lokey Graduate School of Business at Mills College in Oakland, California.

"Depending on the local codes, when the glass area is 25 percent or greater of the fire-rated separation, it is no longer considered an opening," says AGC Glass' James. "At that point it becomes a 'wall application' that has to perform like a fire-rated wall and hold back smoke, flames, and heat." These specialized assemblies include glass with intumescent interlayers that dissipate or block the heat: When temperatures reach a certain level, the clear glass product becomes opaque to help block heat and flames. Fire officials also contend that by turning the glass walls opaque, it also helps reduce panic during fire emergencies.

Photo courtesy of Nichiha USA, Inc.



Bold colors were used on a new facility for St. Francis High School in Wheaton, Illinois, designed by Serena Sturm Architects of Chicago and the architect-academic Keelan Kaiser, AIA, using cement-fiber panels in a high-performance envelope.

BUILDING FOR THE COMMON CORE

An analysis of the Common Core State Standards (CCSS) by the Association of American Educators (AAE) concluded recently that, "changes needed to support educators and schools in teaching to the CCSS" should be undertaken in school facilities around the country.

Recognizing the unique teaching approaches and student experiences involved in the typical Common Core curriculum, learning environments are being developed as more language-rich, collaborative, and technology-friendly places. The AAE's top-level recommendations include:

- Encourage "deeper-order thinking." Common Core does not encourage memorization. Instead, students need to know why an answer is correct. Teachers require students to "explain their thinking and to provide proof," says AAE.
- Make classrooms language-rich. Successful school facilities will provide opportunities to practice reading, writing, and speaking skills "across the board and every classroom from elementary to high school, from self-contained to subject specific."
- Maximize class time. Bell-to-bell instruction is essential for the more complex thinking skills that are taught in Common Core. With this in mind, architects must use products and techniques for reducing class setup or easing reconfiguration of the classroom.
- Build "create and learn" places, not "sit-and-get" lecture settings. Students must be engaged in their lessons to acquire and hone the Common Core's required thinking skills, says the AAE.
- Incorporate technology into learning. In a Common Core school, students are required to use technology to communicate with others and collaborate in the classroom. Architects need to create schools that not only incorporate laptop computers, tablets, and digital whiteboards, but that ease availability and use by students.

All in all, the Common Core school is a different place, where teaching modalities and student expectations have shifted significantly. Architects with new ideas on how to support the curricular and pedagogical shift will be in greater demand in the future.

See endnotes in the online version of this article.

Continues at ce.architecturalrecord.com

***C.C. Sullivan** is a marketing communications consultant specializing in architecture and construction.*

PRODUCT REVIEW

School Standards and Designs Advance

*Slip*NOT® Metal Safety Flooring

Stair Treads and Covers

*Slip*NOT® stair treads are available in plate, grating, perforated plate, and flattened expanded metal; customized to meet specifications. Stair tread covers can be easily retrofitted over existing slippery stairs and are available in steel, stainless steel, and aluminum.

www.slipnot.com *Circle 25*

VS America, Inc.

Reshape the Conversation

An innovative shape that invites collaboration, The Puzzle Table is offered in several colors, surfaces, and edge options to fit a variety of uses. And with six different heights, it also fits a variety of students—K through 12. The tabletop is supported by steel legs connected directly to a continuous frame to accommodate active minds piloted by busy bodies.

www.vs-network.com *Circle 20*

Wenger Corporation

Acoustical Innovations Enhance Music Rehearsal Rooms

The new VAE® Rehearsal system improves learning in ensemble rehearsals by simulating the acoustics of performance spaces ranging from arena to recital hall. By turning a handle, Tunable Acoustical Panels change between providing absorption or diffusion, altering reverberation time to best suit different musical groups.

www.wengercorp.com *Circle 19*

Space Plus

Interior Glass Door Solutions

Glass door solutions including room dividers, office enclosures, partitions, and privacy walls—all made of glass and aluminum and perfect for green construction projects! Sliders, stationary panels, swing doors, pass through windows, and all thoughtfully designed with functionality and safety in mind.

www.spaceplusllc.com *Circle 24*

PRODUCT REVIEW

School Standards and Designs Advance

Nichiha USA, Inc.

Architectural Wall Panels

Illumination Series is more than a pretty face. Behind its virtually endless color palette and sleek, modern appearance, this architectural wall panel is concealing a meticulously engineered drained and back ventilated rainscreen system that manages air flow and moisture. Although its hidden fasteners provide a clean and beautiful look, it's the Illumination Series accessories that really shine. From pre-manufactured corner pieces to custom trim profile options, it's a breeze to get the look you're after and on the performance Nichiha insists on.

www.nichiha.com *Circle 17*

ClimateMaster

Heat Pump Unit

The Tranquility® Vertical Stack (TSM) Series heat pump unit offers simple, cost-effective installation combined with the industry's highest energy performance in the vertical stack product category. Available in 3/4- through 3-ton capacities, the units are engineered to provide energy-efficient heating and cooling as part of either boiler/cooling tower or geothermal heating and cooling systems.

www.climatemaster.com *Circle 23*

The National Terrazzo & Mosaic Association, Inc.

A Lesson in Durability

Durability and indoor air quality are important to schools. A terrazzo installation will last the life of the building, negating the expense and inconvenience of replacing flooring in high-traffic areas. Non-porous terrazzo does not support microbial growth, nor allow moisture to accumulate, contributing to a mold-free, healthy environment.

www.ntma.com *Circle 18*

ELP

LED Wall Washers

New AK Series 1', 2' and 4' LED wall washers outperform their fluorescent predecessors while utilizing less wattage and enjoying significantly longer lamp life. The 4' models are available in packages of over 4,300 or 8,700 lumens. Shallow housing allows wall installation for uplight or floor wash. Comfortable indirect optical design.

www.elplighting.com *Circle 21*


You design a school lab to last decades.
Have you chosen products that do the same?
Created with high-grade stainless steel and factory-tested to last 15,000 operating hours, Miele's G 7804 glassware washer is easy-to-operate, ADA height-compliant and has low water consumption — just 2.6 gpf. This, plus Miele's five year limited warranty, means that the G 7804 will be cleaning test tubes and beakers long after the first students graduate.
EXPLORE
Learn about Miele's Laboratory Glassware Washer Education Package.
miele-pro.com 800.991.9380 proinfo@mieleusa.com
Miele
PROFESSIONAL
CIRCLE 63

PRODUCT REVIEW

School Standards and Designs Advance

AGC Glass Company North America

Fire-Rated Glazing

Pyrobel® is a clear fire-resistant glazing material manufactured by AGC Glass for applications up to 2 hours with hose stream. Pyrobel is impact rated and blocks radiant heat, while preventing fire expansion to protected side. Pyrobel 60 and 120 may be butt-glazed to create a non-load bearing transparent wall system. UL certified.

www.pyrosafeglass.com *Circle 14*

Miele Professional

K-12 Laboratory Glassware Education Package

Miele's K-12 laboratory glassware education package—a lab glassware washer complete with upper/lower baskets and inserts perfect for a school lab (with or without injector baskets). Easy to use, dependable, low cost to operate and a 5-year limited warranty.

www.miele-pro.com *Circle 22*

Guardian Industries Corp.

High-Performance Architectural Glass

Guardian SunGuard SNX 62/27 delivers 62% visible light transmission and a low 0.27 solar heat gain coefficient for an impressive light-to-solar gain ratio of 2.30. Part of the Guardian SunGuard SuperNeutral series, triple silver SNX 62/27 broadens the design and performance possibilities of glass and helps projects earn LEED points.

www.SunGuardGlass.com *Circle 16*

CENTRIA

Metal Panel System

CASCADE™ is CENTRIA's newest single-skin metal panel system. With the option to blend seven new ribbed profiles with CENTRIA's full line of Concept Series® panels, CASCADE interchangeable single-skin panels set a new standard for customization in façade design. CASCADE features a distinctive 1-1/2-inch-deep rib, combining a soft curve with an angular sloped web for dramatic shadow relief.

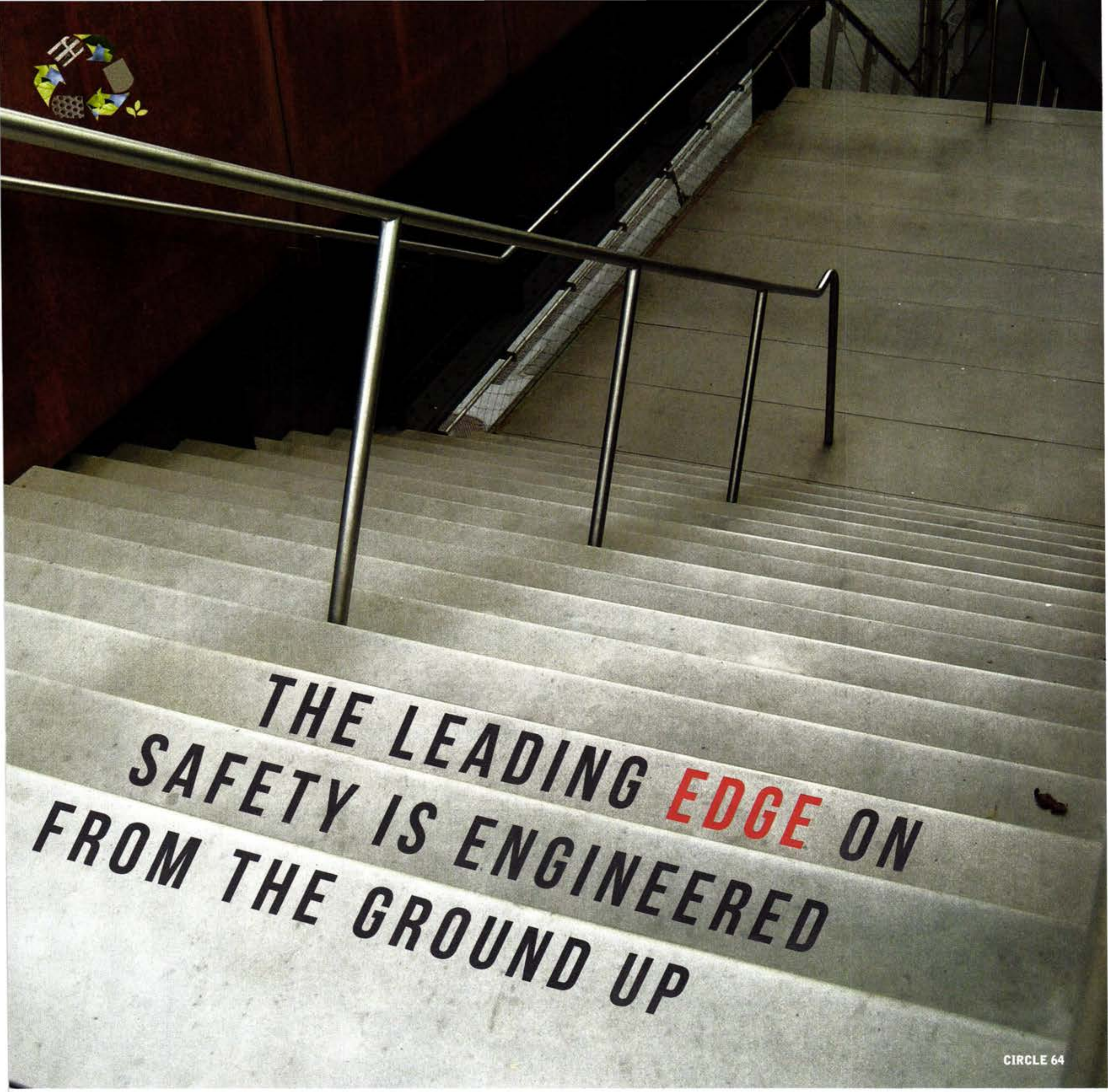
www.CENTRIAperformance.com *Circle 15*

Bonded Logic

Clear Fire-Rated Solutions

The UltraTouch Sound Control System™ combines high-density recycled denim batt insulation with vibration damping strips to provide increased sound isolation. The system provides additional STC points to various wall assemblies, and eliminates the need for two layers of drywall. Contains 80% post-consumer recycled content and also provides R-13 thermal performance.

www.bondedlogic.com *Circle 26*


THE LEADING EDGE ON
SAFETY IS ENGINEERED
FROM THE GROUND UP
CIRCLE 64


LECTURE HALL.
Introducing the Architectural Record CEU App. The only app that allows you to fulfill credits and track your progress without Internet access.
ARCHITECTURAL RECORD
Continuing Education Center
Sculpting the Skyline
FROM ARCHITECTURAL RECORD
By Joann Gonchar, AIA
The article explores the architectural concepts and structural strategies behind Kuwait City's tallest building and discusses the construction methods used to build it.
LEARNING OBJECTIVES
1 Explain how evaluation of programmatic requirements and environmental conditions helped designers generate the form of Kuwait City's Al Hamra Firdous Tower.
2 Describe the key structural elements of the tower and its foundations.
3 Explain the structural and construction challenges presented by the tower's geometry.
4 Describe how construction methods were adapted for the harsh desert environment.
Credits: 1.00 HSW
COURSE LIBRARY
Download free at iTunes. Sponsored by Armstrong

Wood Scores A+ for Schools & Student Housing

Natural building material takes top honors for cost, aesthetics, and performance

Sponsored by reThink Wood and WoodWorks

If there is a generalization to be made about the design of educational facilities, it is that architects are called upon to achieve a wide range of objectives with limited budgets. In many cases, the project has been initiated to accommodate a growing student population. The architect's job is to create an exceptional learning environment and, whether public funds are involved or the school wants to set an example for the community, there are often strict energy and other performance objectives.

Across the country, many designers have turned to wood-frame construction because it typically costs less while meeting all code and safety requirements—and because it offers advantages such as speed of construction, design versatility, and a light carbon footprint. In Arkansas, for example, CADM Architecture saved $2.7 million by switching from a steel and masonry design to wood; but wood was also used as a design expression to create an inspirational space that encourages students to stay in school. In Montana, architect Gordon Whirry says, "Many schools, particularly in higher education, are moving toward a more environmentally responsible approach to design

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

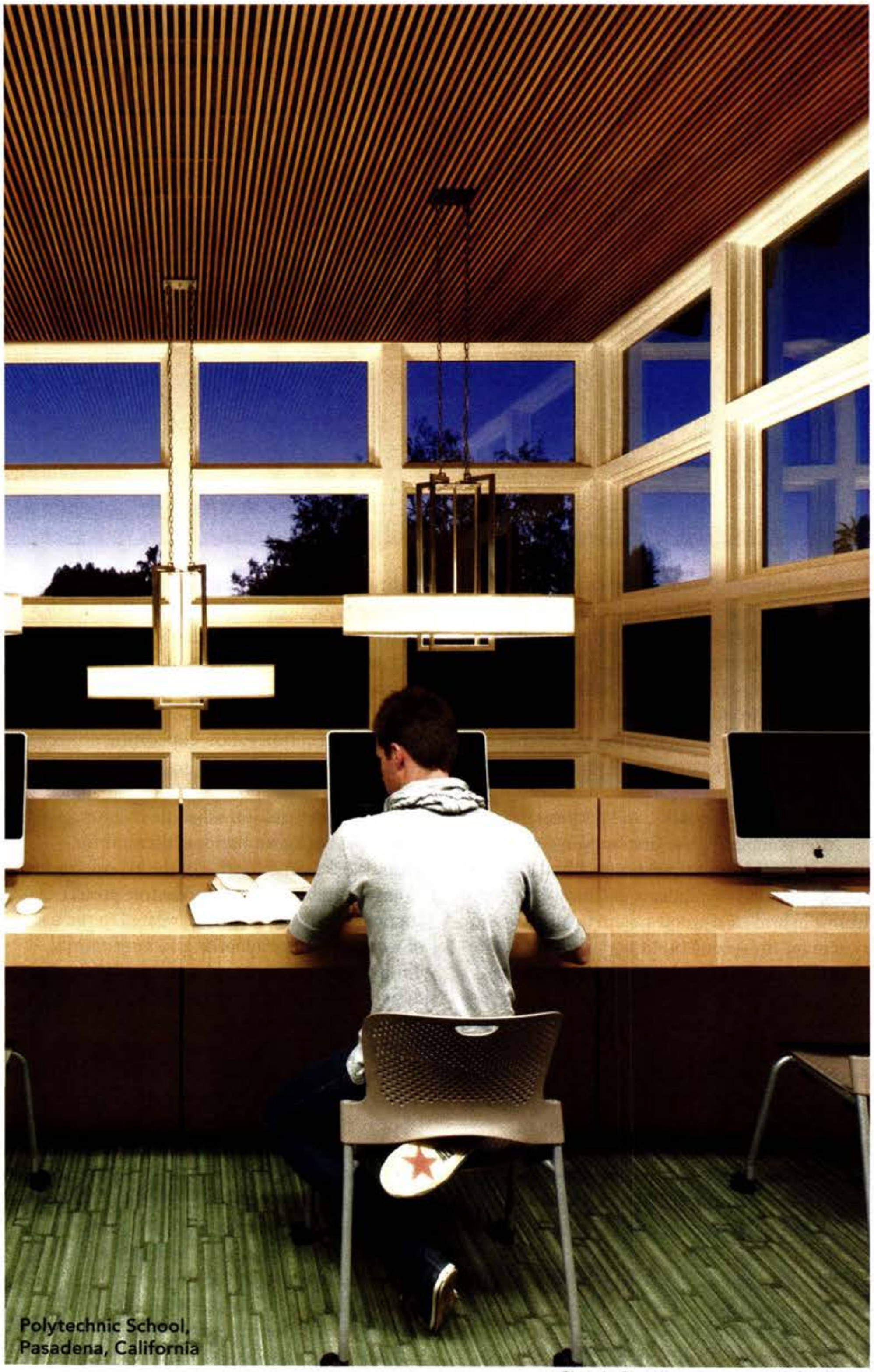
EARN ONE GBCI CE HOUR FOR LEED CREDENTIAL MAINTENANCE

Learning Objectives
After reading this article, you should be able to:

1. Discuss how wood has been used as a structural and finish material in schools.
2. Consider the effects of wood on human health and well-being in an educational environment.
3. Describe the environmental and economic advantages wood brings to educational facilities and student housing projects.
4. Explain how wood contributes to a project's green building goals.

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

AIA/CES #K1401H
GBCI COURSE #0090010887



Polytechnic School, Pasadena, California

Photo by David Lena; courtesy of HMC Architects

Photos courtesy of W.I. Bell (under construction); Dennis Ivy

At El Dorado High School in Arkansas, switching to wood framing from the original design saved $2.7 million.

and construction," and "wood can complement that effort." Meanwhile, California's Wendy Rogers, AIA, LEED AP and a principal of LPA, Inc., says, "We often use wood in school designs. It's affordable, strong, and durable."

Likewise, wood has become a preferred choice for student housing projects, which are often viewed as an extension of the college or university—and are required to meet the same objectives for cost, quality, and performance.

After completing the first building of a multi-phase student housing project for Illinois State University, OKW Architects in Chicago switched from a hybrid steel-wood system to an all-wood system for the second building, which was more economical. "Most goals are developer-driven," says OKW's Eileen Schoeb. "These structures are built to generate revenue. Therefore, both square footage and efficiency are very important, which is why wood works so well."

And, while cost was the initial reason Mahlum Architects chose wood for the University of Washington's West Campus Student Housing – Phase 1, it also contributed to an award-winning development that meets progressive environmental goals.

WOOD SAVES MONEY

When specifying wood in schools, architects cite cost as the number one reason—and wood helps the bottom line in several ways. In addition to lower material costs, wood building systems typically cost less to install than other materials, while meeting all of the same safety and performance requirements. Whether comprised of traditional wood framing, panelized products, or prefabricated assemblies, wood construction is fast, expediting project completion. "Schools are always working toward a fixed start date, and wood is a good choice when the construction schedule is compressed," says Scott Lockyear, national director for WoodWorks, an initiative of the Wood Products Council established to provide free project support and other resources related to the use of wood in non-residential and multifamily buildings. "There's no need to wait for shop drawings or steel fabrication. Deliveries and frame assembly tend to move rapidly, and most communities have a large pool of skilled tradespeople with wood framing experience, which minimizes construction delays and keeps labor costs competitive."

LPA's Rogers notes that speed of construction was important in the firm's work for the cash-strapped Lake Tahoe Unified School District in building South Tahoe High School. Rogers says both time and money were saved by using wood-frame construction. "Specifically, we benefitted from rapid erection and minimized labor required for assembling wall-to-roof connections."

Also from a cost-saving perspective, wood's relative light weight reduces the need for foundation capacity and associated costs. "Wood-frame walls can be used as load-bearing walls, eliminating the need for additional beams," says Lockyear, who also reports growing interest from architects in wood roofs. "Utilizing a sloped wooden roof system which can house mechanical systems in a conditioned space can also reduce HVAC requirements as compared to flat roof systems with mechanical units exposed on the roof. In terms of aesthetics, cost, and design flexibility, the use of wood in school construction offers significant value."

In Arkansas, wood framing proved to be the most cost-effective structural system for the El Dorado High School. "Originally, the project was designed in steel and masonry, which is common for a building this size," says J. Richard Brown, PE, principal engineer with Engineering Consultants, Inc. in Little Rock. "But the budget was too high. So our response was to look at other framing types. That's where we found considerable savings." During the early pre-construction stages, structural steel, pre-cast concrete, and wood were evaluated against steel framing. "Ultimately we made the decision to maximize the use of wood framing throughout the project. By just changing the framing, we were able to save about $2.7 million."

SCHOOL SAFETY

Regardless of whether they're built in wood, steel, or concrete, schools must be safe. Protection from fire, seismic, and wind events is a concern in schools across the country.

Fire protection. While no building is completely fireproof, construction materials and systems can make a building fire safe. Fire-resistive construction allows time to discover a fire, suppress it before it spreads, and evacuate if necessary. Ordinary wood-frame construction with plywood or oriented strand board (OSB) sheathing provides ample fire safety and easily meets requirements of the International Building Code (IBC). For larger wood-frame schools, protected construction, heavy timber construction, or fire-retardant-treated construction on exterior walls may be required. Per IBC 903.2.3, sprinklers are required in areas larger than 12,000 square feet in Occupancy Group E building types. Most schools fall into this category. In addition, local building code amendments typically require sprinkler systems and other fire control measures in school construction, regardless of size or material used.

Another advantage of wood, and particularly heavy timber, is its unique charring properties. When exposed to fire, surface char insulates the member so it can continue to support its load, increasing the amount of time before the member fails.

"At South Tahoe High School, there were only a few areas that required additional fire protection and they were met using fire-treated dimensional wood," says Rogers. "Where portions of a glued laminated (glulam) member needed to be protected, the member itself met the criteria for heavy timber."

Seismic performance. In some parts of the country, seismic safety is particularly important. In California, for example, one of the most highly regulated states in the U.S. in terms of seismic requirements, wood-frame schools are common. "Wood has historically performed well during an earthquake," says Lockyear. "Wood is lightweight relative to other construction materials, and light weight correlates directly to lower seismic forces and better performance during seismic events." In addition, wood-frame structures, which have numerous nailed joints, are inherently more ductile than those with rigid connections, making them more flexible and allowing them to dissipate energy when subjected to the sudden loads of an earthquake. The fact that wood structures have numerous load paths also helps avoid collapse should some connections fail.

Performance in high winds. All buildings are at risk during high wind events and each structure, with its own unique set of characteristics such as stiffness and strength, reacts differently to wind loads. However, wood

Rendering courtesy of Lord, Aeck & Sargent Architecture

MID-RISE WOOD-FRAME HOUSING MAKES THE GRADE

The academic and social benefits of having students live on campus are widely recognized. However, with a record number of students attending colleges and universities, educational institutions are looking for creative ways to cost-effectively expand their housing capabilities. They also want developments that help to attract and retain students by meeting the same quality and environmental objectives as other campus buildings. For many, mid-rise wood construction is an obvious choice.

At the University of North Carolina at Greensboro, for example, wood saved $15 a square foot on one student housing project, Spartan Village Phase I, compared to a metal and concrete alternative. Designed by Lord, Aeck & Sargent Architecture, the 385,000-square-foot project provides 800 new student beds while creating a new neighborhood that sets the tone for future mixed-use developments.

Where student housing is being added to existing neighborhoods, wood offers several advantages. Multi-story wood structures meet residential code requirements and adhere to required safety and structural performance guidelines for urban infill buildings. Plus, infill real estate often carries a premium price, so the economic advantage gained by building multiple stories of wood over a podium-type structure may be the only way a project can work financially. At the same time, educational institutions are increasingly using mixed-use projects to add vital businesses to surrounding neighborhoods.

At the University of Washington, Mahlum Architects made the most of the urban location for a five-building project known as West Campus Student Housing – Phase 1, designing each building with five stories of wood-frame construction over a two-story concrete podium. Constructed for $177 per square foot, the award-winning development includes ground-floor amenities such as a grocery store, conference center, and fitness center, which project architect Anne Schopf calls, "part of a growing trend to make urban campuses more student-friendly."

SCHOOL CONSTRUCTION AND THE IBC

Wood is approved by the International Building Code (IBC) for use in school construction.

- Type V is the most common type of wood construction and is allowed for school design. Type V is typically a cost-effective type of construction, particularly when load-bearing walls are wood. The IBC allows use of untreated wood throughout a Type V structure. Under the IBC, one-story Type V schools can be up to 87,875 square feet and two-story schools may be as large as 138,750 square feet. If additional square footage is required, two-hour rated fire walls can be used.
- Type IV, also known as heavy timber construction, allows use of solid or laminated wood members such as glulam, wood decking, and structural sheathing when there are no concealed spaces. Fire-retardant-treated (FRT) wood can be used to frame exterior walls.
- Type III construction allows wood roof and floor systems as well as interior wood-frame walls. FRT wood is required to frame exterior wood-frame walls.
- Building Types I and II allow the use of heavy timber construction in roof construction and for secondary members. FRT wood can also be used in certain applications. *Designing Schools with Wood* from APA – The Engineered Wood Association details the approved use of wood in school construction by IBC building type.[1]

buildings can be effectively designed to resist high winds. When designing a wood-frame building to resist high winds and other lateral loads, design engineers use sheathing products such as wood structural panels, structural fiberboard, particleboard, and board sheathing to create diaphragms and shear walls that transfer the loads into the foundation. When structural wood panels such as plywood and OSB are properly attached to lumber framing members, they form some of the most solid and stable roof, floor, and wall systems available. These materials are also used to form the diaphragms and shear walls necessary to resist high wind loads. Alternatively, designers can use rigid-frame construction to transfer the lateral loads. Wood is able to resist higher stresses when the load is applied for a short time, a feature that enhances its performance in high wind events, which are typically of short duration.

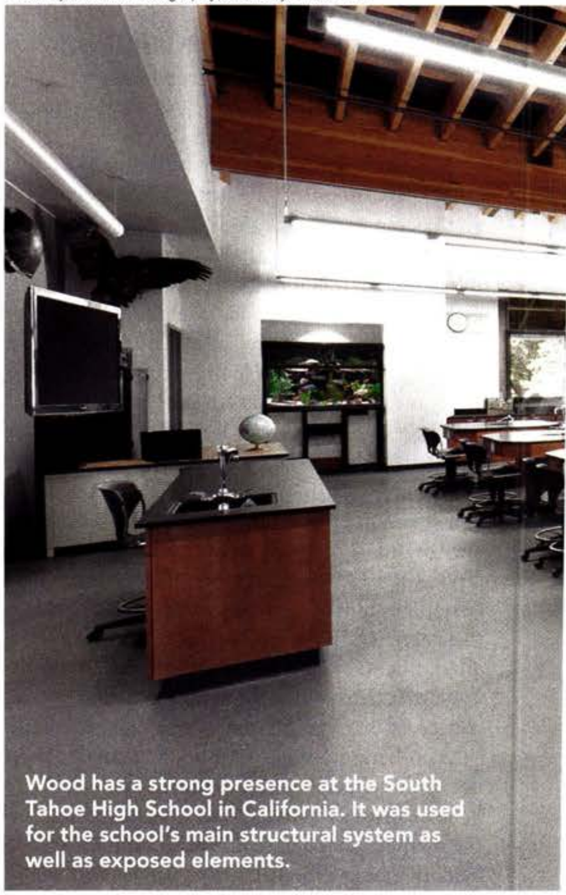
In designing the K-12 Polytechnic School (see cover image) as a podium structure with two stories of wood-frame construction over a concrete parking garage, Kyle Peterson, LEED AP BD+C of HMC Architects in Los Angeles, took an ingenious approach to meeting California's seismic criteria. "We have a fairly high floor-to-floor dimension, thus the design team needed to be creative in order to get the required shear values and maintain the large window openings that were desired," he says. As part of the project, two relocated historic wood-frame buildings were also upgraded to meet shear and seismic requirements. "Since there were no requirements for shear in the early 20th century, there was very little available space to add shear walls. The use of prefabricated shear panels was the best solution in order to maintain the beautiful, large window openings and provide the required shear values. The buildings were gutted, and the interior framing was upgraded to achieve all these requirements."

HUMAN HEALTH AND WELL-BEING

Green building objectives are broader than just environmental effects and have come to embrace human health and well-being issues, which involve both physical health and the psychological aspects of human performance—an area especially relevant to schools. The stress-reducing effects of nature are well documented, and intuition tells us that a connection to nature improves our sense of well-being while indoors. In fact, studies surrounding biophilia, the innate attraction that humans have to living organisms and life-like processes, support the use of wood and natural building products in a learning environment. Many building designers cite the warm and natural attributes of wood as a reason for its use, and are finding that users respond well to a visual or tactile connection with exposed wood products. "Wood is immensely popular and inviting, making it a perfect material to be used in learning environments," says LPA's Rogers.

A study at the University of British Columbia and FPInnovations established a link between wood and human health. In the study, the presence of visual wood surfaces in a room lowered activation of the sympathetic nervous system (SNS). The SNS is responsible for physiological stress responses in humans such as increased blood pressure and heart rate while inhibiting the parasympathetic system responsible for digestion, recovery, and repair functions in the body. The study immersed 119 university students in one of four different office environments, some with wood surfaces and others without. Stress as measured by SNS activation was lower in the wood rooms in all periods of the study. The study concluded that wood is one way to create a healthier built environment. Study author David Fell says that while research on wood and schools is underway in British Columbia, the results of the office study apply to any interior environment. "The stress-reducing effects we found for wood in office environments are in theory transferable to any building type as these are innate reactions to natural materials. By extension, we would expect the application of wood in schools to contribute to lower stress activation in students and teachers," says Fell. "Any built environment activates our sympathetic nervous system to some degree. From a biological/evolutionary perspective we are adapted to functioning in nature. By adding natural elements back into the built environment, these stress reactions can be reduced."

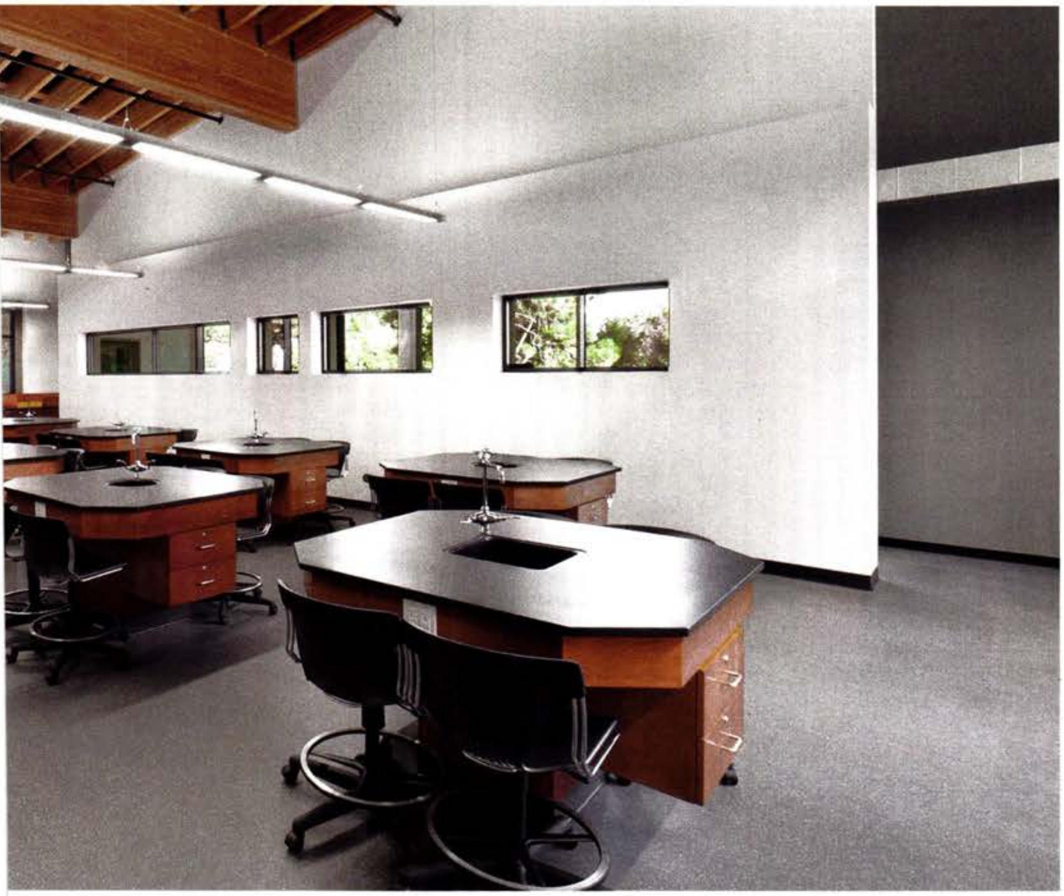
Photo by Costea Photography; courtesy of LPA Inc.

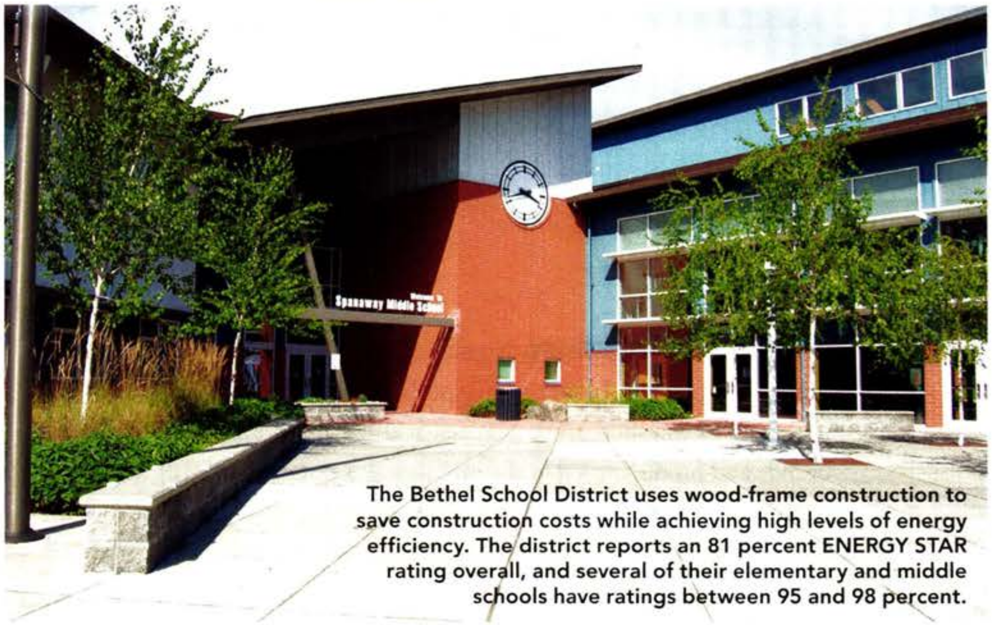


Wood has a strong presence at the South Tahoe High School in California. It was used for the school's main structural system as well as exposed elements.

A SMART ENVIRONMENTAL CHOICE

As a material that grows naturally and is renewable, wood's environmental advantages are increasingly being recognized by government and business. In 2011, Agriculture Secretary Tom Vilsack announced the U.S. Department of Agriculture's strategy to promote the use of wood as a green building material. "Wood has a vital role to play," he said, noting that U.S. Forest Service studies show that wood compares favorably to competing materials. This is particularly relevant to the education sector, which, according to a 2013 study by McGraw





The Bethel School District uses wood-frame construction to save construction costs while achieving high levels of energy efficiency. The district reports an 81 percent ENERGY STAR rating overall, and several of their elementary and middle schools have ratings between 95 and 98 percent.

Photo courtesy of Erickson McGovern Architects, Bethel School District

Hill, poses the largest opportunity, by dollar value, for green building. The report states that, "Between 2008 and 2011, the green share of education construction grew dramatically, rising from 15 percent to 45 percent as a percentage of construction starts by value." It also notes that all new construction is expected to be green by 2025.

"Sustainability was extremely important to LPA and the Lake Tahoe Unified School District," says Rogers. "The fact that wood is a renewable material with proven durability reinforced our choice to use it as the primary structural system for the high school."

Robert Sotolongo, AIA, LEED AP of DTW Architects & Planners, Ltd. in Durham, North Carolina, agrees, adding that sustainability was a consideration in designing the K-8 Duke School in North Carolina. "Southern Yellow Pine was the primary wood used in the structure and decking. The wood is an abundant natural resource in the southeast, making it a sustainable, renewable, and regional choice," says Sotolongo, "It was very important for the Duke School community to incorporate sustainable design features in their new campus and wood was a key element of the sustainable design."

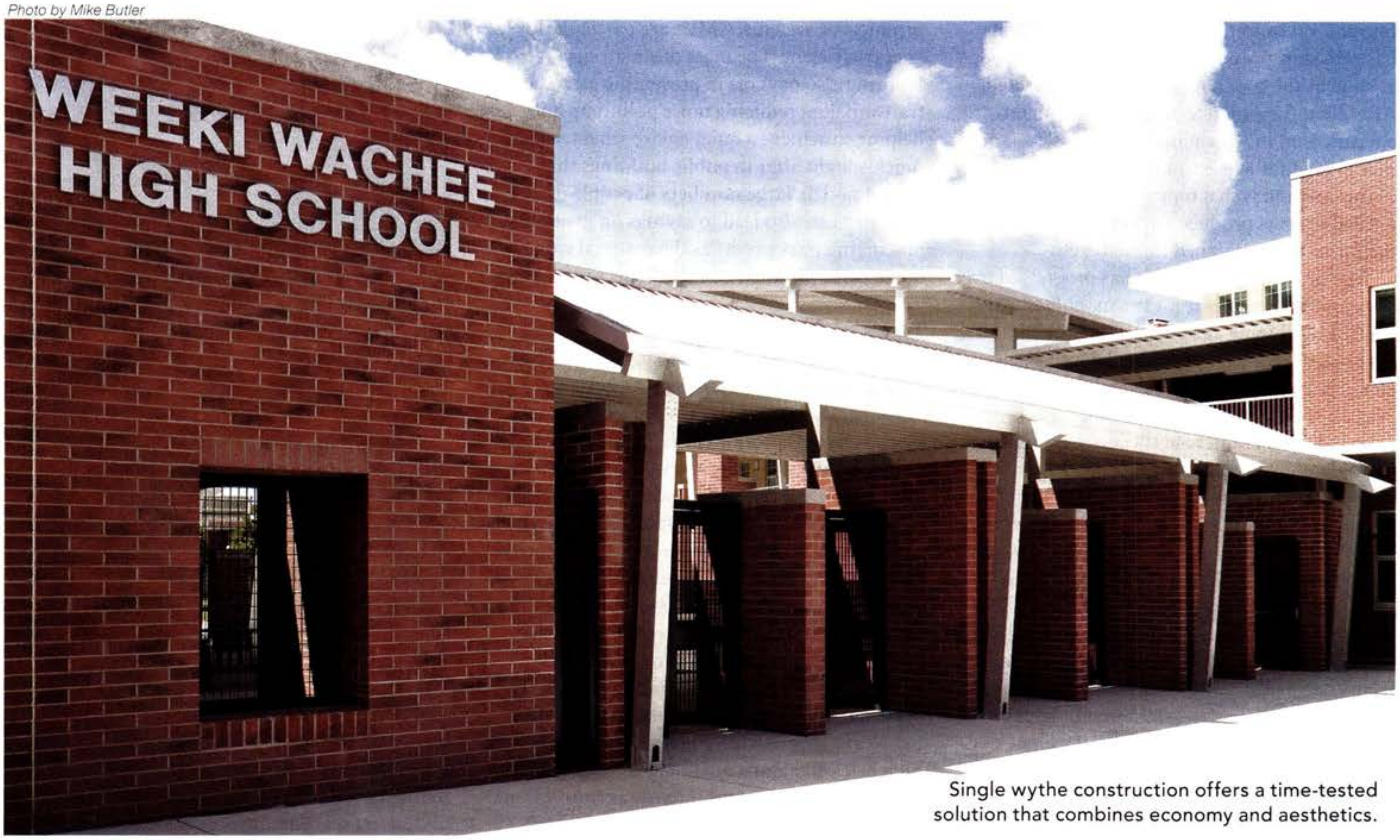
Energy Efficiency

Wood-frame buildings can be easily designed to meet or exceed even the most demanding energy-efficiency requirements and, depending on the structure, may result in operational savings for the school district over time. For example, because steel is less resistant to heat flow than wood, steel studs create a bridge for heat transfer through the building envelope. As a result, steel-frame buildings require more insulation to achieve the same thermal performance that wood buildings provide, and even then may cost more to heat and cool. If metal is not thermally isolated, the resulting thermal bridges can also become prime locations for moisture condensation. "The wood studs just do not transfer heat and cold the way metal studs do and consequently help the energy efficiency of the exterior envelope," says Sotolongo.

See endnote in the online version of this article.

Continues at ce.architecturalrecord.com

Photo by Mike Butler



Single wythe construction offers a time-tested solution that combines economy and aesthetics.

Quality Masonry

Single wythe construction offers an aesthetic, economical solution for today's buildings

Sponsored by Oldcastle Architectural

Single wythe concrete masonry units (CMU) are a durable, cost-effective, aesthetically versatile form of masonry construction that has been widely used worldwide for decades. A sustainable, effective solution for owners and architects looking for permanence and low maintenance, single wythe construction is defined as a stone, brick, or concrete wall that is one masonry unit thick. A single wythe wall offers the economic advantage of serving as the structural system with multiple finish options on the exterior, and the interior as well. But as single wythe walls do not require the backup of a traditional cavity wall construction, in order to provide full protection from the elements they must be carefully detailed and constructed. This article will identify the factors that ensure proper performance and discuss the details and specifications that should be considered during the design process in order to achieve superior masonry buildings.

CMUs: WHAT ARE THEY?

Concrete masonry units are manufactured blocks used in construction. They come in a variety of sizes, colors, and finishes, the most common size being 8 inches deep by 8 inches tall by 16 inches long. They are generally comprised of sand, cement, stone or aggregate, and can have a color pigment such as iron oxide. Admixtures, such as integral water repellants, are also included to improve performance. CMUs are typically produced with hollow centers to reduce weight, with the added benefit of allowing insulation to be placed in the cores if specified.

Wet and dry casting are the two most widely used methods today, with each requiring a unique mix of natural sands and aggregates. Wet cast concrete typically has 33 percent moisture content whereas in dry casting, there is 6 percent moisture content. The dry cast mix is consolidated by intense tamping with an air hammer until it is densely compacted and ready

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

Learning Objectives
After reading this article, you should be able to:

1. Identify the factors that ensure sound energy and environmental performance in a single wythe wall.
2. Explain the prevailing energy codes and their implications for continuous insulation and traditional wall assemblies .
3. Discuss four lines of defense in preventing moisture intrusion in concrete masonry construction.
4. Detail a successful single wythe project.

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

AIA/CES COURSE #K1401C

for removal from the mold. Dry-cast concrete has zero slump, and the forms can be stripped as soon as the concrete has been consolidated. After that, the concrete block is cured in an environment in which high humidity levels are maintained for at least 24 hours. A key benefit of this method is that only one set of forms is needed to mass produce a specific product, and the form can be stripped immediately.

The production of CMUs has progressed over the years from a one-at-a-time manufacturing process to a highly automated, state-of-the-art procedure. Inventors started developing concrete block right after the Revolutionary War. In 1832 the first concrete block was patented, but commercial success was found in England. Up until 1906, concrete block producers were experimenting with refining the manufacturing process. In this early hand tamp one-at-a-time machine, a workman would fill the machine with cement and aggregate, hand mixed on the ground. He would tamp the mix in and discharge the finished block. In 1915, block was produced from ash or cinders from coal, hence being known as "cinderblock." By 1920, there were several thousand small plants producing 50 million CMU. Due to mechanization in 1941, 500 million units were being produced by fewer plants, and as of 2004, some 4.5 billion units were being produced by 600 companies in the U.S. The original tamping method has been replaced with vibration and compaction, and today's block machine produces 1,200 8-inch block equivalents per hour.

Benefits of CMUs

From the beginning, CMU has been a sustainable material produced with local materials by local manufacturers using recycled content. In terms of length of service life, one has only to look at the pyramids and the great cathedrals of Europe to see the durability of masonry construction. By its very nature it conveys permanence and quality. Masonry endures, with little or no maintenance, and CMUs continue to be identified with longevity and low life-cycle cost. They are relatively inexpensive compared to competing products, and the variety of shapes, colors, textures, and sizes available gives architects a full palette.

CMUs also get high marks in energy efficiency. Materials such as insulation that have a high R-factor are usually associated with greater energy efficiency. However, this is not the entire picture as it neglects the benefit of thermal mass, which is a significant measure of a material's capacity to store heat for future distribution. Because they are high in mass, masonry walls offer excellent thermal insulation. Their slow rate of heat discharge keeps interiors warm in winters, and their high rate of heat absorption makes for cool interiors in summers. When used with complementary products or systems, CMUs are particularly energy efficient. The mass of a masonry building also pays off in preventing easy sound transmission, reducing noise pollution, and helping to achieve a quiet environment, a feature much sought after in public buildings that accommodate large numbers of people. Using masonry can also lead to savings on insurance and maintenance costs as the material won't burn, dent, rot, rust, or suffer insect infestation.

Types of CMUs

Today, manufacturers offer a wide range of CMU products that include gray block, architectural block, landscape block, half-high concrete brick, and several types of specialty block. Split face block, for example, is a concrete masonry unit composed of specialty colored aggregates and color additives put into the mix design. The split face texture offers a more rugged stone appearance and can add interest and dimension to an otherwise plain masonry wall.

Manufactured in a variety of colors and sizes, half-high concrete offers the advantage of a veneer-like appearance in economical single wythe construction. Half highs offer the same quality exterior finish as a cavity wall but with a shorter construction time. Half-high brick-like units are integrally colored and produced to the same standards as conventional masonry and share the latter's strength and resistance to fire and wind and ability to create a maintenance-free façade that is appropriate for new construction and particularly desirable in historic renovations.

In ground face block, also known as burnished block, diamond grinding heads are applied to the face to expose the aggregates. Grinding takes place after the block is cured; it is then sealed with a heat-treated factory acrylic. After the block is cleaned, manufacturers strongly recommended another post-applied coat of sealer for moisture protection and to bring out the color.

In filled and polished block, after the initial grinding process, the pores are filled by hand and rubbed with a cementitious slurry that is color specific to the block aggregates. The block is oven baked and the slurry then becomes an actual part of the block. The block faces are polished again in a multistage process, then lightly ground. A factory-applied clear satin gloss acrylic finish accentuates the natural beauty of the aggregates and provides moisture and graffiti resistance. Architects should make sure the filled and polished block they are specifying meets ASTM C-744 Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.

Another specialty option is the glazed block, in which a thermoset glazing compound is permanently molded to one or more faces. Heat-treated and cured, the compound becomes an integral part of the unit. The result is a tight impervious surface that is easy to clean. This

Photo courtesy of Oldcastle Architectural

Middletown Area High School in Middletown, Pennsylvania, uses colored glazed blocks.

type of block is exceptionally resistant to staining, abrasion, impact, and chemicals. It is graffiti resistant and virtually impenetrable to spray paint, permanent markers, grease, or crayon. Glazed block is ideal for clean rooms as well, as it does not allow collection of dust, germs, or bacteria.

The designer's palette and opportunities for creativity are not limited to exterior applications for masonry. There are many fine examples of what can be accomplished with masonry interiors. Their inherent color variations and texture make CMUs an attractive design element, and with staggered placement, lightly contrasting mortar, or other treatment, they can add life to a space, creating an artistic look that reflects a smart modern design aesthetic.

CMU SPECIFICATIONS

CMUs must meet several specifications. In addition to ASTM E-119 Fire Safety and ASTM E-514 Water Penetration, ASTM C-90 is a standard specification that covers hollow and solid concrete masonry units made from hydraulic cement, water, and mineral aggregates with or without the inclusion of other materials. Parameters that must be met according to the standard include:

- Tolerance +/- 1/8 inch
- Shrinkage (0.065 percent)
- Minimum thickness of face shell and web ¾ to 1 ½ inches depending on width
- Water absorption rate based upon density

Density is a major factor in the specification. There are three classes of CMUs—normal weight, medium weight, and lightweight, with all three suitable for both loadbearing and nonloadbearing applications. Less than 105 pounds per cubic foot is considered light weight; less than 125 pounds per cubic foot, medium weight; and more than 125 pounds or greater per cubic foot, normal or heavy weight. Lightweight units are made from expanded shale or clay, and are best for fire rating and thermal performance, because of air voids in the units.

The ASTM C-90 Standard for compressive strength stipulates a minimum 1,900 psi (average of three), and no unit must fall below 1,700 psi.

Materials used in the unit affect the fire ratings, as does the size of the unit. As an example, an 8-inch x 8-inch x 16-inch hollow block would have a 2-hour rating at medium weight, a 2.75-hour rating at light weight and a 3-hour rating at an ultra light weight, which is a custom product. Architects can obtain a full list of hourly ratings from NCMA TEK 7.1 with the Equivalent Thickness Methodology, which nearly all specifications use or, alternatively, from laboratory test UL 618 or ASTM E119 which, however, is an expensive procedure.

While ASTM C-90 does set standards in several areas, it does not address thermal performance, sound transmission rating, or color and texture issues.

ADDRESSING MOISTURE ISSUES

One of the most significant concerns in designing a wall is moisture. This section will explore the best way to design walls with moisture penetration in mind and with multiple lines of defense. The main objective is to keep water from penetrating or entering the wall in the first place. In addition to precipitation, moisture can enter masonry walls from several different sources, including capillary action, water vapor, and ground water. According to the National Concrete Masonry Association, successful moisture mitigation in concrete masonry walls involves a variety of techniques including flashing and counter flashing, weeps, vents, water repellents, sealants, post-applied surface treatments, vapor retarders, and crack control measures, with all components considered for redundant use yet with the appreciation that not all techniques will be suitable for all wall systems. The preferred approach to controlling moisture is to provide redundancy in a four-level line of defense including surface protection, internal protection, and drainage and drying, the idea being that water tightness of the wall will still be maintained even if one of these systems fails. This is referred to as the belt and suspenders approach.

Cost

In a cavity wall, designers rely on gravity and an unobstructed 2-inch airspace to get water down to the flashing and the weeps. This is the basic "rainscreen principle" wall. In a cavity wall are veneer, cavity, flashing and weeps, and backup. In Chicago, the cost to construct such a system is in the $30-per-square-foot range, based on the Masonry Advisory Council Cost Guide. Applying the rainscreen principle lines of defense to a single wythe wall, the components are an integral water repellent, drainable cores, flashing and weeps, an interior face shell, and post-applied water repellent. Again, according to the Masonry Advisory Council Cost Guide, the cost to construct such a system in Chicago is in the $12.50-per-square-foot range, some 58 percent less than the cavity wall.

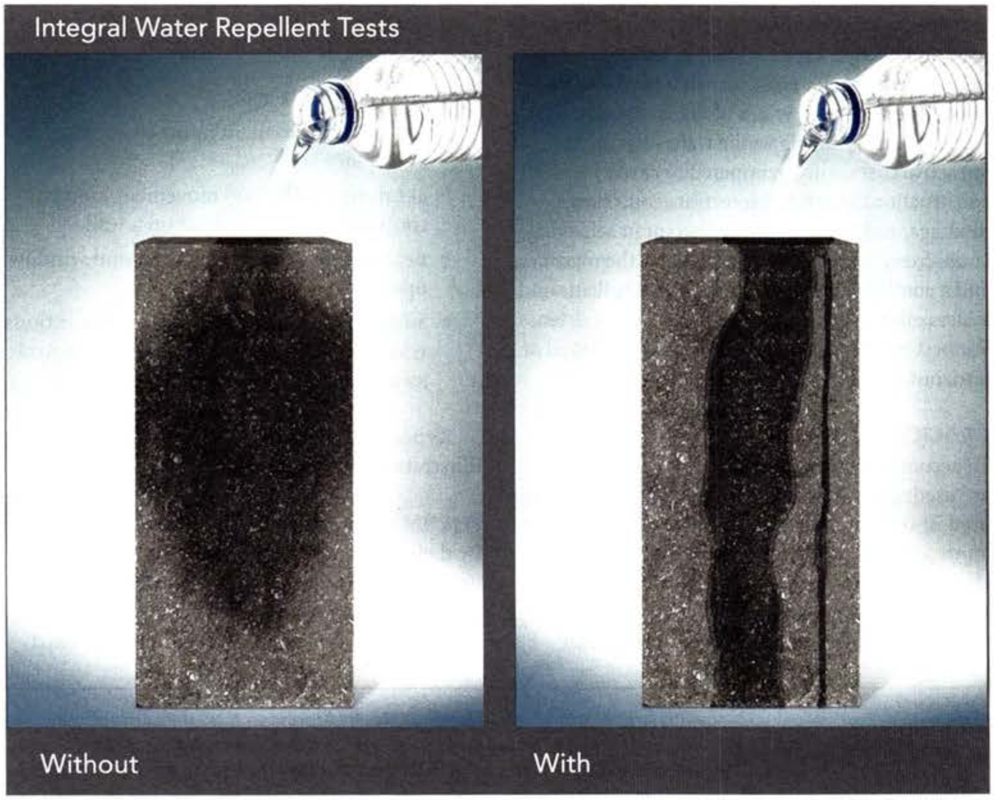
Internal Protection

Integral water repellents are an important part of the moisture control strategy in a single wythe wall. Repellency characteristics manufactured and locked in the design mix reduce the concrete's absorption properties and ensure permanent performance. Consequently, the entire unit is treated so as to provide a back-up layer of protection that lasts the service life of the unit and protects it from moisture during construction. Architects will want to note whether the manufacturer includes an integral water repellent as a standard feature of the CMU.

The figure below shows CMU blocks with and without a water repellent additive. On the block at the left, water poured on top of the block penetrates into the block. The block on the right wicks the water. For best moisture prevention, the integrated water repellent additive should be specified in the block and in the mortar. In fact, the NCMA recommends that the same manufacturer's water repellent for mortar and concrete block be incorporated for compatibility and the same reduced capillary action characteristics. These water repellent admixtures both serve as a vapor barrier and reduce the ability of moisture to travel via capillary action within the CMU. However, these admixtures do not stop moisture that enters through cracks in the wall, and they prevent any water that does penetrate from exiting easily. Consequently, other moisture reduction methods such as flashing and control joints are critical to achieve full mitigation.

Surface Protection

Applying a clear treatment, paint, or opaque elastomeric coating can enhance the water tightness of a wall. It is important to verify with the manufacturer that post-applied surface coatings are compatible with the block's integral water repellents. However, post-applied water repellents are less successful in moisture prevention than integral repellents. They have a limited surface life of approximately two to seven years depending on the manufacturer. While post-applied coatings can be a good



Images courtesy of the Trenwyth team

surface repellent, they do nothing to prevent an untreated unit from getting wet prior to sealing. If using surface protection, most manufacturers recommend a two-coat system.

Flashing

While integrated and surface-applied water repellents can enhance the watertightness of a wall, they are not a substitute for proper design that incorporates flashing. When flashing is used, the importance of proper detailing cannot be over-emphasized. Water mostly moves downward—a principle that informs the locations for flashing on single wythe walls. Flashing is best located at the top of the wall, the window head or bond beams, the window sill, and the wall base. In the accompanying figure (see the online version of this course), note the proper detailing of flashing at the window sill.

Mortar and Mortar Joint Considerations

Also important in producing dry walls are the type of mortar and mortar joint. The lowest strength mortar required for durability and watertightness should be selected as this mortar is typically more workable and able to produce a weather-resistant seal at the unit interface. For best results, mortar joints should be tooled to a concave profile. This improves resistance to water penetration as it steers water away from the surface of the wall. The shape of the tool also compacts the mortar against the CMU to more effectively seal the joint. Because they don't compact the mortar, other types of joints including raked, flush, struck, beaded, or extruded, will create ledges that interrupt water that streams down the face of the wall and are not recommended in exposed exterior walls. It is also important for water resistance that head and bed joints extend the full width of the face shells.

In summary, single wythe walls offer an attractive cost savings compared to cavity construction. Moisture protection, collection, drainage, and back-up are important in achieving "rainscreen" performance in single wythe masonry, and a combination of integral water repellents and sealers offer a "belt and suspenders" line of defense. For best results, flashing and weeps are required at horizontal breaks.

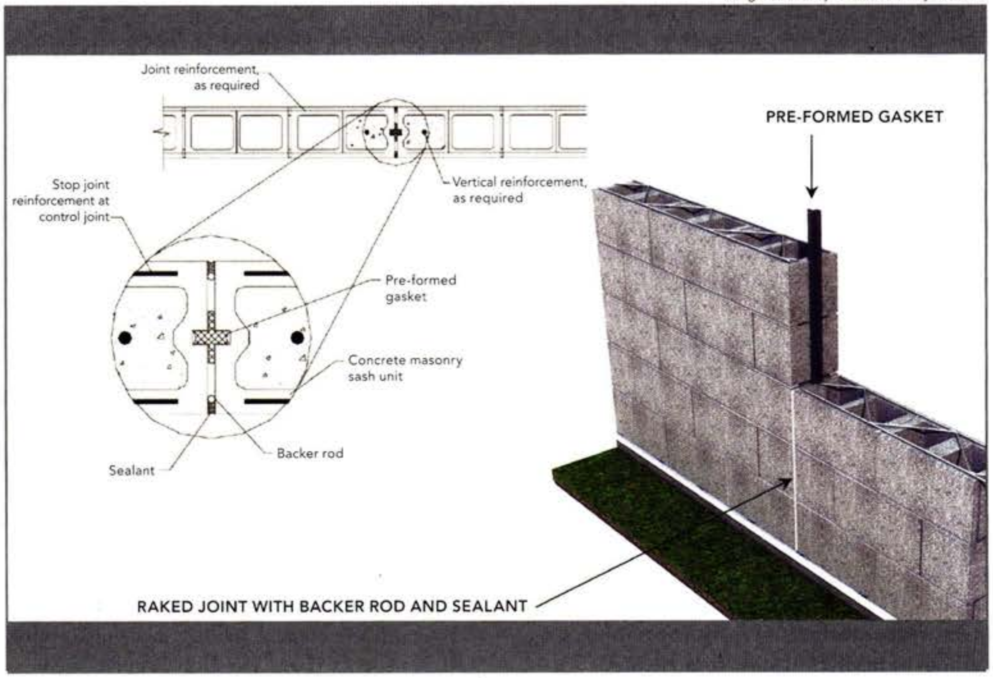
CRACK CONTROL

To accommodate movement, expansion joints are used with clay brick, and control joints are used in concrete masonry construction. Control joints are one way of relieving horizontal tensile stresses due to shrinkage of CMUs, mortar, or grout. In addition to relieving horizontal tensile stresses, control joints reduce restraint, permit longitudinal movement, and separate dissimilar materials. Control joints, which are essentially vertical planes of weakness built into the wall to reduce restraint and allow longitudinal movement due to anticipated shrinkage, should be located where stress concentrations may occur. While these locations can be difficult to pinpoint in practice, following are some rules of thumb in locating the control joints. According to the National Concrete Masonry Association, these are:

- at changes in wall height
- at changes in wall thickness, such as at pipe and duct
- chases and pilasters
- at (above) movement joints in foundations and floors
- at (above and below) movement joints in roofs and floors that bear on a wall
- near one or both sides of door and window openings
- adjacent to corners of walls or intersections within a distance equal to half the control joint spacing.

Types of control joints are shown in the illustration above.

Image courtesy of the Trenwyth team



THERMAL PROTECTION—ENERGY CODES

By their very nature, CMUs have good thermal properties. Yet technology is ever expanding, and insulated units may well be the next generation of masonry. This type of unit contains an insulated thermal barrier, which effectively creates high-insulated thermal mass, high heat capacity, and a long thermal lag time—attributes that combine to create walls that require just a fraction of the energy normally needed to keep the interior cool in the summer and warm in the winter. Because they consume less energy, a smaller HVAC can be utilized, which promotes cost savings and reduction of building energy use. The block design creates an energy barrier between the exterior wall veneer and the interior core, with the installation creating a thermal mass design and reducing air temperature fluctuations. Some insulated units have attained an equivalent performance value of an R-22 wall and an STC rating of 53. In addition to delivering these benefits, insulated CMUs may contribute to LEED points in several categories including recycled materials.

In any event, the thermal performance of building materials is governed by building codes which benefit public safety and support the industry's need for one set of standards without regional limitations. Prime among them is the International Energy Conservation Code (IECC), which is published by the International Code Council (ICC). The ICC develops model codes and standards used in the design, building, and compliance process to construct safe, sustainable, affordable, and resilient structures, and its I-Codes are a complete set of comprehensive, coordinated building safety and fire prevention codes.

Continues at ce.architecturalrecord.com

Stone Wool Roof Insulation—A Climate Driven Choice

Selecting the right insulation product for the right location and use

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

Buildings perform better when insulation material is used that is responsive to their climate and location.

Energy codes and other motivators are pushing all of us to not only design to higher levels of performance in buildings, but to ensure we achieve them. This requires an understanding of not only the ideal laboratory test conditions of building products, but also the actual in place field conditions that influence that performance. When it comes to selecting or specifying building insulation, it has been demonstrated repeatedly that there are a variety of factors that are important to consider. It is not just about lab-tested R-values, but about understanding how insulation plays into the total building performance in specific locations with a specific climate. It also means understanding the differences in characteristics between different types of insulation products. This is true in all parts of a building, but particularly so in roofing assemblies since the roof area of many buildings is a significant portion of the total building envelope and its resulting thermal performance.

DETERMINATION OF ROOF INSULATION R-VALUES

The U.S. Federal Trade Commission (FTC) has authority in this country over manufacturers' products and any claims of performance that are presented to consumers of those products. In 2005, they updated the Trade Regulation Rule titled: Labeling and Advertising of Home Insulation (part of 16 CFR Part 460) in which they identify the "R-value Rule." This rule specifies requirements (applicable to insulation manufacturers, professional installers, new home sellers, and retailers) to substantiate and disclose information related to thermal insulation products used in the residential market. It also prohibits certain claims unless they can be proven.

The primary disclosure required is the insulation product's R-value which the FTC simply defines as "the numerical measure of the ability of an insulation product to restrict the flow of heat and, therefore, to reduce energy costs—the higher the R-value, the better the product's insulating ability." It does go on to state that the disclosure of the R-value shall be based on uniform, industry-adopted standards which in most cases means tests performed under ASTM International standards (formerly known as the American Society of Testing and Materials). These standards are performed in laboratory conditions with specified requirements regarding test procedures, apparatus, and reporting. The ASTM tests are applicable to both commercial and residential products and are referenced widely in architectural specifications. The R-value Rule technically only applies to residential insulation products although the FTC has left the door open to revisit its applicability to commercial products. Either way the tests and standards are the same and all manufacturers follow all the requirements since they don't dictate whether their insulation is used in residential or commercial buildings.

The R-value Rule goes on to list some of the various ASTM tests that are recognized depending on the type of insulation being addressed. In addition, the rule requires

The Long-Term Thermal Resistance (LTTR) of roof insulation can be different from the laboratory performance due to many factors that can be mitigated based on the type of insulation used.

Both images courtesy of ROXUL, Inc.

that R-value tests be conducted at a mean temperature of 75°F and a temperature differential of 50°F (all plus or minus 10°F). Hence, insulation is usually tested with the cold side at 50°F and the warm side at 100°F to create the mean or average of 75°F. It also requires that the tests must be done on the insulation material alone (excluding any airspace). While this creates a very uniform and repeatable method of comparing insulation materials and eliminates any interference from other materials or factors, it may not necessarily replicate real-world field conditions across different locations, different times of year, or different construction systems. In other words, while the tested R-value is a useful comparative factor, actual real-world results may vary to a large degree.

When it comes to certain closed cell foam insulation products such as polyurethane, polyisocyanurate, and extruded polystyrene, there is another variable that will affect performance. These closed-cell foam insulations rely on a blowing agent or gas, other than air, to achieve their thermal resistance values. At the time of manufacture, the cells of the foam usually contain their highest percentage of blowing agent and the lowest percentage of atmospheric gases (air). As time passes, the relative concentrations of these gases change due primarily to diffusion. This results in a general reduction in the thermal resistance of the foam due to an increase in the thermal conductivity of the eventual mixture of gases in the foam cells. These phenomena are typically referred to as foam aging and the R-value Rule requires that tests must be done on samples that fully reflect the effect of aging on these products.

The R-value Rule identifies either the very specific procedure in paragraph 4.6.4 of GSA Specification HH–I–530A, or another reliable procedure to determine aging. However, since HH-I-530A is no longer an active specification, the generally accepted procedure is to use ASTM C-1303 Standard Test Method for Predicting Long-Term Thermal Resistance (LTTR) of Closed-Cell Foam Insulation. This test seeks to estimate the 5-year aged value of the tested products which are considered to predict the 15-year time-weighted average R-value.

While all of this testing is useful, there are two other factors that are not tested, but can certainly influence the real-world performance of the installed insulation. The first is the different range of temperatures that the installed insulation will be exposed to. A building will likely be exposed to much more than a 50-degree temperature differential with the exterior surface being exposed to either very hot or very cold conditions depending on the location and climate. Second, the presence of moisture in a construction assembly has been shown to sometimes affect performance, but generally that is minimal. If there is a breach in the assembly and rain water penetrates, causing the insulation to be wet, then in some cases it can lose its thermal effectiveness. However, for the purposes of this article, we will consider that an anomaly not relevant to the rest of our discussion.

R-VALUE COMPARISON: STONE WOOL AND POLYISOCYANURATE

With a general framework established for looking at R-values in insulation, let's look more closely at two specific types of insulation that are used for roofing applications, namely stone wool board and polyisocyanurate (polyiso) board insulation.

Insulation Characteristics

Polyisocyanurate is a commonly used insulation board, particularly for roofing. The trade association known as the Polyisocyanurate Insulation Manufacturers Association (PIMA) defines it as a closed-cell, rigid foam board insulation consisting of a foam core sandwiched between two facers. The facers are composed of various organic and inorganic materials, usually paper and fiberglass. It is widely used in residential and commercial markets for both roof and side wall applications. Among the characteristics that have contributed to its popularity is a comparatively high R-value per inch of thickness. In fact, it can currently claim to have the highest tested R-value per inch of any other commercially available insulation on the market. The foam core is moisture resistant, the board can achieve an FM Class 1 fire rating, it is widely available, and competes well on price.

By contrast, stone wool roofing insulation does not contain any foam plastics or blowing agents. Rather, it is manufactured out of volcanic basalt rock mixed with some recycled slag in a furnace. The melted rock is then literally spun into wool with minor amounts of organic binder and process additives to create the desired density of the end product as a rigid board. The stone wool fibers are typically non-directional which is important for achieving the multiple performance characteristics of the final product. In terms of R-value, stone wool provides very good performance, but most notably, that performance has been shown to

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

EARN ONE GBCI CE HOUR FOR LEED CREDENTIAL MAINTENANCE

Learning Objectives

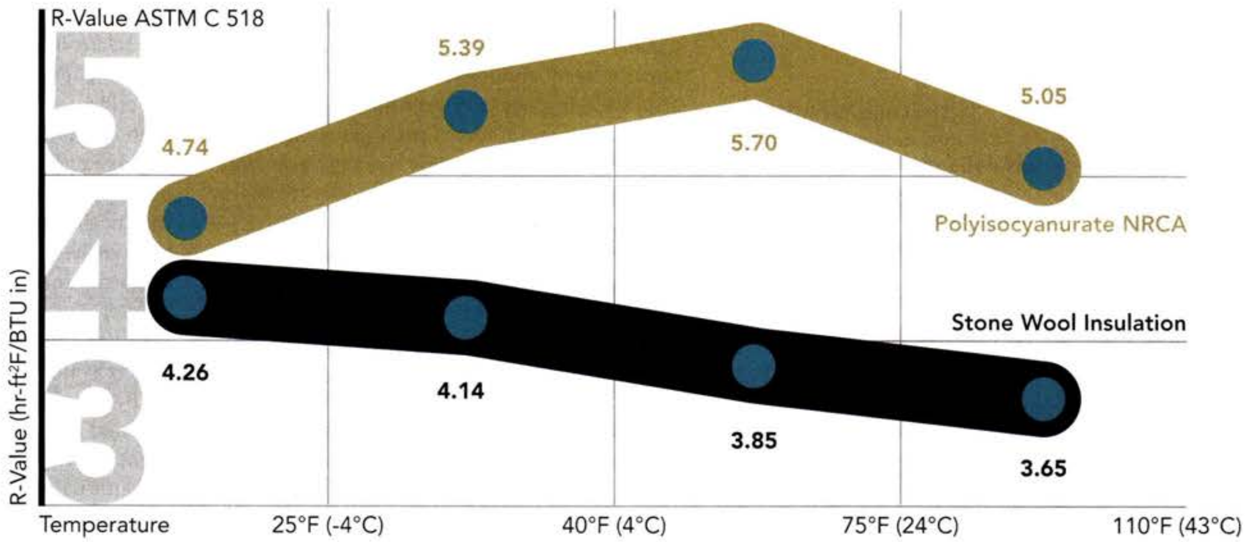
After reading this article, you should be able to:

1. Identify and recognize the process of determining thermal insulation R-values for energy-efficient buildings based on recognized testing procedures.
2. Compare the energy resistance of foam plastic insulation against stone wool insulation in conditions of varying temperature and thicknesses in order to optimize energy performance.
3. Assess the functional characteristics of stone wool and foam plastic insulation products in regard to moisture tolerance, dimensional stability, and fire resistance for long-term sustainability and performance.
4. Investigate insulation types as a means to provide acoustic sound control, particularly in roofing and exterior wall applications.

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

AIA/CES COURSE #K1401D
GBCI COURSE #0090010913

Compared to polyisocyanurate insulation, stone wool insulation thermal performance improves at cold temperatures and performs consistently at all temperatures.



Graph and image (right) courtesy of ROXUL, Inc.

remain constant over time. Since there are no blowing agents, there is nothing to out gas, meaning that the thermal performance does not change. It also has superior qualities in regard to fire resistance, dimensional stability, sound attenuation, and water repellency.

When looking to select or specify roofing insulation, architects and designers may first look at the published R-values of these two insulation products based on lab test results. Stone wool insulation, when tested under ASTM protocols at a mean temperature of 75°F (i.e. 50°F outside, 100°F inside) will yield an R-value of approximately R-4.0 per inch. However when tested at lower mean temperatures, such as 25°F (0°F outside and 50°F inside) that R-value has been shown to increase up to approximately R-4.4 per inch. Conversely, at higher mean temperatures, such as 110°F (135°F outside and 85°F inside) it tests at about R-3.7. These values may vary based on different products from different manufacturers, but the trends have been clearly established and are characteristic of the material.

R-values for polyisocyanurate insulation are similarly tested per ASTM standards at a mean temperature of 75°F. They are further tested per the LTTR method for a weighted average aged R-value. Most manufacturers now publish an R-value of R-5.7 per inch as a result of that testing. However, as far back as 2003, the National Roofing Contractors Association (NRCA) has performed independent testing of polyisocyanurate insulation, through a third-party laboratory, by using actual samples from different manufacturers. These tests were performed according to ASTM protocols and used the 75°F mean temperature as the basis. Additionally, the ASTM protocol also specifies, but does not require reporting, of testing samples at mean temperatures of 25, 40, and 110°F which the NRCA performed to see if there were any differences in R-value.

This work has been carried out and reported in numerous articles and reports in *Professional Roofing* magazine and elsewhere. The NRCA testing concluded that there is indeed a difference based on temperature and there is a notable range in performance between manufactured products. Of note, it determined that as the mean temperature drops below 75°F, the R-value also drops down to an average low of about 4.75 at a 25°F mean temperature. Further, when the outdoor temperature gets above the 75°F mean, the R-value also drops below the R-6 value, which was claimed by polyiso manufacturers prior to January 1, 2014. These findings became the basis for the NRCA to recommend using a more representative value of R-5.6 per inch when designing for warm climates and R-5.0 per inch when designing for cold climates.

Independent Laboratory Testing

Separate from the NRCA studies, an independent organization known as Building Science Corporation (BSC) has conducted a series of similar tests on different thicknesses of polyisocyanurate insulation at different test temperatures that more closely replicate anticipated environmental conditions. Mean temperatures in the real world aren't governed by a 50°F temperature difference between inside and outside, so they conducted tests with a constant 72°F inside temperature and a variable outside temperature to generate the relevant mean temperatures.

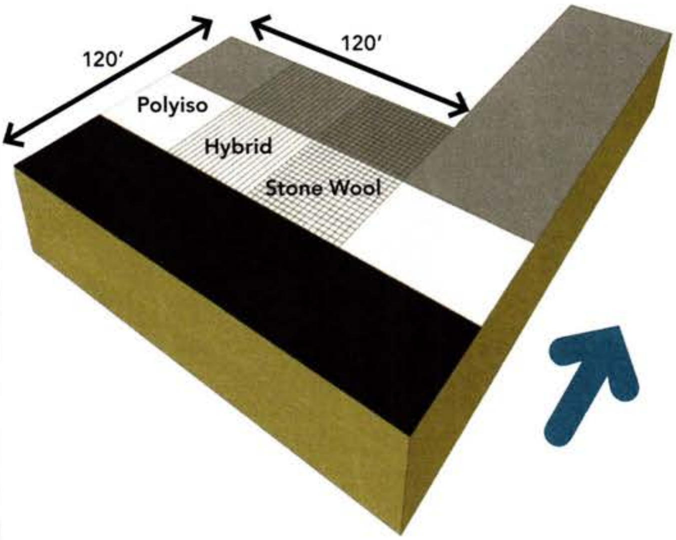
On this basis, BSC first tested samples of 2-inch-thick polyisocyanurate insulation which had a commonly published LTTR aged R-value of R-12.1 or just slightly better than the R-6 per inch for a 1-inch sample. The NRCA doesn't differentiate between solid or stacked boards, so their 2 inch recommended R-value is simply twice the R-5.6 or R-11.2. All of the samples tested showed a decrease in R-values at winter outdoor temperatures below 32°F or summer solar heated roof temperatures above 113°F. Further, they determined that the change in performance is not linear across temperature changes meaning that it is very difficult to predict actual performance between tested temperatures. They also found that there was a notable variation in performance between manufacturers. In essence, this test agreed with the NRCA findings indicating that the design R-values should be reduced from the published values for more accurate calculations.

BSC went on to look at thicker 4-inch layers by stacking 2-inch layers of insulation and using the same test methods as previously. Once again, they found that the performance of the polyisocyanurate insulation declined as the outdoor temperature dropped. This led them to state the following recommendations for using this insulation in cold-temperature climates:

- Use thicker layers of polyisocyanurate insulation to ensure that the performance meets expectations—i.e. the actual R-values will likely be less than the published R-values.
- Use a hybrid insulation approach—install cold temperature-tolerant insulation over the top of polyisocyanurate insulation to increase the mean temperature of the polyisocyanurate.

Field Monitoring Study

In order to determine a more comprehensive understanding of the performance between stone wool and polyisocyanurate insulation used in roofing systems, RDH Building Engineering Ltd. in Vancouver, BC has undertaken a Field Monitoring Study. This ongoing work to be conducted over several years has looked at nine



The RDH study looked at different roofing assemblies in place on the same building to compare performance.

Source: "Monitored Field Performance of Conventional Roofing Assemblies – Measuring the Benefits of Insulation Strategy" by Marcus Dell, PEng, and Graham Finch, PEng, of RDH Building Engineering Ltd. The paper was presented at the RCI Symposium on Building Envelope Technology, November 2013.

side-by-side roof insulation assemblies with variations in insulation make-up and roofing membrane color. The roofing variables consist of three different two-ply SBS membrane cap sheet colors placed over three different conventional insulation strategies (polyiso, stone wool, and a hybrid combination of both), creating a total of nine unique roofing assemblies (each 16 square, 1,600 ft^2 in size) on the same building to study. The thickness of each insulation combination was varied to achieve approximately the same effective R-value in each assembly. Sensors were installed to measure temperature, relative humidity, moisture content, and heat flux at various points within each of the roof assemblies.

Among the findings observed to date:

- Both polyiso and stone wool exhibit a strong temperature-dependent thermal conductivity, though they behave differently at cold and hot temperatures. Since the stone wool does not rely on blowing agents for insulation performance, it demonstrates a more linear relationship between outdoor temperature and thermal performance. Further, the RDH study also observed that the thermal performance of stone wool improves with colder temperatures from standard conditions (75°F), whereas the performance of polyiso declines under both cold and hot conditions.
- A roof constructed with 3.5 inches of polyiso may have a code-acceptable calculated R-value of R-21.3, but when exposed to cold (14°F) would drop to R-20 or as low as R-16.5 depending on its age; and when exposed to hot (167°F membrane surface) temperatures would drop to R-16.5 or as low as R-14 depending on its age.
- In the hybrid assembly (4.5 inches thick), the use of a layer of stone wool insulation (in this case, equivalent to approximately 45 percent of the assembly R-value) over the top of the polyiso significantly improves the effective R-value of the polyiso as it keeps it near optimum temperatures (which are similar to typical interior temperatures); and therefore, results in a better assembly R-value in cold and hot conditions.
- The roof assembly insulated with entirely stone wool insulation (at 5.75 inches thick) will have a more stable R-value (increasing at colder temperatures and slightly decreasing at hot temperatures from calculated R-value), and is not susceptible to a loss of R-value with age.

Based on the above, important considerations when designing roof assemblies include:

- Stone wool and hybrid roofs will maintain R-values close to calculated values, whereas the R-value in the roof with polyiso will drop a significant amount when exposed to cold or hot outdoor (and solar radiation induced) temperatures.
- The higher heat capacity of stone wool insulation reduces the peak membrane temperature, which is positive for the longevity of the membrane and reduces the peak interior temperature, which is a positive for the occupants.
- Stone wool has a more stable R-value than polyiso so it insulates better when exposed to larger temperature differences.

The overall conclusion that can be drawn from all of this collective work is that climate and location matter when selecting roofing insulation. The use of insulation that does not perform as expected will likely increase the actual energy consumption within buildings in both cold and hot climates. This is an important consideration to overall performance and will be a factor when sizing mechanical equipment as well. Climate driven R-values, based on the mean temperature between indoor and outdoor conditions, need to be accounted for in design.

BEYOND R-VALUES: OTHER CONSIDERATIONS

While the significance of R-value is high, there are also other characteristics to consider when selecting the best insulation for a particular location and climate.

Moisture Content

There is a common misperception that stone wool insulation is moisture sensitive. In reality, stone wool acts as a hydrophobic material and is water repellent yet vapor permeable. This means that the insulation does not absorb or hold moisture so the R-value and other physical properties are not affected by water exposure as with some insulation such as fiberglass. The permeability means that the material is breathable so no double vapor barrier or trapped moisture issues arise. Further, being water-repellent also means that stone wool insulation does not promote rot, corrosion, fungi, mold, or bacterial growth.

One of the special properties of stone wool is the non-directional orientation of the material, making it ideal for repelling and draining water away from the exterior walls, industrial pipe, interior walls, or whatever the insulation is protecting. Similarly, an important benefit of the insulation is its ability to allow trapped vapors in a roof or wall assembly to disperse throughout the insulation layer. Hence, water exposure from leaks in a membrane or from condensation within the assembly can be removed by allowing the insulation to vent this moisture. Stone wool will quickly dry out to become fully restored and retain its original characteristics.

Continues at ce.architecturalrecord.com

***Peter J. Arsenault,** FAIA, NCARB, LEED AP, is a nationally known architect, sustainability consultant, technical writer, and continuing education presenter.*
www.linkedin.com/in/pjaarch

Conforming to Code

Effective exterior insulation in rainscreen assemblies for new and emerging energy requirements

Sponsored by Knight Wall Systems

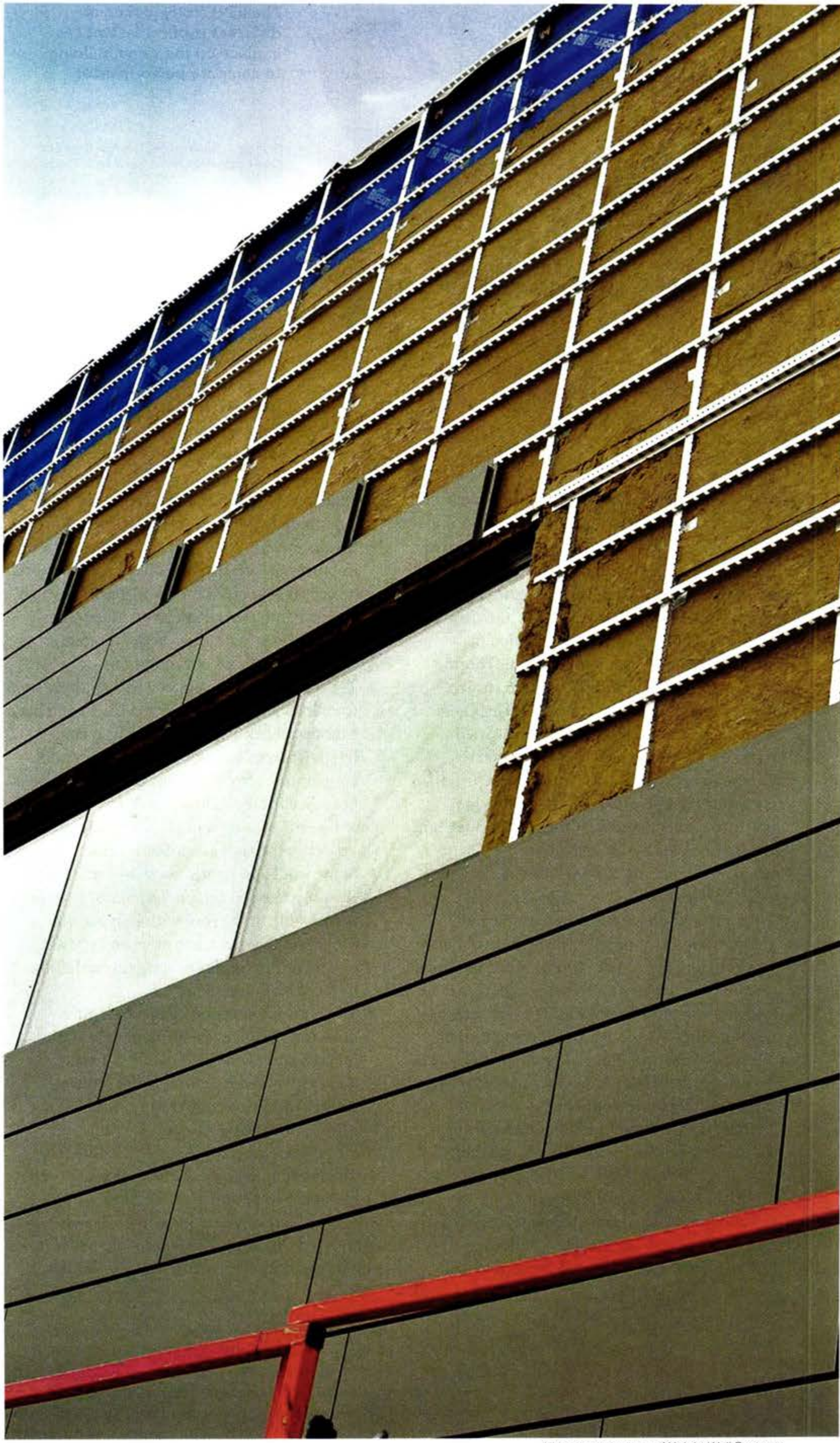
The certainty that evolving energy codes will become ever more stringent is on par with those other two irrefutable inevitabilities: death and taxes. New ASHRAE standards released earlier this fall incorporate major changes to requirements regarding building envelope, lighting, mechanical, and the energy cost budget and, while they may not be adopted by the states for several years, they do signal that the push continues for architects and manufacturers to ramp up solutions for energy-efficient design.

In terms of exterior insulation, design and construction professionals have long struggled with how to achieve the requirements of prevailing energy codes, settling upon the use of "Z" furring strips, or girts. With the introduction of continuous insulation requirements, however, the once-beloved simple "Z-girt" is no longer a viable option. This article will examine requirements of current energy codes, exploring the root cause of why traditional means of exterior wall construction no longer comply. New solutions for steel-framed exterior wall assemblies will be discussed and evaluated in terms of energy efficiency and cost effectiveness.

EVOLUTION OF ENERGY CODES

Driven by escalating energy costs and resultant increases in building operating expenses, energy codes are becoming increasingly stringent. According to the U.S. government, there are more than 5 million commercial buildings and industrial facilities in the United States. Combined annual energy costs of those structures exceed \$200 billion—and as much as 30 percent of that energy is used inefficiently or unnecessarily. If the energy efficiency of commercial and industrial buildings improved by 10 percent, more than \$20 billion could be saved.

Today, two primary baseline building energy codes may be adopted by states and local jurisdictions to regulate the design and construction of new buildings: the International Energy Conservation Code® (IECC) and the



All images courtesy of Knight Wall Systems

Timeline of Prescriptive Insulation Requirements for Steel-Framed, Above-Grade, Walls								
Code/Standard	CLIMATE ZONE							
	1	2	3	4	5	6	7	8
2015 IECC	?	?	?	?	?	?	?	?
ASHRAE 90.1-2013	R-13	R-13 + 3.8 ci	R-13 +5 ci	R-13 + 7.5 ci	R-13 + 10 ci	R-13 + 12.5 ci	R-13 + 12.5 ci	R-13 + 18.8 ci
2012 IECC	R-13 + 5 ci	R-13 + 5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci
ASHRAE 90.1-2010	R-13	R-13	R-13 + 3.8 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci
2009 IECC	R-13	R-13	R-13 + 3.8 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci
ASHRAE 90.1-2007	R-13	R-13	R-13 + 3.8 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci	R-13 + 7.5 ci
2006 IECC	R-13	R-13	R-13	R-13	R-13 + 3.8 ci	R-13 + 3.8 ci	R-13 + 7.5 ci	R-13 + 7.5 ci
ASHRAE 90.1-2004	R-13	R-13	R-13	R-13	R-13 + 3.8 ci	R-13 + 3.8 ci	R-13 + 7.5 ci	R-13 + 7.5 ci

■ - Newest standard not yet adopted

ANSI/ASHRAE/IESNA Standard 90.1 Energy Standard for Buildings except Low-Rise Residential Buildings. The IECC addresses all residential and commercial buildings, while ASHRAE standards cover commercial buildings. The IECC adopted, by reference, ASHRAE 90.1; that is, compliance with ASHRAE 90.1 qualifies as compliance with IECC for commercial buildings.

The original standard ASHRAE 90 was published in 1975. In 1999, the standard was placed on continuous maintenance, which allowed it to be updated several times a year due to rapid changes in technology and energy prices. In 2001, the standard became ASHRAE 90.1, and has been updated in 2004, 2007, and 2010, with associated increases in scope and energy-efficiency targets. The 2013 update of ASHRAE Standard 90.1 is a major revision, containing more than 100 changes from the 2010 version. Standard 90.1-2010 and 90.1-2013 together produce almost 50 percent energy savings from the 2004 version.

Most states apply the standard or equivalent standards for all commercial buildings while others do so for all government buildings. While energy codes are widely considered an efficient way to reduce energy use in the built environment, adoption of standards by states can lag their introduction by a matter of years. ASHRAE 90.1 2007 is the most up-to-date version of the energy code that's been adopted by many jurisdictions and local codes.

One specific and important part of the energy codes currently being implemented calls for an increased performance requirement on exterior wall assemblies, especially with steel-framed walls. The overall goal here is to increase the performance of the wall assembly in resisting the transfer of thermal energy so the conditioned space requires less work by the HVAC system to maintain desirable conditions.

While the code doesn't actually state that exterior insulation is required, it does state that much higher performance numbers must be met. It is widely accepted that the simplest, most expected, and versatile way to increase a wall assembly's thermal performance is by use of insulation applied to the exterior of the wall. Exterior insulation is typically marketed as "continuous insulation" or ci. Ci has been an energy code requirement since the release of ASHRAE 90.1-2004, and the 2007 code calls for more ci in various climate zones. The U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system has followed suit, increasing its prerequisites in the Energy and Atmosphere category. LEED 2009 requires ci per the 2007 ASHRAE code, and the current version of LEED ups that requirement to conformance with ASHRAE 2010.

ASHRAE 90.1 defines ci as insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior, exterior, or is integral to any opaque surface of the building. Fasteners include screws, bolts, nails, etc, meaning that furring strips, clip angles, lintels, and other large connection details are excluded, rendering standard wall assemblies obsolete and calling for a change in the assembly away from batt-insulated stud cavities. The most recently adopted version of the Washington State energy code, one of the most stringent in the country, has even gone so far as to state the specific amount of cross-sectional area of metal allowed to penetrate the insulation and still qualify as ci.

WHY BATT-INSULATED CAVITIES DON'T WORK

Batt insulation limits thermal protection to the wall cavity and creates a thermal bridge for heat transfer through framing studs. In a steel-framed building, thermal shorts reduce the R-value of cavity-insulated wall systems by more than 50 percent. In addition, thermal bridging encourages condensation and moisture build-up that can further reduce the R-value of cavity batts as well as encourage mold and mildew and shorten the service life of the entire wall assembly.

Thermal Bridging—The Key to Effective Insulation

Understanding the dynamics of thermal bridging is critical to specifying the right insulation for a given project. Heat energy transfers from warm environments to cold

CONTINUING EDUCATION

EARN ONE AIA/CES HSW LEARNING UNIT (LU)

EARN ONE GBCI CE HOUR FOR LEED CREDENTIAL MAINTENANCE

Learning Objectives

After reading this article, you should be able to:

1. Discuss prevailing codes and standards as they relate to improved insulation for better energy performance.
2. Define continuous insulation as a means to achieve an environmentally sound structure.
3. Explain various code-approved options in minimizing thermal bridging and how they lead to improved sustainability in today's buildings.
4. Identify rainscreen attachment systems from an energy-efficiency and green building standpoint.

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

AIA/CES COURSE #K1401B
GBCI COURSE #0090010883

environments, that is, from the interior of a building to the exterior of a building and vice-versa in warm climate zones. Conduction heat transfer is the underlying cause of thermal bridging. The heat energy transfers through connected materials where one part of the connected materials, or assemblies, are in a warm environment and the other end of the connected materials, or assemblies, are in a cold environment; in other words, exterior wall assemblies where one side of the wall is a conditioned space and the other side is an unconditioned space, or outside. The rate at which the heat energy transfers is directly related to the thermal conductivity of the materials connecting, or bridging, the two environments. Metal, for instance, is highly conductive of heat, which is why it is used for activities where conductive heat transfer is important such as cooking food on a stovetop, radiators, etc. The goal is to keep the overall thermal conductivity of the materials bridging the two environments as low as possible, therefore increasing the assembly's ability to resist heat transfer.

Adding insulation into an exterior wall assembly is primarily to help increase the resistance to heat transfer through the entire assembly, both inwards and outwards. Bridged materials with a low resistance to heat transfer—and consequently very conductive—which pass through highly resistant materials create a path for heat to follow and "go around." This is also known as a thermal short, or following the path of least resistance. As an example, metal framing members, such as steel studs, penetrating the insulation added to the assembly, create a bridge and allow heat to transfer right through the insulation at 16 inches on center.

Penetrations are pathways for heat to transfer and are known as thermal bridges. The greater the pathway, the greater the amount of heat energy is lost, creating higher

Thermal Conductivity - BTU/(hr. °F.ft)	
Aluminum	±118.0
Carbon Steel	±21.0
Stainless Steel	±8.0
Acetal Copolymer	±0.066
Copper	±223.0
Fiberglass	±0.023
Glass	±0.61

operating costs among other risks. To help reduce this, the assembly design must reduce the amount of conductive material bypassing the insulation, use greater thermally resistant materials within the assembly, and finally break the bridge, or connection, of materials transferring heat energy.

When a wall's R-value is considered, it is important to realize the assembly's R-value is not the rated R-value of the insulation. This is proven with batt-insulated steel stud wall assemblies by the ASHRAE Standard 90.1, which states that R-19 batt insulation in a steel framing application only has an effective, or real, R-value of 7.1, less than 40 percent of its rated value. To clarify, the R-19 batt insulation only has an R-value of R-7.1 when installed in a 16-inch steel stud assembly. But the assembly's R-value is actually 9.2.—the R-7.1 batt plus the R-value of the gypsum board, air films, etc.

The ASHRAE rating is primarily due to the steel studs penetrating the insulation, creating a bridge for heat to transfer. The insulation on its own is R-19, yet once it's made part of an assembly, the installation method will begin to affect it and ultimately create its effective R-value. Effective R-value is the inverse of the U-value for the entire wall assembly, which is commonly referenced within the code.

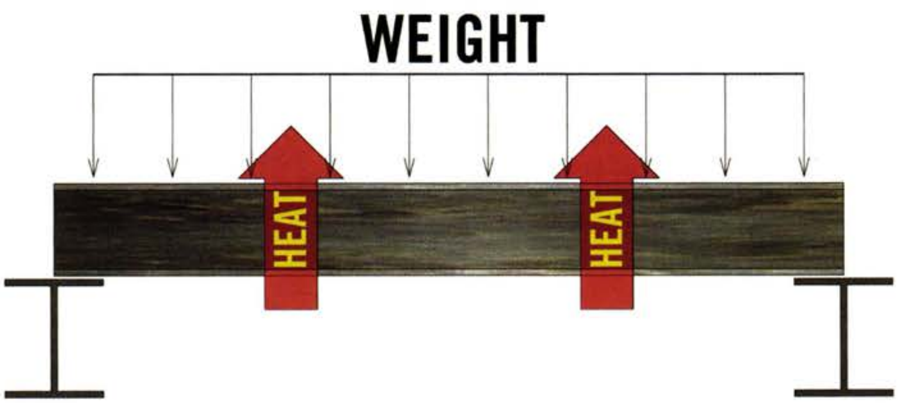
The same challenge of deteriorating insulating values can be seen on exterior insulated wall assemblies as well, where only a fraction of the insulation's stated R-value is actually delivered. As will be discussed later in detail, using a typical continuous furring channel for cladding attachment, such as a vertical Z-girt, will only allow the insulation to perform at ±40 percent of its rated R-value. Rotate the cladding attachment Z-girt 90 degrees to the horizontal and the effectiveness of the insulation will only be increased ±50 percent of its rated R-value. Consequently, the building owner, or occupant, is only receiving half of what they actually paid for.

There are several characteristics of the cladding attachment methodology and configuration that affect overall thermal performance and can cause thermal short circuits, which can drastically reduce the effectiveness of the insulation. There are three key culprits that affect the exterior insulation's clear wall performance—the amount of material penetrating the insulation, the actual conductivity of the material penetrating the insulation, and the amount of contact area between all bridged/connected parts.

Amount of material penetrating the insulation. With a greater cross-sectional area of material penetrating the insulation, a greater amount of heat energy can be moved. The best way to think of this is an eight-lane interstate versus a two-lane road with the cars analogous of the heat energy. Which one can move more cars (read heat energy) from point A to point B per hour? With material penetrating the insulation, the actual thermal conductivity of the material used for the attachment system will allow for more heat energy to be transferred.

Conductivity of material. It is important to note that every material in the world has the property of thermal conductivity, but some materials are very low in conductivity whereas others are very high. Aluminum has a far greater thermal conductivity than steel. Therefore, more heat energy will be able to flow through a cross section of aluminum versus steel, decreasing overall performance even further. Looking at the road and car analogy, aluminum is a 75-mph interstate whereas steel is a 35-mph street. Which way moves cars, or heat energy in this analogy, from point A to point B fastest?

Contact. How the material contacts the substrate and different pieces within the cladding attachment assembly also has an effect on how heat energy transfers. The greater the contact area between conductive materials, the more heat energy can transfer and move from point A to point B. If we limit contact area, we can "bottleneck" and limit the heat energy transfer. So looking at the road and car analogy one last time, reduction in contact area is like a traffic jam on a busy interstate. The cars (heat energy) are still moving from one point to another, but at a much slower rate since only a limited number of cars can get onto the road at once.



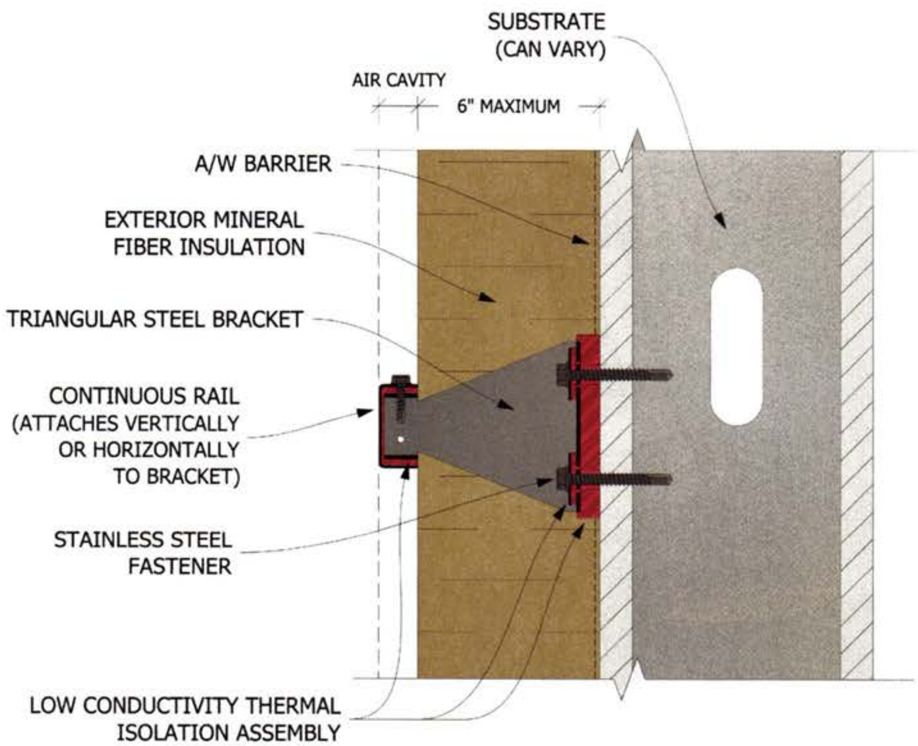
Steel has a small footprint, is non-combustible, and has excellent strength and structural properties. However, it has very poor thermal properties.

THE RAINSCREEN EDGE

One option to complying with code requirements is a properly deployed rainscreen, which is an exterior cladding infrastructure that sits away from a building's outside wall's weather-resistant barrier, creating an air cavity directly behind the cladding that helps to protect the building's important weather-resistant barrier. This allows any moisture that may pass by the cladding to easily drain away from the building, and the air that flows between the cladding and the wall due to convection accelerates evaporation of any residual moisture. A rainscreen should be viewed as a building envelope support mechanism, whose primary function is not to provide barrier protection against water penetration (such as a weather-resistant barrier does). Rather, a rainscreen is designed to limit the amount of water that could potentially come into contact with the primary building envelope's moisture barrier, thereby reducing the chance of water finding a way into the wall assembly. It does this by defending the wall assembly against the five forces that drive rain into buildings: kinetic energy, gravity, capillary action, surface tension, and pressure gradients.

Not all rainscreens are created equal, however, and how they are attached to the building envelope can make a significant difference. Two viable approaches to reducing thermal bridging are mineral fiber and rigid foam rainscreen systems. The former reduces thermal bridging via the use of thermally isolated steel brackets, and the latter by thermally isolated screw attachments through the rigid insulation where no metal penetrates the insulation except for the fasteners, thus meeting the definition of ci. Essentially accomplishing the same thing, these systems can be specified according to user preference. Rainscreen attachment methods used in conjunction with rigid foam are the most thermally efficient and the thinnest energy code compliant wall assemblies since there is so much less metal penetrating the exterior insulation. The thermally isolated steel brackets used in conjunction with mineral fiber systems is far more efficient than any other mineral fiber cladding attachment approach, including brackets made entirely of low conductive fiber reinforced polymers. Though the use of a bracket for attachment does not conform to the code definition of ci, it does meet code via the prescriptive U-factor.

Not all rainscreens are created equal. How they are attached to the building envelope can make a significant difference.



While the manner in which exterior insulation has been typically added to wall assemblies decreases the insulation's thermal performance by half, isolated steel brackets in rainscreen construction can result in increased insulation effectiveness, up to 90 percent over traditional methods. When only thermally isolated screw fasteners penetrate the insulation, 98 percent effectiveness can be achieved.

Mineral fiber systems. These systems may be installed over many substrates including steel studs, wood studs, CMU, clay, and concrete. Live loads imposed upon the system (primarily wind pressures) paired with the substrate type will dictate the size of anchors and spacing required to achieve proper pull-out strength. Some manufacturers use small, triangular, intermittent wall brackets that allow direct attachment of vertical or horizontal rails. Having this flexibility built into the attachment configuration frees designers to layout façade panels any way they'd like, especially if secondary rails are added to the attachment assembly. The small steel brackets are anti-corrosive coated and include a durable plastic base and integral plastic washer. With such a system, only a ribbed area of the plastic base touches the wall substrate, significantly reducing thermal bridging at that point of contact, a particular area of the building envelope that can potentially contribute to heat loss and gain. A plastic cap isolates the stem of the wall bracket from the rail to further decrease any thermal transfer from the bracket to the rail. There is no metal-on-metal contact, which is the key to the brackets' effectiveness.

Continues at ce.architecturalrecord.com

Advertisers Index

Publisher is not responsible for errors and omissions in advertiser index.
To access PDFs of all full-page or larger ads appearing in this issue, go to **ArchRecord.com > Products tab > Product Ads**

S Get more info at **www.sweets.com**

LANDSCAPING, SITEWORK

LIVING WALL FOR LIGHT COMMERCIAL

$$ | NEW

Tournesol Siteworks

By the manufacturer of the premier modular living wall system, the new VGP tray system is economical, easy to install and maintain.

Product Application:
- Exterior and interior applications
- Restaurants, malls, hospitality, and other commercial projects
- Perfect for high-end residential locations

Performance Data:
- 100 post-consumer recycled polypropylene
- Requires no preplanting or grow-in

tournesolsiteworks.com
800.542.2282

Circle 150

ROOFING, SIDING, THERMAL & MOISTURE PROTECTION

ARCHITECTURAL CONCRETE CLADDING

WR | G | NEW

Easi-Set Worldwide

Ultra Hi-Performance Slenderwall is a 28 lb./sf award-winning architectural precast concrete and steel-stud exterior panel system wind-load tested to 226mph.

Product Application:
- BioInnovation Center, New Orleans, LA
- Hilton Gardens, Montreal, Quebec, Canada
- Westin Luxury Hotel, Virginia Beach, VA

Performance Data:
- Continuous closed-cell foam insulation and optional factory-installed windows
- H2Out Pressure Equalized Joint Rainscreen

www.slenderwall.com
800.547.4045 | **Contact:** Arthur Miles

Circle 151

SPECIALTY PRODUCTS

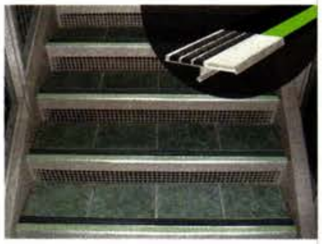
MAKE EVERY STEP A SAFE ONE

Wooster Products Inc.

Anti-slip photoluminescent stair nosings.

Product Application:
- IBC/IFC code compliant
- Used on NYC Trade Centers
- For egress stairwells

Performance Data:
- Long-lasting, highest quality
- New construction or existing steps



www.wooster-products.com
800.321.4936

Circle 152

CLASSIFIEDS

POSITION VACANT

WWW.SMPSCAREERCENTER.ORG
Find marketing/BD professionals with A/E/C experience. Call 800-292-7677, ext. 231

dates&events

Exhibitions

Projects in Contemporary Art & Architecture
New York City
Through January 15, 2014
Featuring work by world-renowned architects, including Moshe Safdie, Bruce Fowle, and Alighiero Boetti, this show at the National Academy exhibits projects by architects of schools, museums, art galleries, and cultural spaces via models, photos, prints, and drawings. The exhibit also features work by National Academy students and faculty inspired by architectural forms and interiors. For more information, visit nationalacademy.org.

Practical Utopias: Global Urbanism in Hong Kong, Seoul, Shanghai, Singapore, and Tokyo
New York City
Through January 18, 2014
Over the past 20 years, the pace and scale of urbanization in Asia has been unprecedented in both the emerging and maturing economies of the region. This exhibition explores new cities built up just outside, immediately adjacent to, or even within the old. Conceived as extensions or embellishments of existing capitals of finance and culture, these new cities within cities serve as focal points for future visions and global ambitions. At the Center for Architecture. For more information, visit aiany.org.

Global Citizen: The Architecture of Moshe Safdie
Los Angeles
Through March 2, 2014
Global Citizen explores the evolution of Moshe Safdie's work and the humanistic design philosophy that he has demonstrated throughout his nearly 50-year-long career. Through the presentation of models, displays, sketches, photos, and videos, the exhibition traces the journey from Safdie's groundbreaking project *Habitat for Expo '67* in Montreal to the firm's most recently completed and current projects from Marina Bay Sands in Singapore to the United States Institute of Peace in Washington, D.C. At the Safdie-designed Skirball Cultural Center. For more information, visit skirball.org.

In Focus: Architecture
Los Angeles
Through March 2, 2014
The long, interdependent relationship between photography and architecture is the subject of this survey drawn from the Getty Museum's collection. Spanning the history of the medium, the exhibition features 24 works by such diverse practitioners as William Henry Fox Talbot, Eugène Atget, Walker Evans, Bernd and Hilla Becher, and Ryuji Miyamoto. Seen together, the varied photographic representations of secular and sacred structures on display reveal how the medium has impacted our understanding and perception of architecture. For more information, visit getty.edu/museum.

Overdrive: L.A. Constructs the Future, 1940–1990
Washington, D.C.
Through March 10, 2014
The first comprehensive survey of the architecture of mid- to late-20th-century Los Angeles, *Overdrive*, at the National Building Museum, sheds new light on well-known landmarks, uncovers hidden jewels, and explores the architectural soul of one of America's most complex cities. Visitors can get an in-depth view of the free-spirited, often experimental architecture of post–World War II Los Angeles, from its ambitious freeway network, sleek corporate towers, and whimsical coffee shops to popular shopping malls, refined steel-and-glass residences, and eclectic cultural institutions. For more information, visit nbm.org.

Frank Lloyd Wright's Samara: A Mid-Century Dream Home
Williamsport, Pennsylvania
January 14–March 29, 2014
This exhibit features original furniture, home décor, architectural fragments, video footage, and reproductions of archival documents and photographs including architectural drawings from Frank Lloyd Wright's Samara, located in West Lafayette, Indiana. The exhibit explores how Wright, with his clients, developed the creation of an affordable, middle-class home, and how the client continued to honor the architect's vision long after his death. At the Gallery at Pennsylvania College of Technology. For more information, visit pct.edu.

Lectures, Conferences, and Symposia

Design Lighting Tokyo 2014
Tokyo
January 15–17, 2014
Design Lighting Tokyo is a trade show that presents advanced lighting technologies and showcases prototype lighting and newly launched manufacturers. On display will be an exhibition curated and designed by architect Akihisa Hirata, whose firm was featured in ARCHITECTURAL RECORD's Design Vanguard issue

in December 2013. At the Tokyo International Exhibition Center. For more information, visit design-lighting.jp.

Shenzhen & Hong Kong Bi-City Biennale of Urbanism/Architecture
Shenzhen, China, and Hong Kong
Through February 28, 2014
The only biennale hosted by two cities, this program of exhibitions, lectures, and events stretches from the boomtown of Shenzhen to the former British colony of Hong Kong. In Shenzhen, two different teams of curators have assembled shows exploring the boundaries of the contemporary city from a historical perspective. Ole Bouman presents *Biennale at Risk*, reimagining China's industrial heritage at an abandoned glass factory, while, at a warehouse near the Shekou Ferry Terminal, Jeffrey Johnson and Li Xiangning examine urban borders. The Hong Kong portion is curated by Colin Fournier and addresses the theme "beyond the urban edge." For more information, visit szhkbiennale.org.

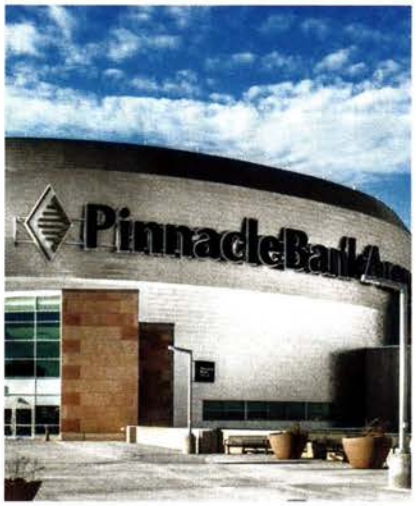
Architectural Ceramics in the 21st Century: Design and Preservation of Contemporary & Historic Architecture
Cambridge, Massachusetts
March 22–23, 2014
Held on the MIT campus, this symposium features more than 35 noted architects, engineers, and researchers who will give presentations on topics including the basic characteristics of terra-cotta, clay, and porcelain tiles. The conference will address the effect of materials on performance and durability, advances in ceramic materials, installation techniques for both new and preservation projects, and evaluation methods for the condition of architectural ceramics. For more information, visit architects.org.

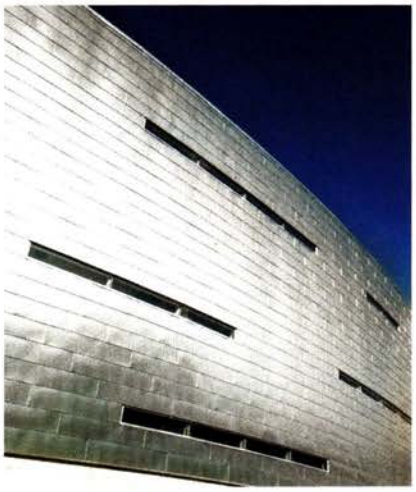
Competitions

Folly 2014
Submission deadline: January 7, 2014
Socrates Sculpture Park in Queens, New York, and the Architectural League welcome proposals for large-scale projects and installations that explore contemporary interpretations of the architectural folly. Especially popular among the Romantics of the 18th and 19th centuries, architectural follies are structures that often have no discernible purpose and are placed within a garden or landscape. A jury of architects, artists, and arts administrators will select a single project to be built on the grounds of Socrates Sculpture Park. For more information, visit archleague.org.

Daniel Urban Kiley Teaching Fellowship
Application deadline: January 15, 2014
The Daniel Urban Kiley Teaching Fellowship is awarded annually to an emerging designer whose work articulates the potential for landscape as a medium of design in the public realm. The Kiley Fellow will be appointed Lecturer in Landscape Architecture at the Harvard Graduate School of Design for the 2014–2015 academic year. While the Kiley Fellowship is awarded competitively on an annual basis, successful fellows are eligible to have their academic appointments renewed for a second year at the rank of lecturer, dependent upon review of their teaching, research, and creative practice. For more information, visit gsd.harvard.edu.

Ceramics of Italy Tile Competition 2014
Submission deadline: February 3, 2014
Ceramics of Italy and the Italian Trade Commission are searching for the most original and imaginative projects featuring Italian ceramic tile. Now in its 21st year, the contest is open to North America–based architects and designers who have used Italian ceramic tile in their residential, institutional, and commercial/hospitality projects completed in the past five





dates&events

years. Winners will take home a cash prize of $4,000 and receive a five-day trip to Italy. For more information, visit tilecompetition.com.

AIANY Design Awards 2014
Submission deadline: February 3, 2014
AIA New York's annual Design Awards Program recognizes outstanding architectural design by AIA New York Chapter members, New York City–based architects, and work in New York City by architects around the globe. The purpose of the awards program is to honor the architects, clients, and consultants who work together to achieve design excellence. For more information, visit aiany.org.

2014 Architectural League Prize: Overlay
Submission deadline: February 10, 2014
Young architects and designers are invited to submit work to the annual Architectural League Prize Competition. All projects, either theoretical or real, executed in any medium, are welcome. The jury will select work for presentation in lectures, digital media, and an exhibition opening in June 2014. Winners will be featured in a catalogue and receive a cash prize of $1,000. For more information, visit archleague.org.

perFORM 2014
Submission deadline: March 24, 2014
The perFORM 2014 house-design competition asks emerging architectural professionals (students and interns) to design a single-family house to be located in Seattle that showcases how high energy performance can complement high design. A panel of leading Pacific Northwest architects, educators, and builders will judge entries based on resourcefulness, applicability, and beauty. For more information, visit hammerandhand.com.

4th International Holcim Awards
Submission deadline: March 24, 2014
Since 2003, the Holcim Foundation for Sustainable Construction has recognized innovative projects and future-oriented concepts from architects and designers worldwide. The Holcim Awards is currently accepting submissions that envision a more sustainable and equitable built environment for all. Including students and young professionals as well as established firms like Skidmore, Owings & Merrill, the Holcim Awards attracts submissions from visionary practitioners and leaders around the world. For more information, visit holcimfoundation.org/awards.

E-mail information two months in advance to recordevents@mcgraw-hill.com.

Good Design Is Good Business

CALL FOR ENTRIES

The fee is US$150 per entry and $50 for each additional project. Download the official entry form at architecturalrecord.com/call4entries. E-mail questions to arcallforentries@mhfi.com. Please indicate **GDGB** as the subject of your e-mail.

SUBMISSION DEADLINE:
February 14, 2014

The editors of **ARCHITECTURAL RECORD** are currently accepting submissions for the **2014 ARCHITECTURAL RECORD GOOD DESIGN IS GOOD BUSINESS** awards program (formerly the BusinessWeek/Architectural Record Awards). Good design is a priority for leaders of business and industry looking to boost productivity, rebrand, and attract customers. The Good Design Is Good Business awards honor architects and clients who best utilize design to achieve such strategic objectives. Winners will be published in the June 2014 issue.

AVAILABLE THROUGH SPECIALTY DOORS

THE WORLD'S FINEST SLIDING DOOR HARDWARE
AS WELL AS ROLLING LIBRARY LADDERS

HAND CRAFTED IN GERMANY

MWE® Edelstahlmanufaktur GmbH

SPECIALTY DOORS 866-815-8151
WWW.BARNDOORHARDWARE.COM
WWW.MODERNSTAINLESSLADDERS.COM

SPECIALTY DOORS

CIRCLE 85

snapshot

PROJECT TESHIMA YOKOO HOUSE: TOWER
LOCATION TESHIMA, JAPAN
DESIGNERS TADANORI YOKOO AND YUKO NAGAYAMA

A COMBINATION museum and funeral hall, the Teshima Yokoo House is the latest addition to the collection of art venues being developed on islands in Japan's Seto Inland Sea under the aegis of the Fukutake Foundation. A collaboration between the 77-year-old artist Tadanori Yokoo and the 38-year-old architect Yuko Nagayama, the museum incorporates three historic wooden houses within Teshima's Ieura village, plus a vibrant garden created by the artist and a 46-foot-high brick tower designed by the architect. Rimmed with brilliant red rocks, a blue-tiled pond is the garden's defining feature, while postcards of the world's waterfalls belonging to the artist line the tower interior. Jet printed onto acrylic, the 9,000 cards reach the 33-foot-high ceiling but, thanks to a mirrored floor, seem to go on forever. *Naomi R. Pollock, AIA*

PHOTOGRAPHY: © DAICI ANO