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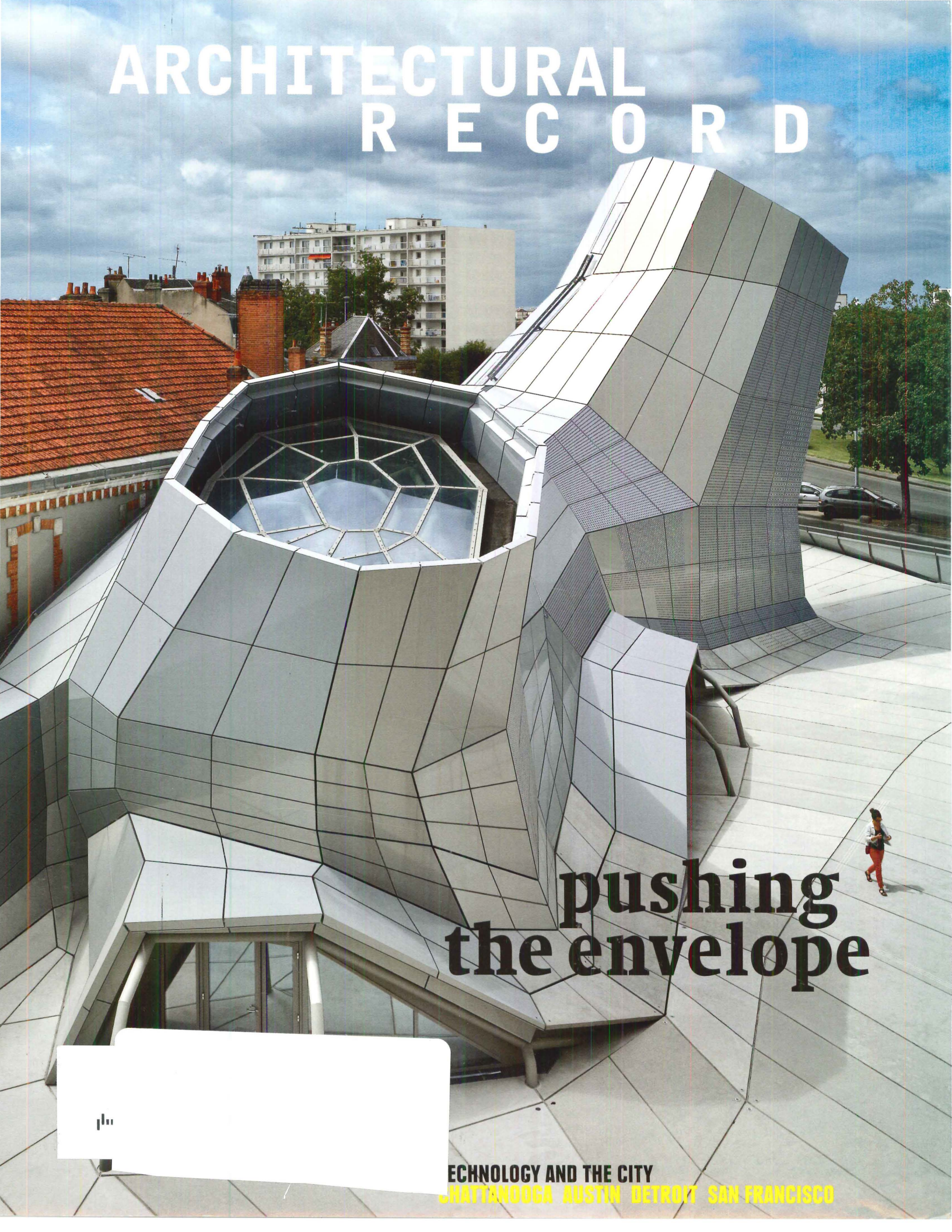

pushing the envelope

ECHNOLOGY AND THE CITY
CHATTANOOGA AUSTIN DETROIT SAN FRANCISCO

Project: Peninsula College, Maier Hall

Location: Port Angeles, WA

Architect: Schacht Aslani Architects

Product: Fireframes® Designer Series with Pilkington Pyrostop® glass

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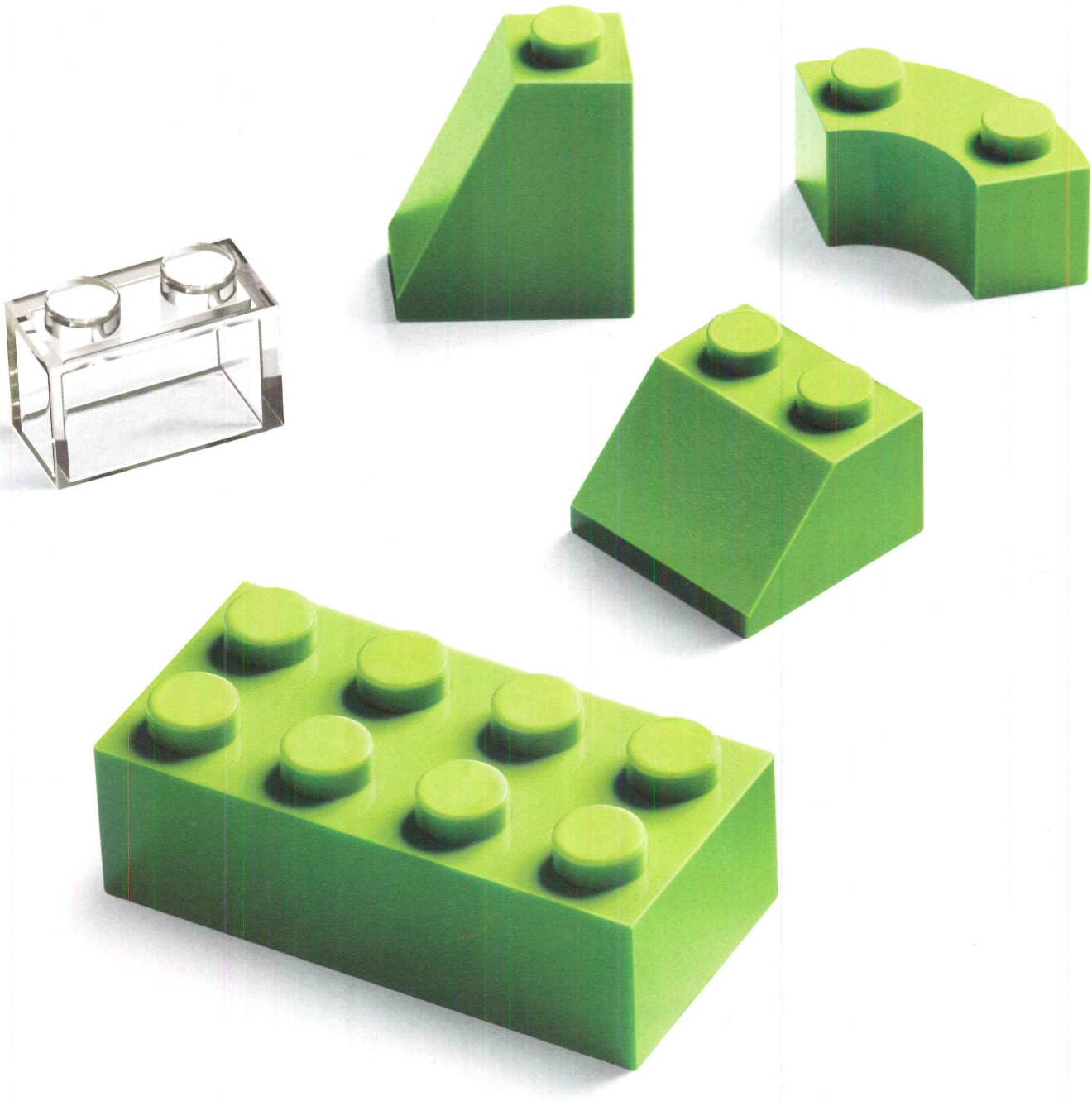

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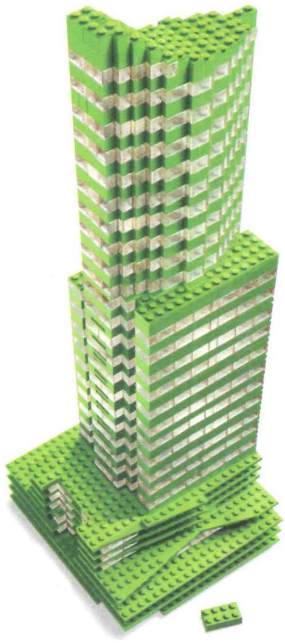

curtain wall

storefronts

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skylights

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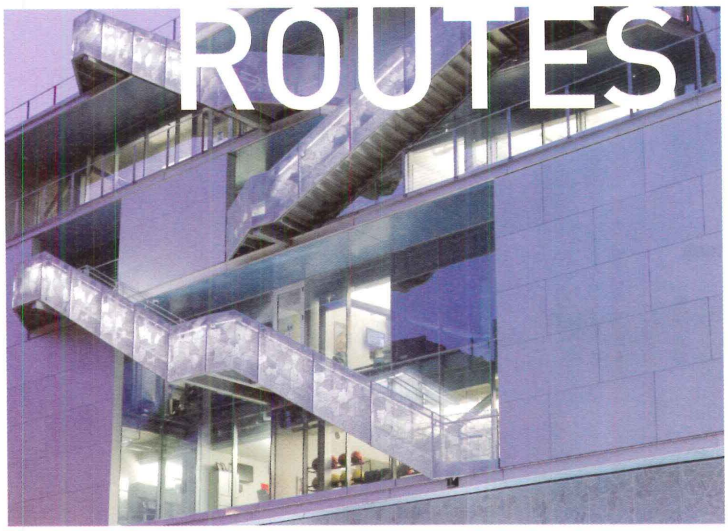
SLANT ROUTES



Columbia University's new field house, the **Campbell Sports Center** by **Steven Holl Architects**, is designed to be a team player with facilities that foster balance between the minds and bodies of student athletes in a range of sports. Inspired by the slanting lines of field-play diagrams, the building's design relies on point foundations and a lightweight steel structure to achieve its diverse program on a sloped site. The university's first new athletics building since the mid-1970s, Campbell forms a gateway to the revitalized Baker Athletics Complex, and a new game plan for sports at Columbia.

Architect: Steven Holl Architects
Structural Engineer: Robert Silman Associates
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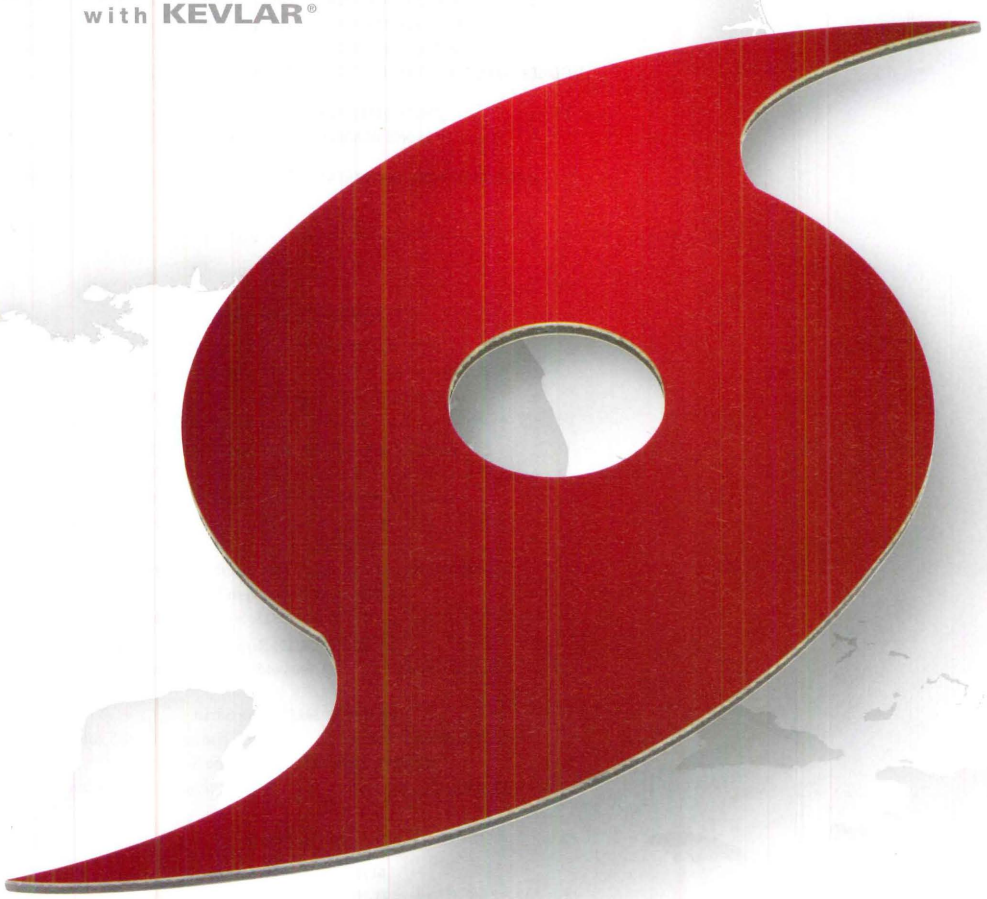

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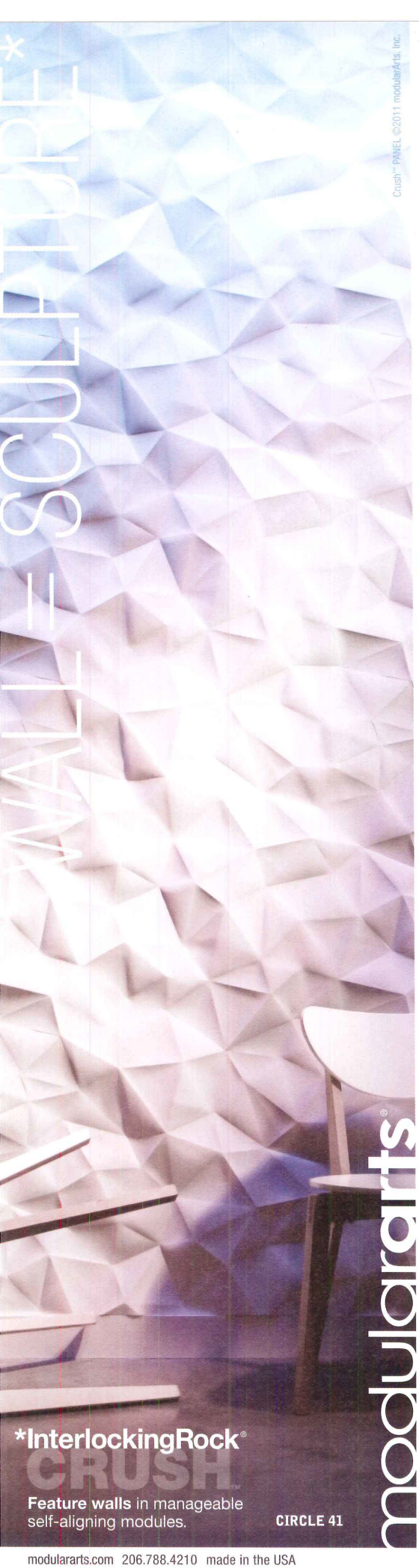

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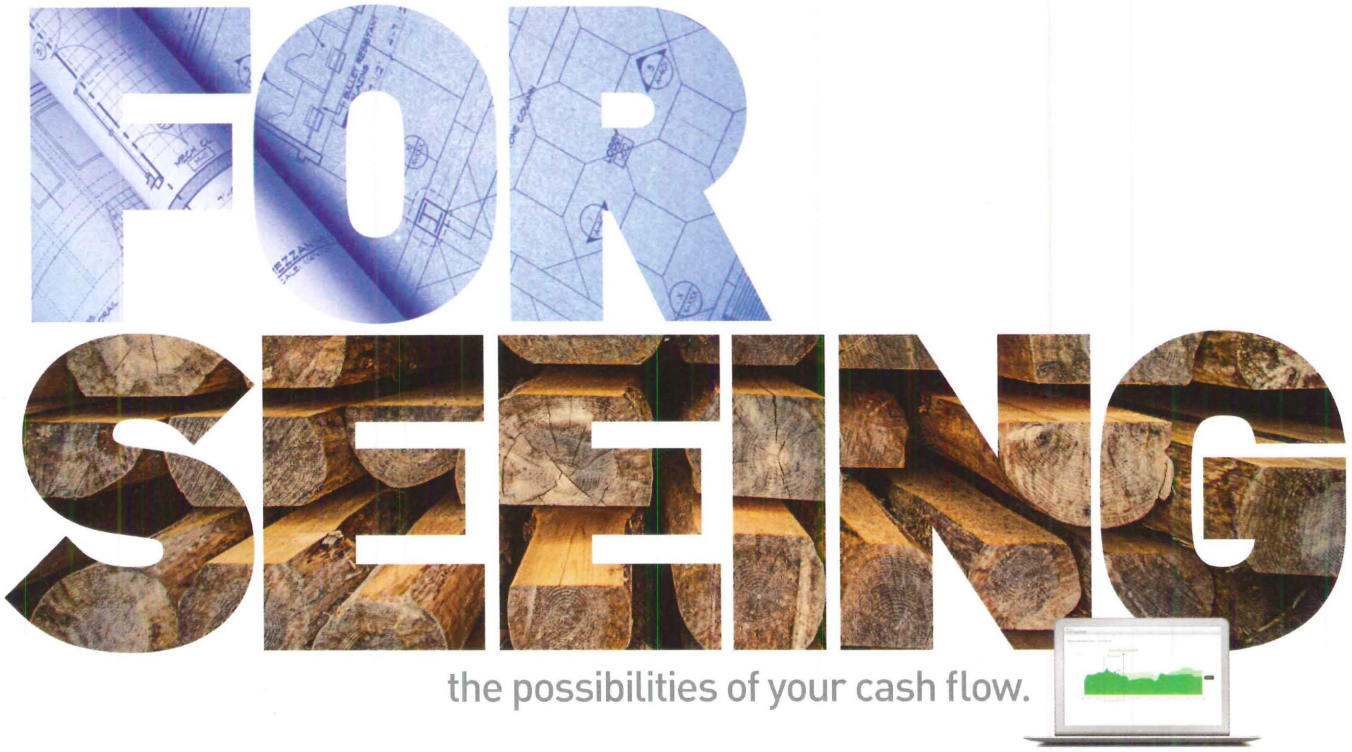

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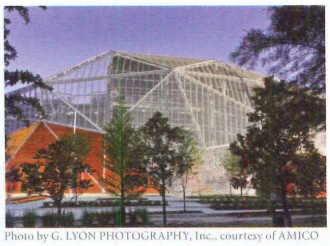

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Expanded Metal Mesh in Architecture

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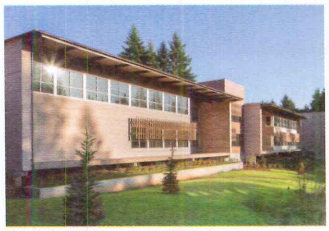

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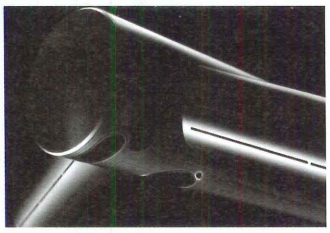

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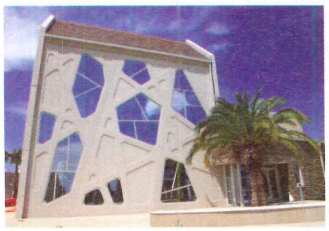

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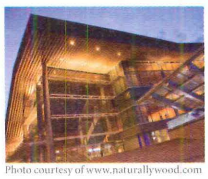

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CIRCLE 64

Change Agent

The end of an era in New York—and a new future for cities and technology.

TWO YEARS ago, RECORD published an award-winning issue devoted to the evolution of New York City in the decade since 9/11. We gave much of the credit for the city's newfound vibrancy to Mayor Michael Bloomberg, under whose administration exemplary urban design and architecture have flourished. The vast enhancement of the public realm—hundreds of acres of new parks, especially on the waterfronts; miles of bike lanes; pedestrian plazas; handsome new civic and cultural buildings—have created a dynamic and alluring urban environment for residents and tourists, while helping support the economic vitality needed for maintaining New York as a global capital.

Now Bloomberg is leaving office after 12 years, and his legacy is coming under sharp scrutiny (page 29). Some people complain the city is *too* cleaned up—they miss the gritty authenticity that used to taint Times Square or the Meatpacking District near Chelsea, where the hyper-popular High Line snakes, and where soaring real estate values have driven out wholesale butchers in favor of art galleries and chic restaurants. The industrial neighborhood of Williamsburg in Brooklyn, once home to cheap lofts and scruffy saloons, has been transformed by condo towers, though the quality of construction doesn't always match the high price tags for apartments.

Bloomberg's rezoning of nearly 40 percent of the city has helped fuel the boom in high-rise office and residential construction, radically altering once-sleepy neighborhoods. In the waning months of this real estate–friendly administration, developers are racing to secure approvals for projects, such as a sliver apartment building for Midtown Manhattan designed by the firm SHoP that will be 100 feet taller than the Empire State Building.

New York by its very nature is restless, and change is as much a part of the city's ambience as the rumbling of the subway underfoot. Nostalgia for the way things were, in Times Square or anywhere, isn't a New York state of mind.

But there's real concern about growing inequities. Though the mayor has pushed immigration reform—and has spoken about the importance of the service sector for the economy—he has presided over an era of widening income gaps, with crushing costs of living for many middle-class families, not to mention for aspiring artists, young professionals, and other workers who flock to the city. And the micro-apartments championed by the mayor—inhumanly small and likely to drive up per-square-foot rents—are not the answer to affordable housing.

At a recent forum about the future of the city, a prominent real estate developer suggested that if New Yorkers were priced out of living in Manhattan, they could always move to Brooklyn or Queens. Actually, people are getting priced out of Brooklyn too, but the real issue that his remark skirted is the need for diversity. Diversity—of races, ages, cultures, and socioeconomic groups—is what gives a great city its juice. Diversity means good mass transit and public schools and leads to a richer array of services and amenities. Diversity needs to be woven throughout the fabric of the city.

What Bloomberg has promoted is diversification of the city's economy. His legacy includes a plan to build up the technology industry with research and business development, in part by creating the new CornellNYC Tech campus. Its first building, designed by Morphosis, is set to break ground next year.

Other cities are using the tech hook to boost their economies as well. In this issue we look at the fortunes of three urban centers—Austin, Texas; Chattanooga; and Detroit (yes, Detroit)—to show how technology start-ups are not only attracting investment and young people but affecting local culture, design, and development (page 59). Old industrial buildings are rehabbed in these places and converted into business incubators, while coffeehouses, microbreweries, and locavore restaurants also thrive. Think Brooklyn-beyond-the-Hudson.

Can urban success become too successful? Austin, which was chosen to be a Google Fiber City (the tech giant will begin wiring neighborhoods for high-speed Internet starting in 2014), has a population that's growing by 120 people a day. The lure is not only the tech scene but also the worlds of music and film, and the university as well—and it's getting hard to find affordable places to live in the central city. In San Francisco too, the economic boom—as more tech companies seek the urbanity that's missing from Silicon Valley—is making some longtime city dwellers feel a kind of despair for the hippies now being replaced by hipsters (page 72).

Finding the balance between old funkiness and new luster is the challenge of cities. But we don't mean just style or ambience. We mean finding a way for cities to embrace the future while remaining truly democratic, open, and accessible to all. ■

Cathleen McGuigan

Cathleen McGuigan, Editor in Chief

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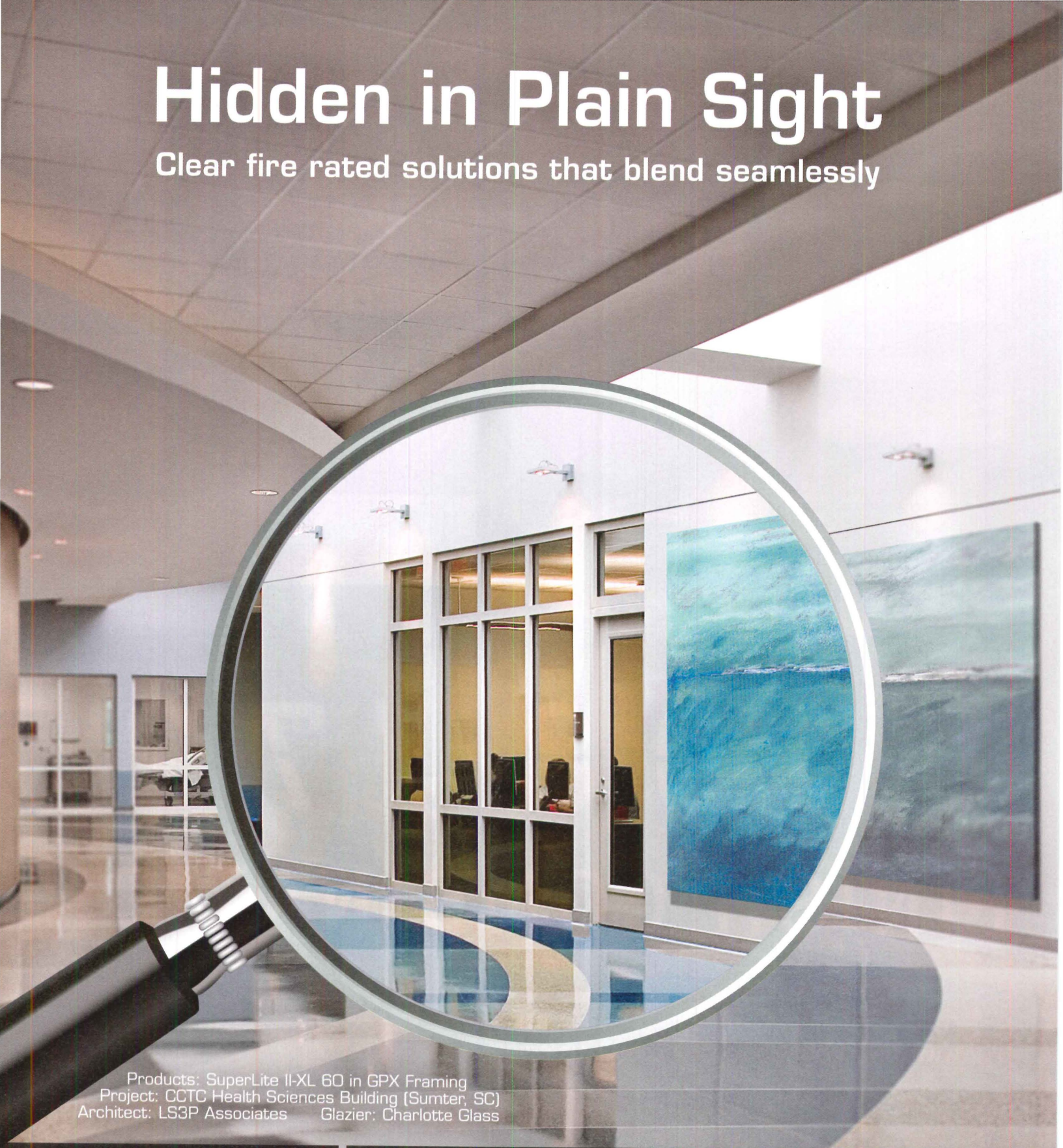

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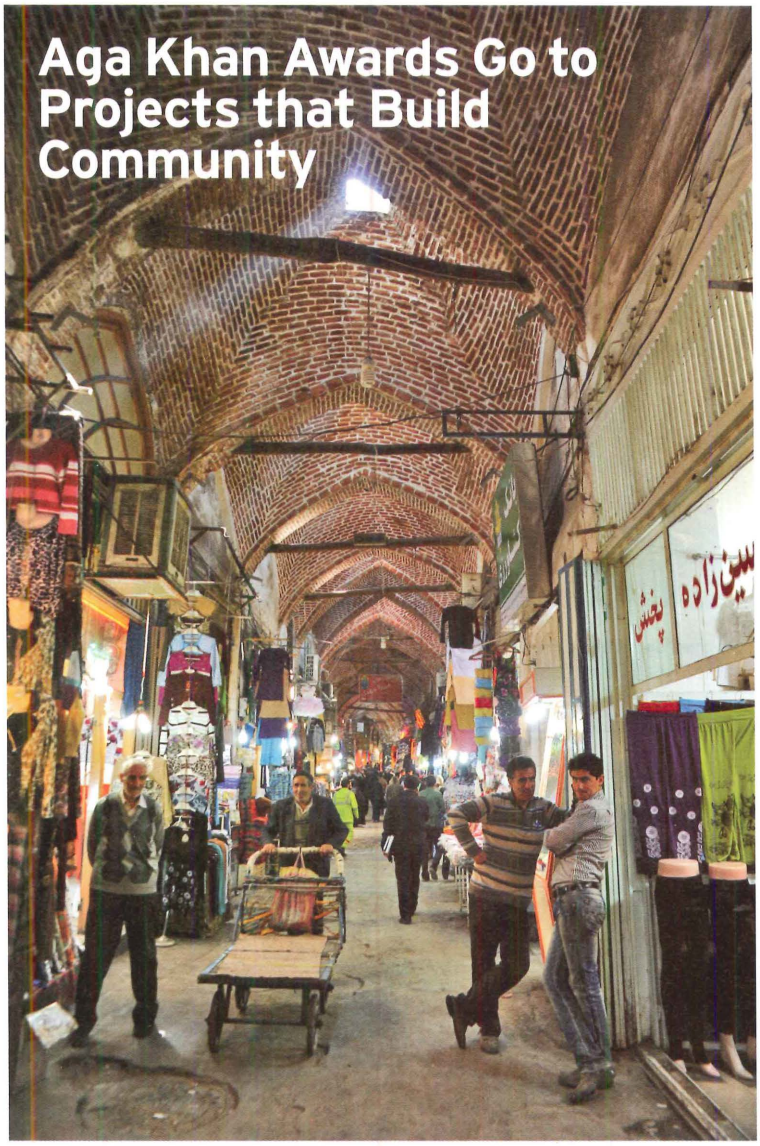
perspective

"It blocks everything," Rogers said—including the Lloyd's building, Rogers's London masterpiece. "It's got no light and shadows, no change. It's really 'Look at me.'" —*Richard Rogers on Rafael Viñoly's Walkie-Talkie, The New Yorker, August 26, 2013.*

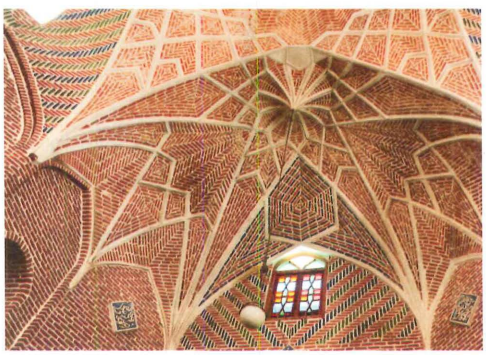
Aga Khan Awards Go to Projects that Build Community



A bazaar in Tabriz, Iran, that originated in the 10th century includes 3.5 miles of covered marketplace. It has been undergoing a long-term renovation (above and inset, below).

BY CATHLEEN MCGUIGAN

UNLIKE MOST big design prizes, the Aga Khan Award for Architecture, since its inception in 1977, has always focused more on projects than on the architects who build them. Given every three years as recognition of design excellence in the Muslim world, the awards don't distinguish among building types or scale—historic restoration, new construction, or urban design are all eligible. Of course, high-profile projects by famous architects have grabbed top honors in years past, such as the Petronas Towers in Kuala Lumpur by Pelli Clark Pelli Architects,



the Institut du Monde Arab in Paris by Jean Nouvel, and the Bibliotheca Alexandrina, Egypt by Snøhetta Hamza Consortium.

But the award's greatest significance has been in spotlighting projects of social consequence by little-known designers, such as a primary school in Burkina Faso by Diébédo Francis Kéré or another school in Bangladesh by Anna Heringer and Eike Roswag, that have gone on to become models for activist architects.

With the latest round of awards, presented at a ceremony in Lisbon last month, social

A Public Plaza Near an Ando Gem

Freecell's proposal for a new public space (below) will be a playful contrast to Tadao Ando's neighboring Pulitzer Foundation for the Arts (bottom).

Brooklyn-based Freecell Architecture has snagged first place in an invited design-build competition to reimagine a disused lot across from the Tadao Ando–designed home of the Pulitzer Foundation for the Arts, St. Louis. The Pulitzer Foundation and the Sam Fox School of Design & Visual Arts at Washington University in St. Louis, cosponsors of the competition, aim to reinvigorate the downtown Grand Center cultural district with a place for public programming. The firm's winning proposal for the site is Lots, a temporary space comprising a raised platform and tentlike, adjustable fabric funnels that extend upward and downward from the structure's frame. The project's short and direct name refers to the abundance of activities and large crowds the pavilion will host, Freecell said in a release. The firm will receive $50,000 for construction and an honorarium of $10,000. Lots is slated to open in summer 2014. *Asad Syrkett*

concerns were paramount. Community impact was a central theme of all five winning projects: the Salam Center for Cardiac Surgery in Khartoum, Sudan; the revitalization of the historic center of Birzeit, Palestine; the Rabat-Salé Urban Infrastructure Project in Morocco; the rehabilitation of the bazaar in Tabriz, Iran; and the Islamic cemetery in Altach, Austria. While the Tabriz bazaar is a major historic landmark—originating in the 10th century, it contains 3.5 miles of covered markets—the jury zeroed in on the key role played by its tradesmen tenants in the success of its restoration. In the village of Birzeit, what caught the jury's attention was not just rebuilding an historic core, but the process that created local jobs and training.

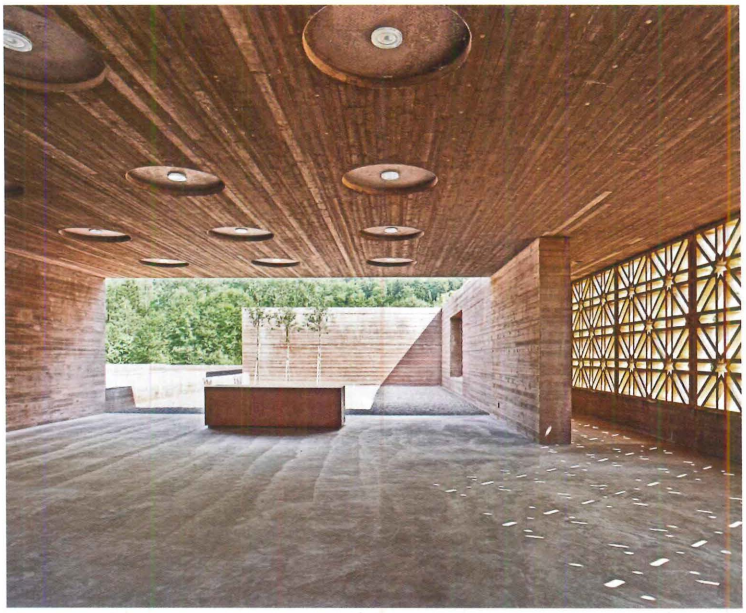
The best contemporary architecture among the winners is the Austrian cemetery, designed by Bernardo Bader Architects, with its rosy concrete walls, serene spaces, and beautiful siting. But its larger importance is how it reflects the changing community of Muslim immigrants, many of whom now wish for burial in their adopted homeland rather than following a tradition of returning remains to their country of origin.

This year's Master Jury, which included the architects David Adjaye, Toshiko Mori, and Wang Shu, shortlisted 20 projects out of more than 400 submissions. Technical experts visited each of those projects and reported back to the jury. The jury's deliberations were described, somewhat jokingly, as "serious debate on the verge of a fist fight."

One project that reportedly divided the jury was the bridge between Rabat and Salé in Morocco. A plainly utilitarian piece of infrastructure whose impact lies in uniting a poor city with a wealthy one, the bridge incorporates roadways for cars, bikes, pedestrians, and a tram, with a landscape scheme at one end and potential public space beneath.

"This year, more than ever, we were dealing holistically," explained Adjaye, "looking not just at design but at the commitment to the built environment and the public realm."

The jury's selections surprised some who serve on the advisory steering committee for the awards, including Glenn Lowry, director



Designed by Bernardo Bader Architects, a new cemetery serves Muslim immigrants in Altach, Austria. Many now want to be buried in their adopted homeland.

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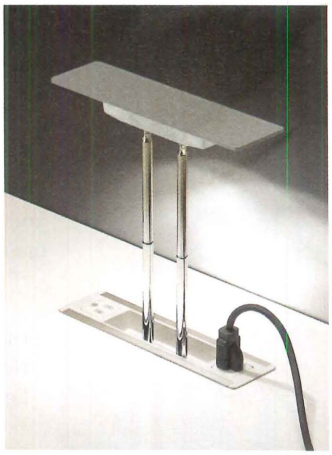

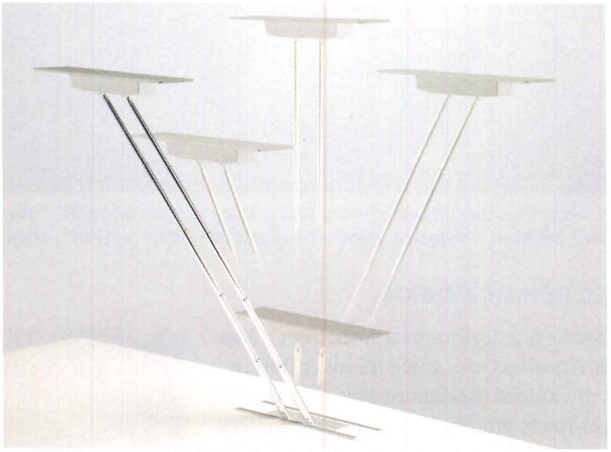

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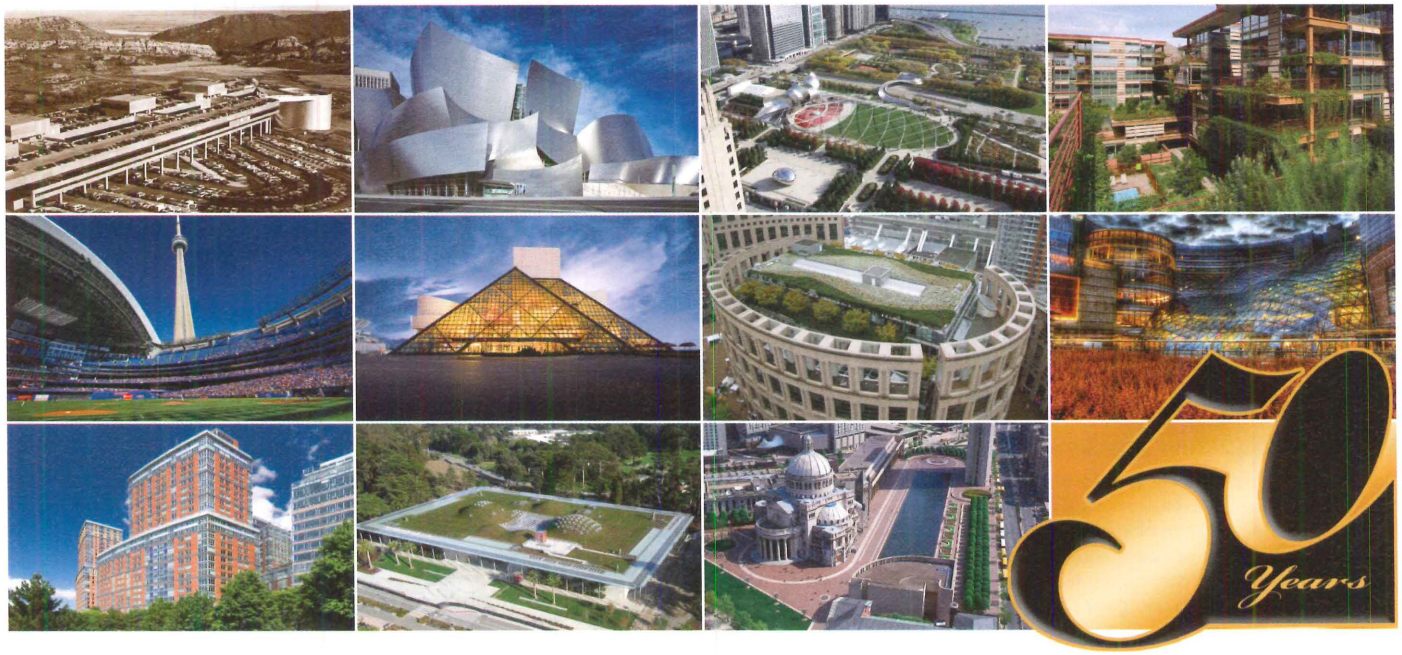
The Hassan II Bridge, designed by Marc Mimran Architecture, unites two cities (above). The decaying core of a Palestinian village was restored (shown before, above center, and after, above right).

of the Museum of Modern Art in New York. "The jury had a strong agenda," he said, "but that's okay." Another member, Mohsen Mostafavi, dean of the Graduate School of Design at Harvard, said, "Personally, I was surprised not to see more 'architecture as architecture.'"

The honored projects share prize money totaling $1 million, allocated among the stakeholders behind each one—NGOs, local governments, community groups—and not necessarily the architects.

At the awards ceremony, held just after dusk in a courtyard of the medieval Castle São Jorge, with its spectacular views over Lisbon, the Aga Khan, 76, spoke about the prize's beginnings. "The Award was designed not only to honor exceptional achievement but also to pose fundamental questions," he said, including the query, How can Islamic architecture address "the needs and aspirations of rapidly changing societies?" Behind the glamorous celebration that evening was the reality of the conflicts and poverty that roil many of those societies, raising problems that the honored projects try to address—which makes the Aga Khan Award its own kind of bridge, from a world of good fortune to one of deep needs. ■



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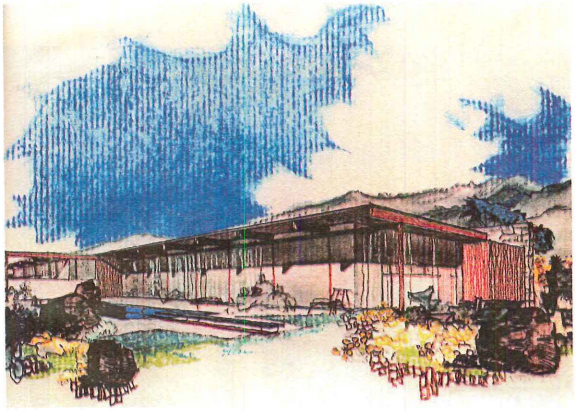
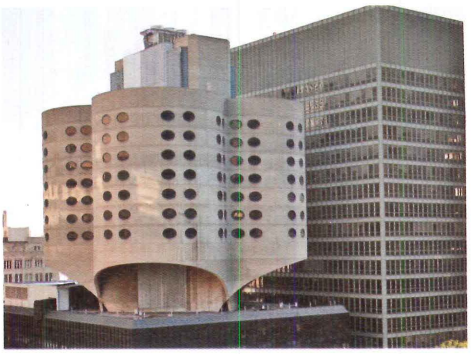
CIRCLE 78

Design Returns to NYC's Big Screens

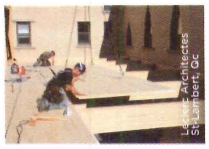
THE FIFTH Architecture and Design Film Festival returns to Tribeca Cinemas in New York City from October 16–20 (**RECORD** is a festival sponsor). Festival director Kyle Bergman says that this year, the 25 short and feature-length films focus on urbanism, exploring population growth, planning, and of course architecture, from Moscow to Cape Cod. Highlights include *The Human Scale*, about the work of city planner Jan Gehl, directed by Danish filmmaker Andreas Dalsgaard, and *The Vision of Paolo Soleri: Prophet in the Desert*, directed by Lisa Scafuro. For the complete list of films and a schedule, visit adfilmfest.com. ■

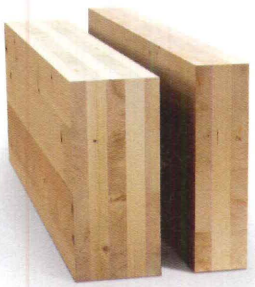


The Oyler House: Richard Neutra's Desert Retreat (left) tells the story of the life-changing commission. Haunting creations (above) are the focus of *Bending Sticks: The Sculpture of Patrick Dougherty. The Human Scale* (below).



The Latin Skyscraper (left) explores the connection between the Barolo Palace of Buenos Aires and Dante's *Divine Comedy*. *The Absent Column* (above) focuses on Bertrand Goldberg's Prentice Women's Hospital, asking questions about preservation and demolition.





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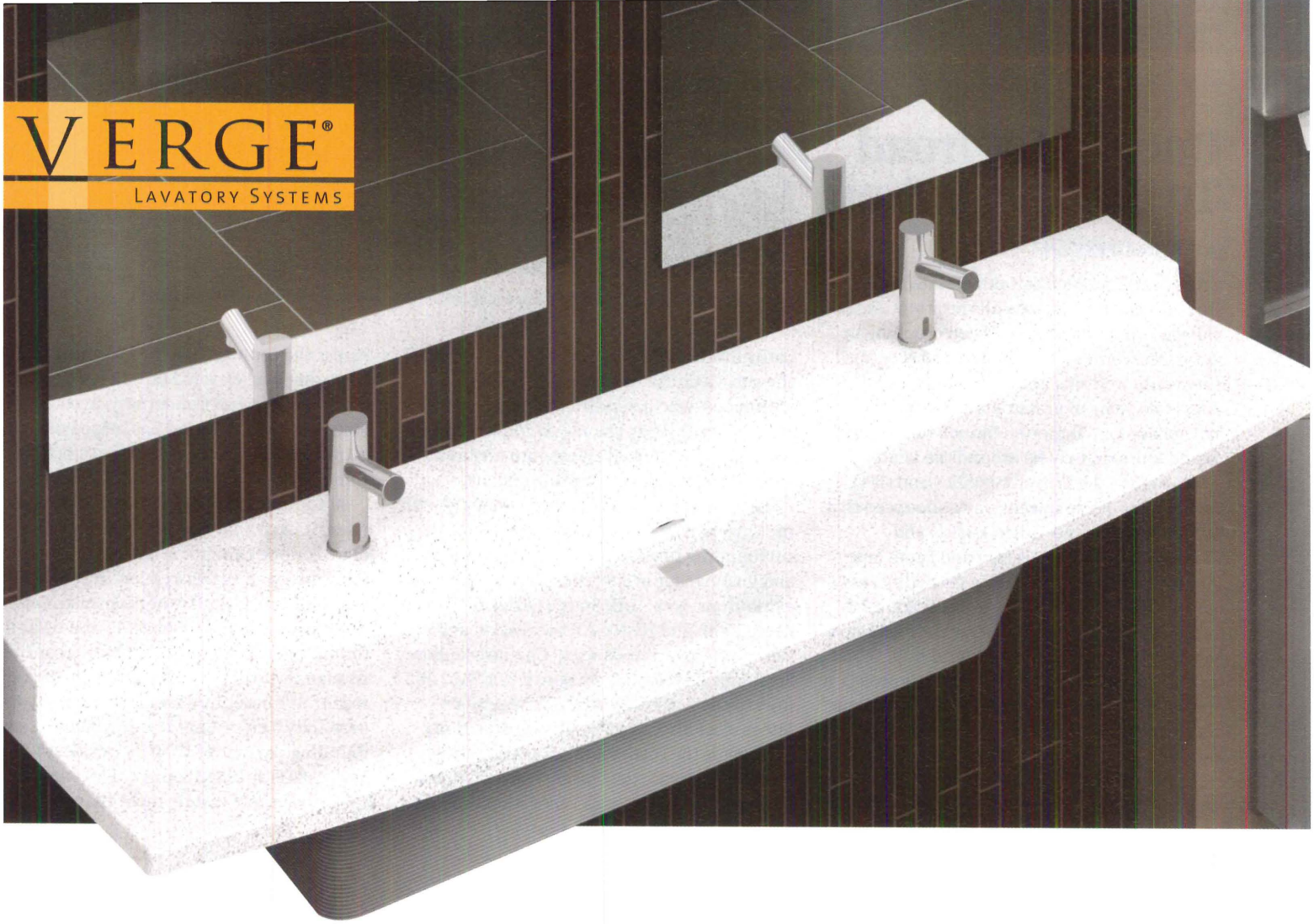

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Queens Railroad To Become a Trail

BY ANNA FIXSEN

A rendering of the QueensWay, as it might look in the Forest Hills section of Queens, New York.

THE HIGH Line, Manhattan's elevated rail line-turned-catwalk, gets all the attention, but rails-to-trails projects have been cropping up across the country for decades, and New York City could welcome another soon in Queens. After two years of grassroots organizing, a new phase for a forgotten branch of the Long Island Railroad may lie around the bend.

In August, the Trust for Public Land (TPL) and Friends of the QueensWay announced that WXY Architecture + Urban Design and DLANDSTUDIO Architecture and Landscape Architecture will spearhead a feasibility study for the development of the QueensWay, a 3.5-mile segment of track to be transformed into a landscaped greenway and cultural hub. "This may be the most unique rails-to-trails project in the country," says Marc Matsil, New York State director for TPL. "It offers a lot of topographic diversity."

Passing through six communities, the QueensWay would provide pedestrian and bike paths for the 250,000 residents who surround the site. Over the next 10 months, the architects—who are calling their team WXY + DLAND—will study the site to convert the warped, weed-choked tracks into a vibrant space for public programming and art.

The architects hope to engage quickly with the QueensWay, taking advantage of the surrounding mature trees, glacial moraine, and viaducts for events such as pop-up exhibitions. New York State's Office of Parks, Recreation, and Historic Preservation and New York Governor Andrew Cuomo's Regional Economic Development Council put $467,000 toward the feasibility study in December. The project also received private donations.

It seems the road not taken is increasingly the place to tread; the QueensWay will join a growing number of track-renovation projects across the country, like the Bloomingdale Trail, a 2.7-mile-long elevated rail line in Chicago, another TPL project under way. According to Matsil, the organization has helped redevelop 42 railroads: with the High Line's popularity, these trails are becoming more desirable.

But proponents of the QueensWay want to make it clear that this is not just another High Line. For one thing, it is more than twice as long and has a variegated landscape. Unlike the snails'-pace shuffle of pedestrians along the High Line, the QueensWay will be a trail for biking, running, and hiking. According to its planners, these trails represent more than a trend. "It's becoming almost a necessity for every city," says Claire Weisz, principal and founding partner of WXY. "Considering New York City is as big as four or five cities, we could definitely handle more than one." ■

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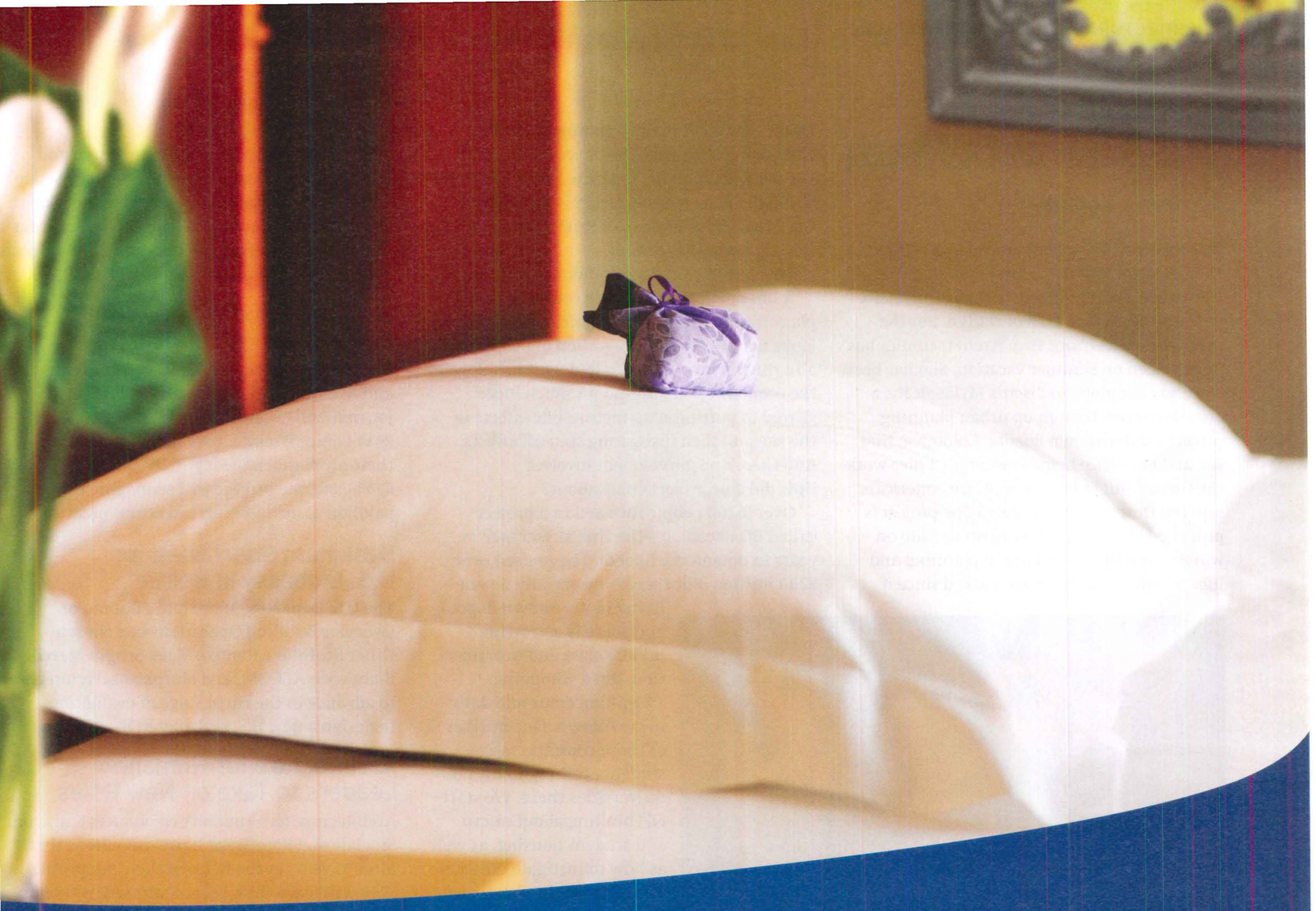

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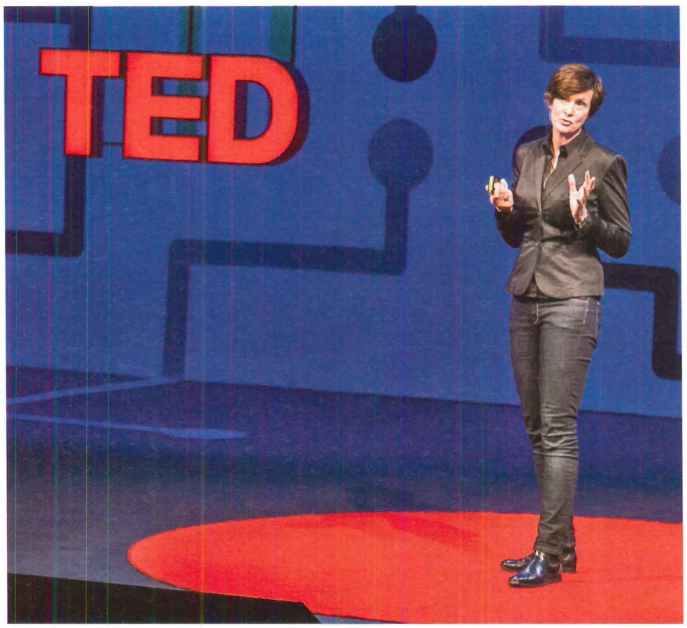
[NEWSMAKER]

Winka Dubbeldam

BY LAURA RASKIN

THE START of the school year marks Winka Dubbeldam's first fall semester as chair of the Department of Architecture at the University of Pennsylvania's School of Design. But the principal of New York firm Archi-tectonics has hardly been on summer vacation. She has been traveling the globe to discuss MyIdealCity, a crowd-sourced, bottom-up urban planning project for downtown Bogotá, Colombia, that she and her office helped develop. ("I love working there. I might be a closet Latin American," says the Dutch-born architect.) The project is propelled by an English-Spanish website on which more than 3,000 urban planning and lifestyle questions have been asked since it launched this spring. Dubbeldam and her team are drawing trends from the answers and feeding the information into an ongoing set of proposals for the city. The project and research was the subject of an exhibition at Architecture Forum Aedes in Berlin this summer. RECORD spoke to Dubbeldam about MyIdealCity's innovations.



Dubbeldam presenting *MyIdealCity* at the TEDGlobal conference in Edinburgh.

How did you get involved?

Rodrigo Nino [president of real estate marketing company Prodigy Network and the creator of MyIdealCity] asked the most perfect question I ever got from a client, which was: "Would you like to be the lead architect for a bottom-up proposal for downtown Bogotá? Put a team together, organize exhibits and academic events and TED talks, and run the whole thing." For me it really combined what I've been doing academically for years and what I've been doing in my practice. I was more than thrilled. I put a team together with urbanist Gary Hack [former dean of Penn's School of Design] and James Corner.

How is it different from top-down planning?

A top-down plan typically comes from city planning and the mayor. A bottom-up plan looks not only at the integration of people, but also the intrinsic qualities in downtown Bogotá, the economy, politics. And it's much more geared to putting acupuncture-like effects in the site and then instigating spin-off effects. And there's no government involved.

How did this project come about?

Over 3,200 people invested in a project called BD Bacatá. It's the first skyscraper in years in downtown Bogotá. They raised over $200 million. But there is essentially no one living in downtown Bogotá, and there is a growing middle class and urbanization. But a whopping 1.7 million commute daily to downtown. One million of those commuters are students coming to over 33 universities there. We started thinking about micro and student housing, as well as how to instigate creation of supermarkets, laundries, Internet cafés, post offices. This would reduce traffic and pollution. One of our initiatives is working with local artists to create a new arts district.

Is the city government involved?

No. They are doing things, though. They just launched a plan by OMA for their government buildings. It's very top-down [laughs]. I really love Rem so if anyone can do that, he can. But it was hilarious. Talk about top-down!

The $200 million was raised for BD Bacatá?

Yes, and essentially they raised too much. And they realized that just plopping a tower into the downtown wasn't the way to go. You need to talk to the people, get them behind it, to get the whole area going. So I thought it was extremely enlightened for my clients to understand and focus on that.

Did the excess money raised go into funding MyIdealCity?

Yes, to give back the investment to the people and to downtown. We hope that it informs the next step. ■

noted

Firm Named for New Sandy Hook School

Svigals + Partners was chosen to design and engineer a new Sandy Hook Elementary School in Newtown, Connecticut. Voters will decide this month whether or not to demolish the current school building where 20 children and 6 educator were shot to death on December 14, 2012.

Curators Chosen for U.S. Pavilion at Venice Biennale

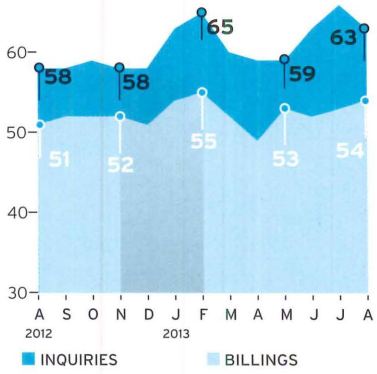
Curators from New York's Storefront for Art and Architecture and Boston-based PRAXIS Journal will organize the U.S. pavilion at the 2014 Venice Architecture Biennale. Calling their proposal *Entitled OfficeUS: Criticism by Re-making*, the project will reimagine the pavilion as an active architectural practice.

Designers Shortlisted for U.S. Embassy in Beirut

The U.S. Department of State's Bureau of Overseas Building Operations has chosen Diller Scofidio + Renfro, Mack Scogin Merrill Elam with AECOM, and Morphosis Architects to advance to the third stage of evaluations to design a new U.S. embassy in Beirut.

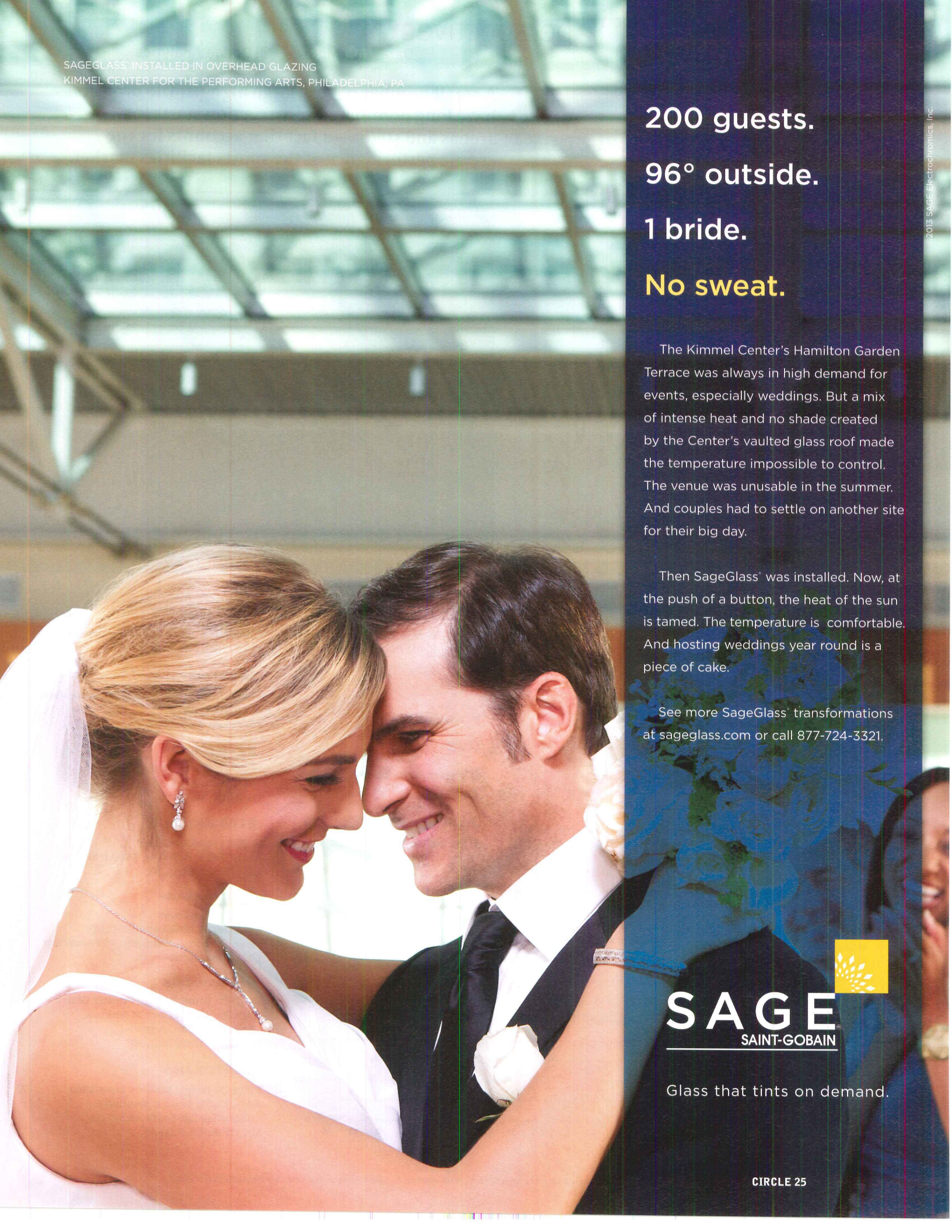
Architecture for Humanity Leaders to Take on New Roles

Architecture for Humanity cofounders Cameron Sinclair and Kate Stohr have announced that, after 15 years at the helm of their nonprofit, they will leave their roles. Stohr will return to her career in television and web production; Sinclair will help launch a fund to support the growth of Architecture for Humanity.



Design Professions in Recovery

The Architecture Billings Index (ABI) continues to show that design activity is growing nationally, with an August score of 53.8, up from a mark of 52.7 in July. The sector breakdown was: mixed practice (60.1), commercial/industrial (54.8), multifamily residential (52.1), institutional (50.8). The project inquiries index was 63.



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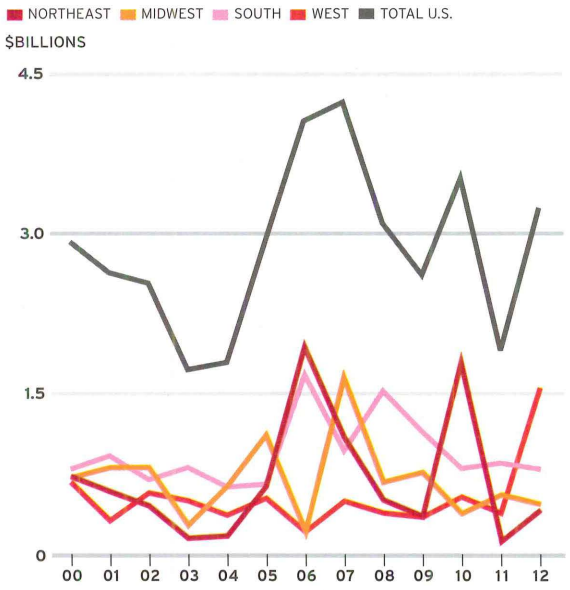
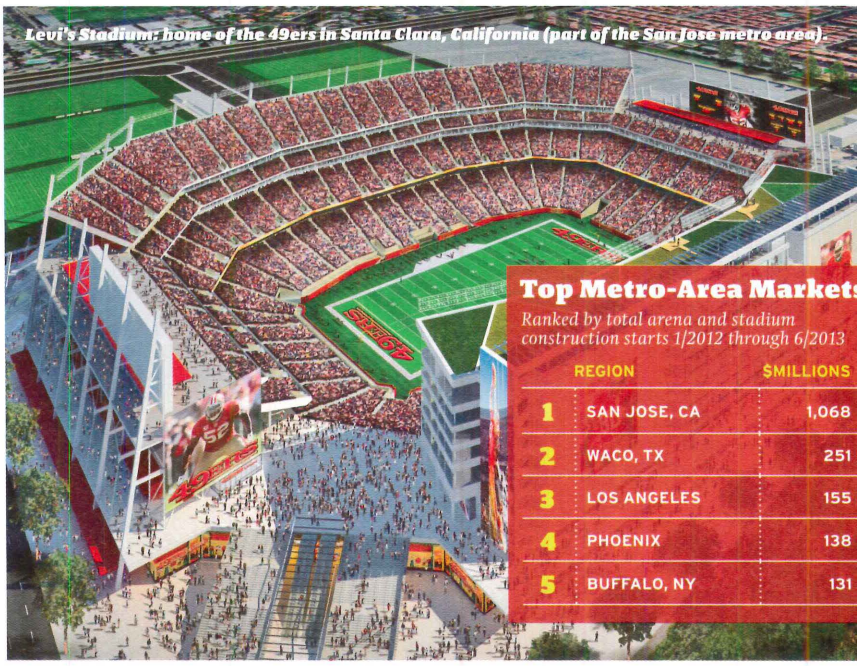
A small number of very large high-profile projects have long dominated construction starts for arenas and stadia – a fact that accounts for the erratic performance of the sports facilities market.

Arena and Stadium Starts by Region
In addition to U.S. total

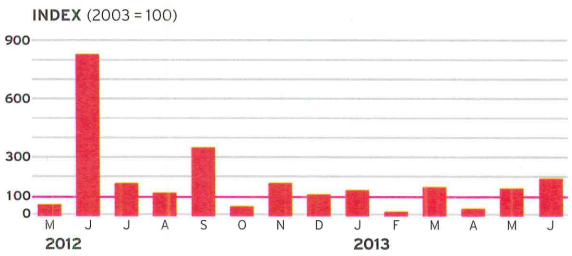




Top Metro-Area Markets
Ranked by total arena and stadium construction starts 1/2012 through 6/2013

	REGION	$MILLIONS
1	SAN JOSE, CA	1,068
2	WACO, TX	251
3	LOS ANGELES	155
4	PHOENIX	138
5	BUFFALO, NY	131

The Dodge Index for Arena and Stadium Construction
5/2012–6/2013



The index is based on data for U.S. arena and stadium construction starts that have not been seasonally adjusted. The average dollar value of projects in 2003 serves as the index baseline.

Top Design Firms
Ranked by stadium and arena construction starts, 1/2011 through 7/2013

1. HNTB
2. Populous
3. HKS
4. D'Agostino Izzo Quirk Architects
5. Browning Day Mullins Dierdorf Architects

Top Projects
Ranked by stadium and arena construction starts, 1/2012 through 6/2013

$1 BILLION
PROJECT: Levi's Stadium: home of the 49ers
ARCHITECT: HNTB
LOCATION: Santa Clara, CA

$250 MILLION
PROJECT: Baylor Stadium
ARCHITECT: Populous
LOCATION: Waco, TX

$130 MILLION
PROJECT: HARBORcenter
ARCHITECTS: Populous, GSB Architects
LOCATION: Buffalo, NY

$100 MILLION
PROJECT: PPL Center
ARCHITECTS: Sink Combs Dethlefs, Elkus Manfredi Architects, USA Architects
LOCATION: Allentown, PA

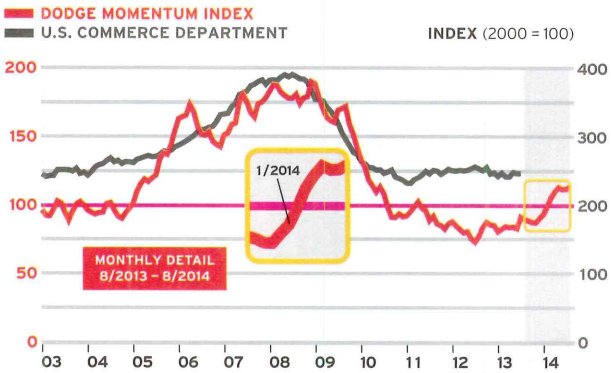
$100 MILLION
PROJECT: Denny Sanford Premier Center
ARCHITECTS: Sink Combs Dethlefs, Koch Hazard Architects
LOCATION: Sioux Falls, SD

$100 MILLION
PROJECT: Dodger Stadium Renovation
ARCHITECTS: Levin & Associates, D'Agostino Izzo Quirk Architects
LOCATION: Los Angeles

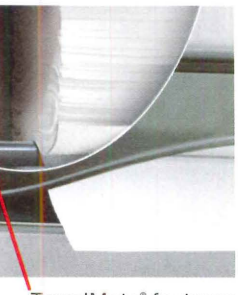
MOMENTUM INDEX GAINS GROUND

In August, the Momentum Index advanced 1.4% to 114.2, resuming the steady gains reported in the first five months of 2013. The index is up 27% versus the same period last year.

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 to 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.



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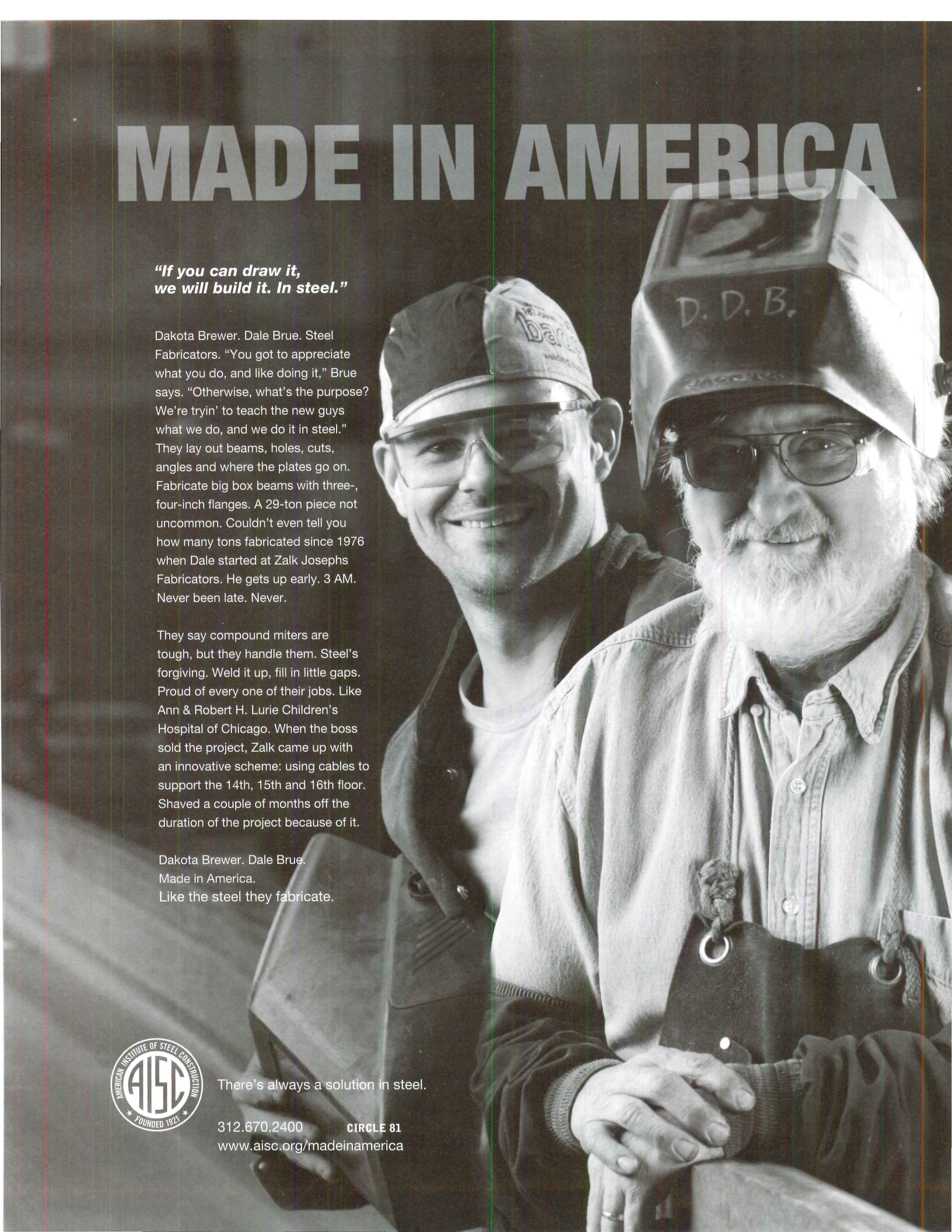

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The Legacy of Mayor Mike

After 12 years of astonishing change in New York, Bloomberg earns mixed marks.

BY FRED A. BERNSTEIN

ON A STEAMY afternoon in early August, a who's who of New York architects crowded into a conference room to hear city officials answer questions about Seaport City, a proposed mixed-use development meant to protect Lower Manhattan from flooding. The scope of the project is astounding—adding acres of landfill behind a vast new levee, it could eventually be larger than Battery Park City—but interested firms were given just three weeks to form teams to conduct feasibility studies. The tight deadline was partly a concession to Mother Nature, with rising waters a constant threat to low-lying sections of the city, and partly to Father Bloomberg, the sometimes paternalistic mayor who will leave office and, with it, his ability to reshape the city, in three months.

"Next year could be a huge shock to the system, depending on who is elected," said Kirsten Sibilia, a principal of Dattner Architects, a Manhattan firm that has completed a number of civic projects during the Bloomberg era, including, in partnership with Grimshaw, the highly praised Via Verde housing complex in the Bronx. During his 12 years in office, the mayor and his team of hard-driving commissioners have added 800 acres of parkland, created 450 miles of bike lanes, and rezoned nearly 40 percent of the city. Some 40,000 new buildings have risen and 750,000 trees have been planted. Among the Bloomberg-backed triumphs are the High Line and Brooklyn Bridge Park, the Barclays Center also in Brooklyn, and the 9/11 memorial (which was in limbo until Bloomberg became head of the National September 11 Memorial & Museum in 2006).

- **800 new acres of parkland**
- **450 miles of bike lanes created**

But each of the projects has a downside. The High Line will terminate at the new Hudson Yards development, which looks to be a planning catastrophe, its public spaces afterthoughts among the over-scaled, over-slick towers. Brooklyn Bridge Park, like many other new green spaces, needs significant private funding for maintenance: new condo and hotel buildings along the park's perimeter are intended to provide it. And the Barclays Center rose without the middle-income housing its developer had promised would cover the Atlantic Yards, still an appalling gash of train tracks in an otherwise rebounding borough. The widespread rezoning has allowed for successes, like Hunters Point South in Queens, but also disasters, like the phalanx of 40-story apartment buildings that will deprive Greenpoint, in Brooklyn, of its views and afternoon light.

There were astonishing oversights during the Bloomberg years. One was ignoring the underground hellhole known as Pennsylvania Station, a major portal that is not only unsightly but also unsafe. The current effort to move Madison Square Garden, in order to expand the station now confined to the arena's basement, was spurred by *The New York Times*'s critic Michael Kimmelman and taken up by the City Council. Bloomberg's statements have been equivocal. "Fundamentally, I would like to leave businesses alone," Bloomberg said when asked about the permit that allows the Garden to remain in place. There was also zero movement on another urgent need—efficient transportation from the city's airports to its population centers.

The mayor's wish to "leave businesses alone" may have sped the closing of St. Vincent's Hospital in Manhattan, now being converted into condos. Meanwhile, the potential demise of Long Island College Hospital in Brooklyn so concerned Bill de Blasio, the Democratic candidate for mayor, that he was arrested at a protest in July. The condo-ization of the city was a constant theme and complaint in the Bloomberg era as income disparities were reflected in housing costs' soaring ever skyward.

But Bloomberg's vision did extend to public projects. He backed the Lakeside Center, a recreation complex by Tod Williams and Billie Tsien in Brooklyn's Prospect Park (scheduled to open in December) and the Cornell/Technion campus to be built on Roosevelt Island, with groundbreaking for the first building, by Morphosis, promised for 2014. Bloomberg also raised the quality of quotidian public buildings, with police stations, firehouses, EMS call centers, and branch libraries benefiting from a Design and Construction Excellence Program that more than lived up to its name. And, according to architects with inside knowledge

Nearly seven miles of Manhattan streets are closed to vehicular traffic for Summer Streets events.

- **Nearly 40 percent of the city has been rezoned**
- **40,000 new buildings have risen**

of city government, he got the Planning, Buildings, Transportation, and Parks departments talking to each other—a big change from what had been a balkanized bureaucracy. According to Andrew Winters, director of capital projects and planning for the Cornell/Technion campus, Bloomberg showed a "fearlessness" in taking on complex building and infrastructure problems.

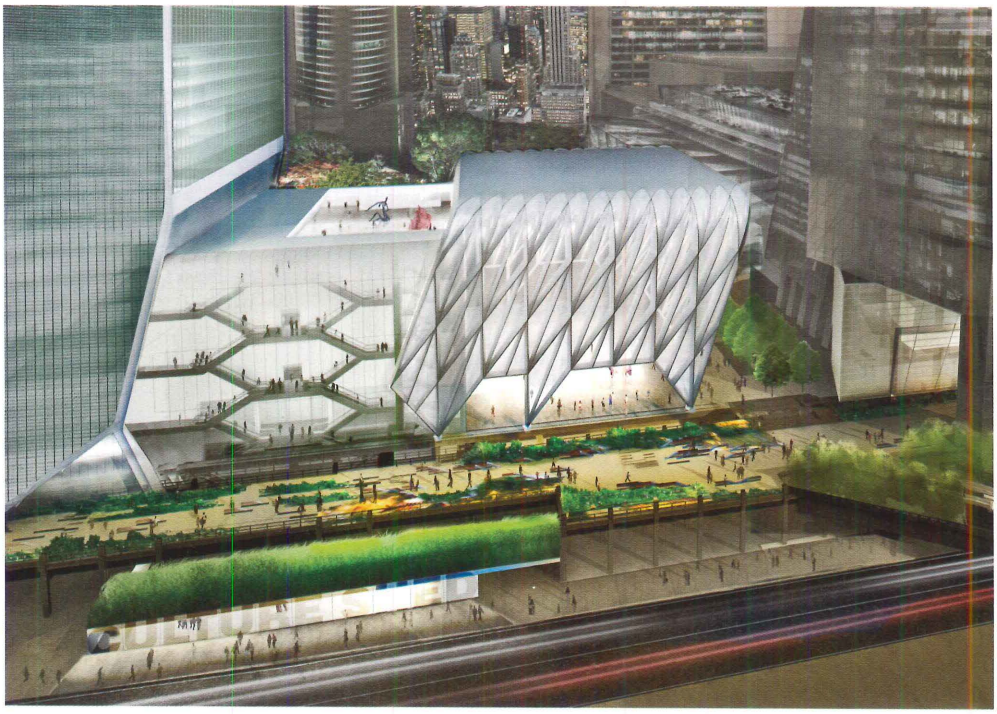
Yet, despite the fearlessness, a surprising number of initiatives were left—mercifully, in some cases—to the last minute. Among them is the proposed rezoning of the neighborhood around Grand Central Station, which seems more of a giveaway to developers than a solution to an existing problem at a time when the World Trade Center, Hudson Yards, and—possibly—Seaport City would provide millions of square feet of offices.

Other plans that came so late in the mayor's tenure that they face an uncertain fate:

- The completion of a waterfront development in Staten Island, including the world's largest Ferris wheel and a mall with skyline views; the mall would be one of a notable number of New York City waterfront projects by the politically connected SHoP Architects.
- The construction of an immense ice skating center with nine rinks and a 5,000-seat arena in the Bronx's Knightsbridge Armory.
- A micro-units initiative, meant to provide affordable apartments. The first building, by nARCHITECTS, appears to be on track.
- The permanent paving of Times Square's pedestrian-only zones, following a plan by Snøhetta.

And there are the dozens of proposals in the mayor's resiliency report, a response to last year's superstorm Sandy that supplements PlaNYC 2030, an extensive 2007 proposal for greening the city as its population increases. They include surge barriers for Coney Island and echelons of sand dunes for the Rockaways. Perversely, it might have been better if Sandy had hit earlier in Bloomberg's tenure, giving him more time to develop protections. Now it is up to his successors to try to implement his multibillion-dollar plan.

With Bloomberg out of office, there's no telling which proposals will bear fruit. But the number of architects who gathered for the Seaport City meeting was a hopeful sign. Thanks to 12 years in which city government built often and well, many architects are involved in civic projects that they once might have shunned. As Claire Weisz, principal of WXY, says, "Bloomberg's legacy of getting things to happen in the shared public realm is a substantial one." That legacy is, in fact, more substantial than any one building. ■



A rendering of Seaport City in Lower Manhattan (top left). The Culture Shed (above), a 170,000-square-foot arts institution planned for Hudson Yards on Manhattan's West Side, was designed by Diller Scofidio + Renfro in collaboration with Rockwell Group. Bloomberg's latest capital budget appropriated $50 million for the new arts building.

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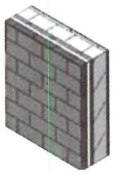

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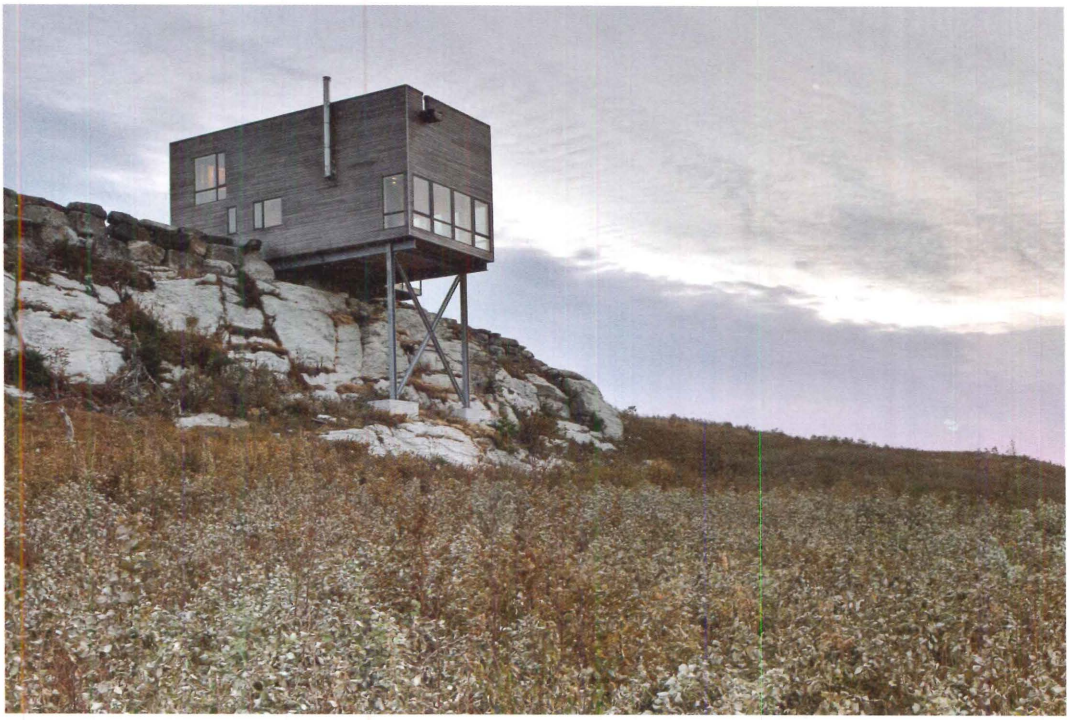
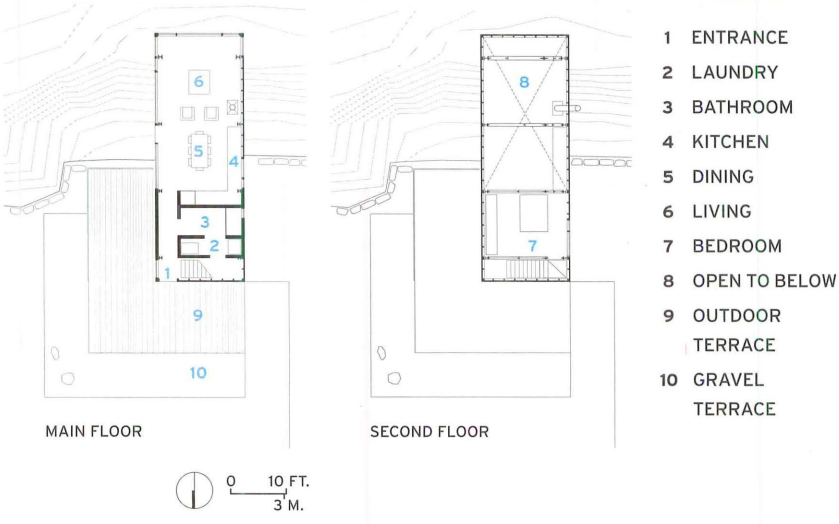
perspective **house of the month**

ON A ROCKY OUTCROPPING ALONG NOVA SCOTIA'S SCENIC ATLANTIC COAST, MACKAY-LYONS SWEETAPPLE ARCHITECTS CREATES A HOUSE INSPIRED BY THE LOCAL VERNACULAR. **BY ASAD SYRKETT**





1 ENTRANCE
2 LAUNDRY
3 BATHROOM
4 KITCHEN
5 DINING
6 LIVING
7 BEDROOM
8 OPEN TO BELOW
9 OUTDOOR TERRACE
10 GRAVEL TERRACE

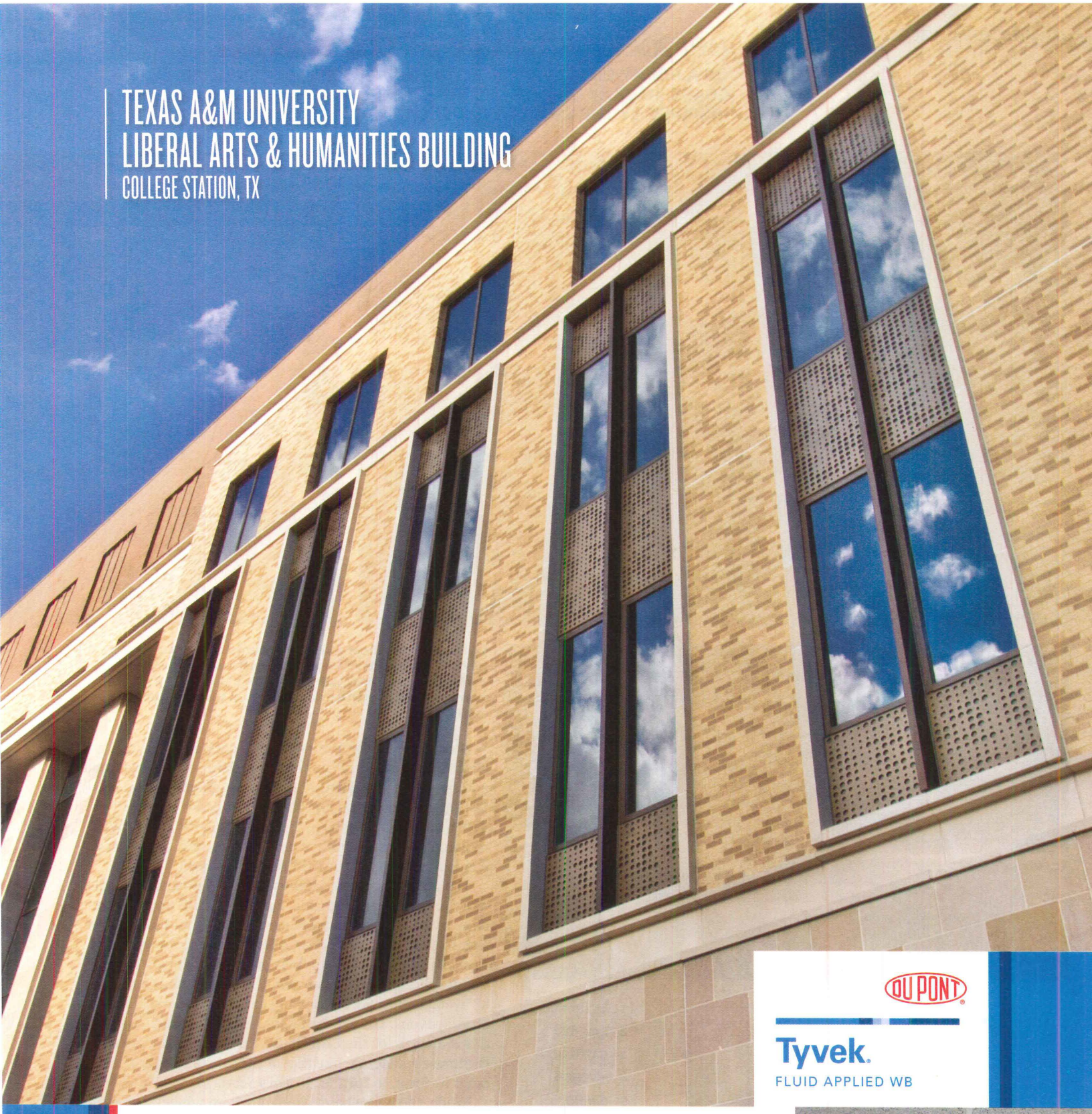
Visitors to the Cliff House approach an unfenestrated facade (bottom), punctuated by a single doorway. Inside, a bathroom and laundry off the entrance make way for an open kitchen, dining room, and living area (above right). Windows on the sides and front of the house capture ocean views (top left).

"ON THE first day on the project, we decided to fly it off a cliff," says Brian MacKay-Lyons, describing the simple wood and steel–frame residence his firm designed. The two-story, 970-square-foot house juts out from its perch on a bluff overlooking Nova Scotia's windswept Atlantic coast. "We thought, 'we can be boring and build on land, or we can do it this way.'" And so the Cliff House was born.

The owners, a young family that shuttles between a primary residence in California and their native Nova Scotia, didn't want their summer house to upstage its dramatic site. To that end, Halifax-based MacKay-Lyons Sweetapple Architects (MLS) hewed to their practice's principles, choosing simple materials: an envelope of cedar acts as a kind of "wood lampshade," wrapping a steel frame, explains MacKay-Lyons. The area's ubiquitous fishing shacks served as inspiration for the Cliff House, and the architect expects the house's cladding, like that of the cabins from which it takes its form, to "pickle" in Nova Scotia's briny air.

Inside, the house has a pared-down, rough-hewn aesthetic that showcases its wood-and-steel construction. This simplicity, says MacKay-Lyons, minimizes distractions, highlighting views of the ocean and coastline just beyond large windows at the front of the house. Open-plan communal spaces on the first level, and a second-level bedroom that overlooks the living room and has views out to the sea, create a sense that the house is "hung from the ocean horizon," says MacKay-Lyons. "When you're in the house, you should feel mostly a sense of refuge." ■

View additional images at architecturalrecord.com.



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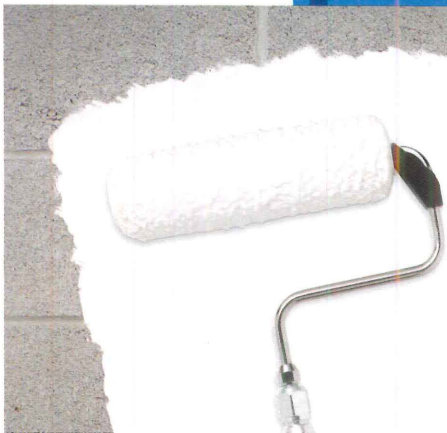

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CIRCLE 59

Cor-Ten and Carrara

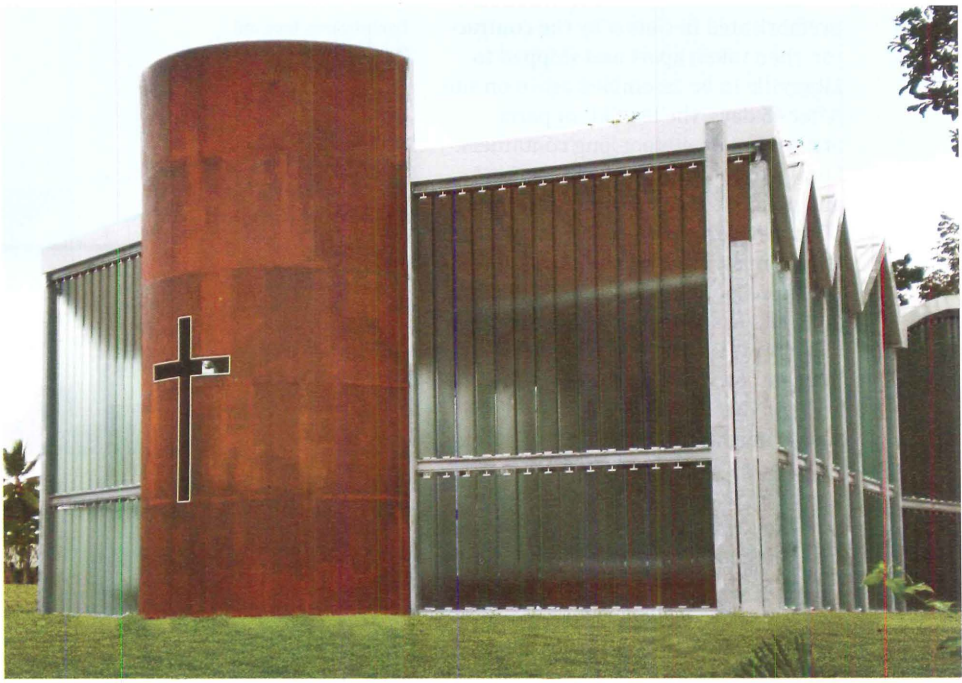
Italian architects FATmaison design a private chapel in Gabon using an unusual mix of materials

BY SUZANNE STEPHENS

SEVERAL YEARS ago, Italian architects Diego Quadrelli and Silvia Terrenghi of FATmaison received an unusual commission after going on a holiday to Gabon, the oil-rich West African country with a population of 1.6 million. Acquaintances introduced the two to Dr. Marcel Eloi Chambrier-Rahandi, a former prime minister of this country (which won its independence from the French in 1960). Later, when his wife, Roselyne Ossengue Chambrier, died, he decided to build a chapel and tomb for her on wooded property near their home in Libreville, Gabon's capital. The client was enamored of Italian architecture and its traditional use of Carrara marble. The architects, whose office is in Monza, Italy, near Milan, had a modern design in mind and favored Cor-Ten steel cladding with channel glass. So they came up with a scheme that combines both traditional and modern materials and typologies. Known as the Revival Sunset Chapel, the 1,780-square-foot structure, whose symmetrical plan resembles a priest's vestment, has a curved Cor-Ten apse embracing the altar on the west, where Carrara marble dominates the interior. Black marble covers the floor of the dark rectangular tomb on the east, also enclosed in Cor-Ten. In the middle, the chapel's steel frame rises to a series of narrow gables crossing the nave. While the serrated roofline vaguely recalls an early modern factory, Quadrelli notes this motif recurs in Gabon's decorative objects.

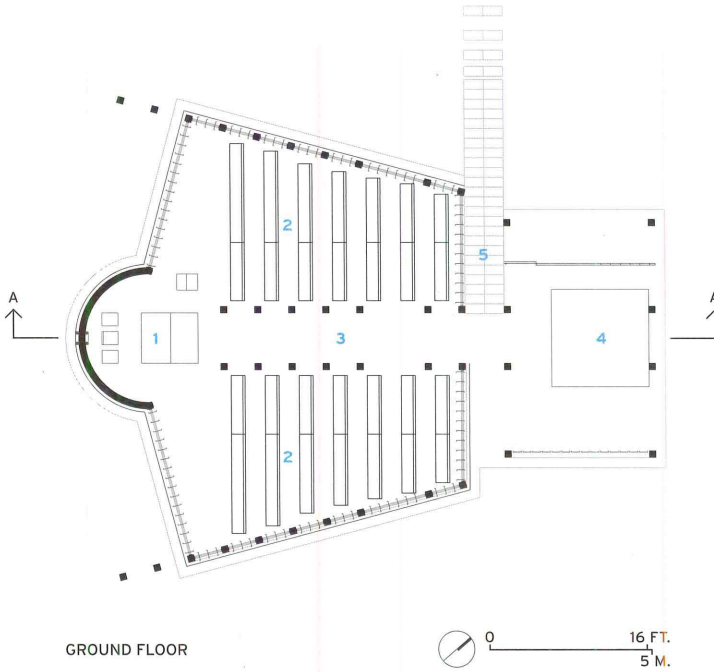
The sanctuary, which seats 200, is not air-conditioned. Rather, the architects hung channel glass from the structural frame so that breezes flow through generous gaps. The louvers in turn pivot to increase ventilation while still sheltering those inside from Libreville's frequent rains.

Owing to the complexity of constructing the chapel, the architect and client decided to have the $350,000 building



The architects designed a private memorial chapel in Libreville, Gabon, using a mix of modern and traditional materials and forms. The apse, enclosed in Cor-Ten steel (above) and incised with a cross, is finished inside with Carrara marble and pine (left top). Channel glass walls and a serrated roofline (left) strike a distinctly contemporary note.

View additional images at architecturalrecord.com.



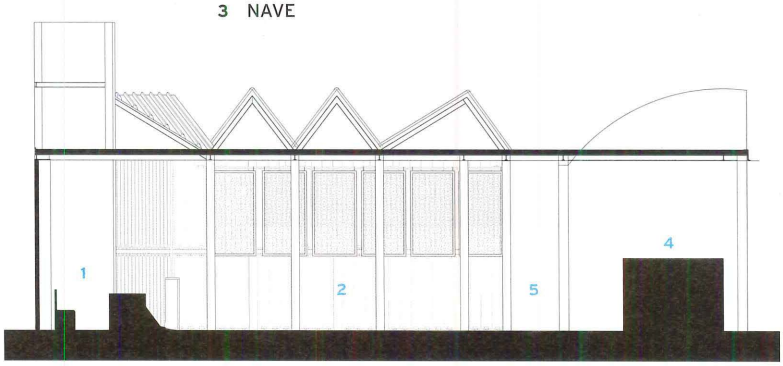
prefabricated in Genoa by the contractor, then taken apart and shipped to Libreville to be assembled again on site. After 45 days, the lean kit of parts arrived in two 40-foot-long containers. Local workers had prepared the land and poured the foundations, and a team of Italian workers were able to put the structure together in less than a month.

The Catholic chapel opened March 1, 2013, the first anniversary of the death of Madame Chambrier. "It was so important to have it ready on time," says Quadrelli. Certain aspects of the design heighten the experience of the memorial. For example, the architects carved a cross out of the apse wall so that the rays of the setting sun illuminate the marble floor with the shape of a crucifix and send light to the tomb, which most of the time is bathed in a crepuscular gloom. It is "a symbol of rebirth after death," says Quadrelli.

The name of the firm, FATmaison, has its own significance. Formed from the acronym of the firm's motto (in English), "Feel Architecture of Tomorrow," and fused with the French noun for "house," the architects wished to capture their globally oriented and free-thinking spirit: "We are young and want to work all over the world," Quadrelli says of the largely residential practice formed in 2008. As seen in the design of the chapel, the two bring all the multivalent sensibility of their name to their mission. ■

Congregants face the pulpit (above) where a steel frame defines the interior spaces and supports a series of narrow gables traversing the nave. The mausoleum at the rear of the chapel is enclosed in Cor-Ten (below). When it rains, water runs off the back of the tomb in a channel centered between two higher portions of a gently sloped roof.

1 ALTAR
2 PEWS
3 NAVE
4 TOMB
5 ENTRANCE



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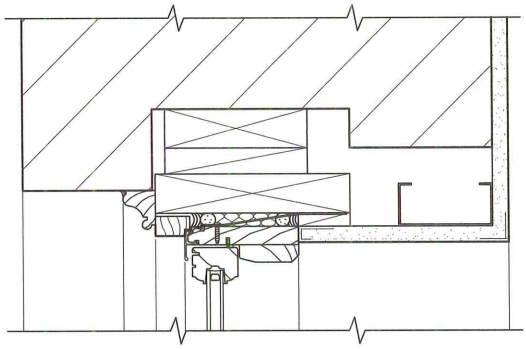

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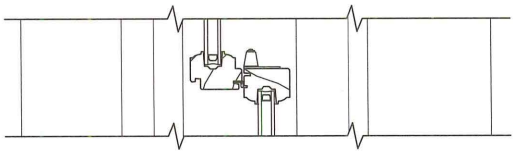
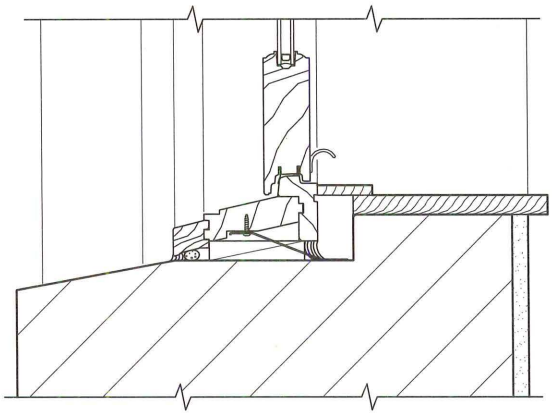
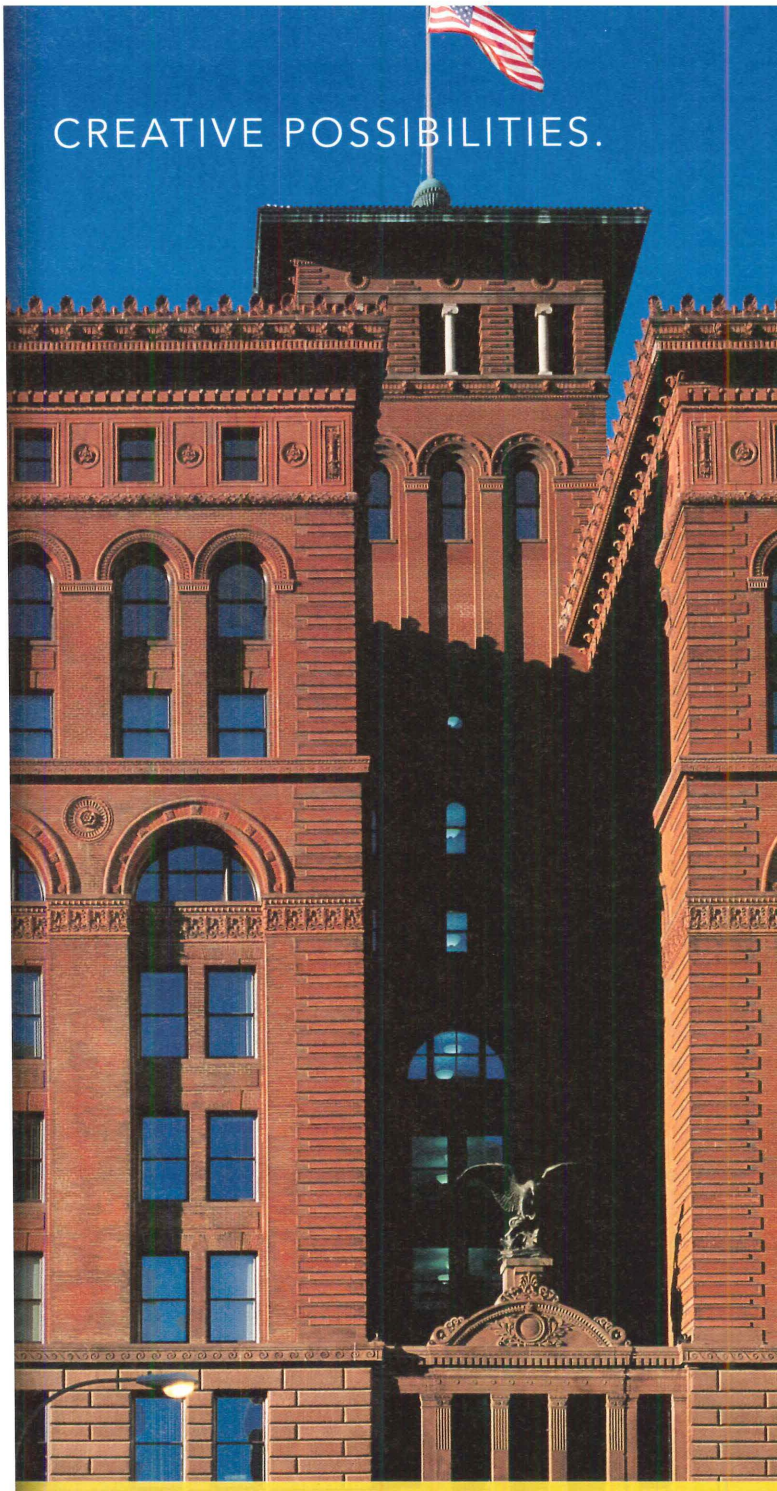


CHECKRAIL



SILL

CREATIVE POSSIBILITIES.



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CIRCLE 33

The Price of Monumentality

The Gateway Arch: A Biography, *by Tracy Campbell. Yale University Press, 2013, 232 pages, $26.*

Reviewed by Jayne Merkel

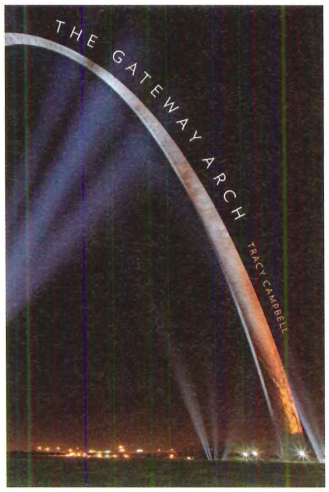
THIS SMALL, minimally illustrated black-and-white book is a curious tribute to Eero Saarinen's soaring monument in St. Louis. It is part of a series called Icons of America, joining the *Statue of Liberty, Joe DiMaggio, Wall Street, Alger Hiss, The Hamburger,* and others. The Gateway Arch has been back in the news since Michael Van Valkenburgh Associates won a competition in 2010 to redesign the area around it. That firm's scheme, intended to rejuvenate both the park and the adjacent downtown, will submerge and plant over the highway that separates the two areas.

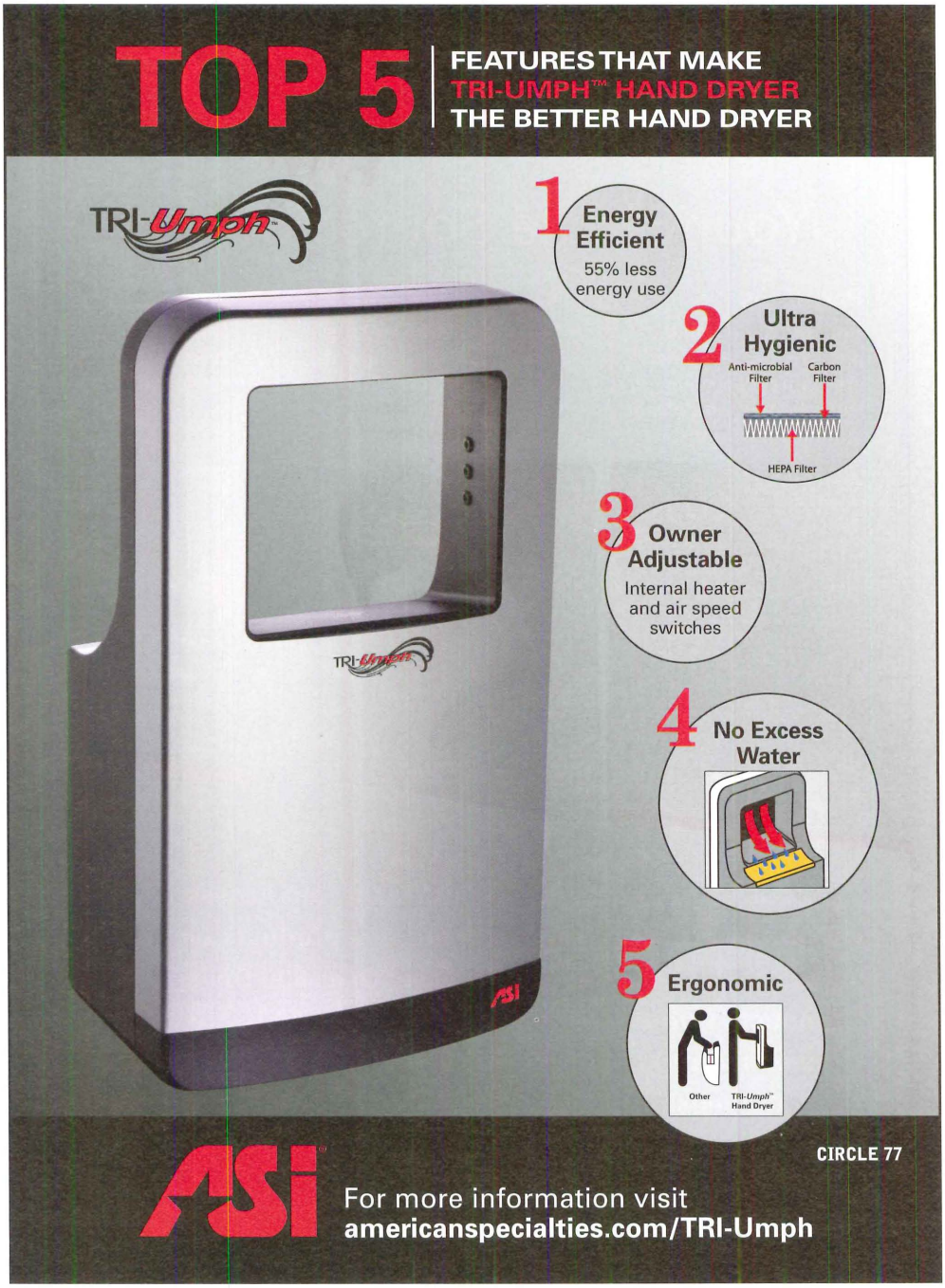
This book provides a solid and complete history of the political maneuverings that led to funding the arch, the competition that chose its design, and the process of actually building it. The book is carefully researched and clearly written by University of Kentucky history professor Tracy Campbell, who wonders whether building the arch was folly. Initially, he rues the loss of a historic cast-iron district on the riverfront, which was razed to make way for the monument. Then he suggests that, had the old district been preserved, St. Louis might not have declined so precipitously in later years—though he admits that political decisions, such as separating the city government from the county administration, were a major factor. While the loss of the neighborhood was unfortunate, other Midwestern river cities, where no wholesale demolition of old riverfront properties occurred, also declined.

Campbell clearly despises Saarinen, whom he calls "arrogant." He pretty much ignores the astounding array of buildings the architect designed (before he died of a brain tumor, in 1961), so the reader cannot see the arch in the context of a body of work. But he devotes a lot of space to Saarinen's troubled first marriage—portrayed solely from the point of view of his wife Lily. Saarinen was a workaholic who put his architecture first—not an easy partner. But had Campbell quoted Saarinen's second wife, Aline, instead of concentrating solely on their sexual encounters, a very different portrait of the architect would have emerged. An art and architecture critic, she appreciated his genius and insecurity, and understood its roots in his upbringing.

Campbell softens his reservations about the arch toward the end but remains ambivalent about whether it should have been built. Intriguingly, he concludes, "Its real symbolism is not to the westward expansion of the 19th century, but to the power and dominance of the United States in the 20th century," a moment in history that may now be closing as once-mighty cities like St. Louis retrench. If the Van Valkenburgh project, which has yet to be funded, doesn't move forward, we may see that the era was as fleeting as he suggests. ■

Contributing editor Jayne Merkel is the author of Eero Saarinen *published by Phaidon in 2005.*





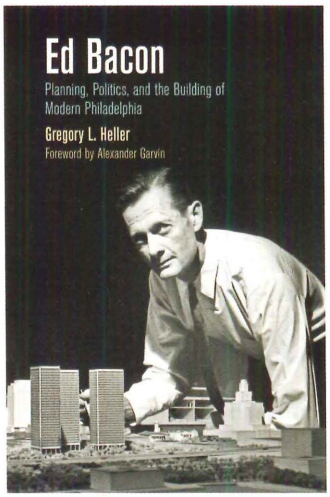
Power Broker

Ed Bacon: Planning, Politics and the Building of Modern Philadelphia, *by Gregory L. Heller. Foreword by Alexander Garvin. University of Pennsylvania Press, 2013, 290 pages, $36.*

Reviewed by Craig Whitaker

ED BACON was born, raised, and—except for a brief stint in Flint, Michigan—spent his long career in Philadelphia. Gregory L. Heller notes in fascinating detail every post and position Bacon held, every colleague, boss, opponent, mayor, and governor who crossed paths with him. More than a biography, this book is the story of mid-20th-century planning, complete with the passions and dogma that attended it, as told through one man in one city.

In doing this, Heller answers the question still posed about Bacon eight years after his death: What did he really do? He graced the cover of *Time* magazine in 1964. He fought, argued, and pleaded for inner-city highways (until they no longer seemed the answer), for new communities, and for social justice, and did so in a variety of positions (e.g., director of the Philadelphia City Planning Commission). He was often strident and arrogant, but always



in the service of planning as a serious endeavor and Philadelphia as a model for what should be done. Part of Bacon's legacy, or lack thereof, is that he was forever having to fight for power in some new administration or fend off an opponent. Heller, who is a consultant on economic development and urban issues, spent many hours while at the University of Pennsylvania interviewing Bacon.

Bacon's career was contemporaneous with Robert Moses's and Ed Logue's, both of whom understood the vagaries of democratic governance better than he. Moses wore many hats simultaneously, making him very difficult to dislodge in a single blow. He also learned that the tolls on his bridges and tunnels were perfect sources of funds for subsequent projects, obviating the need to appear hat in hand before some legislative body. Logue understood that planning without the power to implement was thin gruel. When New York Mayor John Lindsay offered him the position of development director, Logue turned it down because he couldn't also be chairman of the City Planning Commission. Bacon always had to scrap for power and money.

Bacon's architectural legacy is spotty. He oversaw the demolition of the abandoned "Chinese Wall" of elevated railroad tracks running from the Schuylkill River to the foot of City Hall, but took down Frank Furness's railroad station in the process. He engineered the resuscitation of Society Hill, but inserted three stark modern towers by I.M. Pei.

Heller doesn't dwell on my own favorite example of Bacon's complexity, the book *Design of Cities* (1967). Bacon tries in one chapter to equate modern design with the work of the artist Paul Klee, which has always seemed slightly loony to me. But he also includes discussions of Michelangelo's Campidoglio and the walk in Florence from the Ponte Vecchio to the Piazza della Signoria—two of the most insightful analyses I've ever read. ■

Craig Whitaker is an architect and the author of Architecture and the American Dream.

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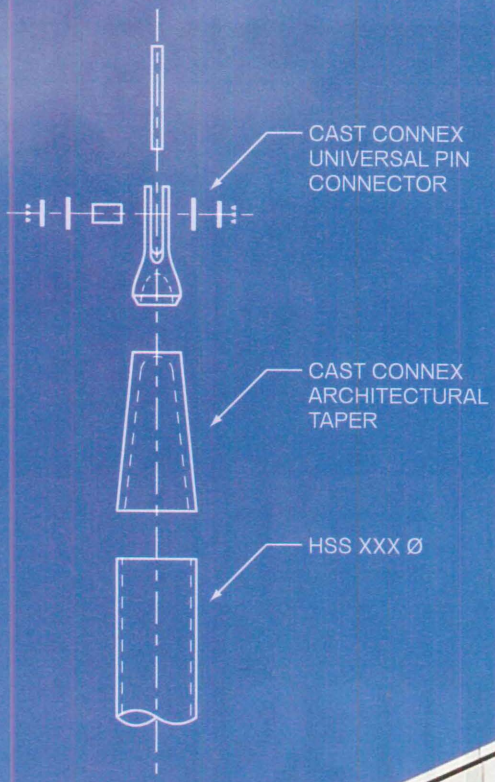

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2.0	12.1	11.4
2.5	15.0	14.4
2.6	16.6	15.0 (2 layer system - R 30)
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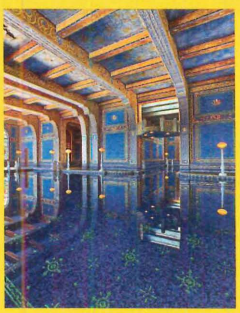

The answer to the September issue's Guess the Architect is **JULIA MORGAN**, whose design for the Roman Pool at Hearst Castle (left) in San Simeon, California, was completed in 1934.
For more details, including the winner, go to archrecord.com.

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Porcão Restaurant, New York. Design: James L. Cohen/SBLM Architects. Photo: Thomas Loof

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CIRCLE 45

products commercial bath

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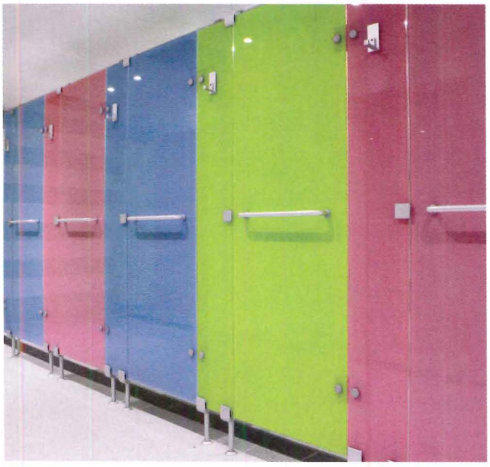

Monterrey Lavatory Faucet

American Standard americanstandard.com

Newly added to the Monterrey line of commercial faucets, the Single Control Centerset Lavatory Faucet is offered in two versions: one with a 1.5 gpm aerator, the other with a 0.5 gpm multilaminar spray, both of which save water without compromising pressure and coverage. Its washer-free ceramic disc valves help prevent wasteful dripping, and its solid cast-brass body is finished in chrome. CIRCLE 205

Custom Shower and Toilet Stalls

Carvart carvart.com

Custom glass and hardware systems company Carvart offers solutions for a variety of architectural-interior needs, including frameless wet-space partitions such as shower stalls (shown) and toilet cubicles. This installation features Carvart's Color Line of tempered and laminated glass panels, which are attached to each other and the floor with anodized aluminum fittings.

CIRCLE 210

DuraStyle by Matteo Thun

Duravit duravit.us

Award-winning architect Matteo Thun puts his modern stamp on an upscale bath collection aimed at the commercial market. The DuraStyle series, noteworthy for the weightless or floating appearance of its fixtures, includes full or hand-rinse washbasins (shown), wall-mounted or floor-standing toilets, urinals, bathtubs, storage units, and even mirrors with integrated LEDs (also shown). CIRCLE 206

Hybrid Flushometer

Kohler kohler.com

Taking cues from its own sensor-faucet technology, Kohler's latest flushometer incorporates a hybrid layered capacitor that collects small electrical discharges from the battery every time it's activated, enabling the cell to maintain high-level power storage. These hybrid energy cells are estimated to provide up to 30 years of maintenance-free use compared with the three-to-five-year lifespan of typical flushometer batteries. CIRCLE 209

Ara Bath Collection

Delta deltafaucet.com

Clean, rectilinear lines are the hallmark of this new bath suite from Delta. Offered in chrome or the company's Brilliance Stainless finish, the line includes single or double faucets, hand showers and wall-mounted showerheads (shown), tub fillers, and towel bars. All the fixtures are WaterSense labeled: the showerheads provide up to 40% water savings and faucets up to 32% over standard units. CIRCLE 207

HDR120 Sensor Activated Clean Dry

TOTO totousa.com

TOTO's HDR120 hand dryer demonstrates that designing inside the box can also yield attractive results. Its simple white form measures a compact 12" x 21½" and conceals sensor-activated double-sided blowers that generate 208 mph of air speed. Side panels and a tray prevent excess water from dripping to the floor. The energy-efficient unit operates quietly—at 57dBA—compared with other commercial dryers. CIRCLE 208

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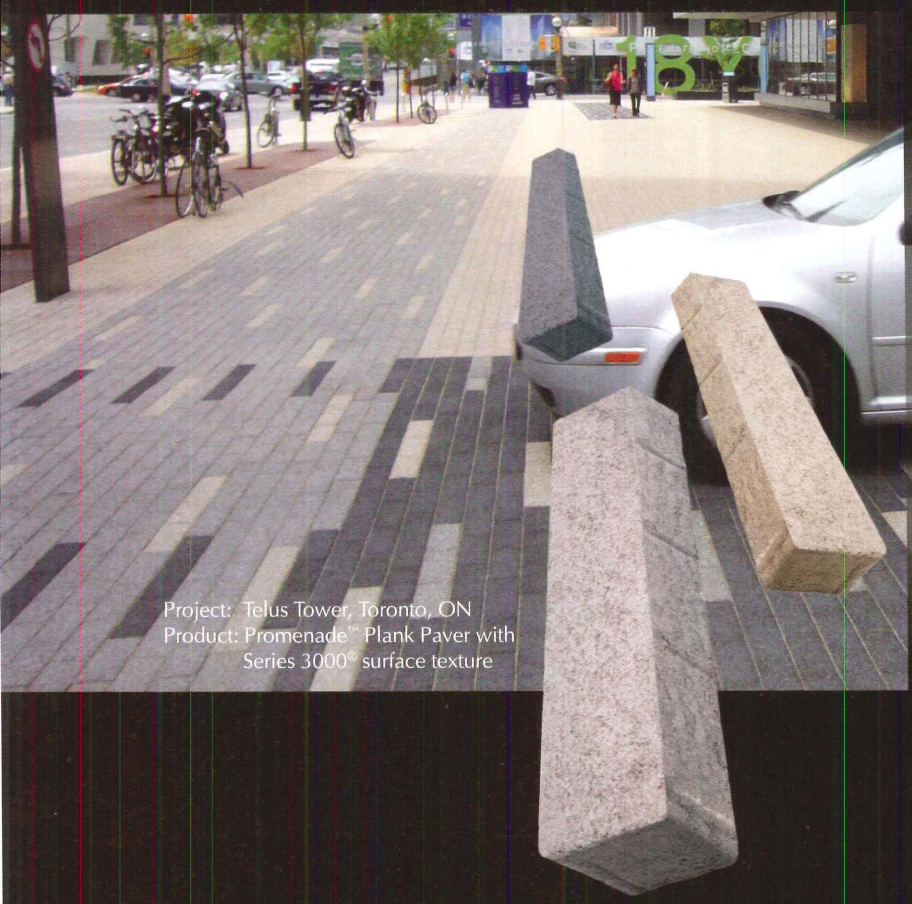
THIN IS IN



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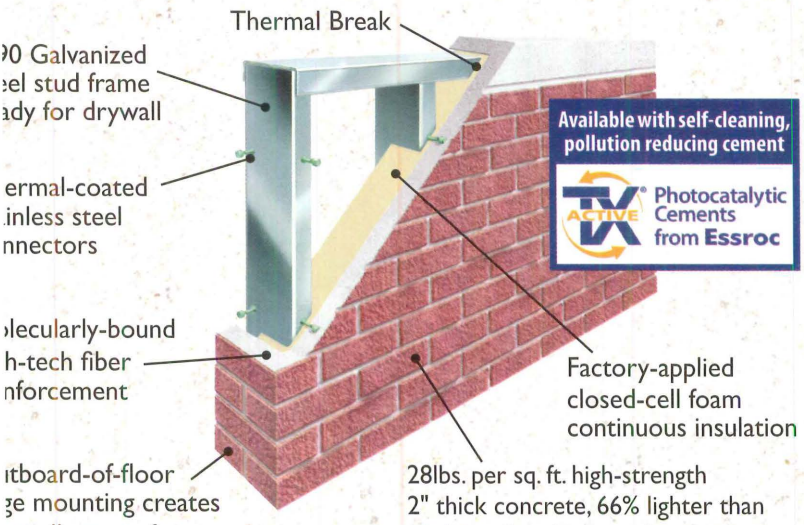

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products **briefs**

A ROUNDUP OF HIGH-STYLE ITEMS, FROM LED LUMINAIRES MADE OF RECLAIMED BOARDWALK WOOD TO DOORS THAT COMBINE TRADITIONAL CRAFTSMANSHIP WITH MODERN LINES. BY **SHEILA KIM**

Stickbulb Pendants by Rux

New York City architecture and industrial design firm Rux sources sustainably harvested or reclaimed wood—including Coney Island boardwalk ipe and local water tank discards—to create simple bars fitted with linear LEDs. Stickbulbs, as they're called, are modular units that can be arranged by the end-user, or predesigned as striking pendants (right), floor or table lamps, and wall sconces. stickbulb.com CIRCLE 200

Mack Door Hardware

Geometric motifs and obtuse angular planes define Mack, a series of escutcheons and assorted door components that range from pulls to pushes, square knobs to vertical and horizontal levers, and lock sets to doorbell plates. All the hardware is hand-cast in bronze with 90% post-consumer recycled content, and finished in a hand-applied patina that grows richer over time. Metal color and texture options include silicon bronze light, medium, dark, rust, and brushed; bronze dark lustre; and white bronze light, medium, dark, and brushed. rockymountainhardware.com CIRCLE 204

Alejandro Cardenas Collection

While no stranger to designing fashion fabrics, artist and illustrator Alejandro Cardenas has only recently created his first interior textile line. Designed for KnollTextiles, the eponymous collection consists of three graphic patterns (left): Glider abstractly references constantly shifting views, as might be seen by someone gliding through the air; Biscayne features a floral motif constrained by a grid; and Soon is a mosaic-like field of color. Glider and Biscayne are cotton-polyester-nylon blends and Soon is digitally printed on 100% cotton sateen. knolltextiles.com CIRCLE 201

Modern Door Collection

TruStile's new Modern Door Collection offers an up-to-date alternative to the traditional rail-and-stile format. While it has the same character and advantages as the multipanel construction, such as resistance to warping and bending due to the separate components, it complements contemporary and minimalist architecture with its symmetrical, linear patterns formed by right-angle components. The doors are available in various woods or MDF, and with accent panels of glass, resin, leather, and metal. trustilemodern.com CIRCLE 202

Verona Island Range Hood

The Verona Island range hood by Zephyr Ventilation features a sleek glass-plane canopy with built-in LEDs that can change from white to blue or amber to suit both the kitchen design and the cook's mood. The hood not only reduces energy consumption by almost 80% but also utilizes the company's DCBL Suppression System technology to reduce operating noise by up to 77% compared to standard units. Verona Island is available in 36" or 42" widths. zephyronline.com CIRCLE 203

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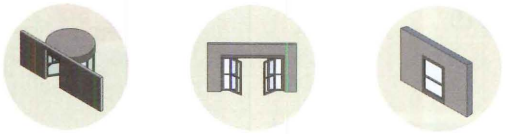

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ADFF's opening night film on October 16th at Tribeca Cinemas will be an exclusive "sneak preview" of the Danish film, *The Human Scale.* This fascinating film features the Danish architect and professor Jan Gehl who has studied human behavior in cities for 40 years. He has documented how modern cities repel human interaction and argues that we can build cities in a way that addresses our need for inclusion and intimacy.

The five-day Festival includes seven US premieres, five New York premieres and two "sneak previews."

CIRCLE 76

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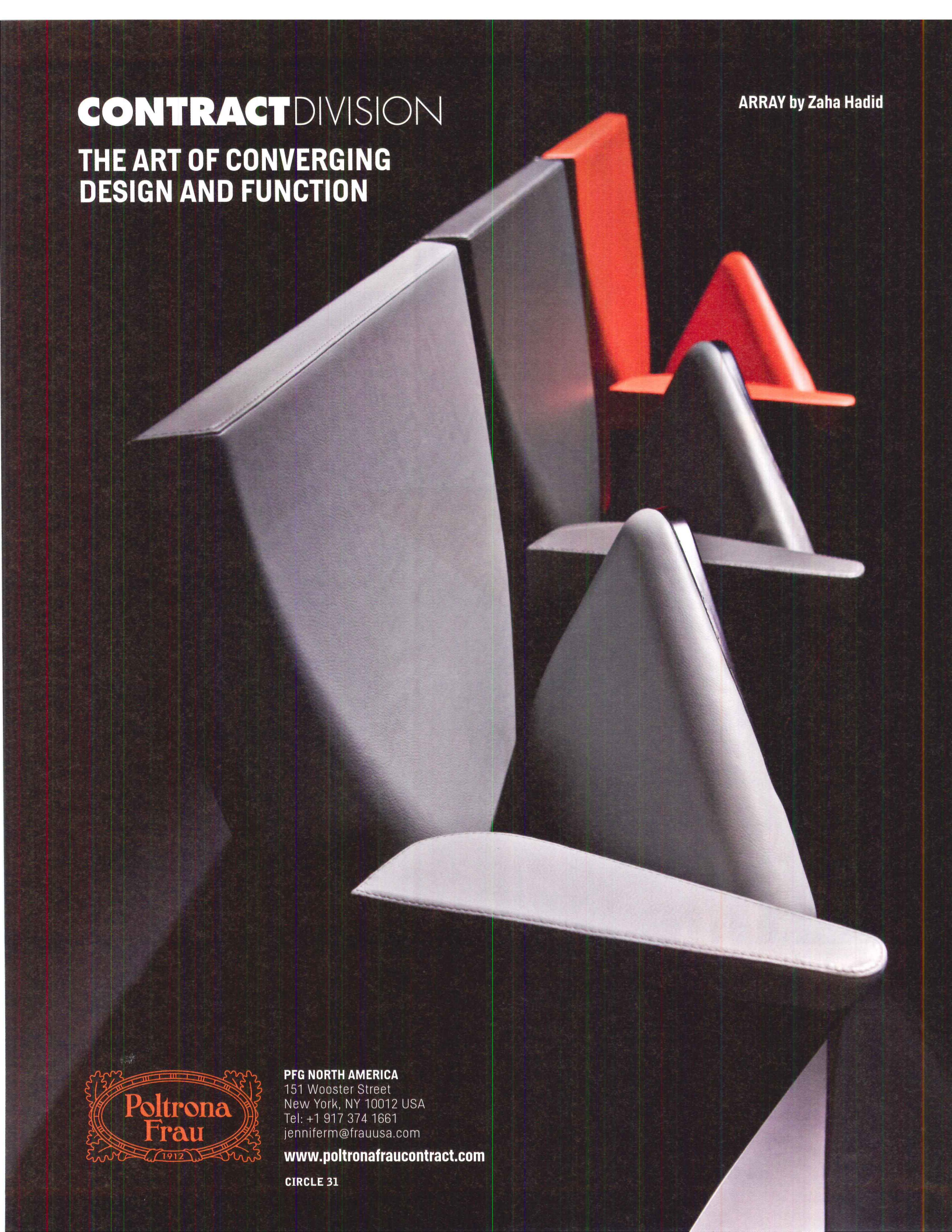
ARRAY by Zaha Hadid



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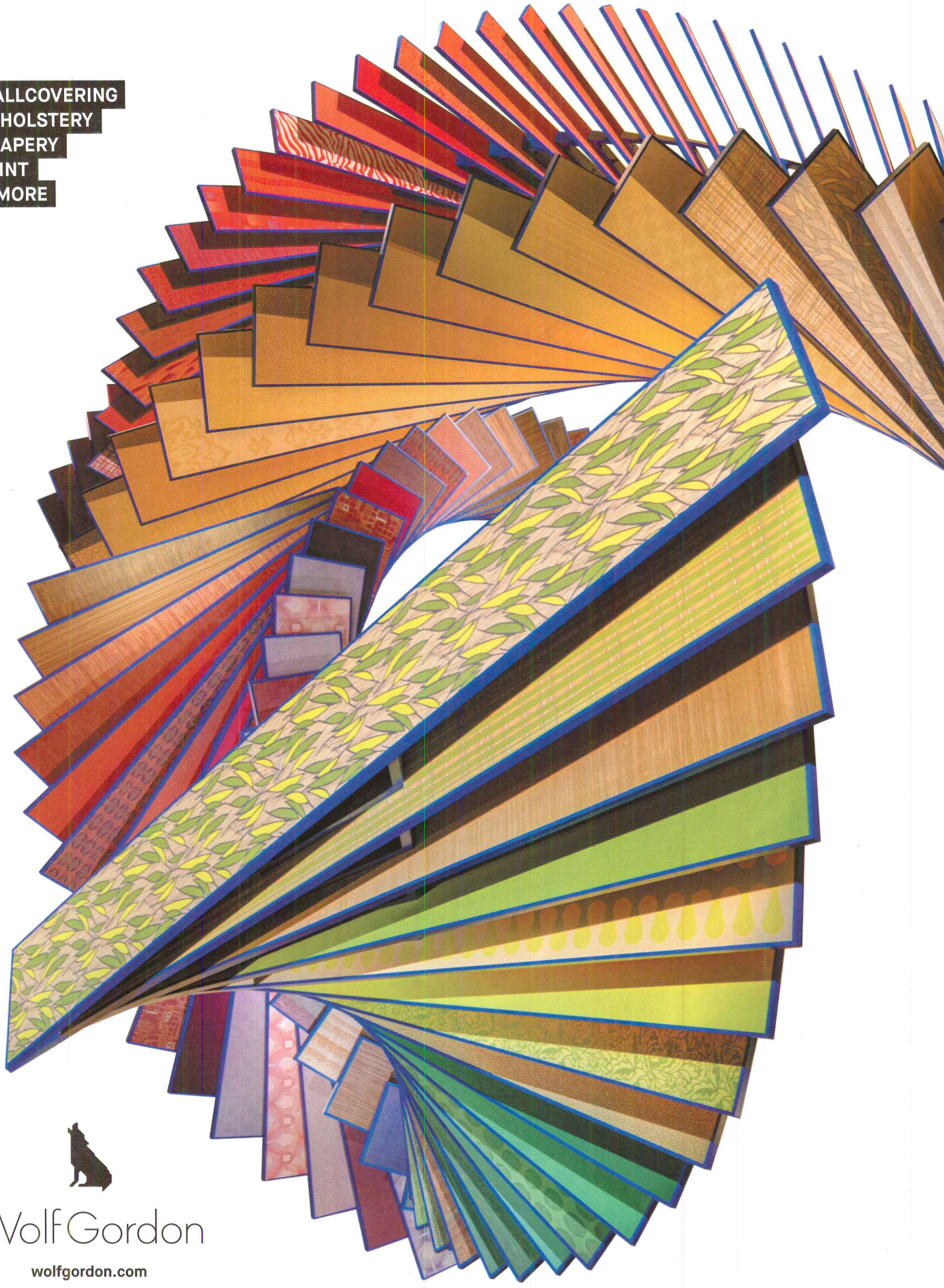

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CIRCLE 72

Matt Wood, of Chattanooga-based Internet retailer Smart Furniture, worked on the new office setup for local startup incubator CO.LAB.

TECHNOLOGY AND THE CITY

The technology industry is shaping contemporary American cities the way that steel or automobiles did in an earlier era. But what makes technology such a defining force is how it affects not only the economy but the texture of urban life. Digital enterprises and their young teams infuse the city with disposable income and a taste for microbreweries, rock climbing, food trucks, bike lanes, locally roasted coffee, and just about anything artisanal.

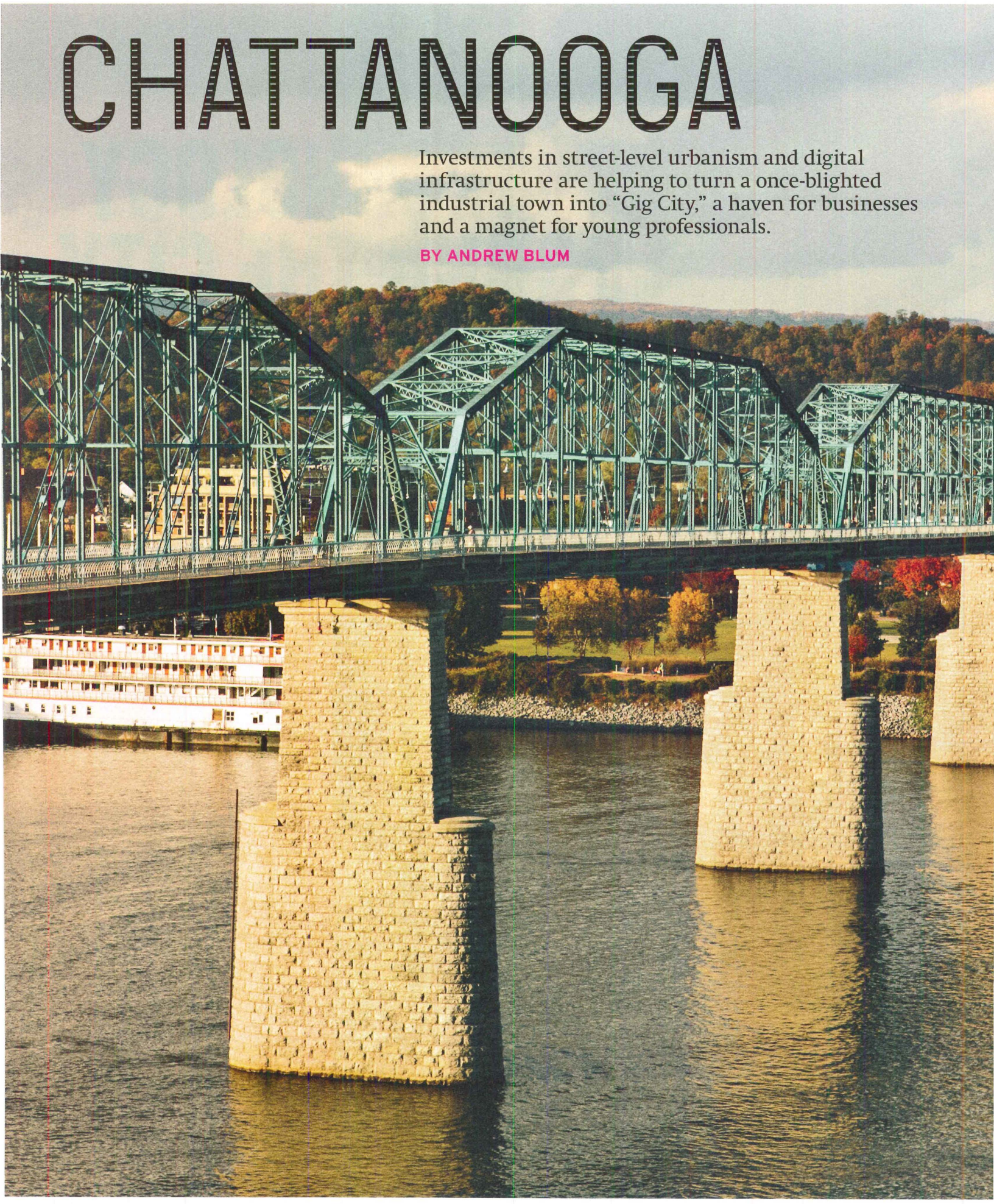
In the following special report, we present snapshots of four American cities being transformed by a new business landscape: **Chattanooga, Tennessee**, a once-blighted railroad town that now offers Internet speed up to 1 gigabit per second; **Detroit**, where digital industrialists have revamped once-abandoned buildings and helped bring some 10,000 new jobs downtown; and **Austin, Texas**, where a startup market is booming while the population balloons by 120 people a day. We also check in on **San Francisco**, where in the past year the average rent has climbed nearly 8 percent, and longtime residents wonder if the city has become a victim of its success, a once eclectic place in danger of becoming a monoculture of wealthy nerds.

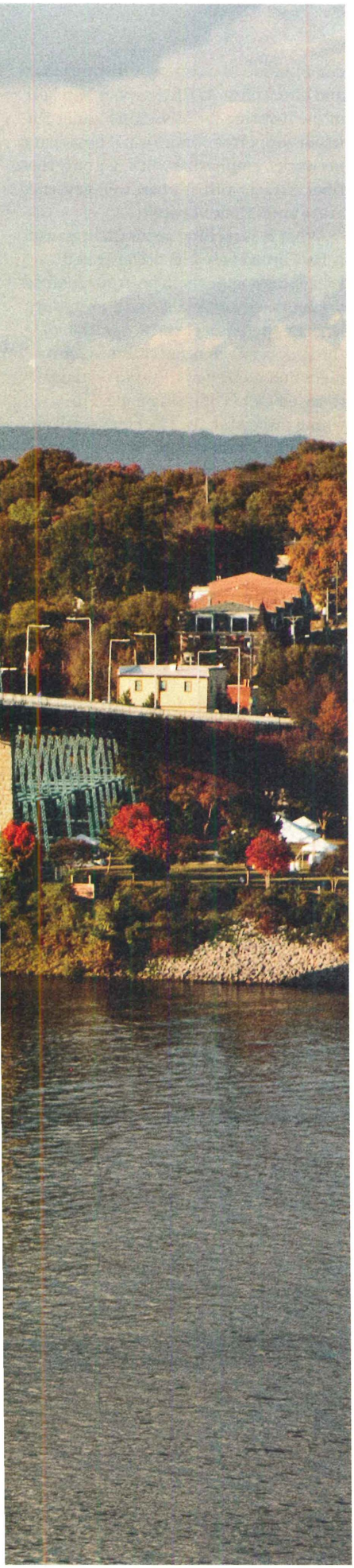
These urban areas are betting on a growing digital economy. And in each case, tech culture is changing the face of the city.

CHATTANOOGA

Investments in street-level urbanism and digital infrastructure are helping to turn a once-blighted industrial town into "Gig City," a haven for businesses and a magnet for young professionals.

BY ANDREW BLUM





ON A recent evening, Dan Rose, the 32-year-old co-owner of the newly opened Flying Squirrel restaurant in Chattanooga, Tennessee, sat at the packed bar, sketching ideas for his next project, with architect Thomas Palmer, a graduate of Auburn University and its Rural Studio program. Rose is quintessential new-Chattanooga, a walking symbol of what the city aspires to be: after graduating from Skidmore College in upstate New York, he came south to wait tables and climb some of the best vertical rock faces in the country, many within biking distance of downtown. Eight years later, he's still here, caught in the city's rising entrepreneurial tide.

Among once-struggling rust-belt cities now on the upswing, Chattanooga is breaking away from the pack. Increasingly identified with places that combine high-tech and big nature to attract people and jobs—such as Austin, Texas (see page 64); Boulder, Colorado; and Portland, Oregon—it also flaunts the singularly alluring feather

FAST FORWARD
With up to 1 gigabit-per-second Internet infrastructure and new bars, restaurants, and coffeehouses like the Flying Squirrel (top) and The Camp House (above), Chattanooga is becoming a hotbed for young entrepreneurs and more established tech companies.

in its cap: some of the fastest Internet speeds in the western hemisphere. In 2010, the city-owned power utility, EPB, completed a fiber-optic network that allows it to offer up to 1 gigabit-per-second bandwidth to every home and business in the city. Chattanooga became "Gig City" and launched recruitment programs to lure businesses, from startups to multinationals. The network is emblematic of the city's many efforts to transform itself from having an all-but-deserted core to becoming an amenity-rich magnet for a young, enterprising population.

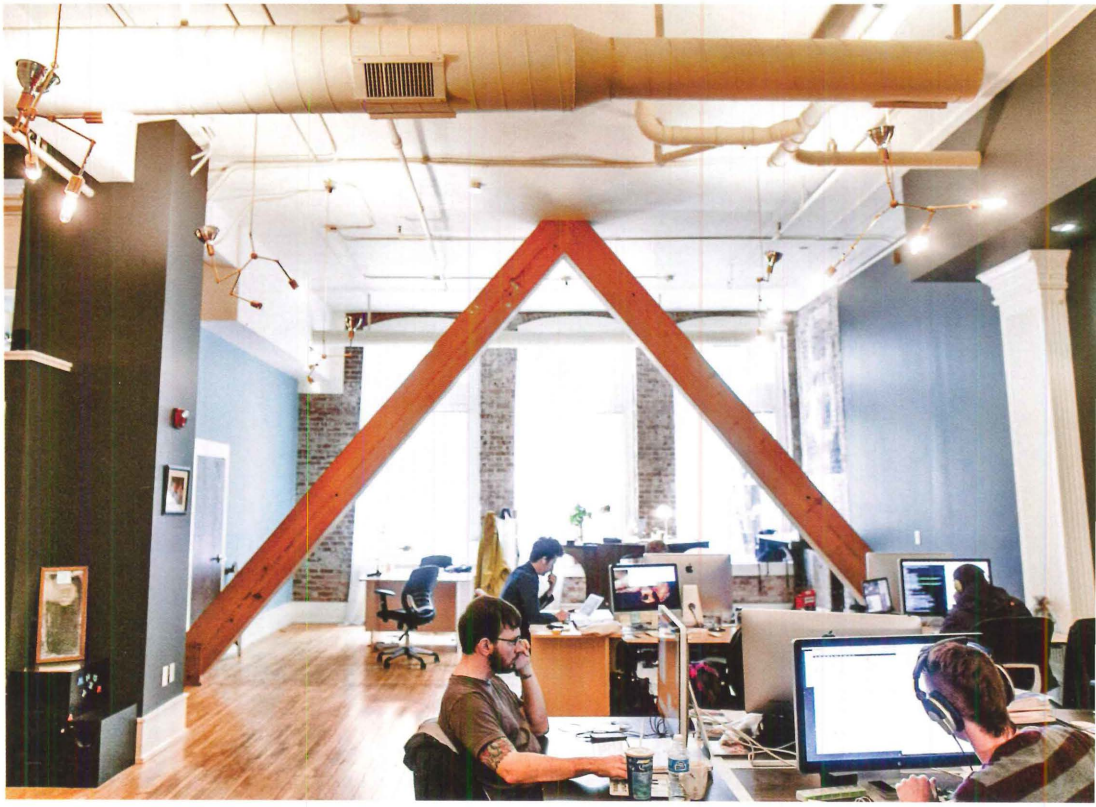
Chattanooga's rebirth is one of the more improbable stories of American urbanism. The city's nadir is easy to pinpoint: the October evening in 1969 when Walter Cronkite reported on CBS News that Chattanooga had been named the "dirtiest city in America." It was a sad decline from its postwar peak as one of America's leading industrial centers, when the cheap Tennessee Valley Authority electric power made it the machine shop of the South—and the surrounding hills trapped the resulting polluted air.

Today, most of the city's new buildings wear LEED plaques. Metropolitan Chattanooga added more new jobs in the 12-month period ending October 2012 than the rest of Tennessee combined. Its success was enough to attract President Obama to town in July to talk about "that first and most important cornerstone of a middle-class life: a good job in a durable, growing industry." The president spoke against the backdrop of online retailer Amazon's new 1 million-square-foot Chattanooga distribution center, one of the most prominent success stories to come out of the city's effort to lure large businesses. That facility opened on the heels of a billion-dollar Volkswagen factory, which began production in 2011, and a growing constellation of suppliers has since surrounded it. (Both Volkswagen and Amazon received millions of dollars in state and city tax incentives to move to Chattanooga.) As it continues to attract new companies, the city has cultivated its young and progressive, high-tech and pro-business image. In April, it inaugurated a new mayor, native Chattanoogan Andy Berke. At age 45, the Stanford graduate embodies the city's newfound reputation.

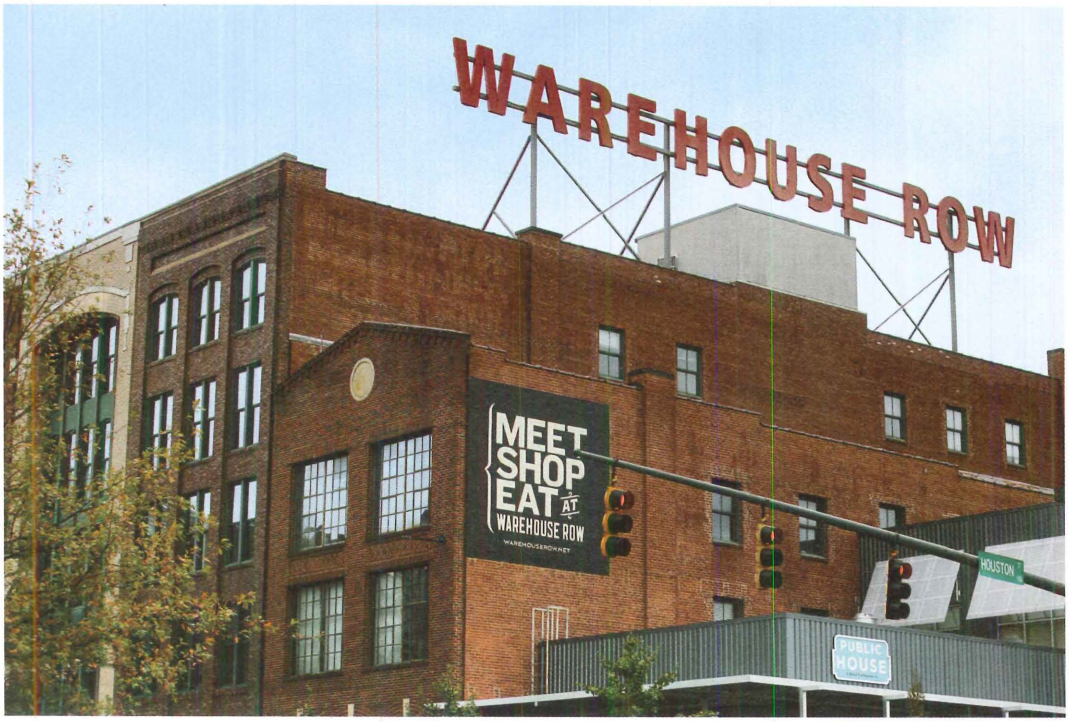
If an urban center can be said to pivot, Chattanooga has done so in less than a generation. In 1997, then-mayor Jon Kinsey called Harold DePriest, CEO of EPB, into his office to ask what the city-owned utility was doing to benefit the community. DePriest took the question seriously and recognized—years ahead of his colleagues—that high-speed Internet access would be to the 21st century what electric power was to the 20th. "The whole idea of bringing electricity to the Tennessee Valley in the 1930s was to improve the quality of life," says David Wade, the current COO at EPB. "So it [the fiber-optic network] is in line with what the company was created to do." It helped that the city's railroad roots—you've heard of that song "Chattanooga Choo Choo"—put it alongside the path of the major transcontinental fiber-optic backbones (which often follow the tracks), giving it robust access to the rest of the Internet. When the $390 million project came online, it gave Chattanooga a rare amenity among American cities and a leg up on attracting businesses.

The utility's ability to execute construction of the fiber network is an example of Chattanooga's adroit combination of competent institutions and civic spirit. As Christopher Mitchell of the Institute for Local Self-Reliance, a major supporter of municipal broadband networks, emphasizes, "It's not only that fiber attracts jobs, it's that well-governed areas build fiber networks."

What is surprising about Chattanooga is how broad-based its orchestrated renaissance appears to be. Among entrepreneurs, city officials, and community leaders, there is a clear recognition of the link between economic development and quality of life—particularly those elements of it that appeal to young professionals. The city's wealthy foundations have catalyzed the impulse, funding design competitions, public artworks, and cultural events. Rather than trying to get on the map using the "Bilbao effect," their focus has been on smaller-scale urban changes. "While other cities were building ballfields and big entertainment kind of things, we decided to build Chattanooga for all of us who are going to live here," says Sarah Morgan, president of the Benwood Foundation. On the Southside, the Lyndhurst Foundation financed sidewalk improvements along Main Street, design guidelines for the



LAUNCH PAD Startup incubator and venture capital investor the Lamp Post Group opened their offices in 2011 on the second floor of Chattanooga's 100-year-old Loveman's department store building.



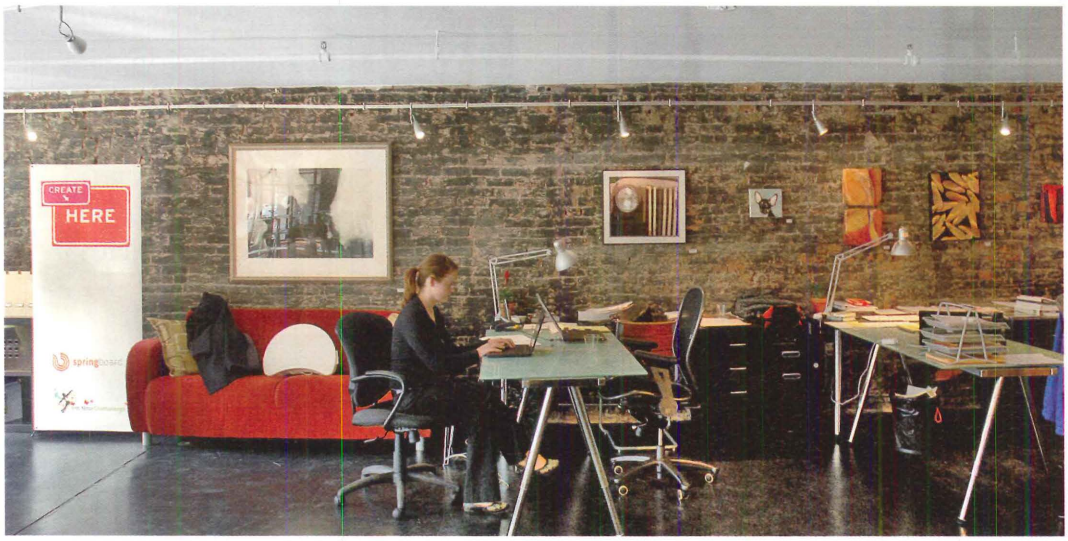
residential neighborhood, and CreateHere, a nonprofit that encourages local cultural development, with incubator space and a business planning course (Rose and his partner, Max Poppel, are graduates).

Recently, the CreateHere space has been reborn as "Co.Lab," an incubator for tech startups. Sheldon Grizzle, the Florida native who cofounded the space, is a prime example of the city's ambition. "If I didn't feel like there was opportunity here, I wouldn't be here," says the entrepreneur. "But I think people who are attracted to Chattanooga are going to make the choice because of the lifestyle—not purely because it's the best place to start a business."

A focus on design has long played a part in making downtown Chattanooga a desirable place to live. The biggest moves—including the construction of a major plaza and the reclamation of the industrial waterfront—were guided by Stroud Watson, an architect and professor who from 1981 to 2004 ran an unusual entity called the Urban Design Studio. Founded at the University of Tennessee School of Architecture, it migrated inside city government, becoming an in-house urban design consultant to a succession of Chattanooga mayors. Watson believed in "the city-as-living room," as he called it, with an unusually humanistic and fine-grained emphasis on the city's in-between spaces. In a debate over the entrance plaza of the Tennessee Aquarium—Chattanooga's leading tourist attraction—Watson notably insisted, "We're not building a front yard for the aquarium; we're building a front porch for the city."

Now Chattanooga's downtown is in a moment of transition. There is still a 15 percent office vacancy rate, but some parts of the city feel like a hipster theme park. There is a new bike-share program, and an electric shuttle that runs in a loop across downtown. Coffee shops serving carefully prepared pour-over cups (like The Camp House) are filled with 20-somethings working on MacBooks beneath filament bulbs. Farm-to-table restaurants occupy reused brick buildings, and impeccably renovated Victorian houses sport Neutra numbers. Last year, a pair of local designers used Kickstarter to crowdfund the creation of Chatype, a "city-wide typeface." There is a weekly food truck rally on an empty lot downtown, a PechaKucha night, and an artisanal sausage-maker in a Southside storefront designed by Palmer.

It all adds up to a city on the brink, if not quite there yet: after 5 p.m. on a weekday evening, a location scout for a zombie film wouldn't have to worry about clearing the streets downtown. But there is plenty to admire: the "front porch" plaza in front of the Aquarium; festive bus shelters with circus lights (and every lightbulb in working order); luxury condos along the riverfront; even a remarkable new downtown climbing gym, built in and on a disused movie theater, with a roughly four-story synthetic rock wall facing the street. The technological promise of gigabit-speed Internet is that it collapses time and space, allowing businesses to be anywhere. And with all of its non-virtual amenities, Chattanooga's betting on being a nice place to be. ■



GOOD NEIGHBORS A recent downtown revival project turned a group of 19th-century railroad warehouses into retail, restaurant, and office spaces (top). The organization CreateHere (above) evolved into CO.LAB, a nonprofit that helps entrepreneurs and artists set up shop in Chattanooga's Southside neighborhood.

Andrew Blum is a New York–based journalist and the author of Tubes: A Journey to the Center of the Internet.

AUSTIN

With a new generation of tech entrepreneurs setting up shop, a steadily ballooning population, and Google Fiber on the way, a rapidly changing city tries not to lose its cool.

BY WILLIAM HANLEY

ON THE TOP floor of a bland high-rise in downtown Austin, the city's future is being written—or, more accurately, coded. In the gutted shell of a once-staid office, now colonized by giant beanbags and quirky light fixtures, entrepreneurs in T-shirts hack away in podlike clusters of workstations, striving to develop the next big mobile app, cloud data service, e-commerce platform, or other piece of hit software.

The 150 or so companies that rent space here at Capital Factory, one of Austin's many startup incubators, have reason to be hopeful. The recent IPOs of some of their local peers, including Bazaarvoice and HomeAway, have raised hundreds of millions of dollars. In the process, they have also netted the kind of attention typically reserved for a breakout performance at the annual South by Southwest music showcase. In a town synonymous with bands, the tech nerds are making noise.

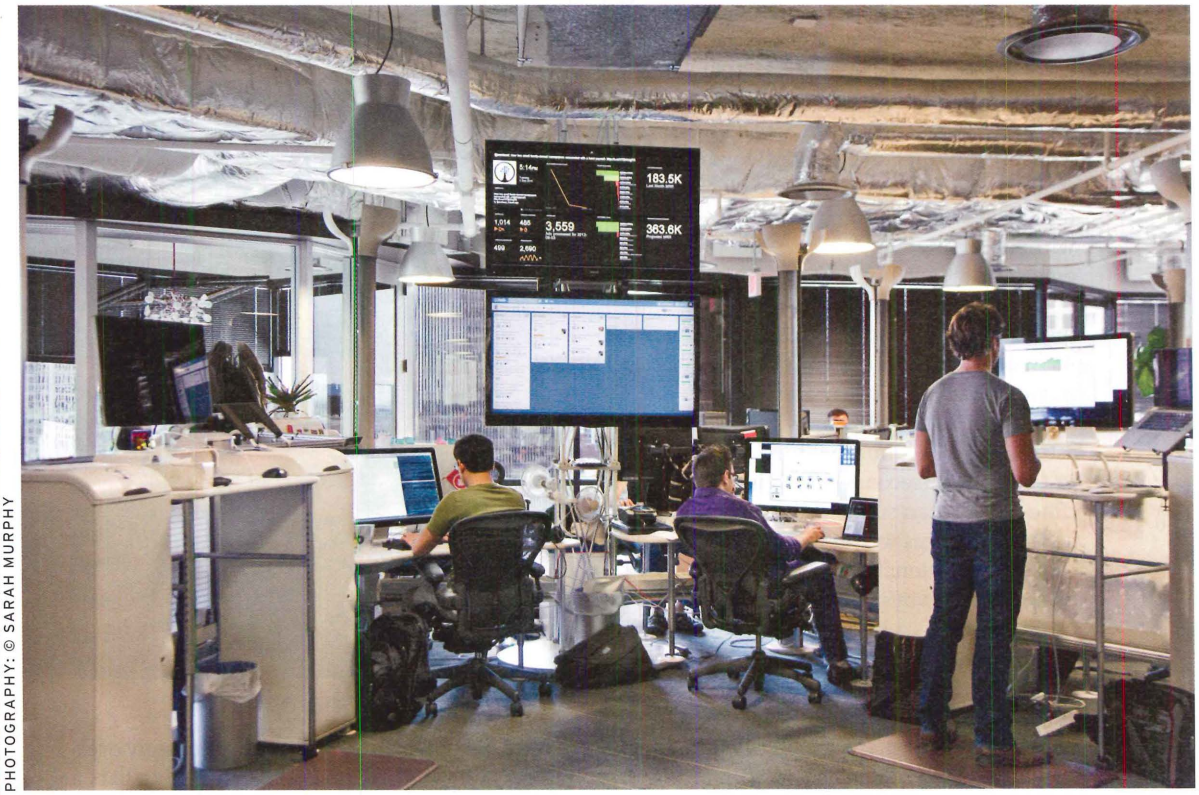
At the same time that Austin's identity is broadening from music scene to startup hotbed, more and more people are moving here—120 every day on average—and the city now faces the challenge of how to grow while retaining the character that makes it such an appealing place to live.

Looking through Capital Factory's glass walls at a skyline ornamented with gleaming new apartment towers, it's clear that Austin is changing, but, still, the numbers are striking. The city's population of 850,000 has grown by close to 40 percent in 10 years and is expected to nearly double by 2039. Meanwhile, companies in greater Austin added some 120,000 new jobs between 2005 and 2012, with roughly 12,000 of them coming from the tech industry. "When there is an influx of people, it creates new opportunities," says Joshua Baer, a seasoned entrepreneur and managing director of Capital Factory. "It's a rising-tides phenomenon."

Austin's magnetism lies in its contradictions: a progressive enclave in the middle of Texas, a college town and a seat of government, a big-city cultural scene with a relatively low cost of living, and a home to both well-designed Thai restaurants and barbecue joints in dusty parking lots. "Keep Austin weird"—once a rallying cry to defend small businesses from invasive chains—has become a brand.

Entrepreneurs find economic charms here as well. "From a tax perspective, a hiring perspective, and a real estate perspective, the business climate was

GOING UP Designed by Houston-based Ziegler Cooper Architects and completed in 2010, Austin's tallest building, the Austonian, is a 56-story residential structure towering above the city's downtown (left). Entrepreneurs at Capital Factory (below), one of Austin's most prominent startup incubators, have panoramic views of a changing city.



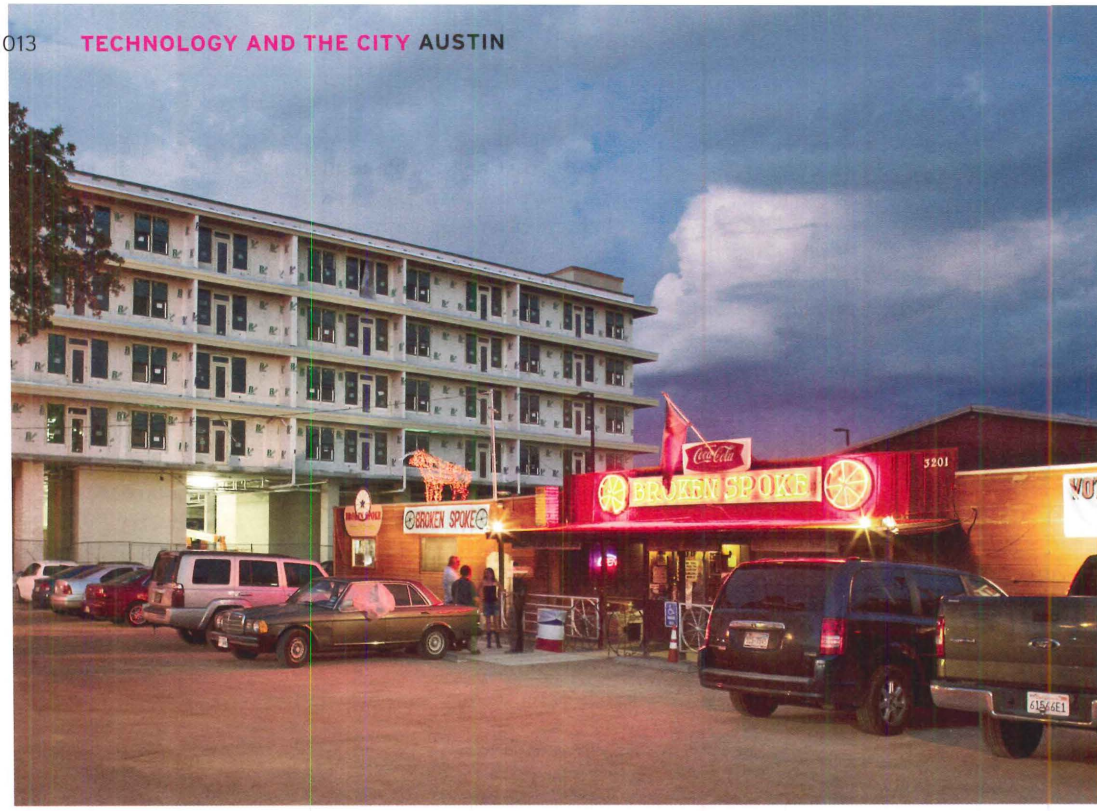
PHOTOGRAPHY: © SARAH MURPHY

much more favorable than anywhere else we were looking," says Capital Factory member Kenny Gorman, who moved from Silicon Valley to Austin when his database service, ObjectRocket, was acquired by a Texas company. The cost of living is a bargain compared to the Bay Area, and Texas famously—if controversially—offers incentives to out-of-state businesses looking to relocate (Apple recently received a $21 million tax break to open a large Austin campus). The University of Texas feeds the talent pool with every graduating class, and the city also has a growing investment community. A recent Atlantic Cities list placed Austin in the top ten most active regions in the U.S. for venture capital, and it also has one of the most active angel investor networks in the country.

"In the self-proclaimed live music capital of the world, people joke that everyone in Austin is in a band," says Shawn O'Keefe, director of South by Southwest Interactive, a digital media-focused sister of the massive music event. "But now you can't throw a rock without hitting someone working in emerging technologies."

Google found the climate so appealing that it made Austin a pilot city for its Google Fiber initiative. Currently slated to arrive next year, the new fiber-optic infrastructure will deliver astoundingly fast Internet service—up to 1 gigabit-per-second—which is 100 times faster than standard broadband, a stat that makes web developers salivate and traditional phone and cable companies nervous. "The tech economy in Austin, with its strong startup and entrepreneurial culture, was critical to our decision," says Jenna Wandres, a spokesperson for Google Fiber. "It's hard to imagine what a generation of gigabit apps could be, and you need people who can develop them."

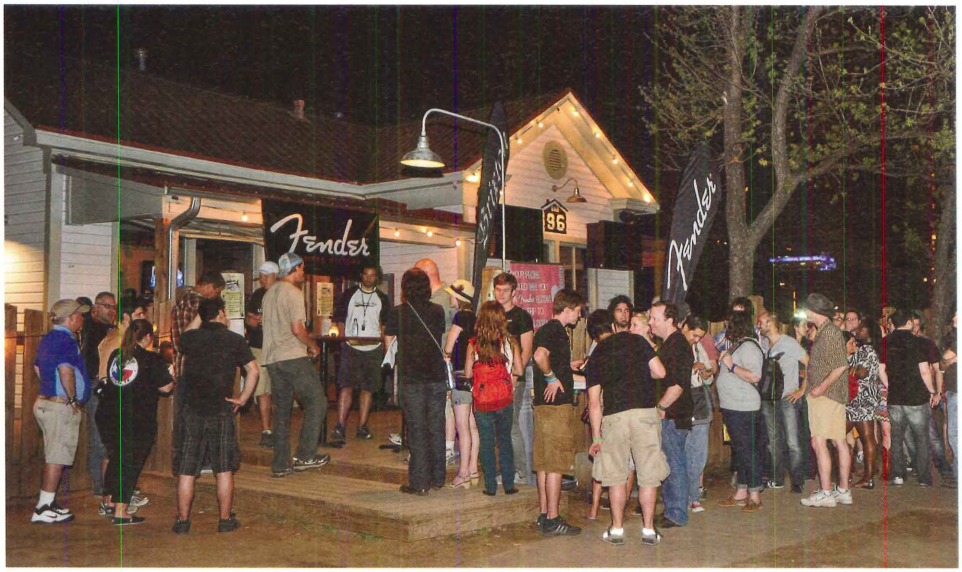
Austin's big tech companies—including mammoth elder statesman Dell—are for the most part based in suburban office parks. But many young entrepreneurs want to be downtown. There, they can sip coffee at Juan Pelota Café, which shares space with a bike shop, buy groceries at an 80,000-square-foot, see-and-be-seen Whole Foods flagship (not far from the location of the organic empire's original store), or drink a beer and see a band on Rainey Street—a cluster of historic wood-frame houses recently converted, seemingly overnight, into a strip of teeming bars and restaurants.



RESIDENTIAL REMIX A developer preserved Austin icon the Broken Spoke but surrounded the dance hall with apartment blocks (top). On a formerly low-rise commercial stretch, a mixed-use project by Bercy Chen Architects brings higher density to Austin's East Side (above).

The demand for housing in the center of Austin, rekindled after a recession lull, has led to new multifamily residential work for architects, but it has also sparked a looming affordability crisis, which could threaten the cultural life that has made the city famous. "If you have a tech job, you can easily afford to live close to downtown, but if you're a musician or someone who works at a hotel, you can't anymore," says Jim Robertson, an architect and the manager of the city planning department's Urban Design Division. "At what point have you killed the goose that laid the golden egg?"

Nowhere is the rising cost of Austin more apparent than the East Side of the city. Historically a cluster of working- and middle-class neighborhoods with predominantly African-American and Latino residents, East Austin has gentrified in waves of musicians, students, and now young professionals. "A lot of the diversity is leaving the city," says Barbara Brown Wilson, director of the Center for Sustainable Development at the University of Texas. "People who have been living here for generations



RAPID TRANSITIONS A neighborhood of historic houses along Rainey Street (top left and right), on the edge of downtown Austin, developed into an overflowing strip of bars and restaurants in just a few years. Now new apartment towers are rising above the nightlife district. The city's single commuter rail line runs through East Austin (above).

and who made the city what is are moving farther out. Now we're sprawling, with a high level of suburban poverty."

Countering the pressure of an overheating housing market is one goal of Imagine Austin, a comprehensive plan for the city released last year. It calls for building up outdated or underused commercial sites along arterial roads close to downtown Austin—in contrast to low-density sprawl around the city's perimeter—and turning them into mixed-use nodes connected by a transportation network. "We have aging commercial streets, aging strip centers, aging malls," says Robertson. "The grayfield opportunities to accommodate the coming influx of population are out there."

Bringing higher-density housing into central Austin on a large scale will require modifying zoning laws. But in a town of cottages, midcentury ranch houses, and renovated Airstream trailers, many community groups see taller buildings as a threat to Austin's character. Last month, the city held the first public-input sessions as it embarks on a process to overhaul the code by 2015.

In the meantime, some higher-density projects have already popped up in traditionally low-density parts of the city. Most notably, the decommissioned Mueller Municipal Airport site has brought a large mixed-use development to the East Side of Austin, and on South Lamar Boulevard, a developer spared the Broken Spoke, a nearly 50-year-old honky-tonk and civic icon, but surrounded it with five-story apartment buildings. Residents are scheduled to move in this month.

The Broken Spoke is a four-mile drive from downtown Austin, and the development around it underscores a key ingredient missing from the transit-oriented plan: better public transit. Three years ago, Austin completed a single commuter rail line, but it otherwise relies on a disjointed bus system. Traffic is a common annoyance. But improving transit is a tough sell in Texas car country. "We're still grappling with what kind of transportation would have the most traction," says Robertson. "We don't have a clear, funded future plan yet."

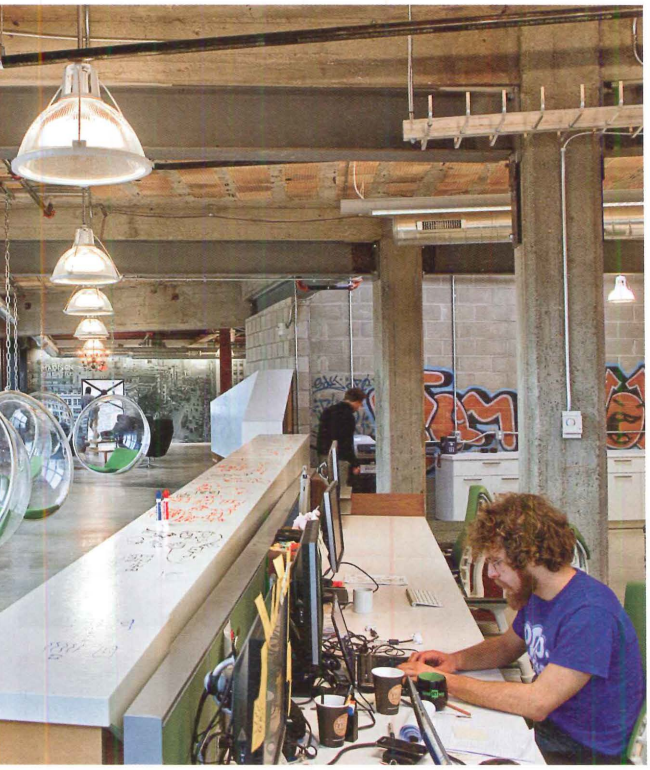
The plan might not come soon enough. When Google began rolling out Fiber in Kansas City this year, it divided the city into districts that it calls "Fiberhoods" and allowed residents to sign up for the service. The neighborhoods with the highest number of preregistered customers got Fiber first. Google plans to use a similar process in Austin, and some community groups have already begun collecting signatures from willing residents, even though, as of September, Google still had not announced a process for introducing the service here. But if demand for housing in central Austin is already heating up, when a neighborhood evolves into a Fiberhood, it will pour gasoline on the fire.

Looking out the Capital Factory windows at patches of construction below a skyline punctuated by cranes, Baer contemplated a changing city. "We can't just keep Austin exactly as it was," he says. "But we need to focus on keeping the best things about Austin as we grow. How do we keep our spirit while we cultivate our entrepreneurial attitude?" ■

DETROIT

In the long-empty buildings of the Motor City's manufacturing past, technology firms are shaping new workspaces for the 21st-century.

BY JOHN GALLAGHER



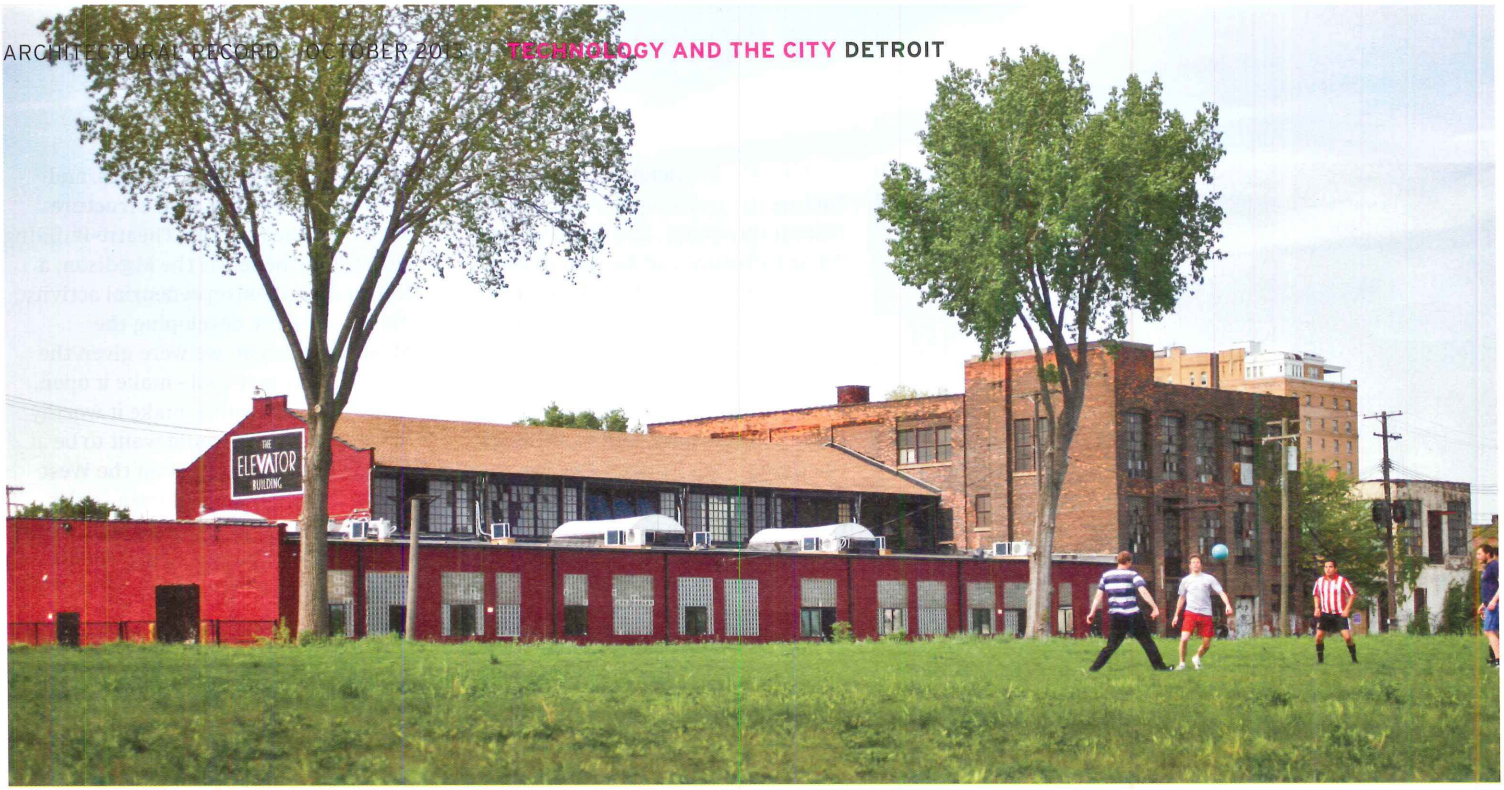
DETROIT'S WELL-PUBLICIZED bout with municipal bankruptcy is masking some positive trends taking place in the teetering city. Among the most important: technology firms are flocking to its downtown core, bringing an influx of young workers and remaking many of its older 20th-century buildings into high-tech havens.

From two- or three-person startups to mortgage giant Quicken Loans, companies of all sizes have set up shop in long-neglected structures. Some are embracing the gritty industrial buildings by preserving rugged finishes, taking up the mantle of toughness and quality they embody. Others are turning to the showpiece offices of previous eras while gutting the interiors to suit a new generation of digital industrialists. These projects have given rise to a series of slogans that capture some of the city's new energy and its hoped-for revival: "Detroit 2.0," "Outsource to Detroit," and, in a nod to the main boulevard, Woodward Avenue, "Webward Avenue."

Some 10,000 new workers have arrived in the past few years, and in the technology sector, they tend to be young, educated, and eager to live near downtown, driving up apartment rents in Detroit's Midtown, Corktown, and Eastern Market neighborhoods and fueling the city's rapidly reviving bar, restaurant, music, and retail scene. Their influence can be seen in the growing number of bicycles on city streets, as well as in new brew pubs, wine bars, and coffee shops. Longtime Detroit staple Avalon International Breads opened a new 50,000-square-foot bakery in February, and in Midtown, the Great Lakes Coffee Roasting Company is one of the hot venues of the moment, transforming into a bar and staying open late. Its interior is outfitted with wood from a demolished Detroit home.

Like that café's salvaging mementos of the city's past, much of the vibrancy of Detroit's tech scene stems from the look and ambience of the converted structures it inhabits. Local architectural firms including Neumann/Smith, Rossetti, and Kraemer Design Group have evolved a style that keeps the industrial rawness of the original buildings but livens it up with colorful custom-built furniture, fabrics, and artwork. A five-story 1917 structure known as the Madison Theatre Building recently reopened as the M@dison, a hub of digital entrepreneurial activity. "When we were developing the M@dison concept, we were given the task of making it cool—make it open, make it collaborative, make it worthy of somebody who would want to be at Google or anywhere out on the West Coast, and then make it even cooler than that," says Jennifer Gilbert, founder and CEO of Doodle Home, which designed the interiors. "The younger

NEXT GENERATION Young tech professionals are making their way to Detroit, working in newly renovated early 20th-century buildings such as the M@dison (top left) and hanging out in new Midtown bars and coffee shops such as the Great Lakes Coffee Roasting Company (right). Avalon International Breads (below), a neighborhood staple, recently opened a new 50,000-square-foot production facility in a vacant warehouse.



generation doesn't want to sit at a desk. On Monday they want to work one way, and on Tuesday they may want to work in a completely different way."

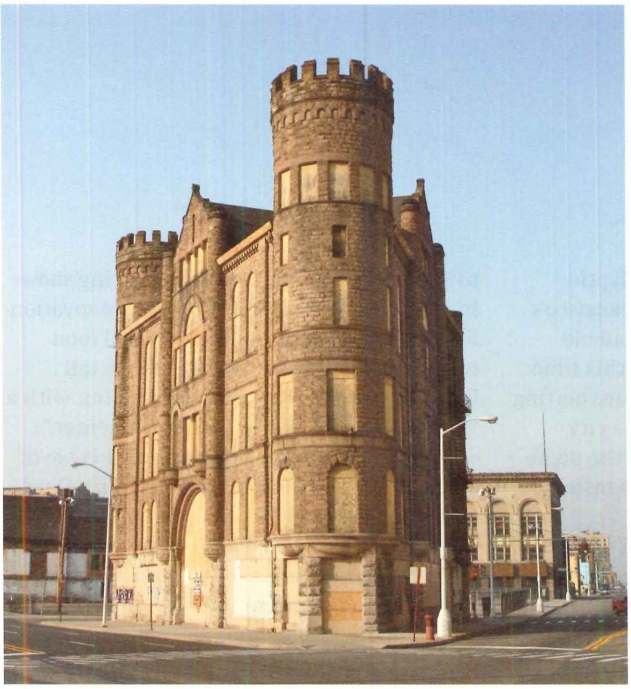
That meant the new offices would contain a lot of wide-open spaces—which, Gilbert notes, was exactly what many of these early 20th-century structures offered. "The M@dison building already had such amazing bones," she says. "All we had to do was uncover it and expose the industrial brick, the terra-cotta tile, the ductwork. That set the tone."

Much of the impetus for this burgeoning tech industry comes from Gilbert's husband, Dan Gilbert, the founder and chairman of Quicken Loans, the online mortgage company. Dan Gilbert, who grew up nearby and is one of the nation's wealthiest people (No. 126 on Forbes's list) moved Quicken's headquarters downtown from the suburbs four years ago and became a crusader for the future of the city. Since then, Dan Gilbert and his team have bought or leased more than 30 buildings downtown, from skyscrapers to four-story 1900s-era structures to the Greektown Casino complex, filling up renovated offices.

Dan Gilbert not only boosted downtown's workforce—Quicken and other large employers like Blue Cross Blue Shield of Michigan have accounted for a high percentage of downtown job growth—he also rallied civic leaders to improve the streetscapes, to create amenities like beach volleyball in Detroit's central Campus Martius Park, and pop-up retail in empty storefronts. He hired the New York–based Project for Public Spaces to help shape a vision for downtown. The organization's founder, Fred Kent, says Detroit offers an unparalleled canvas for revival, given its historic, if tattered, Art Deco skyscrapers, downtown parks, and access to the magnificent Detroit River. "Downtown Detroit's geographic location—and particularly the half-mile from the Detroit River to Grand Circus Park—is the most concentrated diversity of urban assets and place-making opportunities anywhere in the world," he maintains.

SHIFTING GEARS The Elevator Building (above), a 100-year-old industrial building near the riverfront, is rumored to be a former bootlegging outpost used by Detroit's infamous Purple Gang in the 1920s. The space was recently converted into offices for startups. In Midtown, the Green Garage (right), once a Model T showroom, reopened in fall 2011 as an incubator for green businesses.

In addition to architectural distinction, many of the buildings favored by contemporary tech companies have ties to the city's automotive past. The Green Garage, a former Model T showroom, is on the National Registry of Historic Places. Entrepreneurs Tom and Peggy Brennan bought the building in 2008 and spent three years on a renovation to create a net zero energy structure that quickly became a hub of green tech companies. In the city's Midtown district, a 1927 General Motors building, where the famed Corvette was first designed, is now known as Tech One. It's the location of TechTown, the city's leading business incubator. Founding partner General Motors donated the 140,000-square-foot facility that is



currently home to some 50 startups. The structure, designed by Detroit's great industrial architect Albert Kahn, was first a service department for Pontiac and later became the Chevrolet Creative Services building. The auto show displays were built there as well. Now Tech One houses companies like Asterand, a biotechnology firm that supplies tissue samples to drug researchers. Since its inception, TechTown has nurtured at least 250 startup firms and trained thousands of potential entrepreneurs through a variety of programs.

Other businesses are looking beyond the auto industry classics and moving into the city's existing stock of office space, renovating sometimes long-abandoned structures. The 25-story 1001 Woodward tower, built in 1965 as the First Federal Bank Building from a design by the Detroit firm Smith, Hinchman & Grylls (now SmithGroupJJR), stood largely empty after the bank sold it in the 1990s. Developers planned to convert the building into condos before the real estate crash, but in 2010, GalaxE Solutions, a New Jersey–based software firm serving the health-care industry, began to lease a substantial amount of office space, promoting the city as a tech hub with the "Outsource to Detroit" slogan.

In a similar move, Automation Alley, an economic development agency that has operated in Detroit's upscale northern suburbs since 1999, just announced it will open an office in downtown's Broderick Tower, a 1928 office building that was empty for years before a recent renovation. "Our goal is to be a good partner," says Ken Rogers, Automation Alley's executive director. "We think it's a wonderful opportunity for Detroit."

While businesses have helped shape the city by rehabilitating old buildings, the structures themselves have clearly helped shape businesses. The M@dison building, designed by noted theater architect C. Howard Crane, originally included an 1800-seat auditorium; that portion was demolished in the early 2000s for a parking lot, while the attached five-story office section stood largely vacant until Dan Gilbert bought it in 2011. Following its renovation, the space quickly filled up with new ventures, and now several established companies have followed suit—last year, Twitter opened a small outpost there. Other M@dison tenants range from tiny mobile-app developers to Skidmore Studio, a graphic design firm whose president, Tim Smith, says the mix of downtown location and open collaborative space has helped his company boost its revenues and galvanize its mostly young workforce. "Creative people are inspired by their surroundings," says Smith. "And when you're inspired and energized, your work is naturally going to get better." ■

John Gallagher is a business and architecture writer for the Detroit Free Press *and coauthor of the American Institute of Architects' guide to Detroit architecture.*

TECH SUPPORT
The Grand Army of the Republic Building (above), a former club for Civil War veterans and vacant for decades, is now being converted into restaurant and office space. A 1960s-era tower and former bank headquarters, 1001 Woodward (right) is filling up with high-tech companies, while Tech One (bottom) is the city's major tech incubator.

Nerd Alert

A new wave of developments in San Francisco show the danger of betting the urban future on high-tech.

BY JOHN KING

EVERY DECADE or so, an economic boom roils San Francisco. Self-appointed arbiters of cultural taste in this progressive and parochial city declare that gentrification is the most insidious urban danger of all. News flash! Our City will be trampled by newcomers who don't share Our Values.

This time the villains are such locally grown technology icons as Twitter and Facebook, Google and Yelp. Hot-wired job producers that other metropolitan regions dream of; here, in 2013, they're likened to a nightmarish threat.

Consider the alarm sounded by acclaimed author Rebecca Solnit in an essay this year for the *London Review of Books*: "All this is changing the character of what was once a great city of refuge for dissidents, queers, pacifists and experimentalists."

Now consider the alarm sounded by the very same Solnit during the dot-com boom in 2000's *Hollow City: The Siege of San Francisco and the Crisis of American Urbanism*, a requiem for "the great anomaly . . . We were a sanctuary for the queer, the eccentric, the creative, the radical . . ."

So when I once again hear apocalyptic warnings about the threat to San Francisco's soul, they suggest instead that the bubble soon may burst. What's worrisome this time is how developers and government are betting the future on an urban uniculture, a city planned for exactly one segment of the population: lean, lithe Millennials with a taste for food trucks and cash to burn.

You can see this in the packaging of Pier 70, a 28-acre mixed-use project proposed for San Francisco's waterfront.

The developer is Forest City Enterprises, an old hand at urban renewal in all its public-private forms; its largest San Francisco project to date is a 1 million-square-foot shopping mall anchored by Bloomingdale's. The development in the works would include 1,000 residential units and 2.5 million square feet of commercial space on former industrial land, with an estimated infrastructure cost of $152 million.

These most definitely are not small numbers. Yet the public presentations about the master plan—which is still in the early stages—portray Pier 70 as a case study in tactical urbanism with DIY flair, right down to the flow charts with funky lettering showing the "urban ecosystem" where "innovation-focused firms" would subsidize local food markets and artisans. Yes, there'd be tall buildings, the concept maps reveal, but with a "human-scaled creative core at the center."

The renderings are populated by people of all races and an average age of 30, tops. Dogs and bikes are plentiful, as are sunglasses and untucked shirts. One plaza is shown with a farmers' market on the left, food trucks on the right, and a communal table in between. The sidewalk café in another rendering is next to a bicycle path with people doing tai chi among native flowers; the adjacent residential tower is barely sketched in.

The same vibe permeates the city's effort to redo its defining downtown thoroughfare, the broad diagonal of Market Street. In this case, the challenge is to juggle cars and buses, historic streetcars, pedestrians and bicyclists, and the crowds emerging from five subway stations. After several rounds of neighborhood meetings and now-obligatory webinars, the burning question is whether bicyclists—the most tenacious constituency by far—will have dedicated separated lanes on every block.

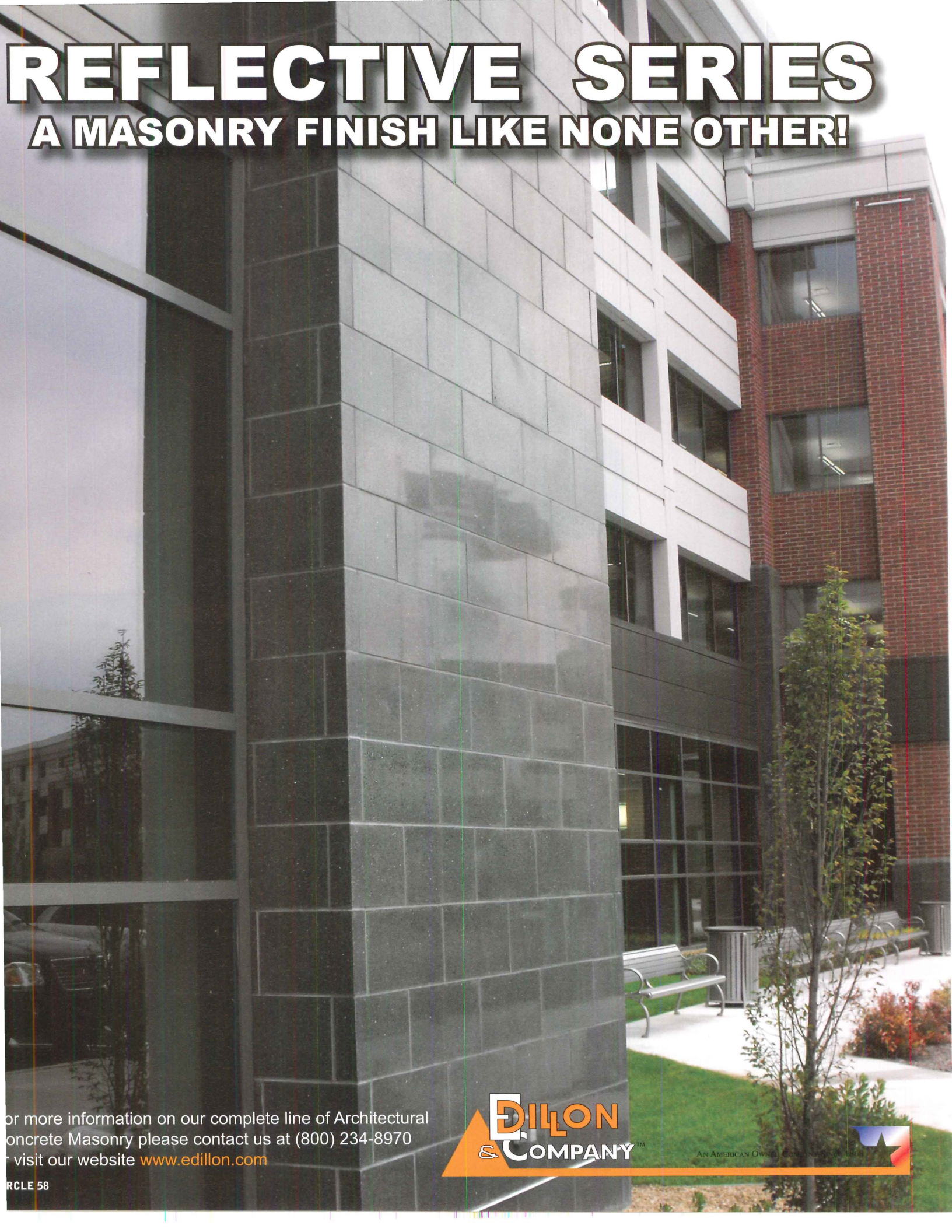
The design firms working as consultants to the city's Department of Public Works on the Better Market Street plan envision "streetlife zones" with spaces "for the virtual, digital and physical worlds to interact." On the rendering of the block that Twitter now calls home, the street furniture includes swinging benches. We see guitarists, bicyclists, two guys in cargo shorts. Nobody wears a tie. Nobody is down-and-out.

There are other projects like these in San Francisco and, from what I've seen, every other ambitious American city today. The visual fluff can be ignored, but it is troubling all the same.

Cities are messy, unpredictable entities. When decision-makers try to force changing districts into a mold—in the case of San Francisco, something akin to Brooklyn-by-the-Bay—the rest of the population could be left outside looking in. ■

GEEK CHIC San Francisco Mayor Ed Lee (foreground, center), Forest City Vice President Jack Sylvan (foreground, right), and others bike through Pier 70. Plans for the site call for food trucks, farmers' markets, and similar amenities.

John King is the urban design critic of the San Francisco Chronicle *and author of* Cityscapes: San Francisco and Its Buildings *(Heyday, 2011).*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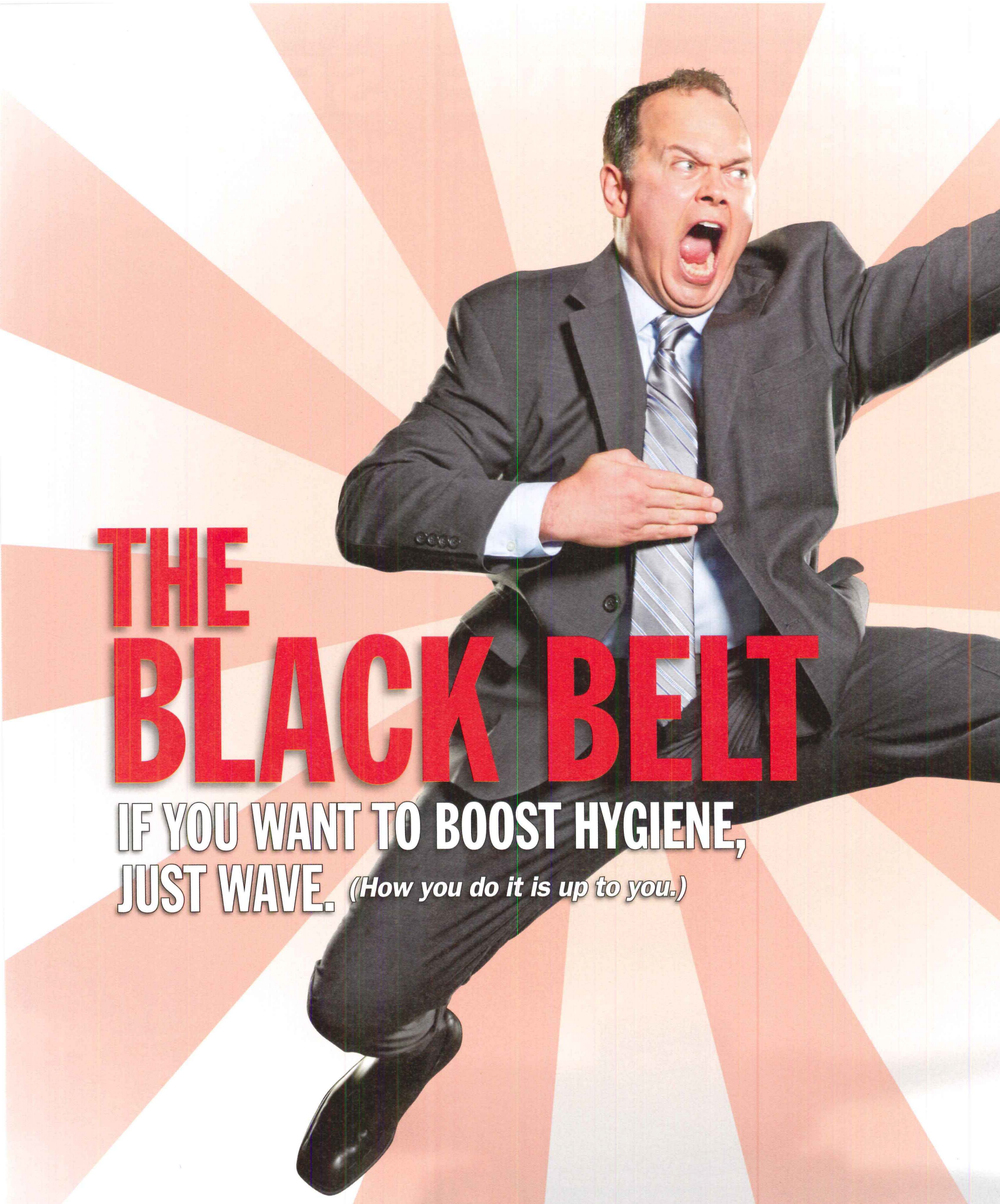

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CIRCLE 51

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CIRCLE 35

pushing the envelope

Just a few years ago, many observers predicted the end of architecture as spectacle. Economic realities seemed to call for a more sober approach to design. While there may have been a pause in the building of instant icons, it didn't last long. We're noticing a return to formal adventurism and an audience hunger for innovation—for elements of surprise and for work that challenges the imagination. Developments in digital and material technologies continue to push architects to look at new ways to build. Still, we think the best architecture must strike a balance between exuberance and restraint. The projects on the following pages—from a futurist arts center in France to a bladelike concert hall in Austria—deftly negotiate the line between extreme exploration and rational solutions, making them not just a little ahead of their time, but timeless as well.

TYROLEAN FESTIVAL HALL, ERL, AUSTRIA, BY DELUGAN MEISSL.

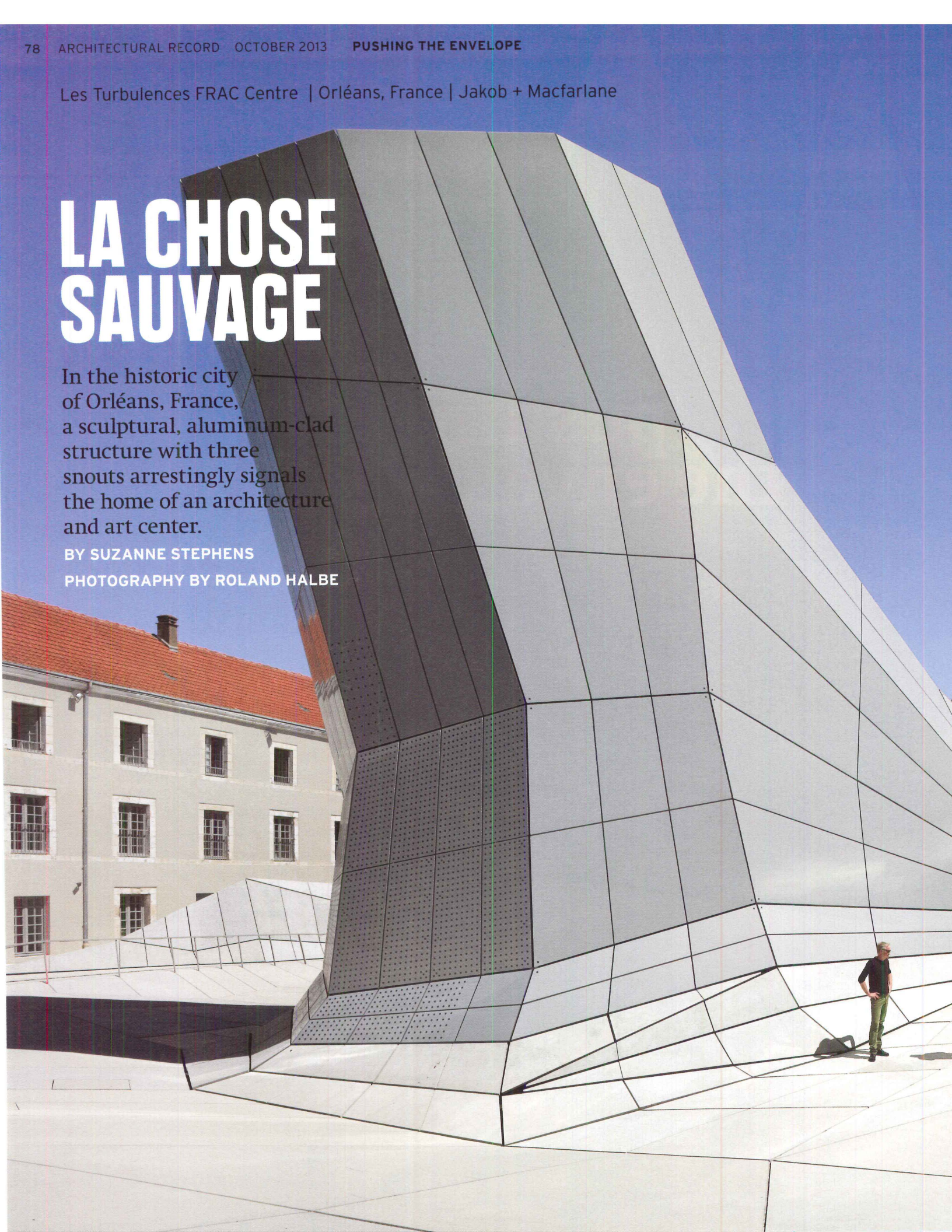
Les Turbulences FRAC Centre | Orléans, France | Jakob + Macfarlane

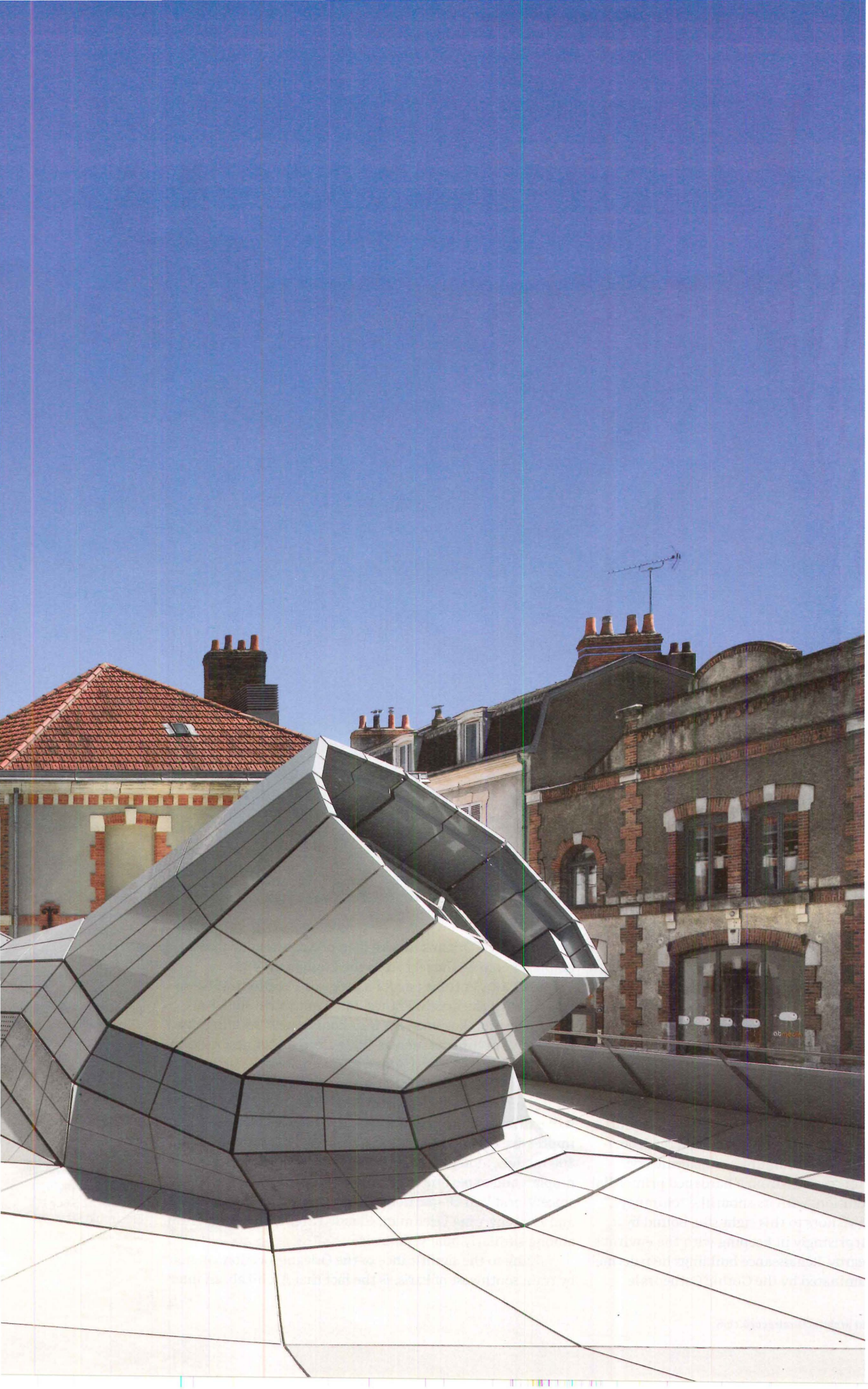
LA CHOSE SAUVAGE

In the historic city of Orléans, France, a sculptural, aluminum-clad structure with three snouts arrestingly signals the home of an architecture and art center.

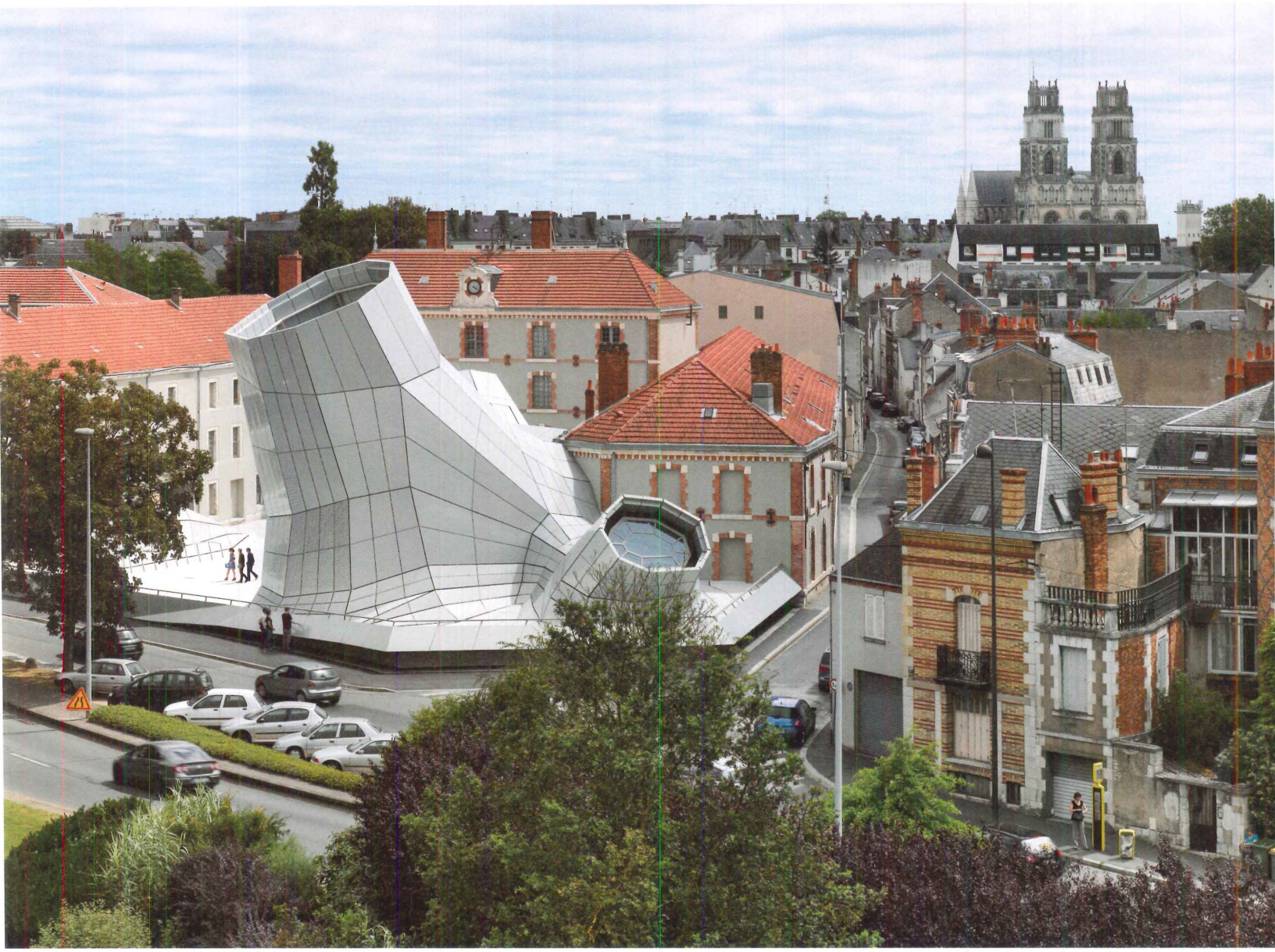
BY SUZANNE STEPHENS

PHOTOGRAPHY BY ROLAND HALBE





ANIMATED FORMS
The digitally computed, faceted extension to the FRAC Centre is named Les Turbulences, owing to its dynamic shape. Architect Brendan MacFarlane and photographer Roland Halbe stand next to one 56-foot-high protuberance, which, like the rest, is covered by aluminum panels and precast-concrete ones (at the base).



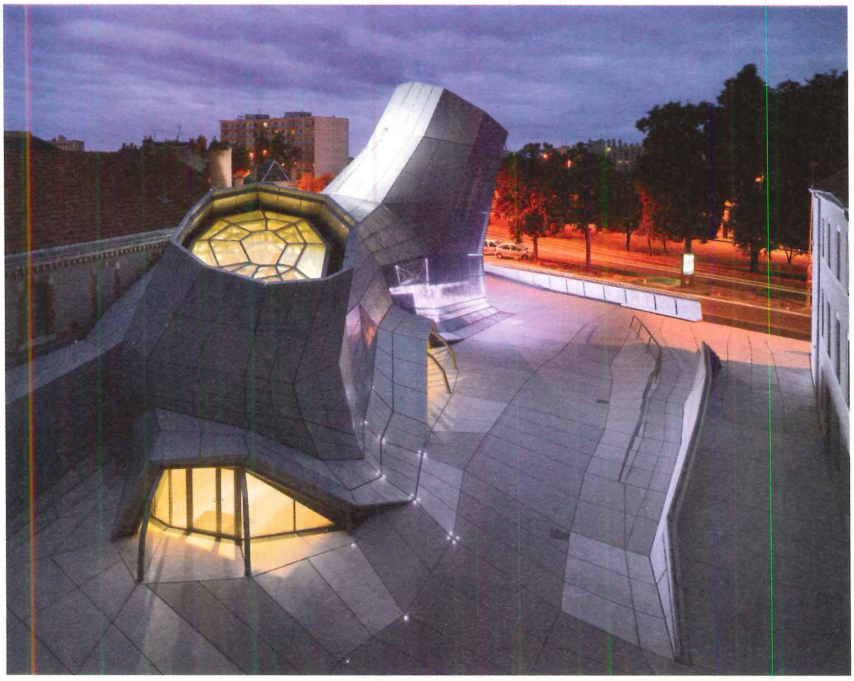
The quirkily exuberant FRAC Centre (Les Fonds Régionaux d'Art Contemporain) in Orléans, France, boldly announces its presence as a new cultural institution with techno-architectural élan. Dubbed Les Turbulences, the complex features a digitally sculpted organic form appended to historic buildings that were once a military supply depot. The project, designed by the Paris-based office Jakob + MacFarlane, involved the restoration and renovation of three 18th- and 19th-century structures plus demolition of a fourth wing to open up the sloping poured-in-place concrete courtyard from which the silvery aluminum-clad, parametric form springs like a sci-fi creature from a hardened primordial ooze. The arresting addition, with its snoutlike "chimneys," energetically beckons visitors to this tight site, bound by a busy road, its scale surprisingly in keeping with the environs of this historic city. Nearby, Renaissance buildings help define the center of town, dominated by the Gothic Cathédrale Sainte-Croix d'Orléans, where Joan of Arc attended mass before liberating the city from the English in 1429.

The FRAC Centre is part of a program, begun in 1982, to decentralize the arts in France. In recent years, the FRAC administration has been commissioning new buildings by innovative architects such as Odile Decq in Rennes [RECORD, June 2013, page 192] and Kengo Kuma in Marseilles, in addition to Jakob + MacFarlane and others, to create settings for its contemporary arts program. With Orléans, FRAC will exhibit architecture for the first time and show off its impressive collection of 15,000 architectural drawings and 800 models, along with works by artists. Featured are utopian and experimental architectural projects conceived since World War II—particularly designs from the 1960s and 1970s by Yona Friedman, Claude Parent, and Archigram, among similarly bold visionaries.

Adding to the significance of the Orléans location, an hour by train southwest of Paris, is the fact that ArchiLab, an inter-

AT HOME
Les Turbulences (above) has a scale and sense of place that allow it to nestle comfortably among the Renaissance-vernacular of brick and limestone buildings (with the Cathédrale Sainte-Croix d'Orléans in the background). Jakob + MacFarlane renovated the U-shaped complex of historic buildings that embrace the new addition. At night, an LED art piece by Electronic Shadows (opposite) gives the skin a sci-fi sparkle.

View additional images at architecturalrecord.com.



national conference of young experimental architects, has had its base of operations in the unused *subsistence militaire* buildings since the conference was first organized in 1999 by Marie-Ange Brayer, director of the FRAC Centre, and Frédéric Migayrou, deputy director of Paris's Centre Pompidou. ArchiLab's ninth meeting and exhibition, *Naturalizing Architecture,* on view until February 2, 2014, appropriately inaugurates the spirited center, with its focus on the interaction of science and architecture.

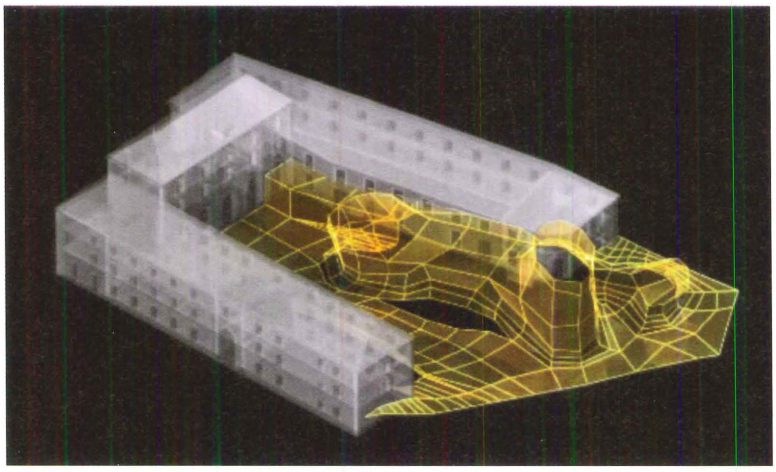
Dominique Jakob and Brendan MacFarlane, who have taken part in past ArchiLab events, designed the insouciantly biomorphic, 5,380-square-foot extension to accommodate the museum entrance, a café, temporary installations, and a video space underneath the various skylit protuberances. Equally important is their sensitive renovation of the stucco-walled, limestone-and-brick-trimmed historic buildings, with red-tile roofs, for the permanent (4,000 square feet) and temporary exhibition spaces (12,000 square feet). All told, the older buildings provide 22,350 square feet for galleries, plus administration, education, and other uses.

By exposing the cast-iron-column-and-wrought-iron-beam frame and wood floors of the U-shaped ensemble, the architects revealed the spare, modern quality of the historic buildings themselves. Since two of the wings' structural grids were not aligned in a unified orthogonal plan but are cranked slightly away from each other, the two partners exploited the "clashing geometries" and a "deformation" of spatial flow that they perceived as an impetus for the extension's design. "We thought the structural grid of the past could be a jumping-off point for a geometry that moves into the future," says MacFarlane.

The "snouts" gleam and glow at night. Clad in light aluminum panels, they are perforated to accommodate LEDs arrayed in dynamic patterns by the French multimedia artists Electronic Shadows. The envelope is basically a double facade: the architects mounted the outer skin of aluminum, as well precast concrete panels (at the base), over an armature of steel plates, supported by a tubular steel frame. The tubes, approximately 6½ inches in diameter, create a three-dimensional matrix that, on the interior, makes a vividly muscular statement about its role supporting each of three chimney/Turbulences: the spirit of Viollet-le-Duc lives on. The largest

CLOSE-UP: CREATING TURBULENCE

DIGITAL CALCULATIONS (below) ruled the construction of the FRAC Centre's irregular geometry. For the aluminum-clad addition's framework, the design team used steel tubes, 6½ inches in diameter, to create a rigid self-stabilizing skeleton. The steel tubes were welded on site (except for the main crossbars) to form nodes where four vertical and horizontal tubes intersect. To do so, the ends of the tubes were cut by a digitally controlled laser and a five-axis digital machining head to create tongue-and-groove joints, each of which is unique. Rhomboidal-steel plates cover the tubular frame. Extending from each corner of the plates are *potelets* (attachment elements) with thermal breaks, which in turn support the framing for the exterior skin of aluminum panels. From the 3-D modeling to the on-site welding, the process called for constant recalculation. The fabricator even put together most of the structure in a factory near Grenoble, France (spot-welding it), before reassembling it at Orléans. The result is a creative, highly futuristic work—one that is both digitally executed and crafted by hand.



credits

ARCHITECT: Jakob + MacFarlane – Dominique Jakob and Brendan MacFarlane, principals in charge

ENGINEERS: BATISERF (structural)

CONSULTANTS: Emmer Pfenninger AG; BATISERF (facade); Louis Choulet (sustainability; electricity); Bureau Michel Forgue (surveyor)

CLIENT: Conseil régional du Centre

METAL FABRICATOR: ERTCM

SIZE: 5,380 square feet (Les Turbulences); 22,350 square feet (renovated buildings); 4,300 square feet (garden)

COST: $10.5 million

COMPLETION DATE: September 2013

SOURCES

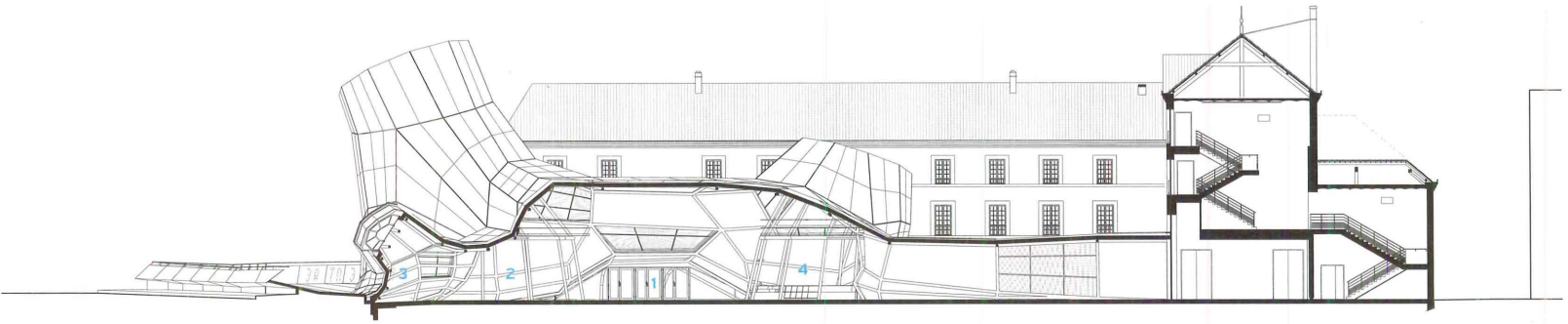
ALUMINUM RAINSCREEN : Alcoa Reynobond

LED LIGHTING: Philips Lighting

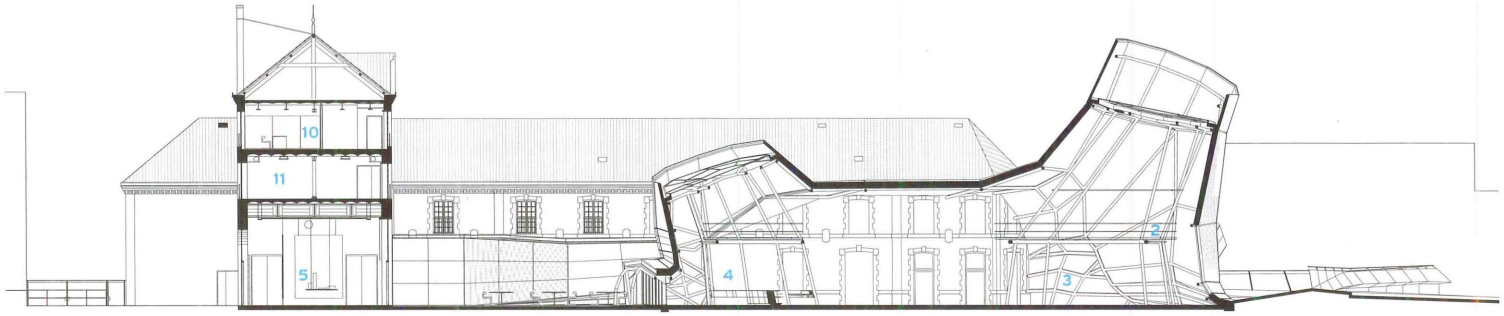
INTERIOR LIGHTING: Thorn Lighting

EXHIBITION LIGHTING: ERCO

THERMAL BREAKS: Schock

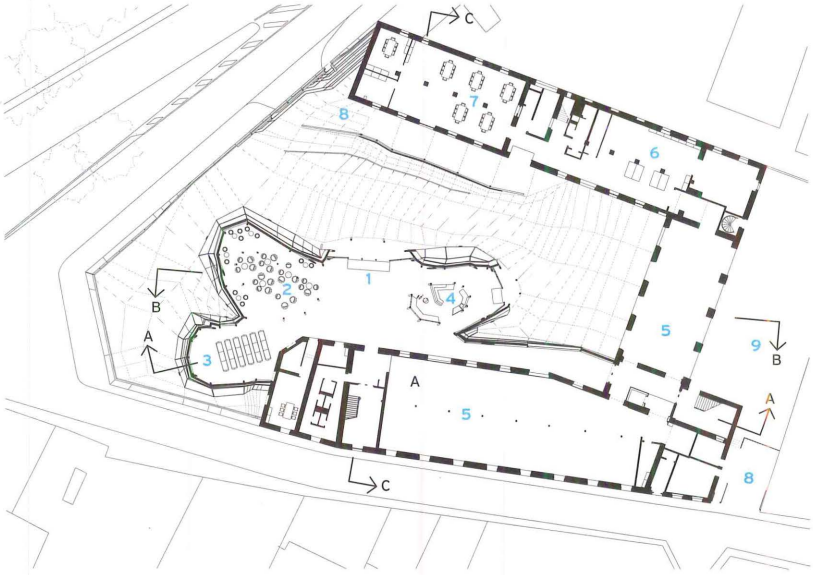


SECTION A - A



SECTION B - B

1 ENTRY
2 INFORMATION GALLERY
3 VIDEO GALLERY
4 RECEPTION/BOOKSTORE
5 TEMPORARY EXHIBITIONS
6 ARCHIVES
7 TEACHING AREA
8 DELIVERIES
9 GARDEN
10 ADMINISTRATION
11 PERMANENT EXHIBITION



MAIN FLOOR

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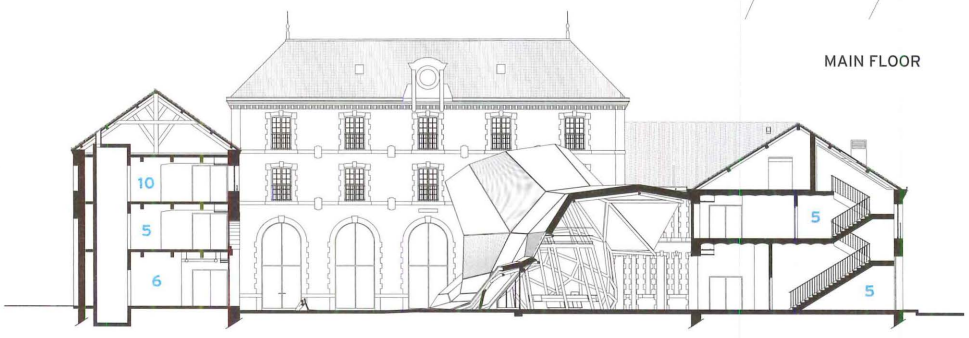
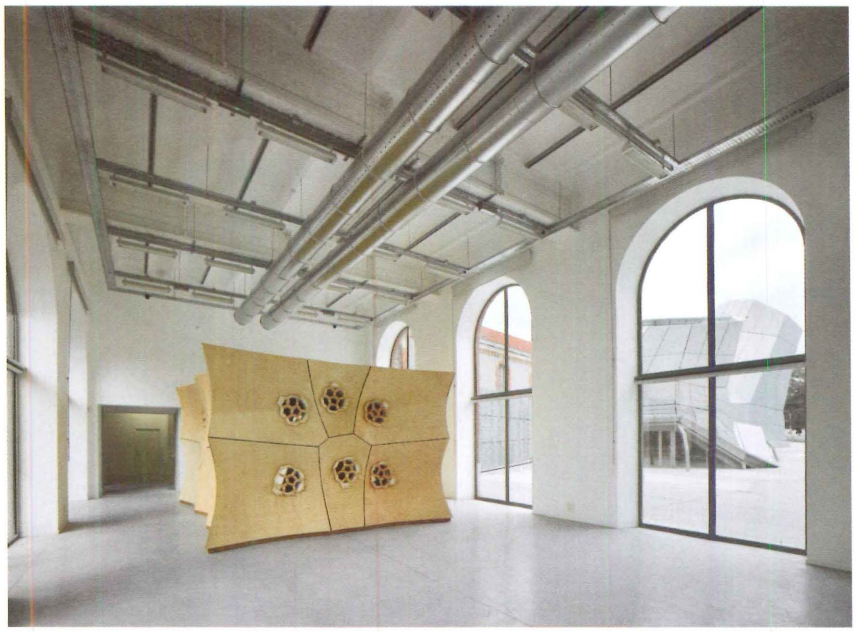


SECTION C - C

0 20 FT.
6 M.

ART PIECE In the main hall (opposite), the admissions counter occupies a Tatlinesque framework topped by a skylit chimney and softened by the acoustic birch cladding. In an adjoining historic building (opposite top) sits a new addition to the permanent collection, *HygroSkin-Meteorosensitive Pavilion*, by Achim Menges Architect + Oliver David Krieg + Steffen Reichert.



Turbulence contains the temporary exhibition space; the middle-sized chimney, with shelves and framework that look vaguely like Tatlin's Tower, is designated for admissions and a bookstore, while the smallest has video installations.

The architects, known best for their Restaurant Georges at the Centre Pompidou [RECORD, September 2000, page 128], the Docks de Paris on the Seine [RECORD, June 2009, page 110], and the Orange Cube, an office and showroom in Lyon, France [RECORD, May 2011, page 122], have long investigated radically digital designs. Yet both MacFarlane, a New Zealander schooled at the Southern California Institute of Architecture (SCI-Arc) and Harvard's Graduate School of Design, and Jakob, trained at the École d'Architecture Paris-Villemin, embrace working with the past. MacFarlane says, "We are not just interested in restoration. We believe in it." With this project, the two bring old and new into a dynamic dialogue, encouraging the interaction between the architectural artifacts on display and the viewers. Because they emphasize craft, detail, and scale in their abstractly expressive design, they have succeeded in creating a shock of the new that avoids the jarring dissonance of some such exercises. ■

City Library | Seinäjoki, Finland | JKMM Architects

OUT FROM THE MASTER'S SHADOW

Just as Alvar Aalto pioneered a softer, less severe form of Modernism, a young Finnish firm innovates with social spaces that point a library addition—and a small town—in the direction of the future.

BY CLIFFORD A. PEARSON

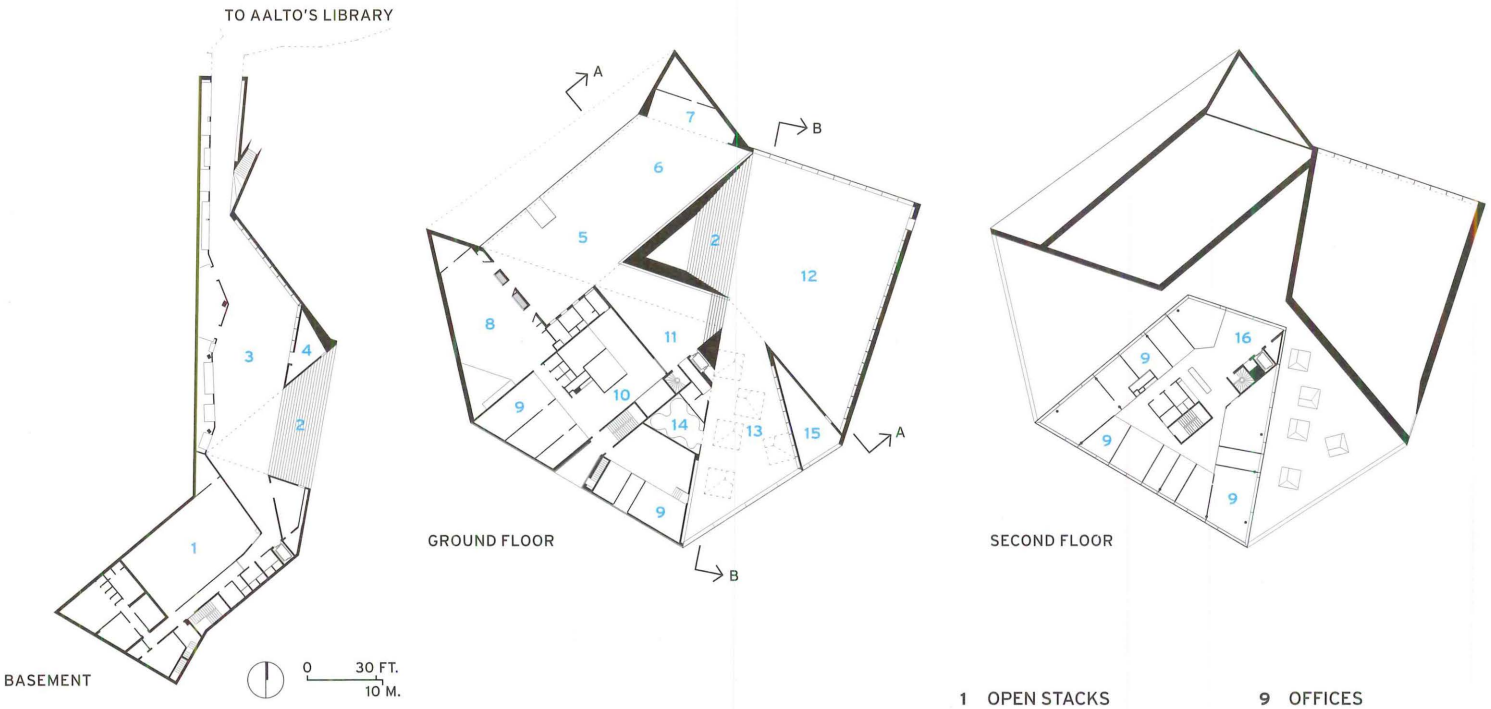
DESIGN DIALOGUE
In deference to Aalto's 17,250-square-foot library (left in photo) JKMM designed its 47,700-square-foot addition (right in photo) to read as a set of volumes, not one large structure. The clocktower of a church by Aalto rises in the background.

Designing an addition to an Alvar Aalto building is hard enough—try doing it with five other Aalto structures hovering nearby, in a Finnish town whose identity has been indelibly linked to the master since the 1960s. A separation of nearly 50 years does help with the task, providing a buffer between the original architect and the young guns hired to muscle their way into the existing cluster of local landmarks. "The shadow of the big guy was something we struggled with," says Asmo Jaaksi, the partner at JKMM Architects in charge of adding to Aalto's 1965 City Library in Seinäjoki. "But the generation before us had more trouble with Aalto," says Jaaksi. "They were paralyzed by him."

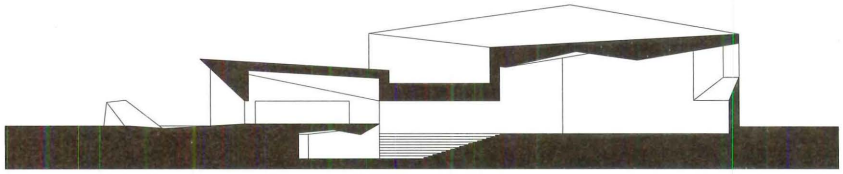
Like most of Aalto's work, his library in Seinäjoki is about creating a place, not whipping up forms. You enter a simple, almost nondescript box, then discover a fan-shaped reading room that embraces you with curving bookshelves, light floating in from above, and a sunken reading area that's as intimate as a public space can be. JKMM avoided direct quotations from the big guy's vocabulary but followed his lead in developing a Scandinavian strain of Modernism that focuses on social interaction and welcoming spaces, rather than heroic forms.

Since its start in 1998, JKMM has established itself as a rising star—recognized in RECORD's 2002 Design Vanguard issue and given the honor of designing the Finnish Pavilion at the 2010 World Expo in Shanghai. In 2008, it won the Seinäjoki competition with a gutsy scheme that pushed its building closer to the Aalto library than any other entry, but broke down the bulk of its design into a trio of simple forms. (The competition required that the addition connect to the original building only underground.) "We wanted the buildings to be close enough to carry on a conversation," says Jaaksi.

View additional images at architecturalrecord.com.



1 OPEN STACKS
2 READING STEPS
3 TEENS
4 MUSIC LISTENING
5 ENTRY HALL
6 PERIODICALS
7 CAFÉ
8 MULTIPURPOSE HALL
9 OFFICES
10 DISTRIBUTION
11 INFORMATION
12 BOOK HALL
13 CHILDREN
14 PLAY
15 SILENT READING
16 STAFF CAFÉ



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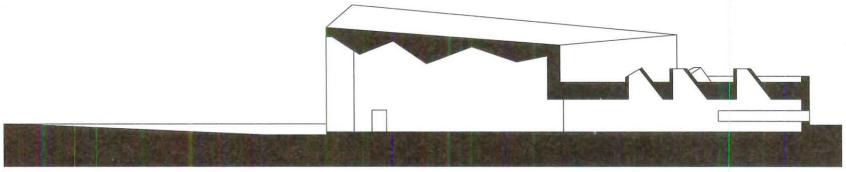

SECTION B - B

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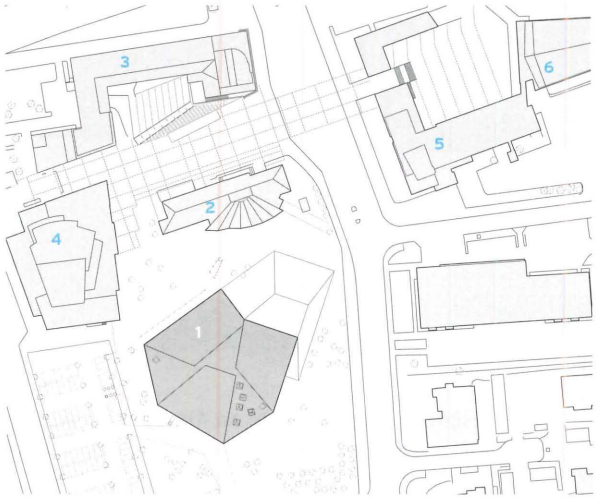
10 M.



SITE PLAN

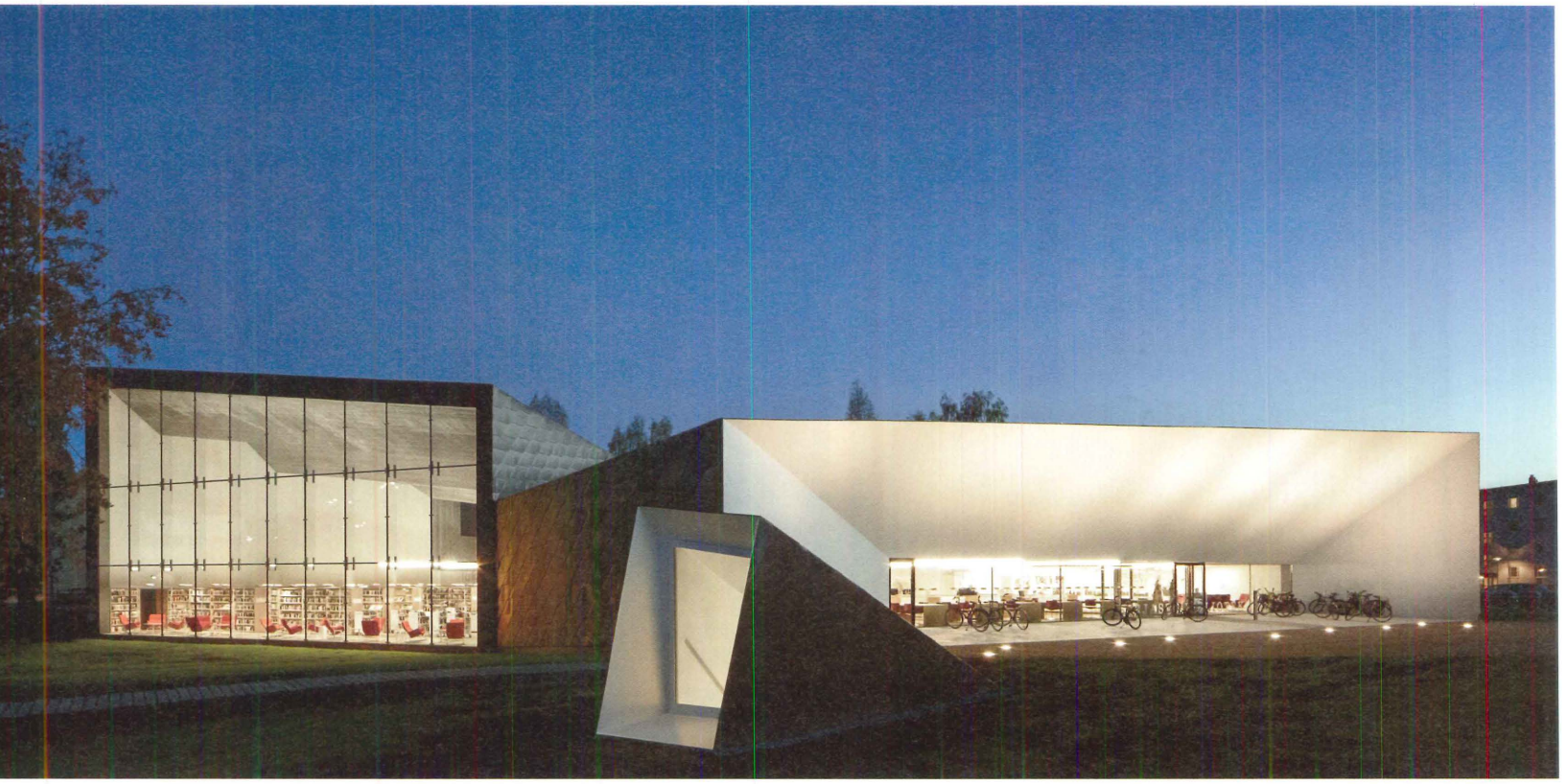
0 200 FT.
60 M.

1 LIBRARY ADDITION
2 AALTO LIBRARY
3 TOWN HALL
4 THEATER
5 PARISH CENTER
6 CHURCH

Aalto left his mark on Seinäjoki, a town of 60,000 people 225 miles north of Helsinki, with a church (1960), a town hall (1962), a parish center attached to the church (1966), a state office building (1968), and a theater (completed in 1987, 11 years after his death), in addition to the library. Grouped together in a three-block area, the buildings constitute the town's cultural and administrative center, a veritable holy district for locals and tourists. "Getting the scale right for the new building was critical," explains Aaro Martikainen, a project architect at JKMM. Because the addition is much larger than the original library—48,000 square feet versus 17,250—JKMM treated it as three interlocking forms. From the outside, you never read it as one mass but see it episodically, as a series of folded sheds.

Aalto clad his buildings predominantly in white tile, topping them with copper roofs. JKMM reversed the palette, wrapping its addition in copper shingles (darker and less green than Aalto's) and using white as an accent. Wary of daylight's damaging books, Aalto employed glass sparingly in his library—mostly as clerestories above the bookshelves. JKMM, though, opened up its building on the north and northeast with great walls of glass that direct views to Aalto's library and church.

The architectural pas de deux continues as you enter the new building. While



LOOKING IN While Aalto's library is mostly opaque, with just clerestory windows in its reading room, the addition offers big views into its main book hall (left in photo above) and its entry pavilion (right in photo above). Even an emergency egress stair from the tunnel connecting the old and new library buildings gets its own copper-clad enclosure with a view inside (center in photo above). The $13.2-million JKMM building joins a collection of six Aalto works in Seinäjoki's cultural and administrative center (below).

credits

ARCHITECT: JKMM Architects – Asmo Jaaksi, lead designer; Aaro Martikainen, Teemu Toivio, project architects; Teemu Kurkela, Samuli Miettinen, Juha Mäki-Jylhilä, Päivi Meuronen, Harri Lindberg, design team

ENGINEERS: Magnus Malmberg Oy (structural); Ylitalo Oy (HPAC); Satakunnan Insinöörikeskus Oy (electrical)

CLIENT: City of Seinäjoki

GENERAL CONTRACTOR: Rakennusliike Timo Nyyssölä Oy

SIZE: 47,700 square feet

COST: $13.2 million

COMPLETION DATE: August 2012

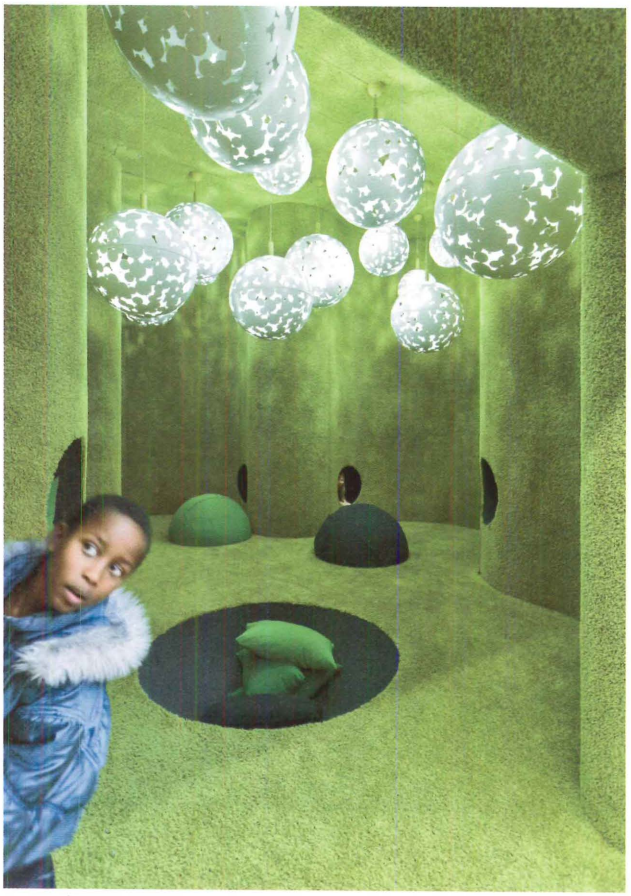
SOURCES

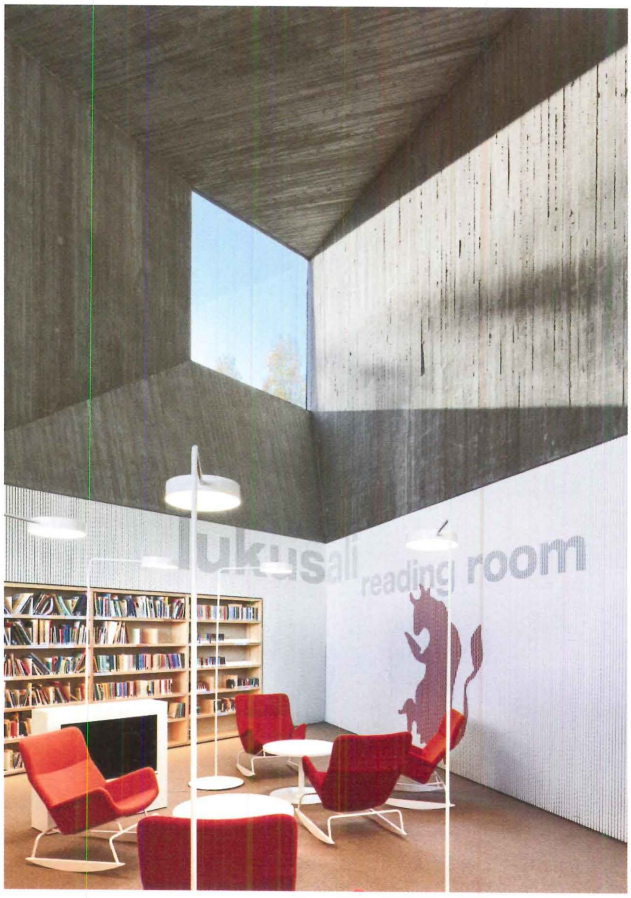
CURTAIN WALL: Pilkington Planar (modified by JKMM)

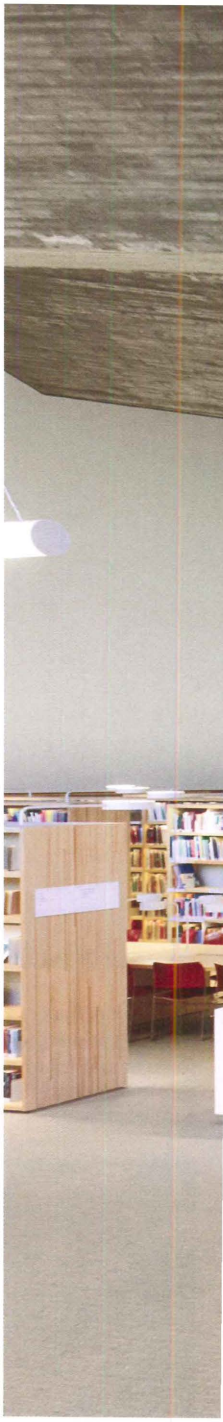
COPPER SHINGLES AND ROOF: Pohjanmaan Rakennuspelti Oy

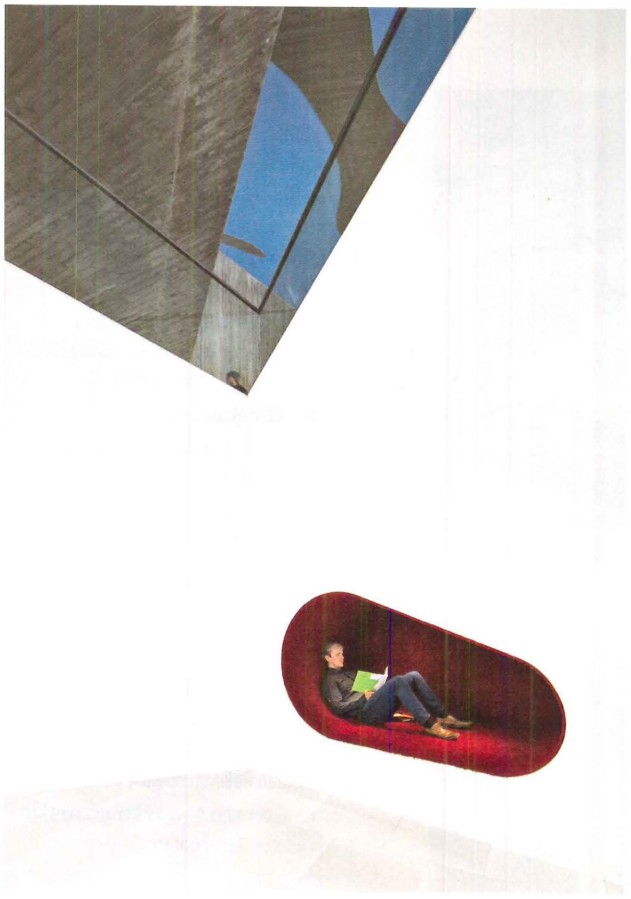
COTTON-BASED SPRAYED ACOUSTIC SURFACES: Decocoat Oy

CARPET: Desso

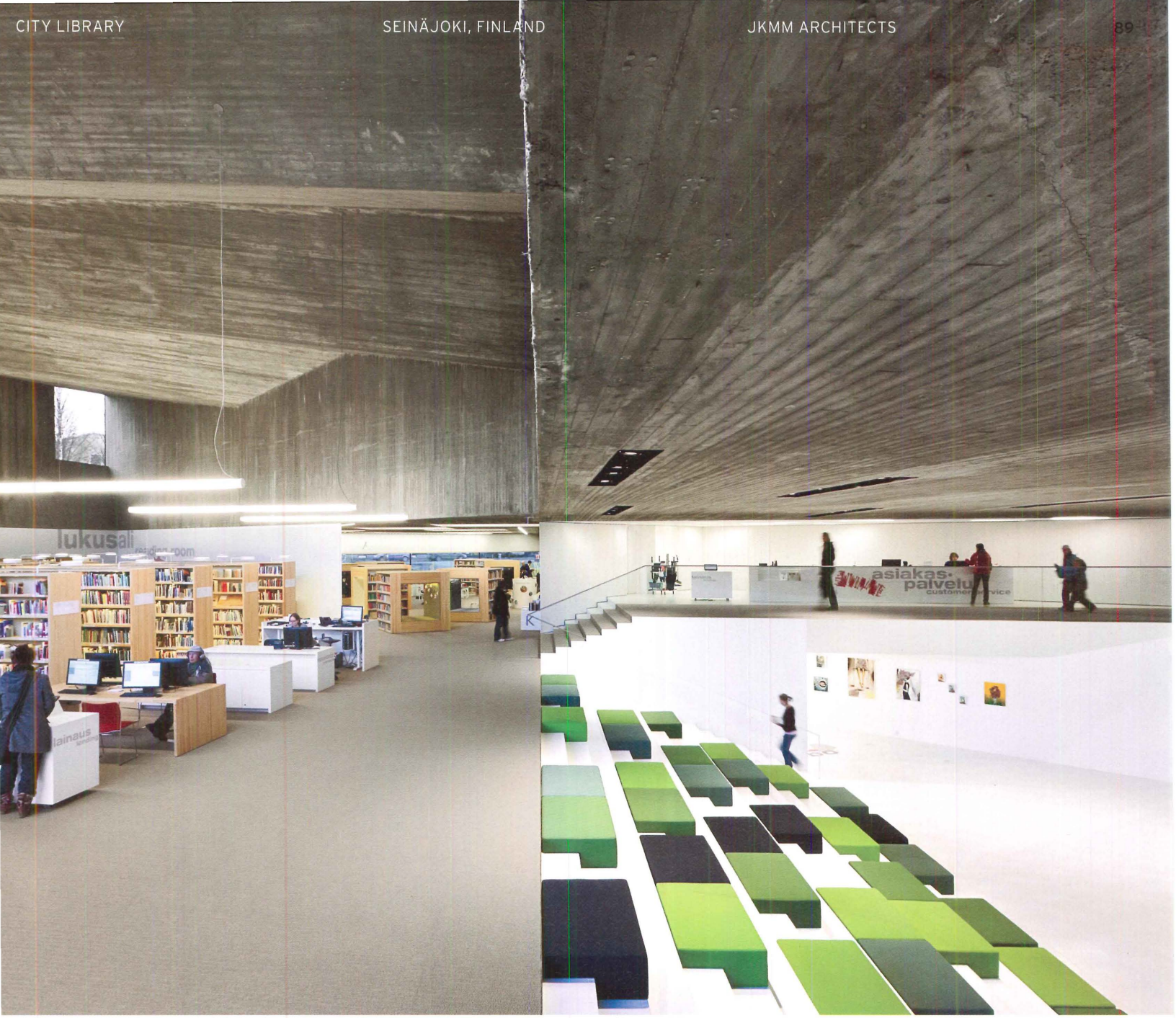








GETTING TOGETHER
Designed for a digital age, the library reduces the presence of bookshelves, instead offering places for people to gather and read, such as the "reading steps" (right in photo above). More intimate spaces include (clockwise from top left) a playroom, a corner of the book hall, reading boxes for kids, and nooks in the teen area.



the original library faces a paved plaza across from the town hall, its addition sits in a parklike setting. You enter the combined library today from the addition, through a glass wall facing the old building's reading room. (The Aalto building is closed for renovations but will reopen at the end of 2014, when it will house the arts and history collections.) On the inside, JKMM's work becomes more exuberant—its rugged poured-concrete structure visible on upper walls and in the folded roof above the main book hall, which echoes in section the plan of Aalto's reading room. To create large column-free spaces, the architects employed long-span concrete beams like those found in bridges. Uneven planks in the formwork give the concrete a textured surface that complements the white-painted wood battens on the walls of the main level.

The three sheds that seem separate on the outside come together on the inside in a series of spaces that flow, one into another: across a narrow bridge past the information desk, down to the book hall and the children's area, then down the amphitheaterlike "reading steps." With all the daylight tumbling onto those stairs, it's hard to believe that, at the bottom, you're in the basement and on your way to the tunnel (not yet completed) to the Aalto building. Yet, within this great open interior, JKMM imbued each area with its own personality, lowering the ceiling in the periodicals room near the entrance, for example, and carving out five 8-foot-deep, angled skylights from the ceiling in the children's section. The firm punctuated the library with splashes of color and whimsical elements, like the curvilinear reading nooks inserted in a wall in the teen area and a playroom padded all around with green carpeting.

The architects designed the building to accommodate the changing function of libraries. "In a digital age, libraries are no longer about searching for information," says Jaaksi. "They're about bringing people together." So he created large open interiors to encourage interaction among visitors and, over time, offer flexibility in the way the facility is used.

What hasn't changed is the library's function as an important civic player. "It's the only noncommercial place that's for everybody," says Jaaksi. While dancing with Aalto's legacy, JKMM has reasserted the role of Finnish Modernism as a progressive force knitting a community together. ■

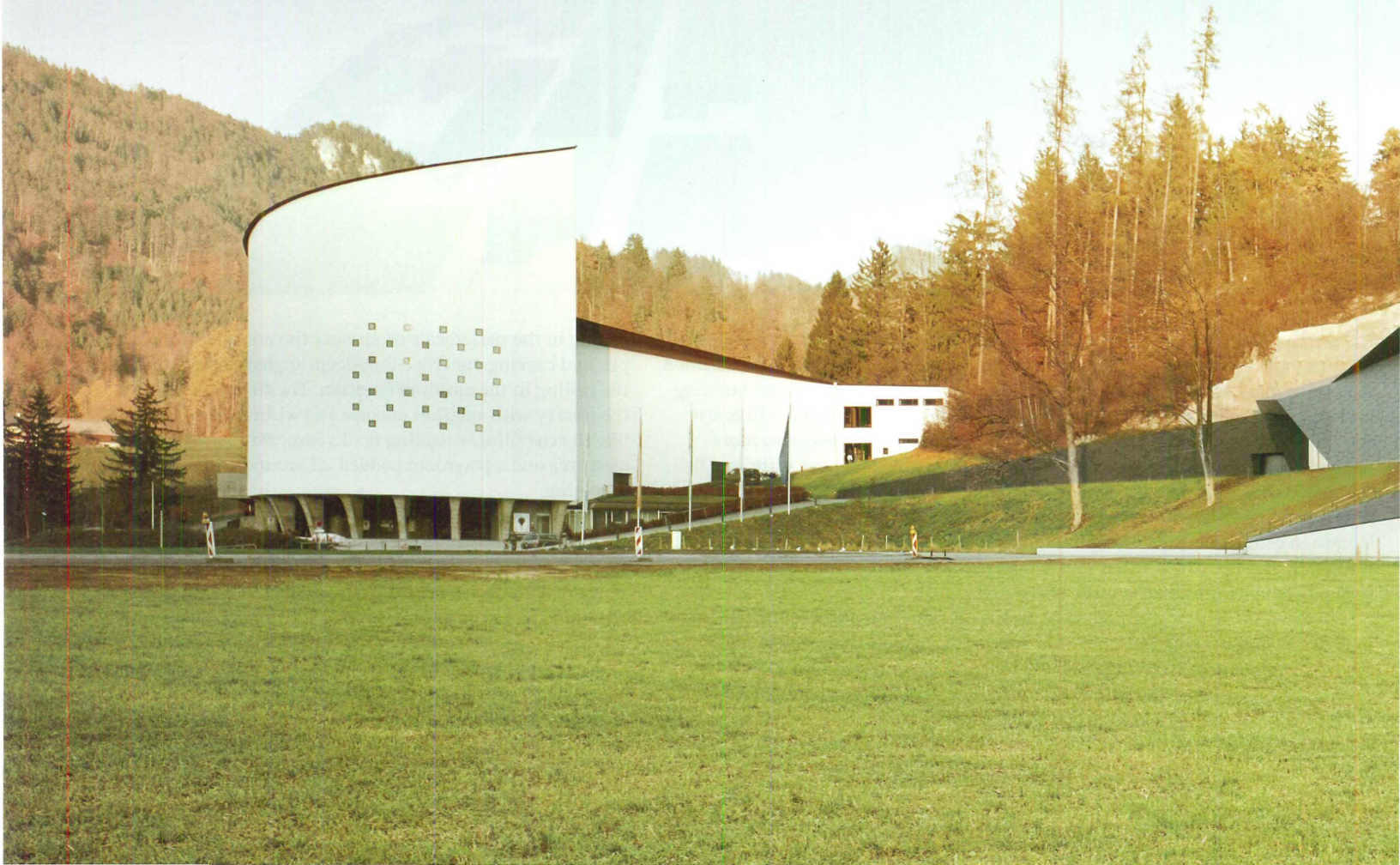
Tyrolean Festival Hall | Erl, Austria | Delugan Meissl Associated Architects

PEAK PERFORMANCE

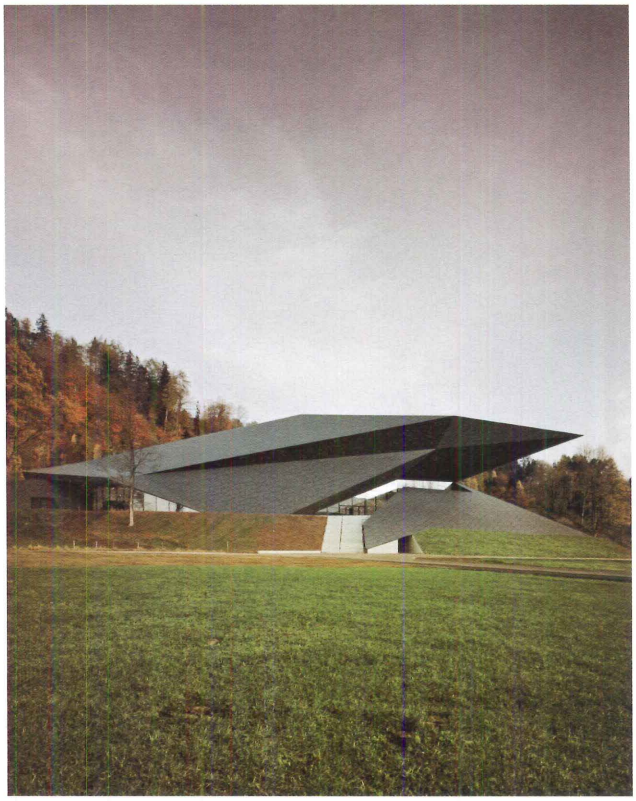
A concert hall carves its own niche in the Austrian Alps while bowing to the neighboring midcentury playhouse and the breathtaking landscape beyond.

BY TRACY METZ

PHOTOGRAPHY BY BRIGIDA GONZALEZ



THE HILLS ARE ALIVE Anchored in a grassy slope, the new building holds an unlikely dialogue with the adjacent Passionsspielhaus, which has hosted Passion plays (acted out by the townspeople) once every six years since the late 1950s.



In the picturesque Austrian village of Erl, just east of the German border, where the rugged Alps seem to descend from the heavens to meet the undulating valley below, a striking, angular structure, the Tyrolean Festspielhaus, or Festival Hall, pierces the landscape that inspired it. "We conceived of the building as tectonic plates shifting over one another," says Sebastian Brunke, one of the project architects (along with Jörg Rasmussen), of the Viennese firm Delugan Meissl Associated Architects (DMAA). "The opening between the two plates forms the foyer, which glows at night and through which the Alpine landscape flows like a carpet." Reflecting the mountains above, the upper volume's sharply pointed cantilever juts out almost 100 feet. Its radical design juts out, too, in Erl–a typical Tyrolean town of traditional wood chalets with flowerboxes full of geraniums.

The new concert hall, with its horizontal orientation and stern, thrusting forms, is also a counterpoint to its predecessor, the adjacent Passionsspielhaus, or Passion Playhouse, a swooping white performance space by Tyrolean architect Robert Schuller. Built in the late 1950s to host a Passion play once every six years (a local tradition that dates back to the early 17th century), the uninsulated, nautiluslike building is only able to operate during the warmer months. Thanks to the new venue, the Tyrolean Festival organization, with its own orchestra and choir academy, is now able to extend its program of opera and classical music into the winter.

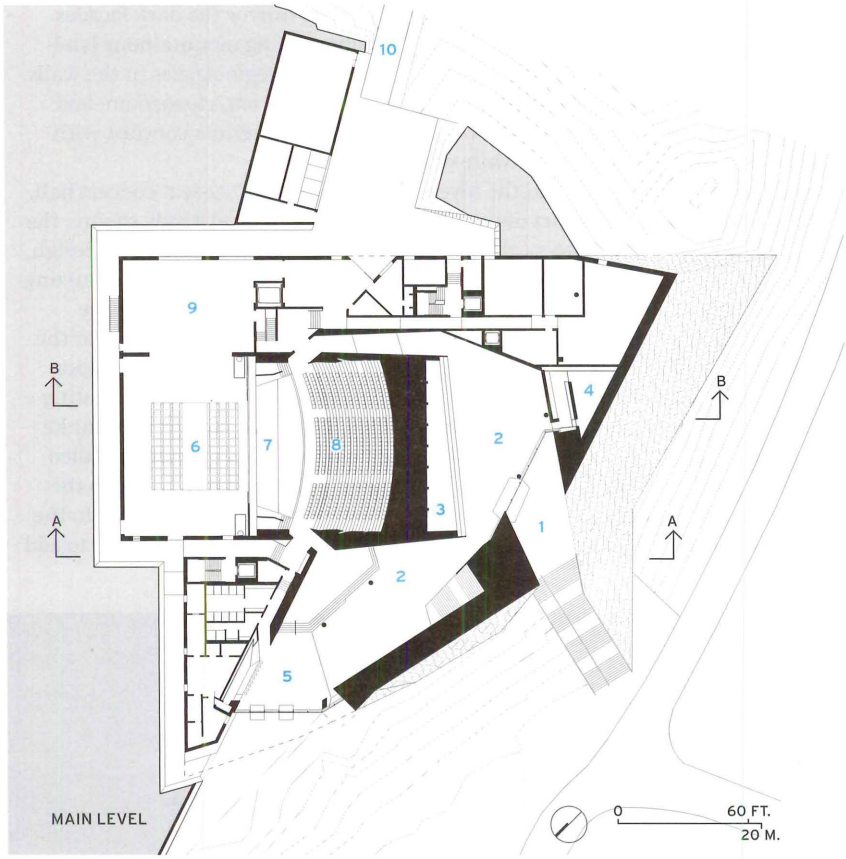
"In order to wrap a volume like this, with its two intersect-

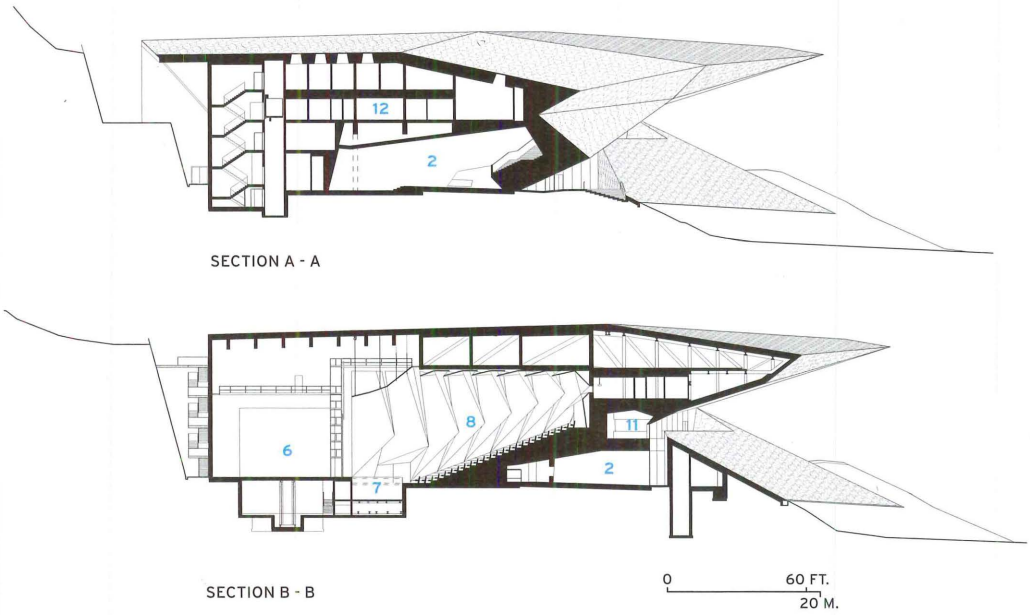
FINELY TUNED
Oiled acacia wood panels (below) lend a visual and acoustic richness to the concert hall. A cavity above the space accommodates lighting technicians as well as serving to draw smoke up and out of the space in the event of a fire. Charcoal-gray fiber cement panels clad the exterior (opposite top and bottom) and create a unique texture for the building's sleek form.

ing planes," explains the 33-year-old Brunke, "we broke the envelope down into elements whose pattern does not have a discernable direction." Lending a reptilian texture to the sleek, origami-like form, a skin of charcoal-colored fiber cement panels shrouds the building and takes on various shades of black and gray depending on the angle of the sun. The surface is composed of modules, each consisting of four panels—two chevron-shaped pieces and two irregular quadrilaterals—mounted on metal frames secured to the building's steel structure as if part of an elaborate jigsaw puzzle.

The influence of the Alpine topography continues past the concert hall's sculptural exterior. Inside, the double-height foyer narrows and widens, reflecting the nature of the site in its 3 percent slope up from west to east. Traversing the building means feeling the sensation of moving up or down that gradient. This is emblematic of the architects' larger design approach, where expanding and contracting spaces guide visitors through their buildings, causing them to experience the dimensions of the architecture in a more conscious way. The lobby's acutely angled walls mirror the dark facades beyond, as well as to the surrounding mountainous landscape, which seeps in through strategic slashes in the walls. Inserted into this public space are a bar, cloakroom, and ticket counter whose darkly hued interiors contrast with the bright white of the lobby.

Beyond the foyer, visitors enter the 732-seat concert hall, the heart of the building. The space is relatively square; the architects altered the original competition-winning design, which was longer and narrower, to cut costs by minimizing excavation into the hillside behind. Even so, a massive quantity of stone and soil had to be removed to anchor the building in the slope. Adjusting the concert hall's proportions also brings the audience closer to the stage, creating a more intimate experience. This "folded cave," as Brunke describes the hall, is lined in oiled acacia panels installed with impeccable workmanship. Flexibility was key to the design. The orchestra pit can be raised mechanically to the same level as the front of the hall, making it possible to add





1 ENTRANCE
2 FOYER
3 COAT CHECK
4 TICKET COUNTER/PRESS LOUNGE
5 BAR
6 STAGE
7 ORCHESTRA PIT
8 CONCERT HALL
9 BACKSTAGE
10 STAFF ENTRY/DELIVERY
11 UPPER FOYER
12 FLY LOFT

130 chairs. And it can be raised farther, to the level of the stage, to hold a full orchestra. Movable wood panels in the wings can alter the width of the stage from 59 to 69 feet, to accommodate anything from chamber music to opera. Offices, rehearsal areas, and dressing rooms are tucked into the irregular "leftover" spaces between the rectangular hall and the assertive facade.

From the point when DMAA won the competition for the project in 2007, progress was swift. It helped that the firm had the trust of the Festival president, Hans Peter Haselsteiner, who is an art collector as well as executive of the project's construction company and its main financier. Construction started in the fall of 2010, and the 95,000-square-foot building was complete in less than 20 months.

The greatest challenge of the project, says Brunke, was to accommodate the specific programmatic demands for the building while maintaining the fluid geometry of its form. The architects also had their work cut out for them with regard to the site and its bold existing features, both built and natural. And here DMAA's instinct was dead on: rather than insert itself quietly onto the scene, the Festival Hall Erl translates the language of its surroundings into a powerful architectural gesture, marking a new era for the tradition of performance in this quaint Tyrolean enclave. ■

credits

ARCHITECT: Delugan Meissl Associated Architects - Sebastian Brunke, Jörg Rasmussen, project managers; Philip Beckmann, Eva Schrade, Torsten Sauer, Simon Takasaki, Anja Vogl, project team

ASSOCIATE ARCHITECT: MHM Architects

ENGINEERS: FCP Fritsch, Chiari & Partner (structural)

CONSULTANTS: Hailight Lichtplanung (lighting); Quiring Consultants (acoustical); e.f.f.e.c.t.s. technisches Büro (stage planning); PKE Electronics (stage machinery); PGI (geotechnics)

CLIENT: Winterfestspielhaus ERL Errichtungss-und Betriebsgesellschaft

GENERAL CONTRACTOR: STRABAG

SIZE: 95,000 square feet

COST: $47 million

COMPLETION DATE: August 2012

SOURCES

CURTAIN WALL, WINDOWS, DOORS: Metallbau Erich Trinkl

STRUCTURAL STEEL: Arge Baustahl - Eisen Blasy Neptun

FIBER CEMENT PANELS: Wanit Fulgurit

ACOUSTICAL CEILING: Barth Innenausbau KG

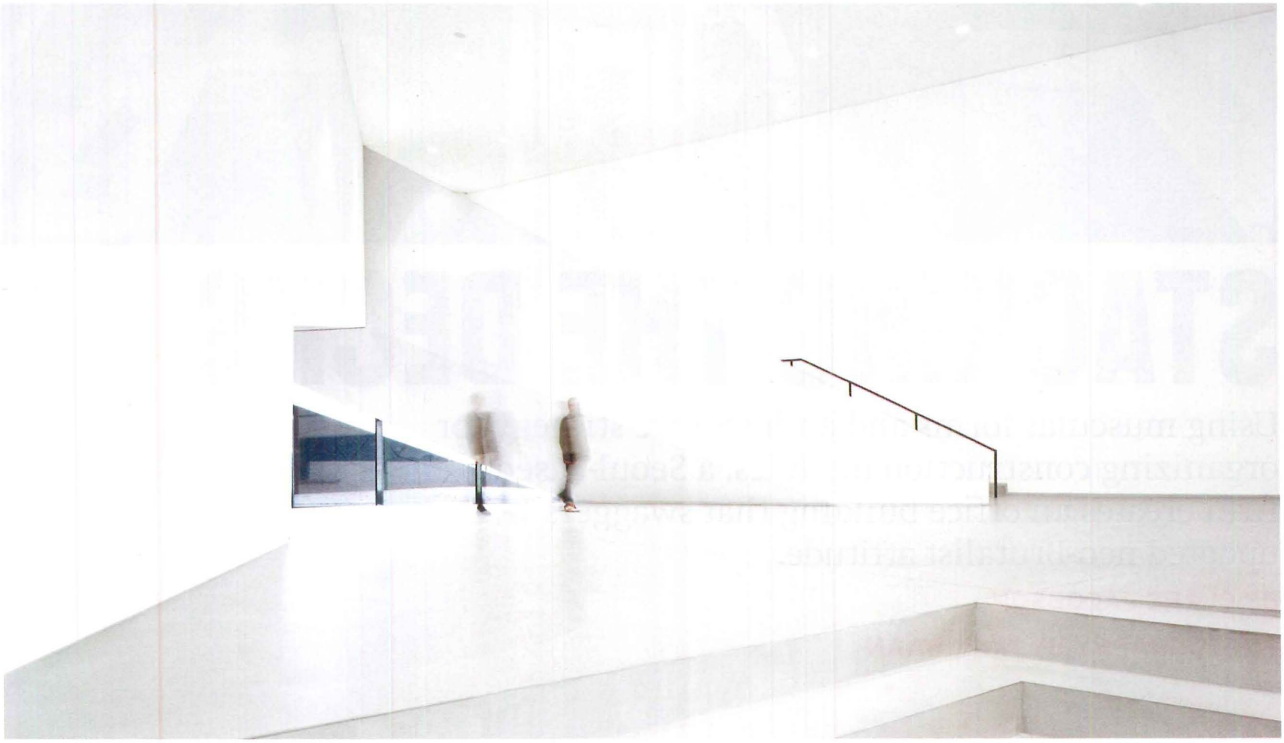
WOOD FLOORS: FISCHER-PARKETT

RESILIENT FLOORING: AUER Estrichverlegung

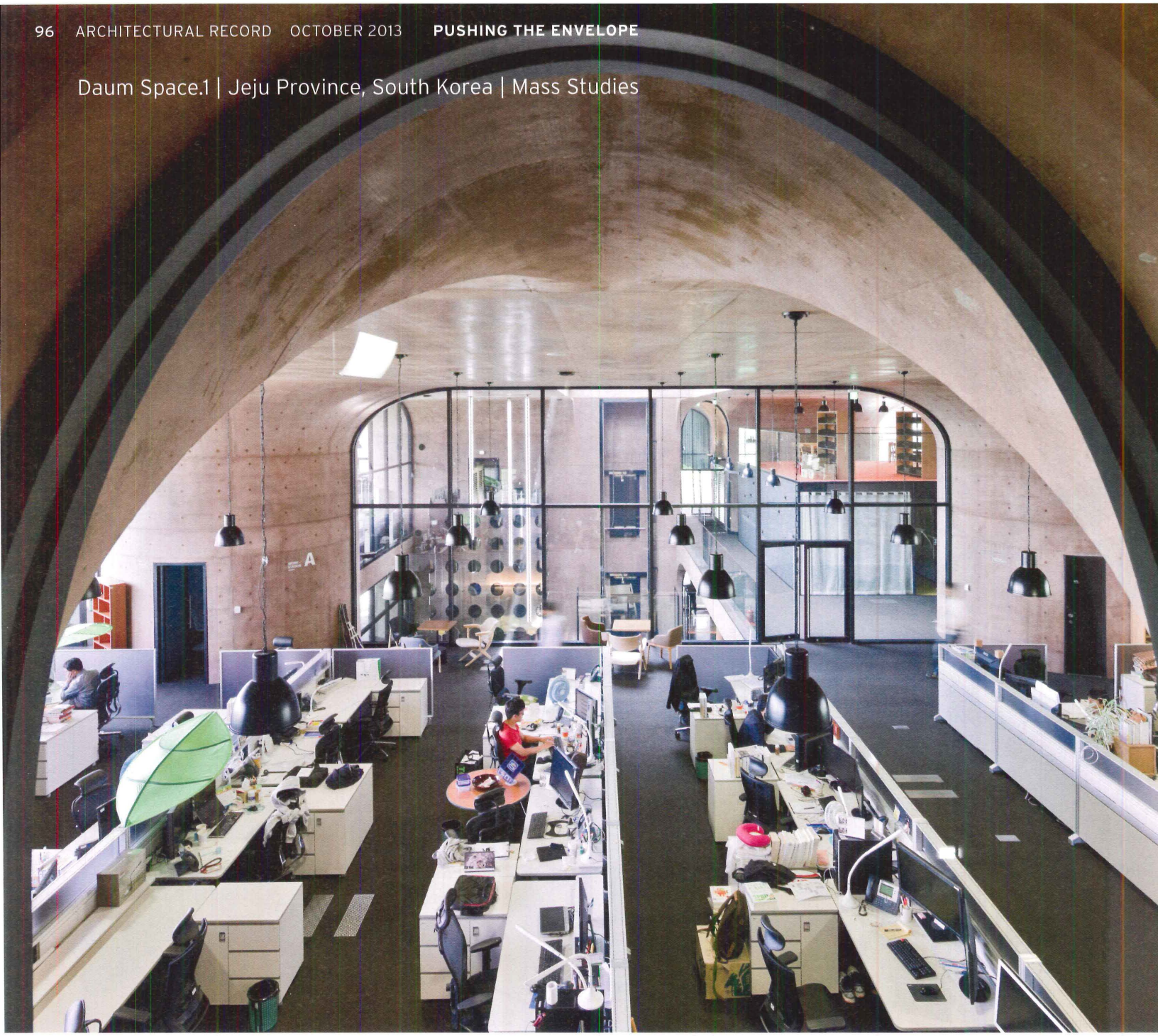
FIXED SEATING: BRAUN Lockenhaus

ELEVATORS: KONE

INSIDE STORY
While referring to the surrounding mountain landscape as well as the building's exterior, the foyer (above and right) also serves as a counterpoint, with its bright white, crisply folded-plane walls and pristine, poured-concrete floors. The space moves visitors from the wide-open spaces of the valley into the performance hall at the building's center.



Daum Space.1 | Jeju Province, South Korea | Mass Studies



STACKING THE DECKS

Using muscular forms and an inventive strategy for organizing construction modules, a Seoul-based architecture firm creates an office building that swaggers with an updated neo-Brutalist attitude.

BY CLARE JACOBSON

PHOTOGRAPHY BY IWAN BAAN

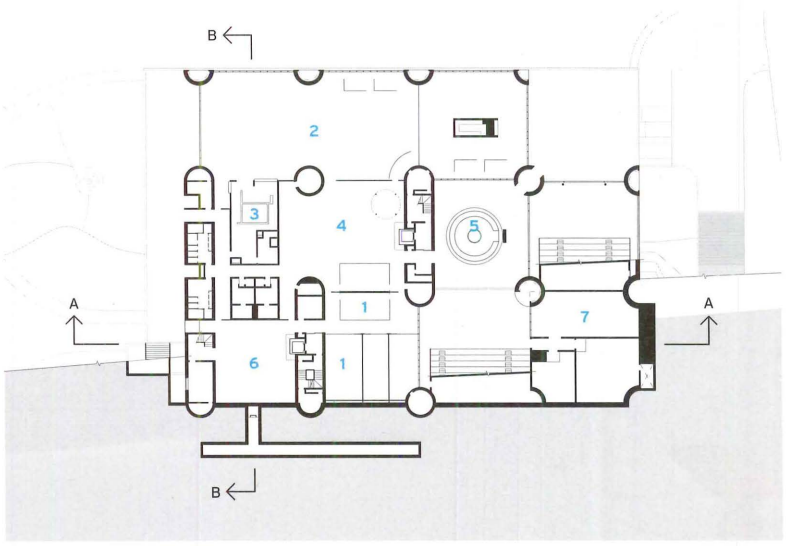
EXPANSION PLAN
The five-story building provides the kind of open, nonhierarchical workspace that the client needs (above). Nestled into the sloping site on an axis that will lead to other office buildings in the future (opposite bottom), it offers green roofs and a variety of outdoor spaces shaded by cantilevered roofs (opposite top).

Jeju may seem an unlikely place to pioneer a new form of structural expressionism in office architecture. The southernmost province in the Republic of Korea—a 713-square-mile volcanic island with the long-dormant Halla Mountain at its center—lies 57 miles off the mainland. Its subtropical climate and natural and fantastical attractions (including one of the world's longest lava tubes and museums dedicated to erotic art and teddy bears) make it a popular tourist destination.

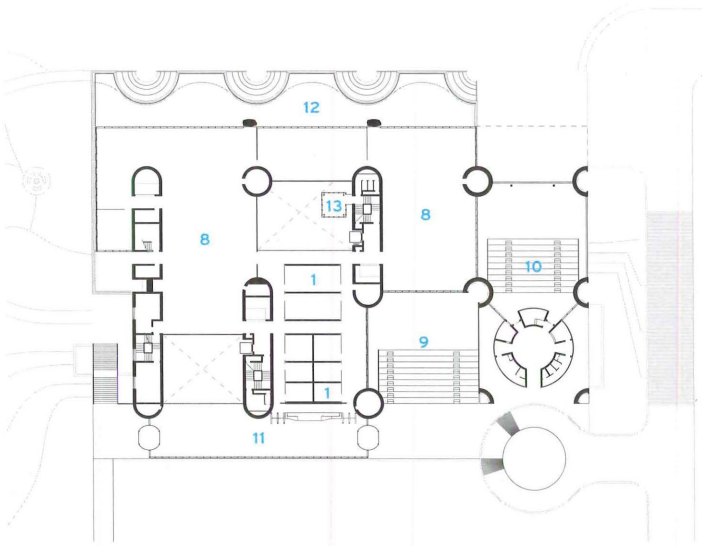
But in Jeju, Minsuk Cho of the Seoul-based architecture firm Mass Studies used the job of creating offices for Daum Communications, a web portal and media company, to demonstrate how a rigorously conceived system of structural elements can produce a building that expresses the dynamic energy of a fast-growing high-tech client. Daum is in the process of moving its main offices from Seoul to this idyllic isle (population 585,000) because it needs more space. In addition, standard office blocks in Seoul are expensive, and their vertically stacked floors with separate executive offices are not ideally suited to Daum's open way of working. On Jeju, the company can expand horizontally on a 33-acre site in a larger development designated for technology industries. The emerging IT hub, meant to emulate the success of Silicon Valley, is near Jeju University, which plays the role of Stanford here, to complete the comparison with California's high-tech corridor.

Cho first gained attention as a partner in Cho Slade Architecture [RECORD, "Design Vanguard," December 2000], a firm he founded with James Slade in New York in 1998 before returning to Korea and starting Mass Studies in 2003.

The firm designed the master plan for the Daum development, as well as the first building, Daum Space.1. Rather

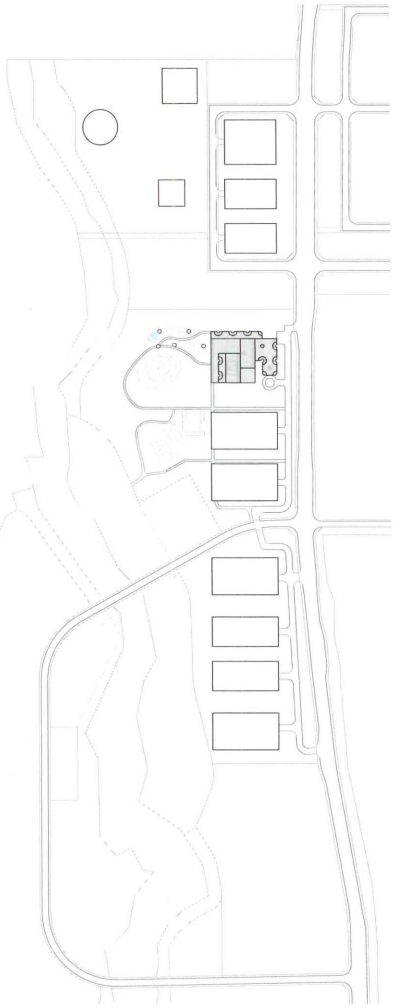


GROUND FLOOR



SECOND FLOOR

0 30 FT.
10 M.

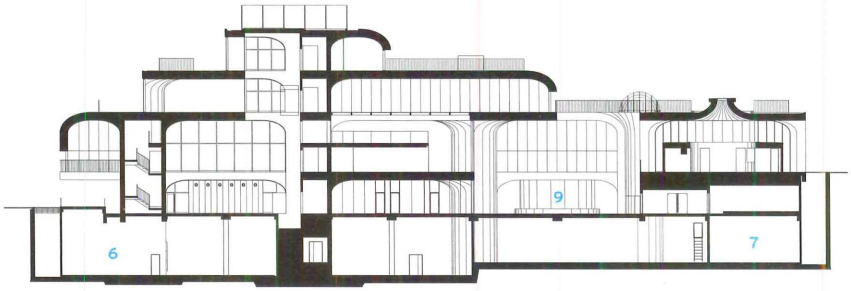


MASTER PLAN

0 150 FT.
50 M.

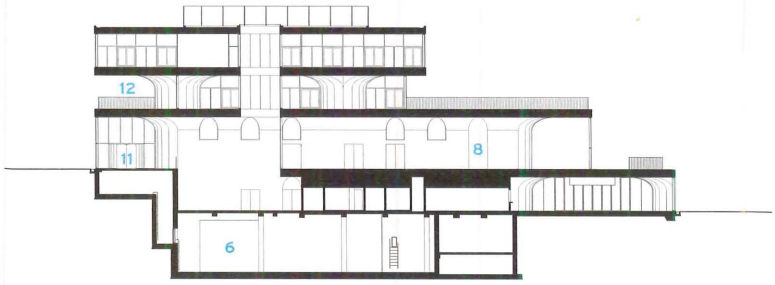
■ DAUM SPACE.1
□ FUTURE DEVELOPMENT

1 MEETING ROOM
2 CAFETERIA
3 KITCHEN
4 LOUNGE
5 PAVILION
6 GAME ROOM
7 GYM
8 OFFICE
9 OPEN-AIR AMPHITHEATER
10 AUDITORIUM
11 LOBBY
12 TERRACE
13 TREE HOUSE



SECTION A - A

0 30 FT.
10 M.



SECTION B - B

credits

ARCHITECT: Mass Studies – Minsuk Cho, Hyunjung Kim, Jisoo Kim, Sungpil Won, Sangkyu Jeon, Jangwon Choi, Kwonwoong Lim, Nikolas Urano, Sebastien Soan, Youngjoon Chung, Junghye Bae, Bhujon Kang, design team

ENGINEERS: The Kujo (structural); HANA Consulting Engineers (m/e/p)

CONSULTANTS: Soltos (landscape); Newlite (lighting)

CLIENT: Daum Communications

GENERAL CONTRACTOR: Hyundai Development

SIZE: 98,850 square feet

COST: withheld

COMPLETION DATE: November 2011

SOURCES

GLASS AND SKYLIGHTS: Hanglas

ALUMINUM-FRAME SLIDING DOORS: LG Hausys

STUCCO SPRAY FINISH: Terraco

PENDANT LIGHTS: Samil Lighting

CROSS SECTION From the south, visitors arriving in the evening can see how the 98,850-square-foot building arranges functions into open work areas and communal spaces such as those for dining and presentations.

than follow a typical model—offices scattered around a campus—the plan concentrates buildings along an "urban" axis and frees up an open "rural" area for a tennis court, putting greens, a walking trail, and a vegetable garden.

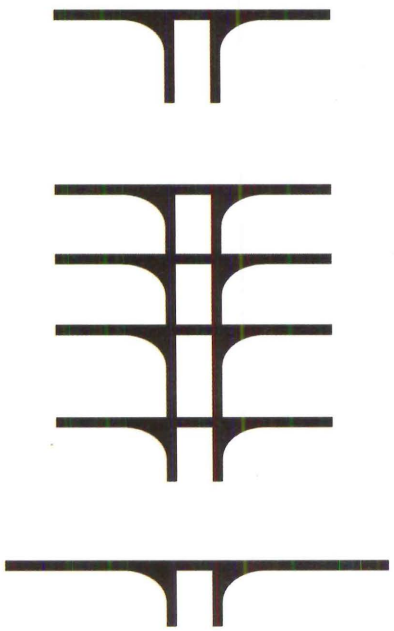
Cho and his team placed Daum Space.1 at the center of the plan, allowing growth to the north and south, and designed it as a set of vaulted concrete modules (see Close-Up, right) that enclose swaths of open work areas.

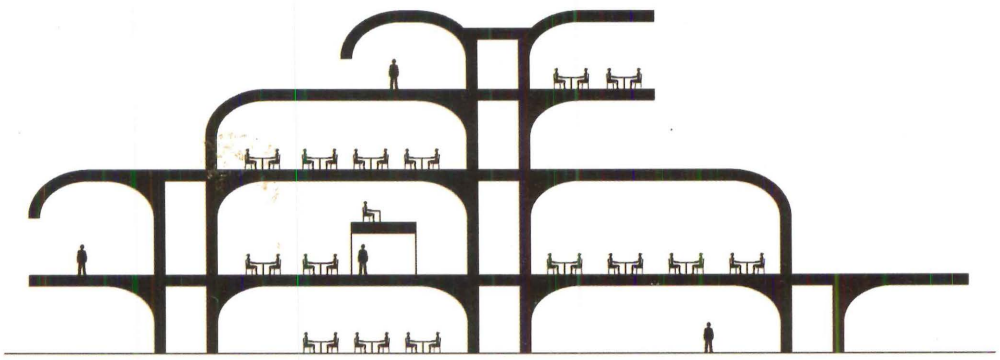
The building's curved colored-concrete forms and complex spatial organization set it apart from the plain white-box offices built by other companies in the area. Its repeating modules, stacked in irregular ways, create rhythmic combinations almost musical in nature. At the same time, its muscular roofs and a series of bulbous concrete piers that fan out at the top to form either half or full circles define an almost neo-Brutalist aesthetic with its own swaggering personality. And the horizontal thrust of the building's forms can be read as a metaphor for Daum's corporate structure.

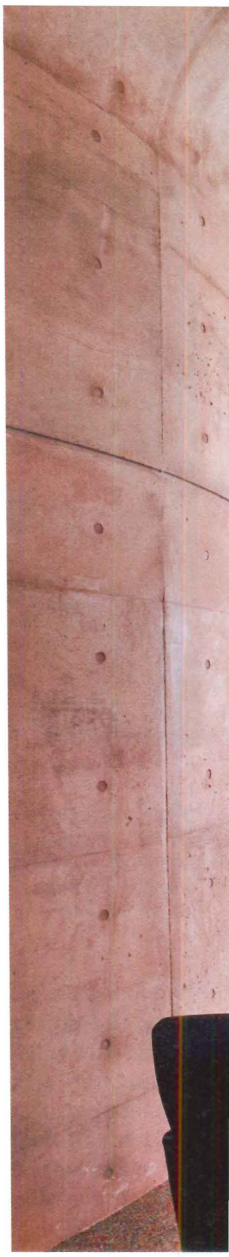
Yet the macho architecture is softened by the gently curved modules that create it. The structural components break down the 98,850-square-foot five-story building into sections stacked

CLOSE-UP: MODULES

CONSTRUCTION MODULES are common in contemporary architecture, beloved for the economy of their repetitive nature. But at Daum Space.1, Mass Studies used modules for less pragmatic, more conceptual reasons. According to principal Minsuk Cho, standardized units bring rigor to the building—something he thinks is often missing in a digitally empowered age. Cho started with five types of modules, each 28 feet square, then stacked them five stories high in combinations varying from 8 to 49 per floor. The design allows for 41-foot spans and 21-foot cantilevers. Exceptions to the standard types, such as ones with pointed-arch openings, add a bit of flexibility to the scheme. Each module has a rounded corner, and together these add a vocabulary of curved elements—albeit restrained ones—to a mostly rectilinear composition. The modules bring a cadence to the large project and establish a relationship between repetition and irregularity.







SPATIAL DYNAMICS Office areas overlook a multistory atrium (top left), one of two such spaces in the building. A cafeteria (left) is just one of the shared facilities employees can enjoy, including a gym, a game room, lounges, and outdoor recreation areas for tennis and putting. A multipurpose hall (above) is used for Daum activities, but it is also available to the public.

like an off-kilter wedding cake. "It has the feel of a village," says Cho, "with an urban scale inside and outside." Even the massive piers are tempered by plants' growing on the exterior of their concave curves.

The architects clad the concrete roofs with thin planks of Indian hardwood, adding texture to these surfaces while matching the rest of the building's reddish-brown. Curved and cantilevered beyond the building's glazed perimeter, the roofs help protect interior spaces from the sun and shield outdoor dining areas, meeting places, and all-important smoking lounges.

The spatial dynamics are even more impressive inside. Tall office areas flank two triple-height atria on the lower floors. Cho compares these areas to the Great Workroom at Frank Lloyd Wright's Johnson Wax Administration Building in Racine, Wisconsin, which, like the Larkin Building before it, reinvented the workplace with a large open-plan floor. Although low movable dividers separate the work areas, tall second-story office spaces recall Wright's famous room with its reddish walls and daylight floating in from above. Windows on a mezzanine level face the work spaces, just as they do at Johnson Wax. But daylight, rather than trickling through individual managerial offices (a no-no in Daum's flat organizational structure), enters the atria from conference rooms and other shared spaces.

An auditorium on the southeast corner of the building, next to a sunken courtyard, offers views to the sea when its floor-to-ceiling curtains are open. The space is used by Daum and also is rented out to the community for movies, musical events, and even served as a campaign stop for a 2012 presidential candidate. An adjacent coffee shop and cafeteria are also open to the general public.

Those bulging concrete piers assert themselves on the inside as well as the outside of the building, injecting graceful curves and providing space in their hollow cores for stairs, elevators, restrooms, and conference rooms. "There are meetings everywhere, in unexpected places," says Cho as he points to a small group of Daum employees in a room reminiscent of a California crash pad.

How have Daum Space.1's bold architecture, open offices, and recreational amenities affected the work of its 350 employees? Dong-Heon Han, a manager at Daum, says it is difficult to measure their productivity compared to that of their 1,100 colleagues in the Seoul office. But he claims that employee retention is higher in Jeju than in Seoul and that, in the company's annual survey, 90 percent of Jeju employees said they were happy. Daum, which had planned to move all of its workers to Jeju by 2020 but now says the schedule will be determined by corporate growth, was initially concerned that workers in Seoul would not want to relocate. But today, with Daum Space.1 at full capacity, some employees in the capital are on a waiting list to make the move. ■

Tchoban Foundation Museum for Architectural Drawing | Berlin | SPEECH Tchoban & Kuznetsov

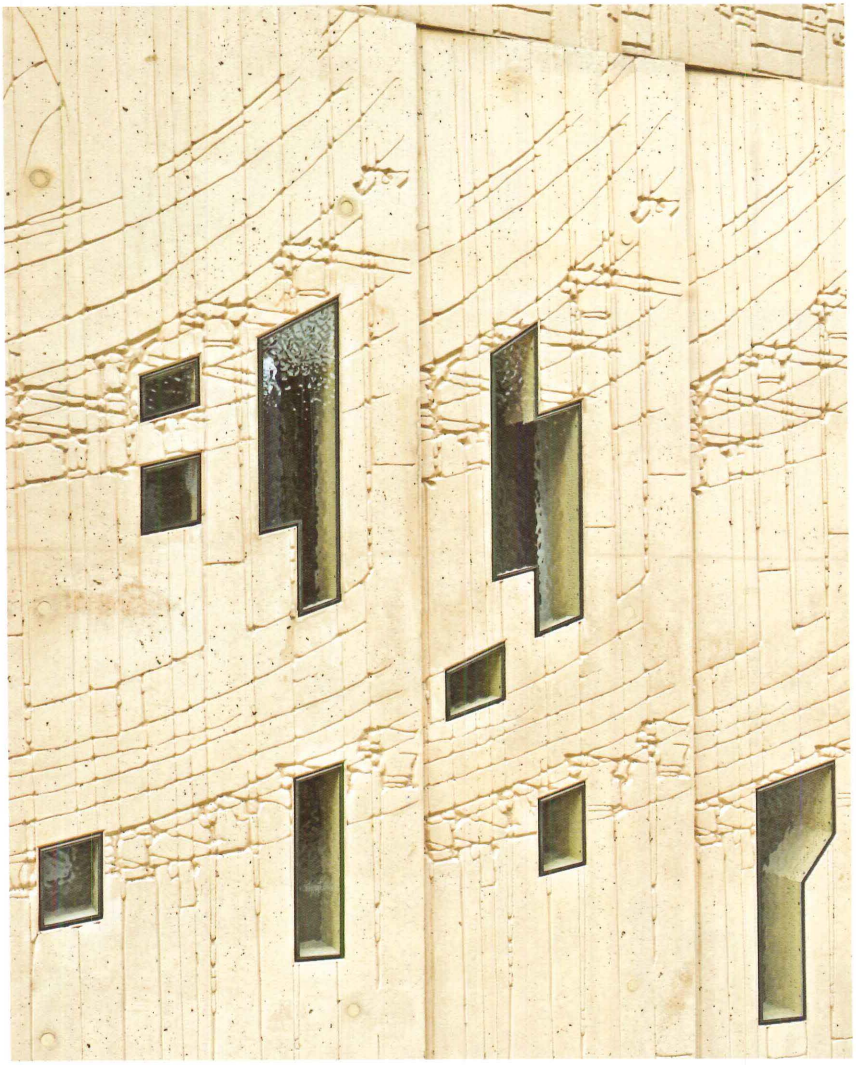
MAKE NO SMALL PLANS

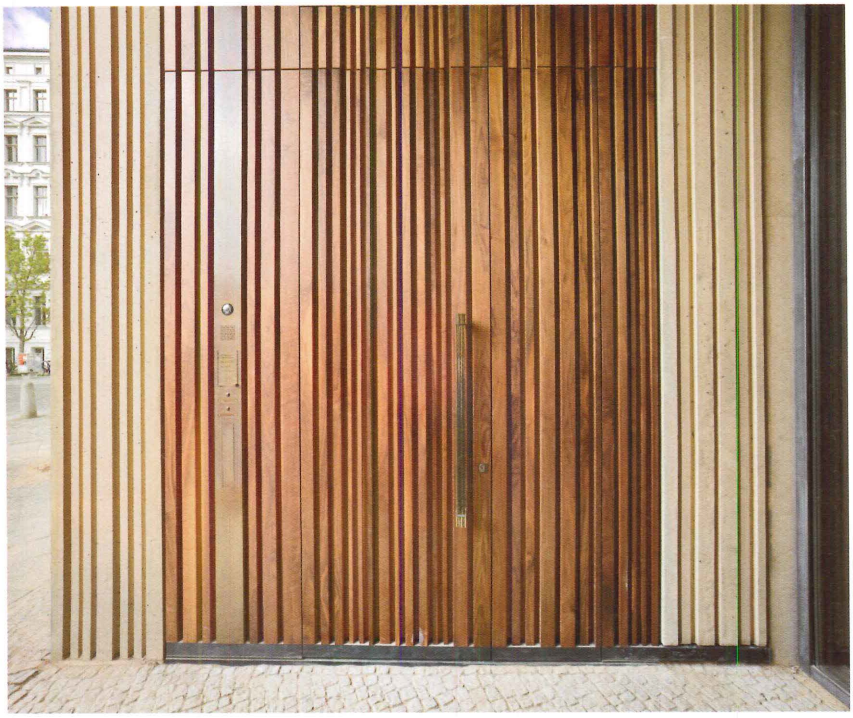
An architect with offices in Moscow and Berlin creates a fitting tribute for the display and study of historic architectural drawings.

BY MARY PEPCHINSKI

PHOTOGRAPHY BY ROLAND HALBE

PURPOSE BUILT Tchoban's new museum stands on the site of a former brewery that houses numerous cultural facilities in its restored buildings (opposite). Stacked and slightly skewed, four levels of the building are wrapped in concrete, each etched with a motif drawn from an enlarged fragment of a work from the architect's historic collection.





Wrapped in facades of concrete, etched with the fragments of enlarged sketches, the Tchoban Foundation Museum for Architectural Drawing in Berlin exploits the craft of construction to celebrate the art of drawing. The building is articulated as four slightly offset levels, like a stack of plan files pulled slightly askew—another nod to its holdings. Referring to the contents was the scheme of the man animating the entire project. Architect Sergei Tchoban, an accomplished draftsman and collector of historical architectural drawings, who practices in Germany and Moscow, established a foundation in 2009 to display his collection and to encourage young architects to draw. Subsequently, the foundation's board of trustees decided to build a museum with an archive, study facilities, and exhibition space. Tchoban's Moscow office (SPEECH Tchoban & Kuznetsov) developed the design, and his Berlin branch (NPS Tchoban Voss) oversaw the detailing and site supervision.

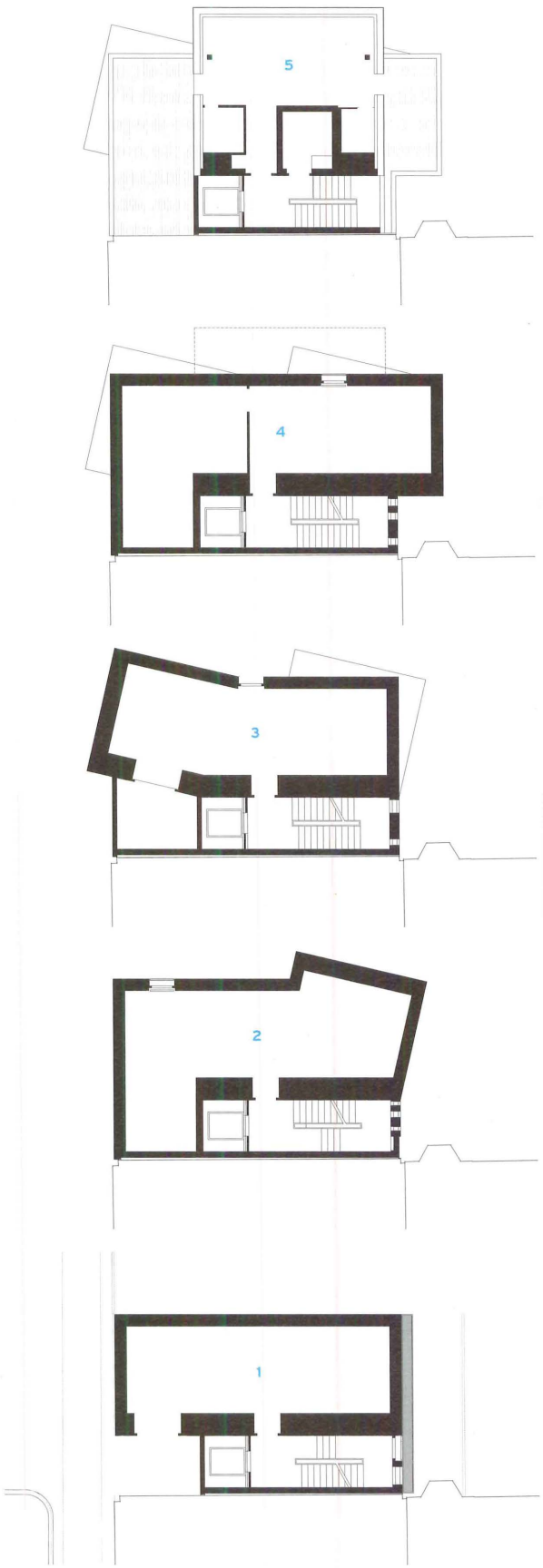
Located on the site of the Pfefferberg, a former brewery whose landmarked brick buildings now house artist studios and cultural institutions, the museum occupies a 26-by-39-foot plot and adjoins the firewall of an existing historic structure. Small and arresting, it gently mediates between the industrial context and the surrounding 19th-century residential buildings. Its facade rises to 72 feet, the typical height of eaves on inner-city Berlin buildings, and the concrete's parchment tone harmonizes with the pastel exteriors of the surrounding apartment blocks. Even the dramatic glass box that cantilevers out above the concrete facade can be considered a bold interpretation of the setback level completing the typical Berlin block. The scored concrete also acknowledges, but does not imitate, the brewery's brick architecture, as both display muscular forms that lay bare their materiality.

Unlike the adjacent Pfefferberg complex, where century-old structures incubate cutting-edge art and design, the museum mobilizes contemporary architecture to preserve older works. Upon occasion, Tchoban has placed words or images on the facade of a project to highlight meanings associated with a site. In a similar manner, the drawings etched into the museum's skin communicate the building's function as a repository for historical architectural representation. They even show some of the museum's holdings and acknowledge the genesis of the collection. Two fragments taken from Tchoban's first acquisition, a sketch by Pietro di Gottardo Gonzaga (1751–1831), an Italian artist active in Russia, appear on the face of the third and fourth levels; an excerpt from a drawing by Angelo Toselli (1765–1827), also Italian and active in Russia, repeats along the second level; and, on the first level, a section of another Gonzaga sketch is visible.

More than mere signifiers, the concrete facades are the supporting structure. The building is constructed as a massive reinforced-concrete shell, like a hollow tower. Upon completion, the floor levels were inserted into this form. The bays jutting out from the second and third levels, respectively, provide bracing. On the concrete's inner side, a layer of

ART & CRAFT Evocative of work produced by the Wiener Werkstätte, the building is as richly detailed as the contents on display within it: a close-up of the ground-level facade (top left) reveals delicately scribed concrete punctuated by a mottled glass fenestration; wood entrance doors (left) echo the striations of the surrounding masonry.

View additional images at architecturalrecord.com.



FLOOR PLANS

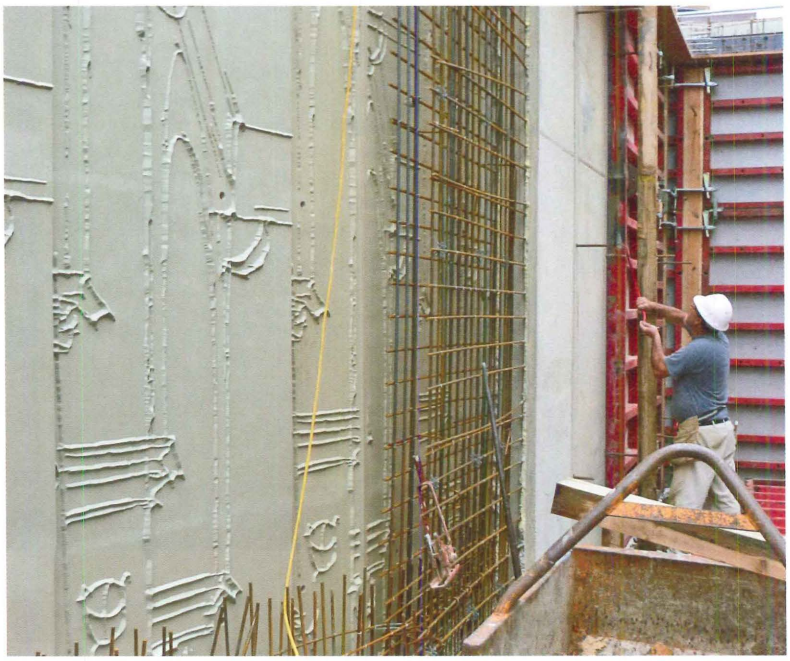
0 16 FT. 5 M.

CLOSE-UP: ETCHING THE CONCRETE

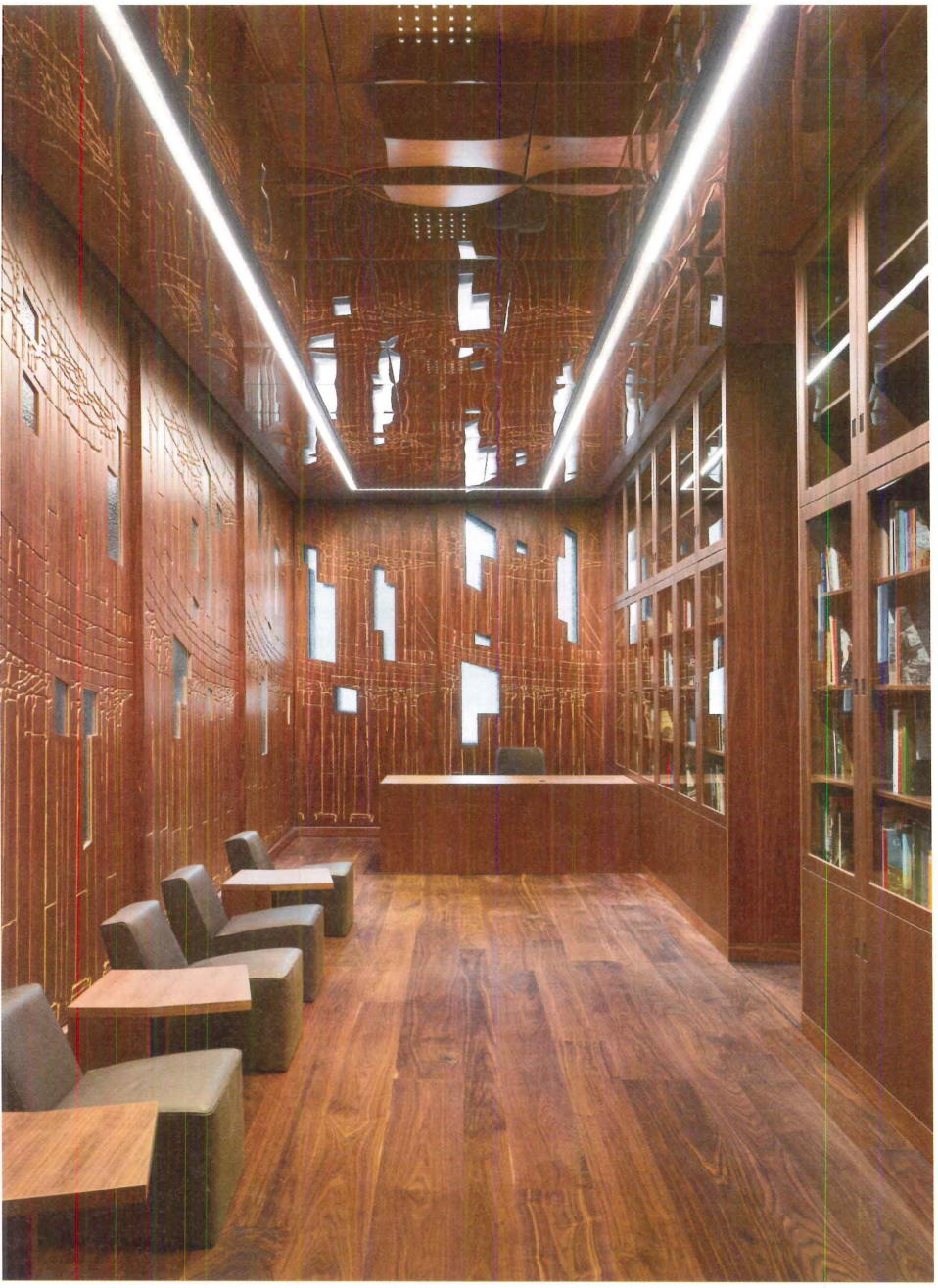
CONSTRUCTED FROM poured-in-place reinforced concrete, the waterproof facade of the Tchoban Foundation Museum for Architectural Drawing features fragments from the collection etched into the surface. To do this, architect Sergei Tchoban and his team scanned works from his archives. They isolated a section of each drawing, then copied and arranged the resulting motifs in patterns. Each of the building's various facades displays one motif repeated, like a horizontal band of irregularly overlapping shingles.

The fabrication process was painstaking. The crew used a CNC milling machine to etch the motifs into a fiberboard panel, chamfering the line edges to create the impression that the lines were sculpted into the concrete. Then they poured a rubberlike liquid polyurethane elastomer onto the fiberboard, which formed a mold upon hardening. They affixed this mold to particleboard, then secured the package to the interior of the concrete formwork, situating the ties to avoid interfering with the lines of the drawings, and sealing the corners and joints with silicon.

The concrete was then mixed with pigments to produce the parchment tone. To ensure a uniform appearance, each level was poured continuously during optimal weather conditions. Once dry, the formwork was stripped. The mold affixed to the particleboard was removed, and matching fiber cement stoppers were plugged into the tie holes. Finally, the concrete received a nano coating to repel dirt and graffiti.



1 LOBBY LEVEL (RECEPTION/LIBRARY)
2 SECOND LEVEL GALLERY
3 THIRD LEVEL GALLERY
4 FOURTH LEVEL (ARCHIVES)
5 FIFTH LEVEL (OFFICE)

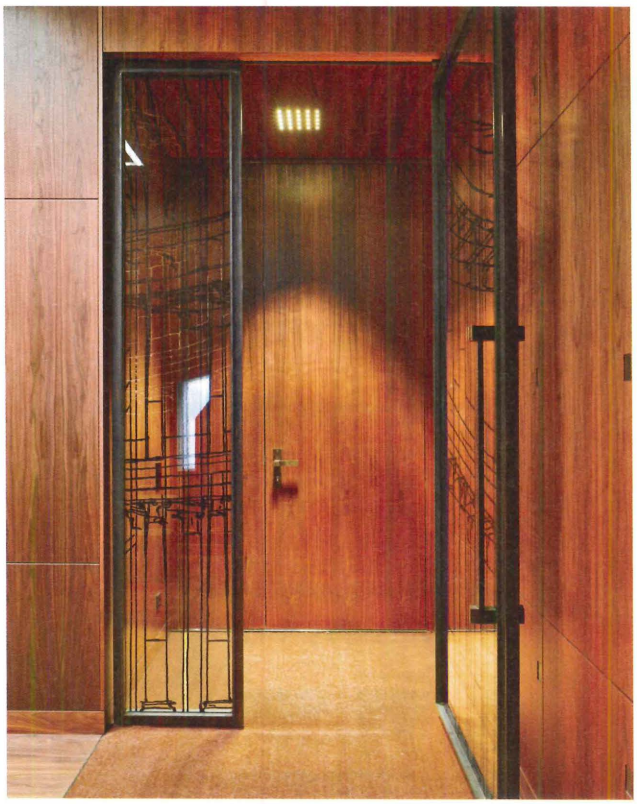


cellular glass insulation acts as a vapor barrier. Behind that, a limestone-masonry wall, coated with lime-cement plaster, regulates the interior moisture content and air quality. As a result, the building requires a relatively small HVAC system.

Inside, all the components of a museum are present, albeit in an abbreviated form. A niche on the northwestern elevation opens into the combined reception area and library. This room leads to the stairway and elevator, which connects to the galleries (second and third levels), the archive (fourth level), and the administrative office (fifth level/roof). Technical and service areas occupy the basement. Bays articulate each gallery, and every floor has at least one unique feature, such as a small room accessed from the third level gallery that overlooks a nearby park, or the exquisite hand-carved lines, recalling the facade, etched into the walnut paneling of the reception/library area. On the roof, panoramic views top this incredibly compact, spatially rich building.

European critics have praised the museum's design and applauded Tchoban's role as a patron. One can quibble with little details: the irregularly shaped windows cut into the base of the facade and along the eastern side of the stairway seem arbitrary and do not provide much illumination. Yet the intensity and quality of the Tchoban Foundation Museum for Architectural Drawing is just right for its content: an encounter with it provides the perfect inspiration to reach for a pencil and start drawing. ■

Berlin-based Mary Pepchinski is a writer, architect, and professor of architecture at the University of Applied Sciences in Dresden.



DRAWING ROOM The walls of the combined reception and library area (above left) recall the etched facade outside in the routed patterns of the walnut paneling. Even the burnished brass-framed glass door in the foyer (above) has a clear foil between the panes printed with the motif that also appears on the exterior skin of this level.

credits

ARCHITECT: SPEECH Tchoban & Kuznetsov – Sergei Tchoban, principal

ARCHITECT OF RECORD: NPS Tchoban Voss – Sergei Tchoban, principal; Ulrike Graefenhain, Philipp Bauer, architects

ENGINEERS: PPW Dipl.-Ing D. Paulisch (structural)

CONSULTANTS: Priedemann Fassadenberatung (facade design); Heimann und Schwantes (facade graphics); Kardorff Ingenieure (lighting)

GENERAL CONTRACTOR: MBM Konstruktionen

CLIENT: Tchoban Foundation Museum for Architectural Drawing

SIZE: 5,360 square feet

COST: withheld

COMPLETION DATE: May 2013

SOURCES

CONCRETE: BSS Beton-System-Schalungsbau; mk-nanotec (coating); RECKLI (forms)

GLAZING: Bischoff Glastechnik; Glasfischer Glastechnik (glass); Lamilux (skylights)

MILLWORK: Tischlerei Hollenbach

HARDWARE: Dorma (door); Assa Abloy (security)

LIGHTING: Selux (exhibition space)

AUTOMATES EVERY OCCASION

Show/hide Rotate Configure

Milstein Hall
Cornell University

Design: OMA team, Rem Koolhaas

The chairs can be stored out of sight, fully or partially deployed, and rotated through 360°. The entire process is completely automated.

Rem Koolhaas, the OMA team and Figueras worked hand-in-hand to create a multipurpose auditorium for Milstein Hall at Cornell University. Used primarily as a meeting room for university trustees and as a teaching space, the hall can also be transformed into an open space where a wide range of events can be held.

The Cornell chair, a product that's unique in the world, was created by combining two Figueras systems: Mutasub and the RT System. The result: spacious chairs that can be stored under the floor, deployed as needed, and oriented to the desired position.

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CIRCLE 52

Winning Playbook

NTB Architecture and UDIOS Architecture am up to give a 1920s-a stadium at the iversity of California, rkeley, a seismic rofit and expansion at respects its history.

Lamar Anderson

HALF TIME
The design team tucked the entrance to the Simpson Center for Student-Athlete High Performance, a new training facility on the site, between walls of concrete and limestone.

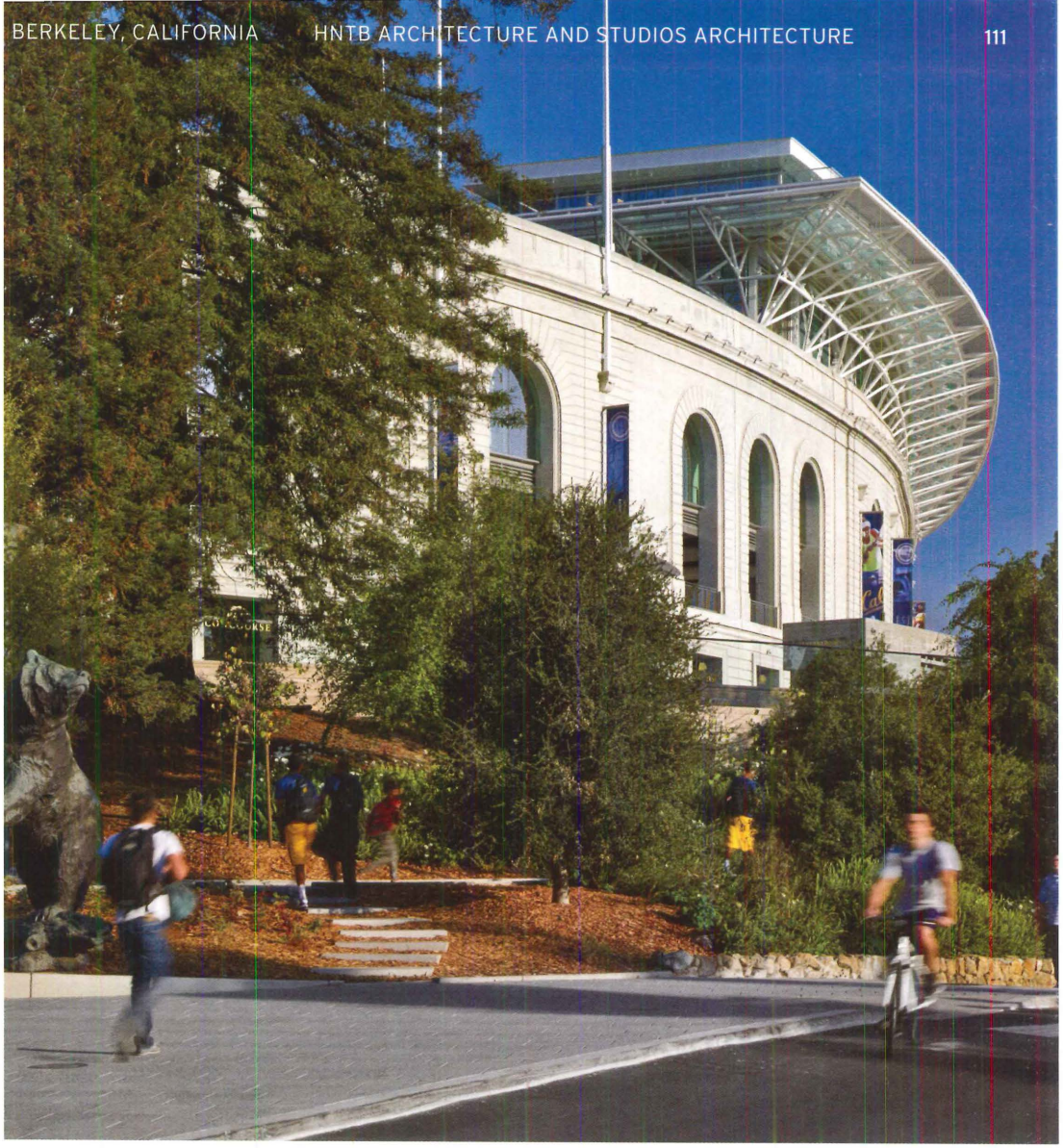
SUPER BOWL
On game days, some 63,000 fans can pack into the newly revamped California Memorial Stadium. A two-story VIP box hovers over the stands (above), accommodating press facilities and a donor club. The arena straddles the Hayward Fault, on a site at the base of Berkeley's foothills (opposite, bottom left). Despite its size—309,000 square feet—the stadium has a discreet presence along one of the university's main thoroughfares, Piedmont Avenue (opposite, top right).

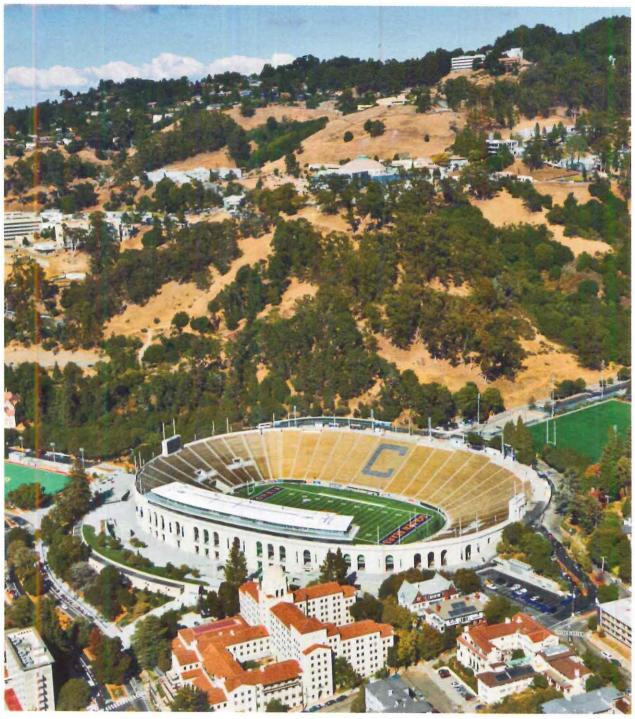
OF THE many neoclassical buildings that architect John Galen Howard designed for the University of California, Berkeley, in the early twentieth century, California Memorial Stadium was perhaps the most breathtaking and the most imperiled: from its perch at the base of the Berkeley foothills, the concrete structure—part coliseum, part amphitheater dug into the hillside—offered 73,000 Golden Bears fans sweeping views of San Francisco Bay to the west, but on a site straddling the Hayward Fault.

After the University of California's Board of Regents mandated a much-needed seismic revamp in 2005, the university enlisted HNTB Architecture and STUDIOS Architecture to overhaul the 1923 structure, which is listed on the National Register of Historic Places. It was a tall order: designers needed to make the stadium safe and boost square footage by 50 percent. However, they were not permitted to interfere with the historic board-formed-concrete facade. In other words, the university wanted an entirely new building, but without altering the original.

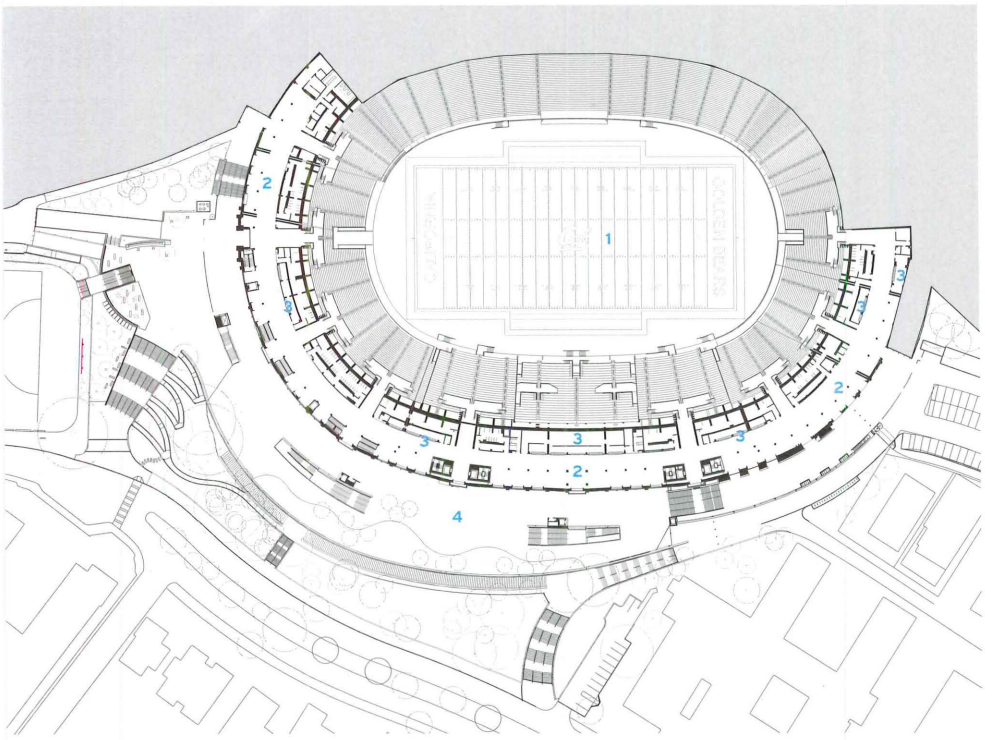
The architects found the solution to this Zen koan of a design brief in the site's slope, much as Howard had 90 years ago. Beginning construction in 2010, they hid a 145,000-square-foot athletic training center largely underground, disguising it behind a series of concentric retaining walls made out of volcanic rock, limestone, and concrete. They demolished the western two-thirds of the old structure—everything but the portion built into the hillside and the facade—and inserted a new eight-story building, including three donor clubhouses, into the original footprint. With the help of Forell/Elsesser Engineers, the team designed the poured-in-place concrete structure (with precast seating platforms in the bowl) in two halves along the fault line, which traces a roughly north-south diagonal from one end zone to the other. For the parts of the bowl directly over the fault, the engineers conceived a pair of wedge-shaped seating sections that can slide up to six feet horizontally and two feet vertically during a powerful quake [see RECORD, January 2009, page 112]. Like a heist in broad daylight, the stadium's dismantling and replacement is the kind of switcheroo that a casual observer could easily miss. "One question you hear from people who were here before is, 'What did you do?'" recounts Joseph Diesko, HNTB's director of sport architecture. "They say, 'It looks like the same place.'"

The biggest difference for fans? They now have a place to congregate before and after games: By tucking the training center into the front of the hillside site, the architects created an acre-and-a-half plaza at the stadium's base, where a scruffy parking lot once brought cars right up to the historic






1 UNIVERSITY CLUB
2 PRESS LEVEL
3 STADIUM CLUB
4 CONCOURSE
5 FIELD CLUB
6 PLAZA
7 TRAINING CENTER



MAIN CONCOURSE LEVEL

1 STADIUM BOWL
2 CONCOURSE
3 CONCESSIONS
4 PLAZA BELOW

credits

EXECUTIVE ARCHITECT: HNTB Architecture–Joseph Diesko, vice president; Fernando Vazquez, project designer; Gregory Baker, project architect/design

ASSOCIATE ARCHITECT: STUDIOS Architecture–Darryl Roberson, Marc Pfenninger, principals in charge; Jeong Choi, Kristin Lacy, project architects/design

CONSULTANTS: Forell/Elsesser Engineers (structural); WSP Flack + Kurtz (m/e/p/t); Bellecci & Associates (civil); Olin (landscape); Knapp Architects (preservation); Horton Lees Brogden Lighting Design (lighting)

CLIENT: University of California, Berkeley

GENERAL CONTRACTOR: Webcor Builders, Hunt Construction Group

SIZE: 454,000 square feet

COST: $474 million

COMPLETION DATE: August 2012

SOURCES

MASONRY: Trenwyth

CURTAIN WALL: Arcadia

SLIDING GLASS PANELS: NanaWall; TEPCO Contract Glazing

GLASS: Northwestern Industries; GlasPro; Viracon

RESILIENT FLOORING: Armstrong, Johnsonite

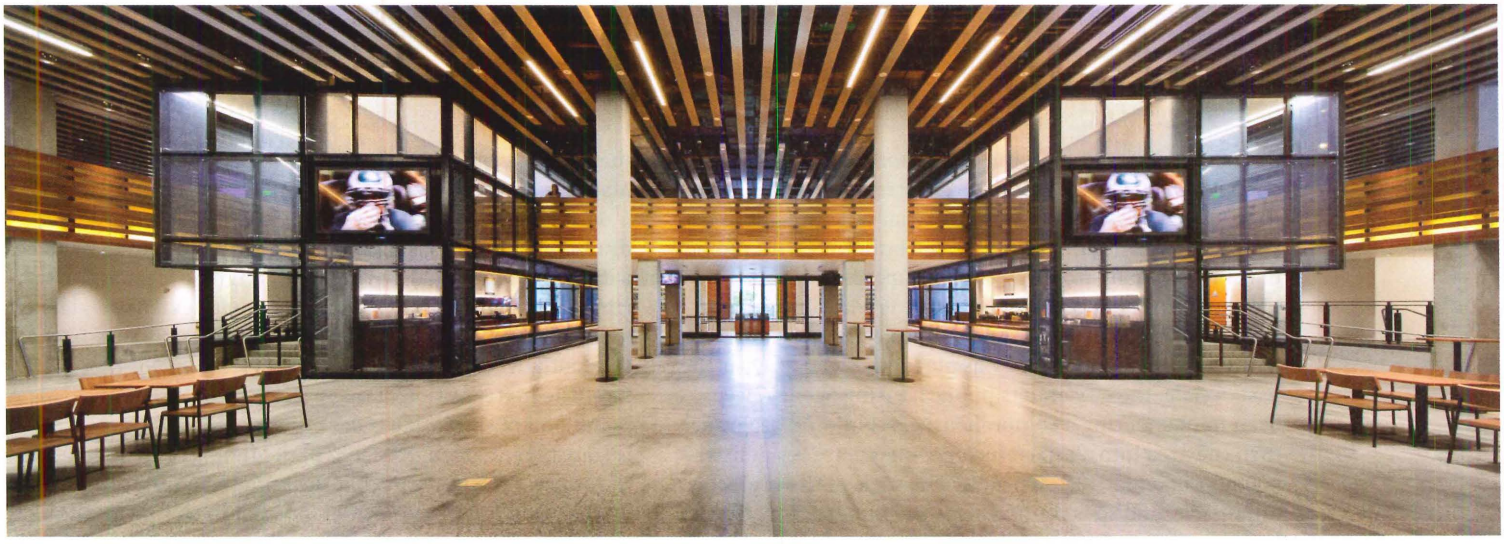
facade. The architects also wanted the stadium to feel like the extroverted building of Howard's day. Unlike most football arenas, which direct all eyes to the field, "this one was built to look outward," says Berkeley assistant athletic director Bob Milano Jr., pointing to the arched windows that frame views of the campus and the bay. In the old stadium, decades of ad-hoc additions had cluttered the corridors and blocked windows; in the new one, every vomitory (the path from the stands to the concourse) offers a view through an arch. "We were trying not only to reinforce the historic architecture, but the historic experience," says Milano.

The west side of the seating bowl does have one modern-looking addition: a two-story glass-and-steel canopy housing the press box on the lower level and a donor club on top. Because it was important to the architects to honor the stadium's original profile by putting some air between the old and new elements, they housed the press box inside a steel box truss. It is largely supported by two concrete elevator cores instead of a sea of columns. "That makes it appear to float," says Gregory Baker, HNTB associate vice president.

This arrangement has seismic advantages too. The engineers designed the elevator cores as a separate structure that passes through the stadium. The cores displaced seats (as did other aspects of the modernization, including complying with accessibility requirements), bringing capacity down by 10,000 to approximately 63,000. But the tradeoff was necessary for safety. In an earthquake, the canopy will sway at its own rate, independently of the bowl's motion.

By solving seismic and architectural challenges in the same gesture, the architects and engineers pulled off a stunning sleight of hand, delivering a modern home for Berkeley football that feels as familiar as the original. ■

INSIDE THE HUDDLE HNTB and STUDIOS created new "donor clubs"—spaces for banquets and other events—including the Field Club (bottom) on levels 4 and 5, and the University Club (below) on level 8. The sense of openness in both of these spaces is carried into the skylit, below-grade athlete training center (opposite bottom).



Making a Splash

Toronto

Designed by MacLennan Jaunkalns Miller Architects, a public aquatic center, surrounded by a park in a mixed-income city housing development, proves public recreational facilities needn't skimp on high-concept design.

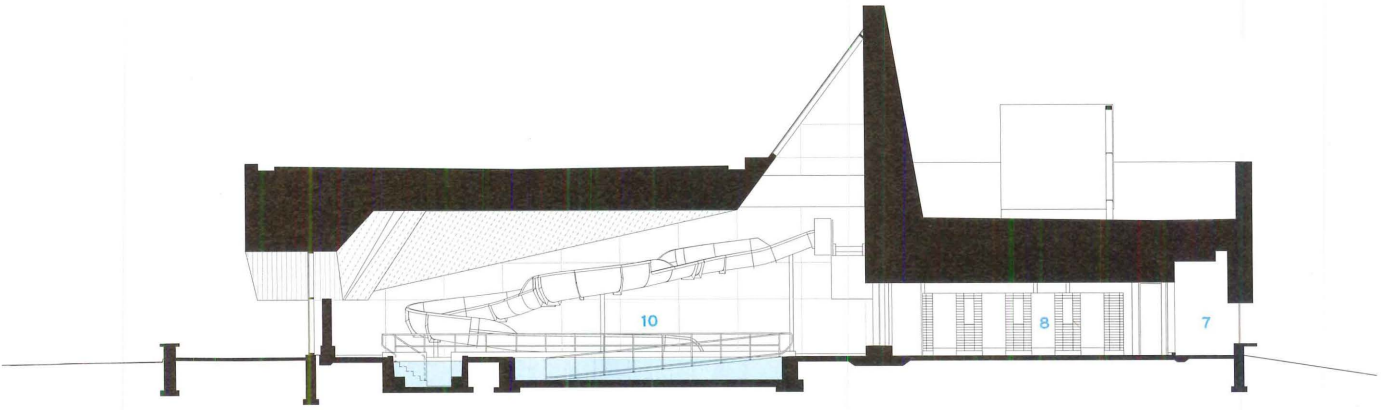
By Alex Bozikovic

BETWEEN 1948 and 1957, the city of Toronto expropriated and leveled 69 acres of its Victorian streetscape. The Regent Park project, designed to improve what was thought to be a working-class "slum," replaced the buildings with public housing, set apart from the city on superblocks that obstructed human and motor traffic. Predictably, it didn't end well. Within a generation, the project's design was seen as misguided, and the area was plagued by crime. Over the past decade, the city and its public housing agency have been implementing a comprehensive rebuilding program to turn the area into a mixed-income, mixed-use residential neighborhood for 12,000 people. The scale of the project is impressive, and so is the architectural quality of its first major public building, the Regent Park Aquatic Centre, by MacLennan Jaunkalns Miller Architects (MJMA).

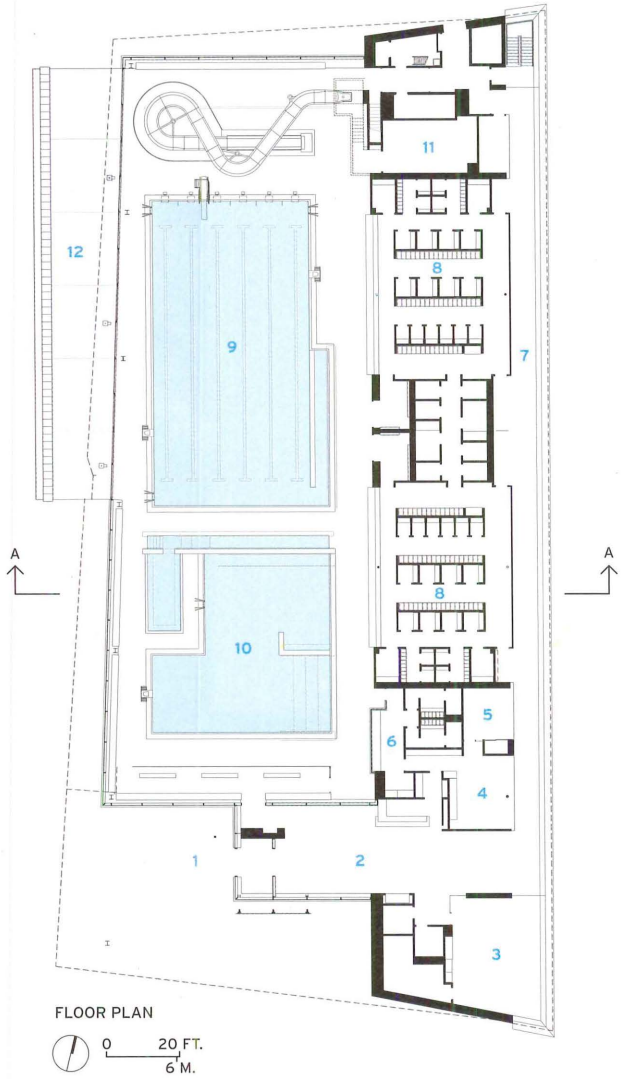
Located in the middle of the district, the new facility is dramatic in its materials and massing. The building balances a dark, brooding quality—due to its angular form and a rippling skin of charcoal zinc panels—with extensive glazing.

Visitors approach the 28,000-square-foot structure from the south, where the main entrance faces a major thoroughfare. The juxtaposition of materials is most apparent at this point: half of the facade is dark and closed, and the other half is transparent, open to a large park (under construction) and the street. "The idea was that the building becomes a pavilion on the park," says David Miller, partner in charge for the

WATER WORLD
Sunlight pours into the double-height entry lobby (right) and onto its finishes of concrete, tile, glass, and wood. In the aquatic hall (above), which features both lap and family swimming pools, residents from the neighborhood's diverse community play under a faceted ceiling of slatted wood.



SECTION A - A



FLOOR PLAN

1 MAIN ENTRANCE
2 LOBBY
3 MEETING ROOM
4 ADMINISTRATION STAFF OFFICE
5 OFFICE
6 AQUATIC STAFF OFFICE
7 CHANGING ROOM CONCOURSE
8 CHANGING ROOM
9 LAP POOL
10 FAMILY POOL
11 STORAGE
12 OUTDOOR TERRACE

project at MJMA. "It made sense to orient it that way, so you have a large body of water along the edge of the green."

Inside, a lap pool and a family leisure pool fill the main volume, bordered by an expansive grid of aluminum-framed windows and sliding doors leading to an outdoor terrace. Overhead, the pool is capped with an angular, folded ceiling of cedar slats and what Miller calls "the dorsal fin": an elongated central skylight that cleaves the ceiling longitudinally, bringing an abundance of daylight into the building's core. A green roof, clearly visible from the surrounding residential buildings, is planted with drought-resistant species, in keeping with Toronto's policy requiring such construction on all new buildings larger than about 22,000 square feet.

"The project benefits from being only a pool," Miller says. MJMA is known for athletic and community centers with various programs, some of which demand large blank walls. Not so here. Instead, the building has two clear axes of visibility. One extends north–south from the street through the lobby, the pool, and beyond to what will eventually be a bosquet of trees. The other extends east–west, across the lobby and the pool—right through its adjacent glass-enclosed locker area, comprising rows of family changing rooms separated by open aisles with views to the street. The result of thoughtful community planning, this arrangement not only maintains transparency (and uses space efficiently), it enables multi-gender groups to dress together in private white-tile cubicles rather than being allocated to segregated men's and women's areas—a godsend for parents and caregivers.

The aquatic center is in high demand already—both from the densely populated Regent Park area, which includes many people who are new to Canada, and from neighboring communities. According to the facility's manager, over 1,200 people use it on a busy day. According to Miller, the clients gave the architects freedom of expression, and they ran with it. "With housing or a library, you meet certain expectations about what the building should look like," he says. "But we've found nobody really knows what a recreation center should be. Here, there was surprisingly little opposition. People accepted the building quite readily." ■

Alex Bozikovic writes from Toronto on architecture and design. He is an editor at The Globe and Mail, *Canada's national newspaper.*

OPEN SWIM
Glazed sections of the charcoal-zinc-paneled facade allow passersby glimpses into the Aquatic Centre. At night, the building becomes a lantern in the park, with light streaming from the transparent entrance (above) and a corridor along the building's east side that runs past its rows of tiled changing rooms (right).

credits

ARCHITECT: MacLennan Jaunkalns Miller Architects – David Miller, Viktors Jaunkalns, Ted Watson, Troy Wright, Jeanne Ng, Siri Ursin, Kyung-Sun Hur, Chen Cohen, design team

ENGINEERS: Blackwell Engineering (structural); LKM – Division of SNC Lavalin (m/e/p); Dillon Consulting (civil)

CLIENT: City of Toronto

GENERAL CONTRACTOR: Atlas Corporation

SIZE: 28,000 square feet

COST: $14.8 million

COMPLETION DATE: November 2012

SOURCES

EXTERIOR CLADDING: Dri-Design (metal panels); Alumicor (metal/glass curtain wall);

ROOFING: Tremco (elastomeric)

GLAZING: Prelco (glass); IBG Canada (skylights)

ENTRANCES: Kawneer

HARDWARE: Ingersoll Rand

INTERIOR FINISHES: Armstrong (acoustical ceilings, suspension grid); Hunter Douglas (acoustical ceilings); Pratt & Lambert (paints and stains); Interface (carpet)

LIGHTING: Philips (downlights), Lutron (controls)

Formula for Success

Austin, Texas

Miró Rivera Architects creates a sprawling, zoomy venue for motor sports, music, and more in the capital of the Lone Star state. By Ingrid Spencer

THOUGH IT isn't quite all tumbleweed and Longhorns on the 20-minute drive from downtown Austin to the Circuit of the Americas (COTA)—the only facility in the United States specifically built to host the Formula 1 Grand Prix auto race—the barren landscape looks and feels like rural Texas. Enter the 1,200-acre venue, however, and you are transported to a world-class center for motor sports, concerts, and events.

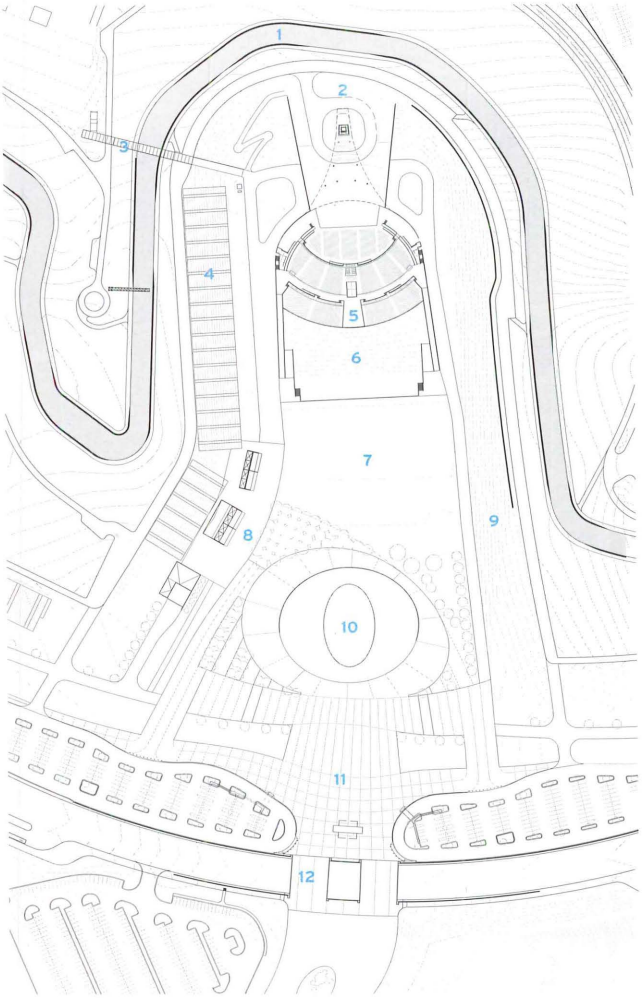
The complex includes a looping 3.4-mile racetrack; a 27-acre Grand Plaza adjacent to a monumental lawn; and the city's largest outdoor concert venue, the Austin360 Amphitheater, with an audience capacity of over 14,000. Anchoring the park is a 251-foot-tall observation tower, veiled on one side by a dynamic sweep of red-steel tubes, meant to evoke the blur of light that trails cars racing in the night. Unlike most public spaces in the region, it doesn't feature the University of Texas burnt orange. The one nod to the Lone Star State is a Texas flag, along with the American flag and 12 others representing countries that have competing teams or host a Grand Prix. There are only 26 purpose-built tracks worldwide certified by the Fédération Internationale de l'Automobile for this high profile, multi-billion-dollar motor sport. "This is not Austin. This is not Texas. This is Formula 1," says Miguel Rivera, principal of the Austin-based Miró Rivera Architects, the firm responsible for the public spaces: the Main Grandstand, amphitheater, Grand Plaza, observation tower, and ticket, restroom and concession buildings, as well as two pedestrian bridges over the track. (The German firm Tilke Architects & Engineers designed the highly specialized track and pit building, a medical building, and a media and conference center.)

The scheme is unique for its abundance of clear sightlines to the 20-turn track. Visitors—up to 120,000 per day—can set up camp on the Grand Plaza lawn near a reflecting pool and xeriscaped grounds shaded by Mexican sycamore trees. Here they can enjoy the action close to concessions and retail stands. To allow for future growth and flexibility, Miró Rivera employed a concrete-and-steel modular system for the concessions, restroom buildings, and Main Grandstand. Protected by a tensile fabric canopy, this 8,255-seat three-story structure includes concessions at grade, an event space and 6,500-square-foot lounge on the second level, plus an additional lounge and 29 private suites on the third.

Because motor sports won't be scheduled year-round, the architects created an alternative venue that could be used for other events. The Austin360 Amphitheater seats some 7,000 people, with room for another 8,000 gathered informally on a grassy slope behind them. Tucked under the tubular construction that fans out from the observation tower at its base, the 120-foot-wide-by-40-foot-deep stage is set within a rigging canopy capable of supporting 100,000 pounds of lighting and audio equipment. Built with precast, post-tensioned box beams, an overpass spans the backstage. Covered by a slab at least 8 inches thick, this bridgelike structure accommodates vehicular and pedestrian traffic, provides fire protection for the tower, and helps to support the tower's tubular veil.

COTA, which cost over $400 million, was designed and

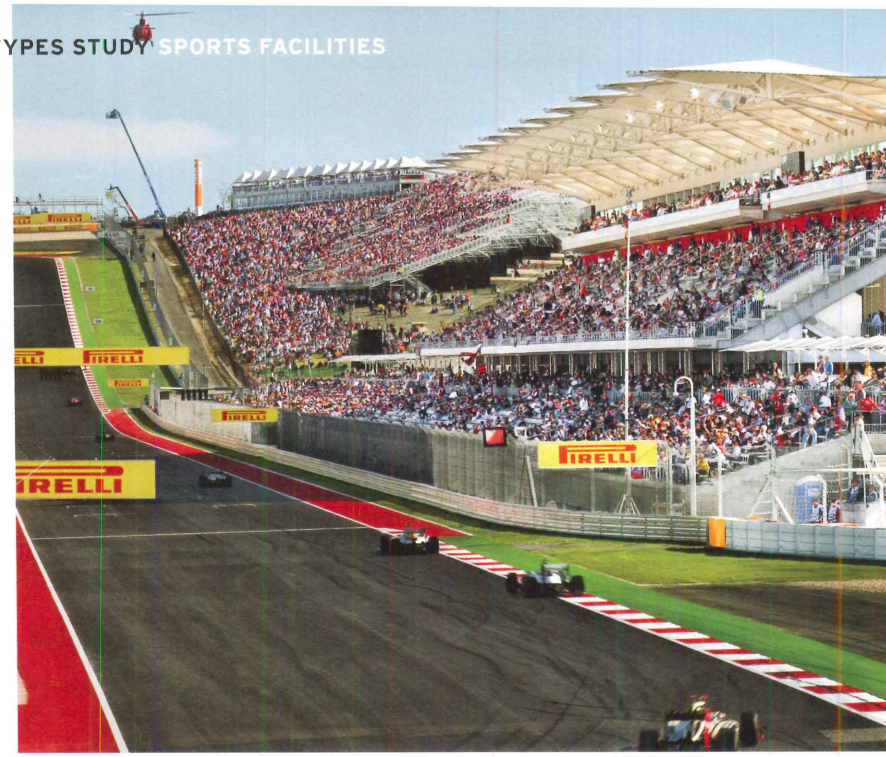
HIGH POINT
Accessed by two helical stairways and an elevator, the viewing deck, 230 feet up on the 251-foot-tall Observation Tower (opposite), offers a panoramic vista of the site (above). Part of the floor is structural laminated glass, for vertiginous views. At night the tower is animated by color-changing LEDs.



SITE PLAN

0 200 FT. 60 M.

1 TRACK
2 OBSERVATION TOWER
3 PEDESTRIAN BRIDGE
4 MAIN GRANDSTAND
5 AMPHITHEATER
6 LAWN SEATING
7 GREAT LAWN
8 CONCESSIONS
9 BERM SEATING
10 REFLECTING POOL
11 ENTRANCE
12 BRIDGE TO PARKING



SPEED WAY The shaded seats and private suites of the Main Grandstand (top) allow viewers to watch the race in comfort with birds-eye views of the pre-race action in the pits across the track. When it's time for a snack, they can join the other spectators at one of the many concession stands (bottom) in the Grand Plaza, where the modular structures were purposely designed to face the lawn rather than front on the track, to accommodate other events throughout the year.

credits

ARCHITECT: Miró Rivera Architects – Juan Miró, Miguel Rivera, design partners; Ken Jones, senior associate; Matthew Sturich, associate; Bud Franck, Diana Su, Jason Kerensky, design team

ENGINEERS: Bay & Associates (m/e/p); Walter P. Moore (structural); Carlson Brigance & Doering (civil)

CLIENT: Circuit of the Americas

GENERAL CONTRACTOR: Austin Commercial

SIZE: 197,000 square feet

COST: $62 million

COMPLETION DATE: November 2012 (Grand Plaza and Observation Tower), March 2013 (Austin360 Amphitheater)

SOURCES

GLASS: TriStar Glass (glazing); VELUX (skylights)

WINDOWS: Safti First (fire-rated)

METAL DOORS: Assa Abloy

ELEVATORS: Otis

MOISTURE BARRIER: Tyvek

built in only two years. Yet the project was fraught with controversy and contract disputes—including those among former race car driver and Austinite Tavo Hellmund, whose vision and drive initiated the endeavor; Bernie Ecclestone, Formula 1's commercial rights holder; Bobby Epstein, the primary investor and COTA chairman; and local opponents. Now, after positive reviews from drivers and fans alike, general admission tickets for the 2013 Grand Prix in November are selling briskly. And with contracts to host the X-Games and other major events on the books, it seems COTA's troubles are in the rear-view mirror. "It was a painful challenge, but worth it," says Epstein, reflecting on the litigious road to last year's inaugural race. "We now have something modern and global." Epstein hopes to expand COTA to include a hotel, a visitors' center, maybe even a museum. With Austin already a destination city because of festivals such as South by Southwest and Austin City Limits, COTA provides one more opportunity for Austin to shine and, as Epstein states, to be "a great place for people to come together." ■

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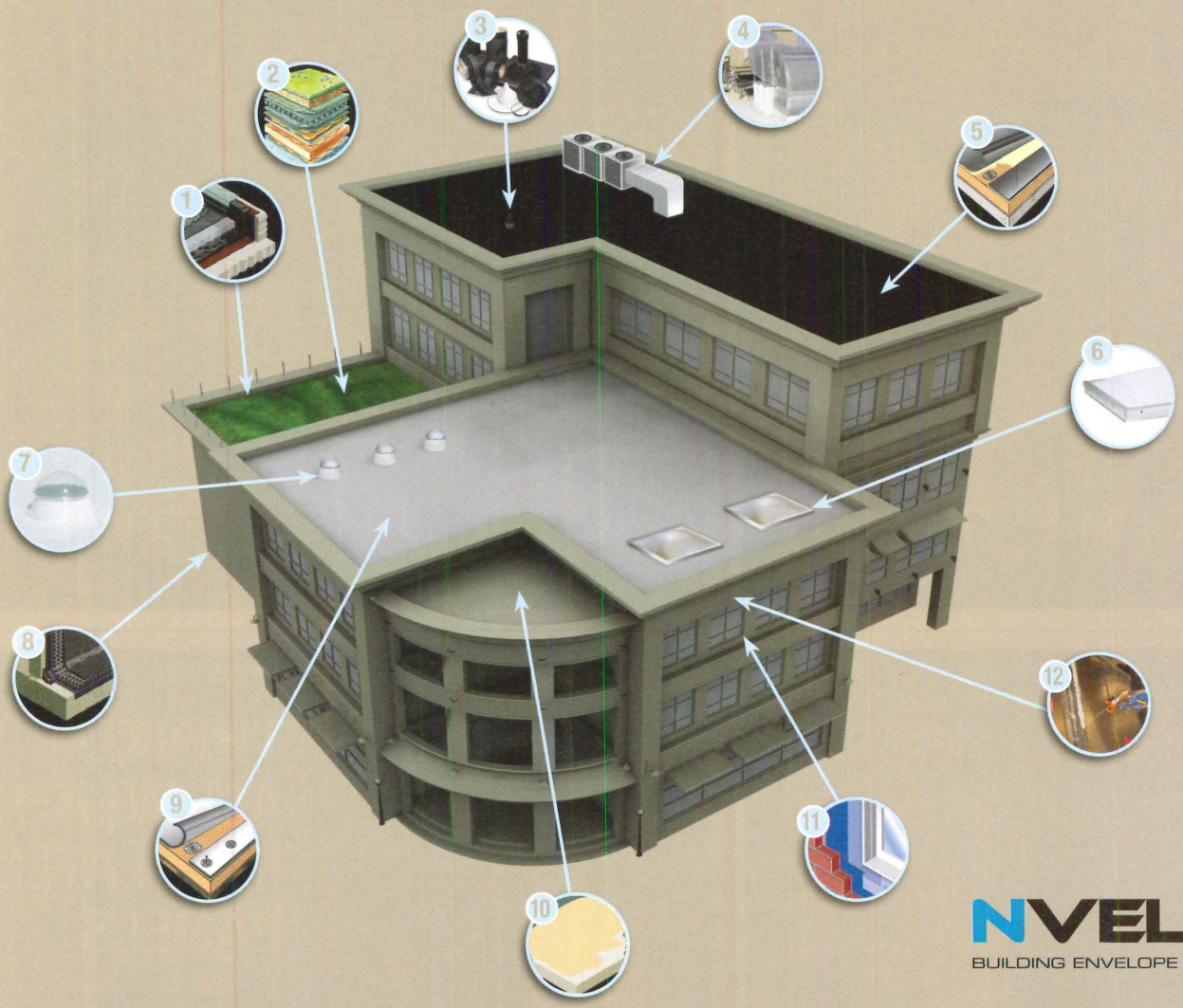

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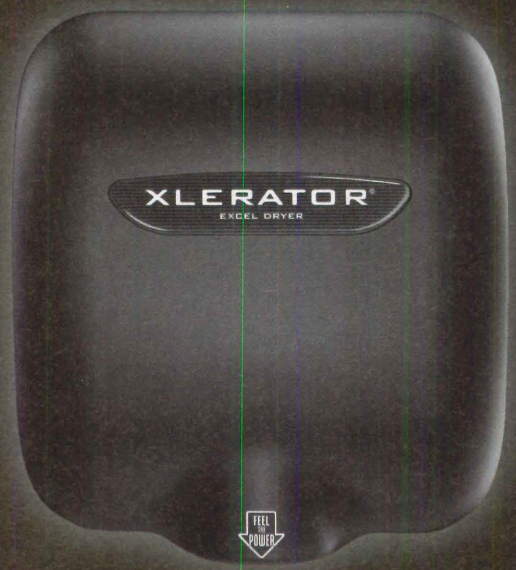

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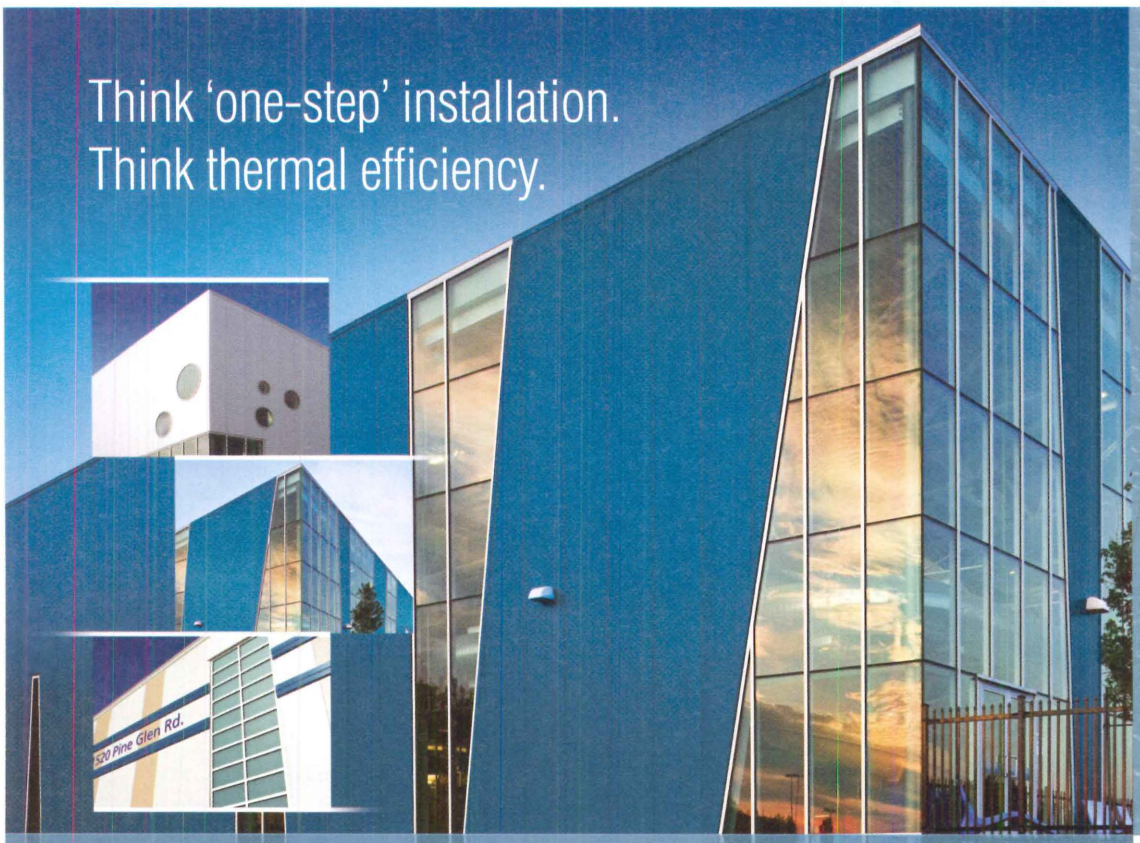

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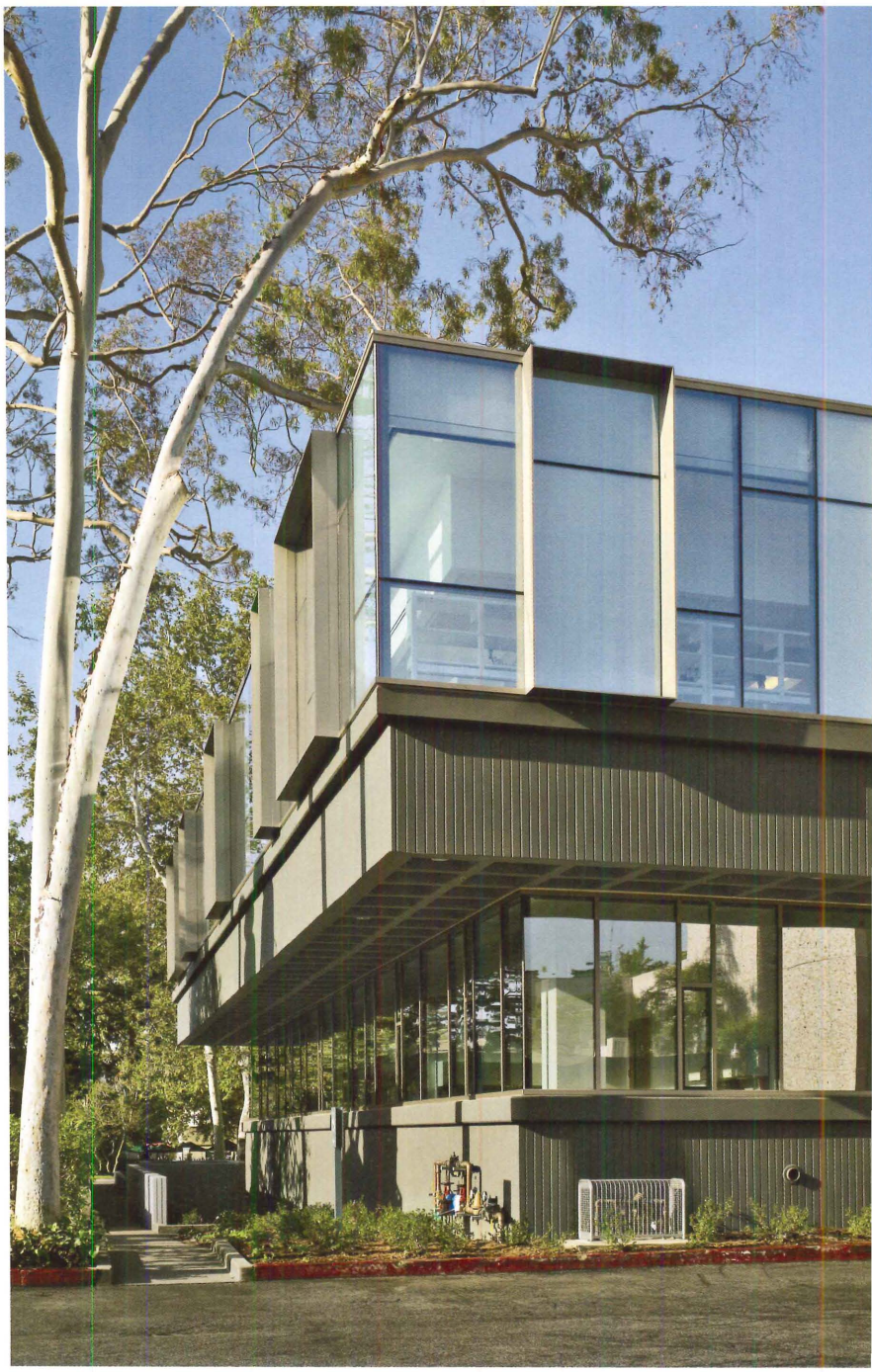
Wrap It Up

Face-lifts for three buildings showing their age aim to correct performance problems, project a more desirable image, and address the needs of new occupants.

By Joann Gonchar, AIA

JORGENSEN LABORATORY, CALTECH

Jorgensen, built in the early 1970s, was originally surrounded on all four sides by deep concrete sunshades (left). As part of its revamp by John Friedman Alice Kimm Architects, it is now wrapped in a mostly transparent glass skin (below).



LIKE ALL of us, buildings of a certain age often have problems with their facades. Even those that have been well maintained can suffer from failing joints, broken gaskets, and crumbling mortar—conditions that cause air and water infiltration, compromising energy performance and occupant comfort. Sometimes buildings, especially those built in the 1960s and 70s, are simply aesthetically out of sync with the desires of current owners or tenants. But despite their problems, these structures often have good bones and can be reinvigorated with a renovation that includes a new skin.

Jorgensen Laboratory, at the California Institute of Technology (Caltech), in Pasadena, was recently revived with such a renovation. The former computational center had been designed by the highly regarded A. Quincy Jones in the early 1970s. But the 30,000-square-foot three-story reinforced-concrete structure was insular and bunkerlike, due to vertical concrete "sunshades," several feet deep, which blocked daylight and obstructed views of the leafy campus.

The university had decided that a new set of users should move in: the Joint Center for Artificial Photosynthesis and the Resnick Institute—two recently established programs focused on energy conservation and generation. There was one major problem, however: the building's image and configuration were "antithetical to the users' mission of sustainability," says John Friedman, of John Friedman Alice Kimm Architects (JFAK).

Caltech hired JFAK to design an overhaul for Jorgensen, which was completed in the spring of 2012. The plan included removing the intrusive sunshades, wrapping the building in thermally efficient glazing, and reorganizing the interior so that many of the new offices and state-of-the-art research spaces could be as near the perimeter as possible. In addition, the architects added a new glass-enclosed entrance pavilion to replace the building's original off-putting entry sequence via a bulky bridge, and they brought sunlight into the interior through a new skylit stair.

Before embarking on the radical transformation, JFAK enlisted engineers from Buro Happold to design new building systems and also to study the effect of removing the sunshades. The aim was to improve daylighting, but without incurring solar gain, says David Herd, a Buro Happold partner. "We were looking for the sweet spot," he adds.

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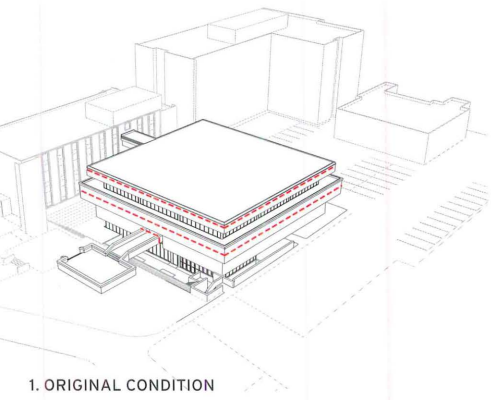
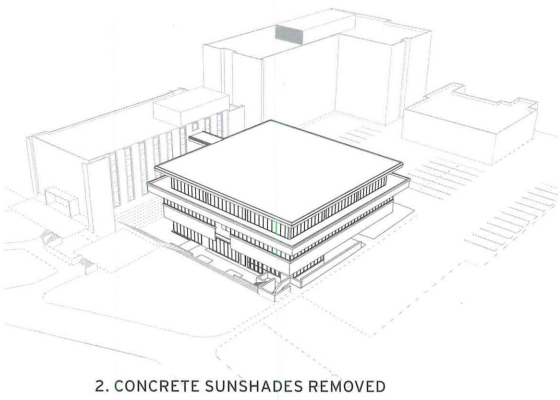
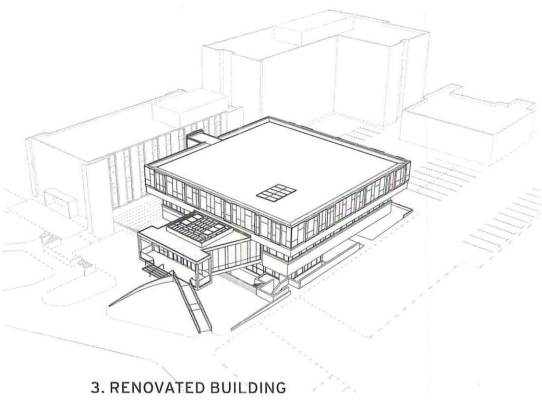


1. ORIGINAL CONDITION



2. CONCRETE SUNSHADES REMOVED



3. RENOVATED BUILDING

By measuring light levels in the existing interior and performing extensive simulations, the engineers demonstrated that JFAK could remove the sunshades without increasing cooling loads. Much of the building perimeter would often be in shadow, they determined, since the first level is mostly below grade, the entry floor is shaded by the overhanging floor above, and the west facade is shielded by an adjacent structure. The surrounding trees also provided some protection.

The team devised a new building skin that relies on an aluminum curtain wall system for the top floor, where the new cladding has a vertical span of 12 feet, and a storefront system for the floors below, where spans are shorter. Both systems incorporate 1-inch insulated glazing units with a low-E coating. Although these components are mostly standard, the architects have created interest and rhythm by varying the sizes of the lites, by making some of the mullions deeper than others, and with strategic use of translucent glass. Its placement responds to functional concerns, such as the location of equipment on the interior, "but it is also partly compositional," says Friedman.

This new, mostly transparent envelope allowed the project team to deploy daylight sensors to reduce energy use. The building also has other energy-conserving features, such as air conditioning that automatically shuts off in any perimeter office where a window is opened, as well as a ventilation system configured to reduce the cooling and reheating of fresh air. Together, these strategies helped the project earn LEED Platinum status and should produce a 37 percent savings in energy when compared to a more typical laboratory building—a projection that Buro Happold hopes to confirm over the next few months through a post-occupancy measurement and evaluation process.

FRESH FACE, NEW SPINE

Skidmore, Owings & Merrill (SOM) relied on a similar approach for its makeover of a fortresslike office building in San Francisco's South of Market neighborhood, at 680 Folsom Street. The just-completed project, designed for developer TMG Partners, had the aim of transforming the property, vacant since 2007, into desirable office space. The comprehensive renovation included replacement of the 1960s structure's seemingly impenetrable precast-concrete facade panels with a high-performance curtain wall, largely glass. "The goal was to make it more open and inviting and have the activity inside energize the street," says Leo Chow, an SOM director.

The project also entailed increasing the leasable area by almost a third, to 500,000 square feet, with the addition of small projections on each facade and two new floors on top

JORGENSEN LABORATORY, CALTECH

Jorgensen's transformation included adding a new glass-enclosed entry pavilion (above left). The building's interior has also been completely reconfigured to place as many labs and offices as near the perimeter as possible. A new skylit atrium and stair (above) allow daylight into spaces deeper in the building's interior.

of the original 12. "The building was a simple, dumb box," says Chow. "We wanted to articulate it as a series of masses."

The replacement cladding consists of one-story-tall, 6-foot-wide units that include 10-foot-high insulated vision lites. These afford views of the city's financial core and San Francisco Bay and let daylight deep into the interior. Vertical aluminum fins on the building's northwest-facing facade shield the glazing from the setting sun.

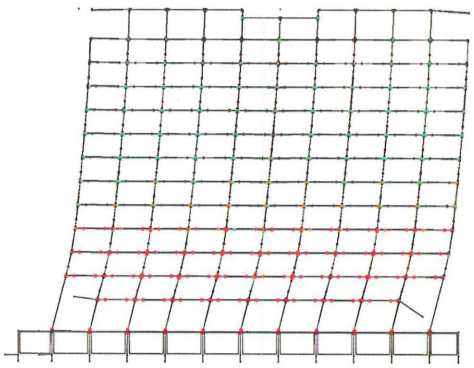
Although attaching a new facade to an existing building is often complicated by elevated code requirements for wind loads and other forces, 680 Folsom's new skin is attached to the structure via the building's original anchors. Their strength proved sufficient, since they had been designed to support the hefty precast panels. "The robust existing slab anchors greatly simplified the retrofit," says Mic Patterson, director of strategic development at Enclos, the project's facade contractor. "We just had to weld our connector to the existing steel embeds, and we were ready to go."

The building's steel moment frame did, however, require a seismic retrofit because of the added floors. Early on, the design team considered adding diagonal bracing. Ultimately they rejected such a system, since the braces would occupy valuable floor space and obstruct views through the new curtain wall. Instead, the project's structural engineer, Tipping Mar, devised a novel solution that involved reconfiguring the building core to create a pivoting spine. During a temblor, this base-isolated, reinforced-concrete element should redistribute seismic deformations throughout the structure and prevent the phenomenon of "weak story" at the base, where perimeter columns have vertical spans of 35 feet instead of 15 feet, the building's typical floor-to-floor height. Weak story exists, says Steve Tipping, Tipping Mar principal, where a story's lateral strength is less than 80 percent of the one above it. The new core at 680 Folsom prevents this condition by "forcing the floors to hang together and act as one unit," he says.

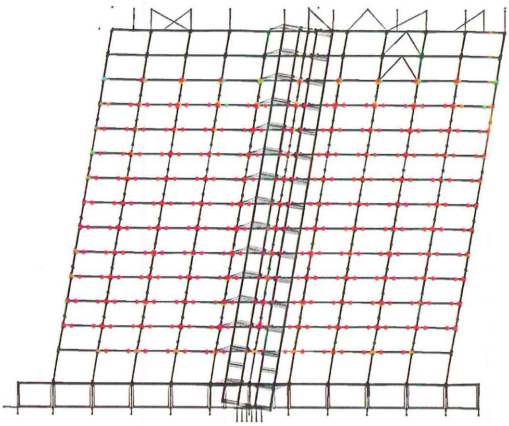
In addition to ensuring that the building's structural integrity is maintained, the retrofit strategy should also

680 FOLSOM STREET, SAN FRANCISCO

Built in the 1960s, 680 Folsom was originally clad in seemingly impenetrable precast concrete panels (above). As part of a just-completed renovation by SOM, the building has a new high-performance glass curtain wall (above right), which affords views of San Francisco Bay and the city's financial core. The project also included a novel seismic retrofit (right). Engineers reconfigured the building core to create a base-isolated, pivoting spine intended to force the floors to hang together and move as one unit during a quake. The device should protect structural elements as well as nonstructural components, including the new skin.



ORIGINAL STEEL MOMENT FRAME



RETROFITTED STEEL MOMENT FRAME

minimize damage to nonstructural components, including the building skin. The pivoting spine will limit inter-story drift (the horizontal movement of one level of a building relative to the one above it), making extensive repairs to the curtain wall unnecessary after a design basis earthquake—a quake for whose magnitude the building is designed, in this case one with only a 10 percent chance of being exceeded in 50 years.

Chow says that the importance of protecting the investment in a building's skin should not be underestimated. "To an owner, that's where the value is," he says, adding that at 680 Folsom, "the facade projects a sense of quality and clean modernism." This image apparently has market appeal: last summer, while construction was still under way, TMG sold the tower to Boston Properties after leasing almost all of its office space to Macys.com and Riverbed Technology. The companies are expected to move in early next year.

LESS-INVASIVE SURGERY

At 680 Folsom and Jorgensen Lab, new facades are just one aspect of those buildings' almost complete reinvention. But installation of a new skin can also be part of less radical transformations, used to address performance problems or to subtly tweak a building's image. Such was the case for a 33-story apartment building with a stepped profile on Manhattan's Upper East Side, designed by Emery Roth & Sons in 1962. The 608-unit tower at 215 East 68th Street was one of the first to use two relatively new, and not yet well-understood technologies: it had a lightweight concrete structure and a cavity-wall facade of one wythe of white-glazed brick with a backup wall of concrete masonry. Over the years, the concrete structure was slowly shrinking. The condition, known as creep, put pressure on the brick, which had been laid without relieving angles. As a result, it bowed and spalled, and water found its way into the interior.

In an attempt to address the problem, the property's manager, Rudin Management, had periodically replaced large sections of brick—a practice that gave the tower a patchwork appearance. For a more lasting solution, Rudin turned to the team of FXFOWLE Architects and a facade specialist, Forst Consulting and Architecture.

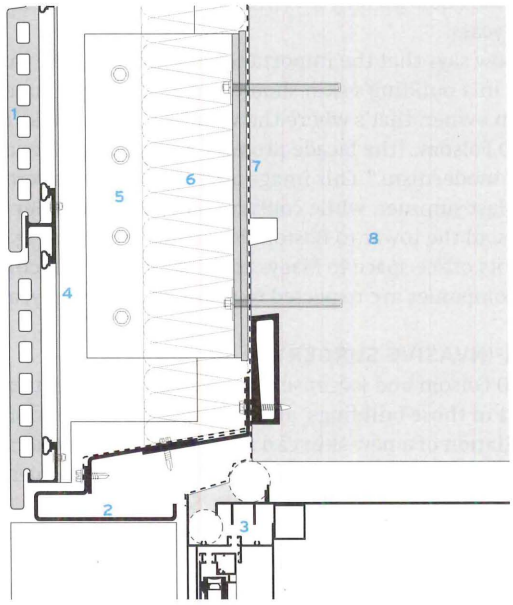
The two firms explored replacing the old skin, which covered about 350,000 square feet, with a new brick cavity wall that would be better detailed than the original. But they soon realized that new reinforcement for the inner block wall could serve double duty, functioning also as an armature for terra-cotta rainscreen cladding. They reasoned that a rainscreen system—a two-stage wall where an outer, open-jointed layer serves as the primary barrier for rain, snow, and hail but is not weather-tight—would offer a number of advantages over a brick cavity wall. Because there is an inner weatherproof layer that incorporates insulation as well as a barrier membrane and is separated from the outer skin by an airspace, the exterior cladding is essentially back-ventilated, improving drying capacity, says Ralph Forst, Forst Consulting principal. Another chief benefit is weight—terra-cotta tiles are significantly lighter than brick, which would mean less stress on the building's structure.

The system that the project team developed consists of tiles typically about 1¼ inch thick, 9½ inches tall, and 36 inches long, supported by an extruded aluminum armature.

215 EAST 68TH STREET, NEW YORK CITY

The residential tower designed by Emery Roth & Sons and completed in 1962 on Manhattan's Upper East Side originally had a glazed-brick, cavity-wall skin (left). To combat problems that included bowing and spalling, FXFOWLE Architects and Forst Consulting and Architecture designed a new facade of terra-cotta rainscreen panels (below). The brick was removed and the new rainscreen installed while the building was completely occupied.

1 TERRA-COTTA TILE
2 ALUMINUM HEAD
3 EXISTING WINDOW SYSTEM
4 ALUMINUM VERTICAL CARRIER
5 ALUMINUM SUPPORT BRACKET
6 SEMI-RIGID INSULATION
7 BARRIER MEMBRANE
8 EXISTING BLOCK WALL



SECTION DETAIL AT WINDOW HEAD 0 6 IN. 25 CM.

215 EAST 68TH STREET, NEW YORK CITY

Approximately 600 different sizes and shapes of terra-cotta tiles have been used to clad the building. However, the typical tile is about 1¼ inch thick, 9½ inches tall, and 36 inches long—a size that one worker can easily handle. Almost all of the tiles are white. But the new facade also includes banding of gray and black, as well as scored tiles, between the building's punched windows.

Behind the tiles is a 4½-inch airspace and then 3 inches of semi-rigid insulation over a new barrier membrane covering the existing block wall. Designers maintained white as the facade's dominant color but added banding of gray and black between the building's punched windows. The scheme retains some of the character of the original brick, "but it is richer and more pleasing to look at," says Bruce Fowle, FXFOWLE founding principal.

Although construction is still going on at the building's base, which will be clad in stone, the terra-cotta work was completed earlier this year. Installation on an existing, fully occupied structure presented several complications. One was the project sequence, which needed to be orchestrated so that it could be performed top-down. If contractors had performed the work bottom-up, the usual method for new construction, they risked damaging already-in-place terra-cotta tiles while demolishing the old brick face, says Bud Streff, director of sales for NBK, the tiles' manufacturer.

The designers and the client are counting on the rainscreen's ease of maintenance. They expect the tiles to be durable, but if some do break or the barrier membrane requires inspection to locate leaks, removal can easily be accomplished without the messy grinding or sawing required for the repair of brick, says Forst.

No leaking or breakage has occurred. However, it's still too early to know if the terra-cotta will be as easy to maintain as its project team hopes. But there is a larger question regarding 215 East 68th Street, and for any building that has been revamped with a new skin: will their new facades seem as fresh decades from now as they do today? It would be interesting to return to the Upper East Side, to the South of Market neighborhood, and to Caltech in twenty years to see if any of the buildings have exchanged their replacement skins. ■

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Learning Objectives

1 Outline structural, functional, and logistical challenges that should be considered when designing a new facade for an existing building.

2 Describe various types of cladding systems, including curtain wall, storefront, and cavity wall and identify their typical components.

3 Describe the elements that make up a rainscreen system and explain why such a system was chosen as a replacement for a brick cavity wall on one building in New York City.

4 Explain the relationship between seismic performance and facade performance and define concepts relevant to facade design in earthquake-prone regions, such as "weak story" and "drift."

AIA/CES Course #K1310A

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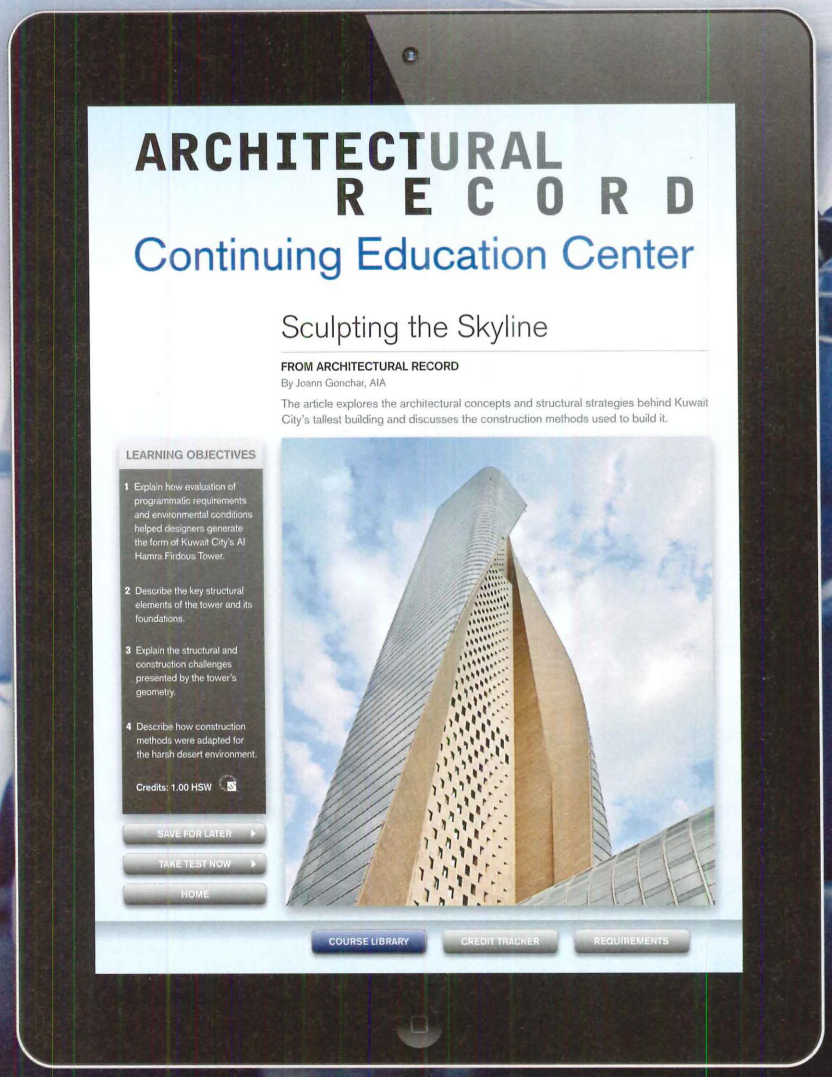

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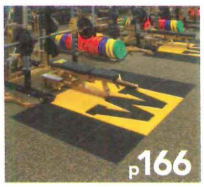

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Plumbing Products Go Green

High-efficiency solutions for sustainably designed restrooms

Sponsored by Sloan Valve Company

All images courtesy of Sloan Valve Company

High-efficiency plumbing products contribute to a sustainable restroom.

Water is one of our most precious natural resources—we cannot live without it. So vital is it that water is often referred to as blue gold and the oil of the 21st century.

Global water consumption has doubled in the last 20 years and will continue to rise in an increasingly populated and energy-intensive world. As a result, water will become scarcer and more expensive. In the U.S., legislation, water conservation programs, and green building rating systems are all calling for ways to save water and achieve water-efficient design. One key strategy in meeting these goals is to stop wasting water. Industry research has zeroed in on significant opportunities to do so in the built environment. Whether it's a school, office, hospital or hotel, most of the water used is in the restroom. According to the U.S. Environmental Protection Agency (EPA), a leaking toilet can waste 200 gallons of water a day, and a dripping faucet or showerhead can waste up to 1,000 gallons per week—scenarios greatly reduced or eliminated by today's high-efficiency plumbing products. From toilets and urinals to faucets and high-speed hand dryers, next-generation products are designed to reduce not only water, but energy, maintenance, and waste as well. This article examines the trends in water usage and how green building programs, particularly the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) v4, are recommending ways to save water. Also discussed will be the types of plumbing products that represent the cornerstone of next-generation green restroom design.

SAVING WATER: WHY IT'S IMPORTANT

Water is critical to life. Humans can survive for weeks without food, but only days without water.

Americans are the biggest consumers of water—the average North American resident uses 100 gallons of water a day. In the U.S., 3 trillion gallons of water are consumed every month. Yet, in 2012 some two-thirds of the U.S. was in drought. As a result, water supply conflicts are building in the Southwest as disputes between farmers, electric utilities, and cities escalate, particularly in drier areas like Denver, Albuquerque, and Las Vegas.

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Learning Objectives

After reading this article, you should be able to:

1. Explain the status of water as a natural resource.
2. Discuss the recommendations of legislation and green building rating systems to save water.
3. Describe the contribution of high-efficiency plumbing products to water conservation programs and sustainably designed restrooms.
4. Specify a suite of water-saving products in commercial restrooms.

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.

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Population growth is the biggest driver of water shortages, and regions such as South Asia and the Middle East will be facing competition for scarce water, which will fuel instability. All over the world, the competition for a limited supply of water is heating up. The CIA predicts that by 2015, drinking water shortages could be a major source of world conflict.

Yet the water situation is not limited to human consumption. The demand for water and energy is intertwined—water is needed to produce energy, and energy is necessary to deliver water. U.S. public water supply and treatment plants consume some 50 billion kilowatt hours per day—enough energy to power 4.5 million homes for a year. Some 13 percent of our electrical energy goes to heat, treat, and pump water. By the same token, energy plants are dependent on water. Making 1 gallon of ethanol takes about 100 gallons of water. The biggest use of electricity for most cities is supplying and treating water. If water levels in rivers, lakes, and aquifers get too low, power plants won't be able to cool down with the worst-case scenario being water shortages shutting down power plants and causing blackouts. Water and energy production are interdependent. Yet, unlike energy, water has no substitute.

Not only is scarcity of water supply an issue, cost is too. More than $4 billion is spent annually in the U.S. on energy to run drinking water and wastewater utilities, and researchers say the cost of water is rising faster than any other utility. Average rates in the top 30 U.S. cities went up more than 9 percent in 2011 alone and as much as 25 percent in other areas. Yet current water rates are the lowest we will ever see; industry watchers predict that the cost of water will rise more than the rate of inflation.

The increase in water price is attributable to the increase in the cost of operational inputs such as chemicals, energy, and labor. In Phoenix, for example, over the last 10 years chemical costs per million gallons of treated water have increased 493 percent, electricity cost by 68 percent, and raw water cost by 41 percent. Drought is also a factor in higher water prices. San Diego imports 90 percent of its water, paying 66 percent more for untreated water because prolonged droughts have reduced deliveries of cheap water from the Colorado River.

Another piece of the cost increase puzzle is aging infrastructure. In some cities, pipes that were laid over 50 years ago are reaching the end of their design life. If they are not replaced, cities face more frequent water main breaks and associated costs. For many cities, this is already a reality. Baltimore, for example, has had over 5,000 breaks in the last five years.

HIGH-EFFICIENCY PLUMBING AND MONITORING SYSTEMS HELP A MAJOR MUSEUM CONSERVE RESOURCES

Chicago's Museum of Science and Industry, which features exhibits highlighting mankind's grandest ideas, renovated its largest public restroom and added two new restrooms with a suite of water-efficient fixtures, and a networked, software-based water control system. The museum installed low-consumption fixtures in place of older fixtures, replacing manual 3.5 gallon per flush (gpf) water closets with sensor-activated 1.6 gpf water closets, manual 1.5 gpf and waterfree urinals, and manual metering faucets operating at 0.25 gallon-per-use with sensor-activated 0.5 gpm faucets. The water closet and faucet updates alone have reduced annual water usage by approximately 800,000 gallons. Installation of waterfree urinals, along with a greywater system that supplies water to flush some of the water closets, saves the museum another 250,000 gallons of water annually, for a total water savings of almost 1.1 million gallons a year.

The Chicago Museum of Science and Industry used high-efficiency plumbing products and monitoring systems to realize significant water savings.

The monitoring system worked so well for the museum that J. Jeffery Johnson, director of facilities, is keen on bringing the systems to its other restrooms. Greywater is the only source of water for about half of the 50 toilets in restrooms with the monitoring system. Although Johnson says he would prefer to have all toilets pulling water from the greywater system, not enough water is generated by lavatory use to flush all of them. Even so, the museum is ahead of most of its peers when it comes to water efficiency, and is Illinois' only cultural institution with a standalone greywater system for restrooms, as well as the state's first institution to roll out dozens of waterfree urinals. Installing the greywater system and the waterfree urinals required special approval from the city and state.

Occupancy sensors at the door to each restroom count how many people enter. Counters placed at each water closet and waterfree urinal aid in restroom monitoring, issuing a warning when a urinal comes within about 100 uses of expiration to ensure that housekeeping replaces the waterfree urinal cartridges in a timely manner. Sensors are also linked to electronic faucets and soap dispensers to signal when a faucet is running non-stop or a dispenser is low on soap. An air sensor connected to the monitoring system detects air quality issues ranging from a higher than acceptable level of sewer gas to a visitor smoking in the restroom.

"The system works flawlessly," says Johnson. The monitoring system alerts feed into a computer in the central dispatch office, which is monitored 24/7, and tie into the museum's work order system, which may either send an e-mail to the housekeeping staff office or automatically generate work tickets. While everyday matters, such as soap dispenser refills, are handled through the monitoring system, more serious issues, such as a lavatory blockage, are dispatched to a plumber. Johnson maintains that restroom service has actually improved due to the monitoring system—consumable outages are no longer a problem, and housekeeping managers have gained workforce flexibility. "It's been a great assistance to us," he says. "If we get a call that a dispenser is out or there's a clog, we can selectively pull people from other spaces to take care of that on an ad hoc basis versus dedicating personnel to restrooms 100 percent of the time." Another benefit: Requests for restroom supplies have decreased as well, and Johnson surmises that using resources more efficiently has resulted in less waste.

Houston is changing out 150 miles of its 7,500-mile water distribution pipe network every year, and Chicago is raising funds to replace 900 miles of its water distribution network. Many cities are facing constrained resources and budget shortfalls that do not bode well for replacement of aging pipes.

SAVING WATER: WHAT'S BEING DONE

Water shortages in the U.S. are prompting legislation and development of large-scale water conservation programs. See the online version of this course for a chart highlighting ongoing efforts in several states. Many states and municipalities also offer water rebate programs that involve replacing a high water-consuming product with a lower water-consuming version, with the jurisdiction reimbursing all or part of the costs. Citywide rebate programs can add up to significant savings. New York City's recent rebate program to replace 800,000 toilets, for example, is expected to save 30 million gallons of water a day. The San Antonio Water System Rebate Program is anticipated to save 1 billion gallons of water a year.

LEED V4: WATER EFFICIENCY

Water Efficiency section takes on many changes.

Prereq 1	Outdoor Water Use Reduction	NEW
Prereq 2	Indoor Water Use Reduction	
Prereq 3	Building Level Water Metering	NEW
Credit 1	Outdoor Water Use Reduction	
Credit 2	Indoor Water Use Reduction	
Credit 3	Cooling Tower Water Use	NEW
Credit 4	Additional Water Metering	NEW

Green Building Rating Systems

The benefits of building green are well known in terms of environmental, economic, health and safety, and community impacts. Looking specifically at the water side of green buildings, using less water means reduction of impact of a limited resource. It also means pumping less water in and out of a building and the associated reduction in energy and utility bills, as well as decreasing the strain on the local water treatment facilities.

Standards in achieving reduced water usage have been established by several green building rating systems, including LEED, Green Globes Building Initiative, EPA WaterSense Program, ENERGY STAR, Green Guide for Health Care, and Collaborative for High Performance Schools.

Similar to its ENERGY STAR program, the EPA WaterSense program is a voluntary labeling program within the EPA Water Efficiency Program that helps guide consumers in choosing simple ways to use less water with water-efficient products and services. Products that have earned the WaterSense label have been certified to be at least 20 percent more efficient without sacrificing performance. The system for labeling residential high-efficiency plumbing products has been completed, and a similar system for commercial products is under development.

Perhaps the most influential rating system in the design community is LEED, the flagship tool created by the U.S. Green Building Council to guide the green building process.

LEED 2009 was not too stringent when it came to water usage. There was one prerequisite for projects—a 20 percent reduction in water usage—and 10 possible points from landscaping, wastewater innovation, and indoor water use. In LEED v4, due out this year, the water-efficiency section incorporates dramatic changes. There are two new prerequisites, a revised title, and updated requirements for water-efficient landscaping and water use reduction credits, as well as two new credits: one for cooling water tower use and another for water metering. In addition, CR2 in LEED 2009, the credit for Sustainable Water Management, has been removed. The chart above summarizes the new water use features in LEED v4.

The new prerequisite, Outdoor Water Use Reduction, offers two options. To meet the requirements of the first option, No Irrigation Required, designers must show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period. The second option, Reduced Irrigation, stipulates that the project's landscape water requirement must be reduced by at least 30 percent from the calculated baseline for the site's peak watering month. Reductions must be achieved through plant species selection and irrigation system efficiency, as calculated by the WaterSense Water Budget Tool.

Prerequisite 2, now called Indoor Water Use Reduction, requires a reduction of aggregate water consumption by 20 percent from the baseline. See the online version of this course for an accompanying figure for base calculations on volumes and flow rates. In addition, all newly installed toilets, urinals, private lavatory faucets, and showerheads that are eligible for labeling must be WaterSense labeled or carry a local equivalent for products made outside the U.S.

A third prerequisite, Building Level Water Metering, is new in LEED v4 and is very specific. Permanent water meters must be installed that measure the total potable water use for the building and associated grounds. Meter data must be compiled into monthly and annual summaries; meter readings can be manual or automated. Further, the project owner must commit to sharing with USGBC the resulting whole project water data usage for a five-year period beginning on the date the project accepts LEED certification or typical occupancy, whichever occurs first. This commitment must carry forward for five years or until the building changes ownership or lessee.

In order to earn points under Credit 1, for Outdoor Water Use Reduction, outdoor water use must be reduced by one of the following options.

OPTION 1

NO IRRIGATION REQUIRED (1-2 POINTS)

Designers must show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period.

OPTION 2

REDUCED IRRIGATION (1-2 POINTS)

The project's landscape water requirement must be reduced by at least 50 percent from the calculated baseline for the site's peak watering month. Reductions must first be achieved through plant species selection and irrigation system efficiency as calculated in the EPA WaterSense model.

Additional reductions beyond 30 percent may be achieved using any combination of efficiency, alternate water sources, and smart scheduling technologies.

There are several strategies designers can take to meet these options and earn the credits, including the use of high-efficiency equipment and stormwater, greywater, and condensate for irrigation, as well as xeriscaping, a landscaping philosophy that uses native, drought-resistant plants to the extent possible and arranges them in efficient, water-saving ways.

Credit 2 Indoor Water Use Reduction awards points for further reduction of fixture and fitting water from the baseline. Additional potable water savings can be realized by using alternate water sources. Points are awarded based on percentage of reduction from 1

HIGH-EFFICIENCY PLUMBING PUT TO THE SUPER TEST AT THE NATION'S GREENEST BALLPARK

High-efficiency plumbing products at Target Field were put to a worst-case scenario test to ensure they would work flawlessly for the fans.

The U.S. Green Building Council, which certified Target Field with LEED Silver status, calls it the "greenest" outdoor ballpark in America. The $545-million home of the Minnesota Twins Major League Baseball team was designed to accommodate the masses of fans who pile into the stadium at game time and then load the common areas during the seventh-inning stretch. In the restrooms, vandal-proof, water-efficient products were installed to meet the stadium's high-traffic demands and "green" building goals. Specifically 610 flushometers were installed on the toilets and 286 flushometers were installed on the urinals for a total of 896 flushometers. This dual-flush option can reduce water volume by 30 percent, which calculates to a cost savings of at least $100,000 per year. The calculation is based on average attendance plus restroom use per baseball season at Target Field with water closets flushing at the standard 1.6 gpf. Pushing the green handle down initiates a standard 1.6 gpf flush for solid waste and paper. Lifting the handle up initiates a reduced flush of 1.1 gpf for liquid and paper.

The efficiency of the system was well tested. Before the 2010 baseball season, the stadium's main domestic water and sanitary systems were put through a worst-case scenario, known in the plumbing industry as the "super flush." The process simulates a worst-case highest flow under tightly controlled conditions and checks the city's mains as well, testing the water delivery to the building. Ultimately, the test answers the question: can the system deliver a specified number of gallons per minute through the main? And can the system discharge a certain number of gallons per minute of sanitary water back to the city's system?

The system works with pumps on variable frequency drives. The pumps ramp up and ramp down based upon demand. Some 150 people participated in super flush using 20 percent of the toilets and urinals. The exercise began slowly with several seconds between flushes and then quickening the pace and adding rooms and floors until reaching the highest flow of about 2,000 gpm.

"The Super Flush is tested in many newly built stadiums to put the sanitary main system in a scenario that most likely would never occur under normal circumstances," says Kip Olson, piping coordinator/food service project manager on the Target Field project for Metropolitan Mechanical Contractors, Eden Prairie, Minnesota, which conducted the test of the entire plumbing system. Olson noted that the test at Target Field went off successfully and without a problem.

point for 25 percent reduction to 6 points for a 50 percent reduction. Strategies to earn points here include specifying high-efficiency toilets, urinals, and electronic faucets, and using rainwater, stormwater, greywater, and air conditioner condensate to flush toilets and urinals.

Credit 3 Cooling Water Tower Use is a new credit in LEED v4 in which one or two points are awarded for conserving water used for cooling tower makeup while controlling microbes, corrosion, and scale in the condenser water system.

Credit 4 Additional Water Metering is also a new credit that allows one point for installation of permanent water meters for two or more of the following water subsystems—irrigation, indoor plumbing fixtures and fittings, domestic hot water, boiler, reclaimed water, and other process water systems.

In determining eligibility for LEED credits for water-efficient products, the methodology of the following calculation is helpful. For a baseline calculation, assume a one-story building with two restrooms and 500 building occupants, equally divided between men and women. The men's restroom includes two urinals, two water closets, and two sinks with manual faucets; the women's restroom includes four closets and two sinks with manual faucets. Males use the urinals twice daily and closets once, females use closets three times daily, and all use faucets three times a day. In calculating the design case, retain the same number of occupants, workdays, and frequency. Assume 0.125 gallons per flush (gpf) urinals, 1.28 water closets, and electronic faucets with low-flow aerators (0.5 gpm with a 12-second duration) for high-efficiency products. The result is a 40 percent savings over baseline.

HIGH-EFFICIENCY SOLUTIONS FOR GREEN RESTROOM DESIGN

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CIRCLE 93

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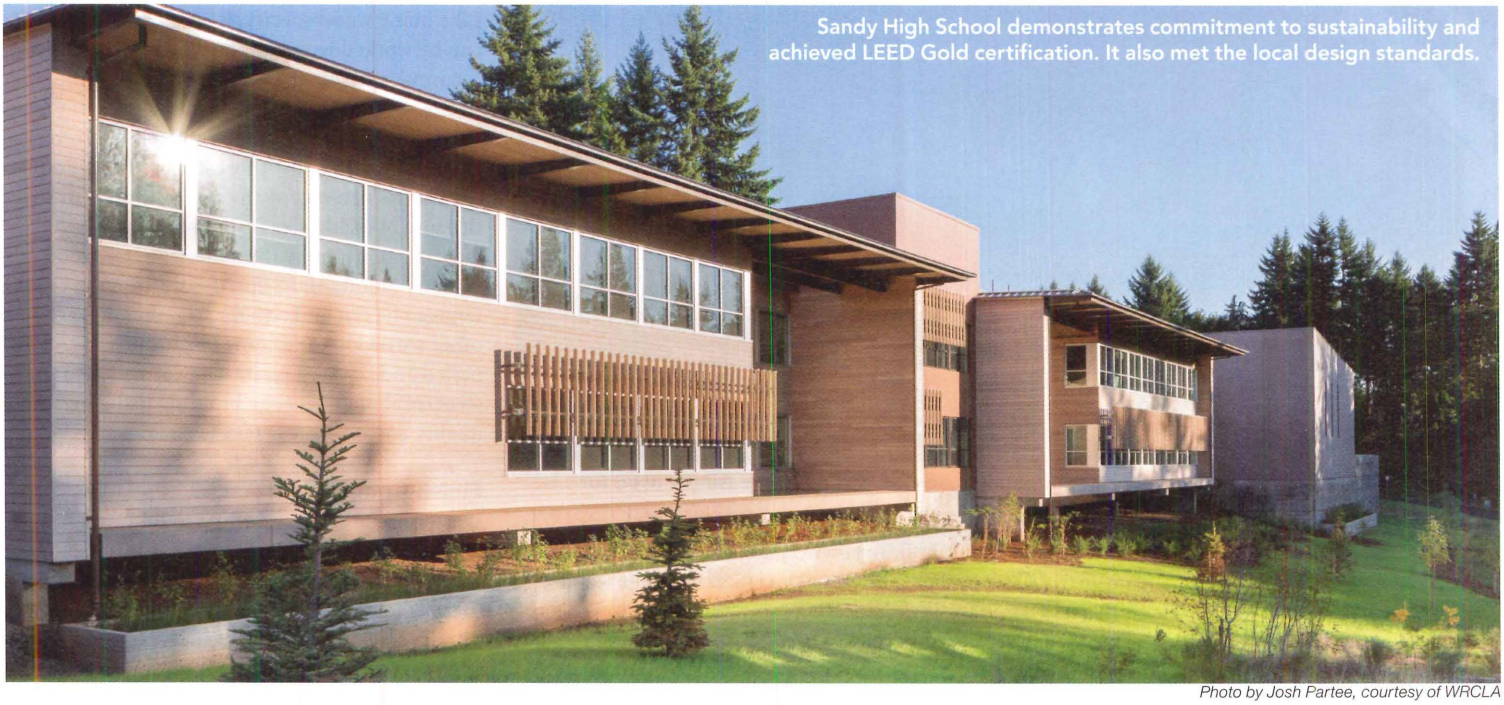
CIRCLE 12

Natural Winner: Western Red Cedar and Nonresidential Building

An age-old favorite, this wood species supports a new wave of green building

Sponsored by Western Red Cedar Lumber Association | *By C. C. Sullivan*



Sandy High School demonstrates commitment to sustainability and achieved LEED Gold certification. It also met the local design standards.

Photo by Josh Partee, courtesy of WRCLA

The use of natural materials in architectural projects is among the most valuable movements spawned by the green building industry. Sustainability is driven both by a reliance on the earth and long-term husbandry. The use of natural products, especially those that are renewable and durable, brings a cascade of benefits: Built environments tend to be healthier. Less pollution results. Occupants are less likely to experience allergies or chemical sensitivities. Energy is saved. And the beauty of nature is on display for all to enjoy.

One of the materials experiencing a recent renaissance of building use is western red cedar, a typical and widespread species in the Pacific Northwest. It is seen in an increasing number of green building projects, including institutional buildings like the award-winning Research Medical Complex of Barcelona, with its exterior lattice of 44,000 western red cedar boards, or commercial buildings like Brian Church Architecture's mixed-use, live-work SEMA 4 development in Leucadia, Calif., with its hull-like western red cedar exostructures.

The recently built Sandy High School in Sandy, Oregon, offers a highly valuable case study on why architects are using western red cedar for these kinds of large-scale gestures. The reasons are myriad, but include such considerations as environmental protection, building durability, and facility life-cycle cost (see case study online).

This evergreen coniferous was once widely known as *shinglewood*—for its storied success in protecting Western homes and buildings. The species grows alone and amid stands of Douglas fir and western hemlock in forests, on mountainsides, and in wet lowlands from Vancouver Island and the Oregonian Pacific Coast to the Inland Empire areas reaching into Idaho. Ruddy brown in appearance, western red cedar (sometimes called "red cedar" or "western redcedar") has a uniquely tight and straight graining pattern, typically with few knots. Its smell is memorable, yet architects and builders often favor *Thuja* for its inherent strength and high resistance to decay and rotting. In fact, this is partly due to its chemical makeup, which includes a natural fungicide, *thujaplicin*, that contributes to the aroma and persists in the timbers for decades after felling.

It adds up to a worthy cash crop, say experts in building materials. "Western red cedar is the most valuable species of the coastal forests and among the most appreciated architectural materials globally," says Paul Mackie, a technical specialist and field representative for the Western Red Cedar Lumber Association (WRCLA), a trade group representing

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Learning Objectives

After reading this article, you should be able to:

1. Describe the benefits of using western red cedar in terms of major green-building standards and forestry industry programs.
2. List the main performance attributes of western red cedar and how they differ from other forestry products.
3. Explain how red cedar materials were employed in a high school new construction project, with details on assemblies and finish treatments.
4. Discuss the kinds of western red cedar products available and their typical architectural applications, with attention to environmental benefits.

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.

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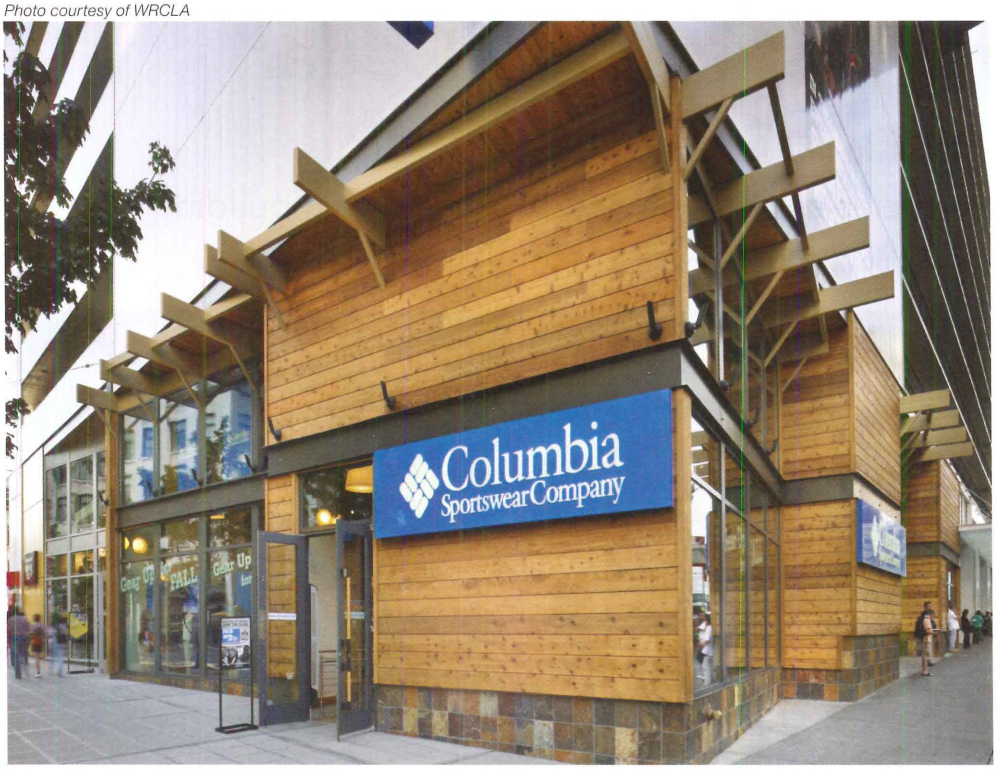


Western red cedar is commonly used for residential buildings, but it is increasingly used for commercial and institutional facilities.

manufacturers and distributors. "First, it is the most stable of all softwood species, and one unique advantage of western red cedar is that it is extremely lightweight."

Use of the wood, which is a traditional building material for residential applications, now extends around the world. In Australia and New Zealand, "western red" is favored for shutters, blinds, and window trims. For years it has been commonly used in the United Kingdom, Japan, the Netherlands, the Czech Republic, France, and Ireland, among other places. Recent projects have included a major U.S. big-box retailer, currently rolling out stores around the globe, from Mexico City and Chile to Europe and Russia, with a cladding of North American *Thuja*.

"The international exposure is amazing," says Mackie, a former wholesale lumber executive whose family has had a legacy of involvement in western red cedar since 1895, and operated western red cedar shingle mills until 1963. "It's an effective choice for architects and building owners who want practically perfect wood. In most cases, one supplier can furnish whatever the project needs."

PHYSICAL PROPERTIES AND IMAGE

Where a high degree of control is desired over a building's aesthetic and construction detailing—and over the availability of matching materials—architects and their clients have gravitated toward the consistency and predictability of lumber stocks like western red cedar.

There are other reasons, too, including brand image and institutional identity for some building owners, like the big-box stores now being built that must use the same wood cladding for locations around the world. Western red cedar has also become an emblematic material, carrying connotations of naturalistic luxury. Architectural styles including regional modernism, neotraditionalism, the Pacific Northwest, and mountain lodge styles of the American West are both marked by heavy use of the materials, and these trends have influenced architects elsewhere in the United States but also in Europe, Asia, and Australia.

Practical reasons to use western red cedar are as longstanding as the early U.S. buildings with original western red cedar timbers now more than a century old. They help explain western red cedar's historically heavy use in architecture and construction, too.

Dimensional Stability

Western red cedar is a low-density softwood with high resistance to shrinkage compared to other wood species. It is approximately twice as stable as commonly used softwoods. Western red cedar timbers also provide high relative thermal insulation ability (R-value) as compared with other woods and building materials.

Workability

Like many wood species, western red cedar can be worked with standard tools for cutting, forming, and joinery, according to Edmund A. Allen Lumber Co., which specializes in the species. Standard carpenter glues and joining methods work well with western red cedar, and the species can accept any typical wood finish. Because of its low density and low shrinkage factors—as given by the American Softwood Lumber Standard, PS 20-70—western red cedar tends to lie flat and remain straight longer than other softwoods and some hardwoods. It can be nailed and screwed easily when attached to the structural members of a building using high-quality corrosion-resistant fasteners.

Finish Compatibility

Western red cedar, according to Edmund A. Allen, "though rich in extractives, is free of the pitch and resin found in other softwoods, making it ideal for a wide range of finishes." This includes lightly toned clear solutions, semi-transparent stains, and two-coat solid colors. The lumber company contends that, "Western red cedar ranks at the top in its ability to accept and maintain a finish."

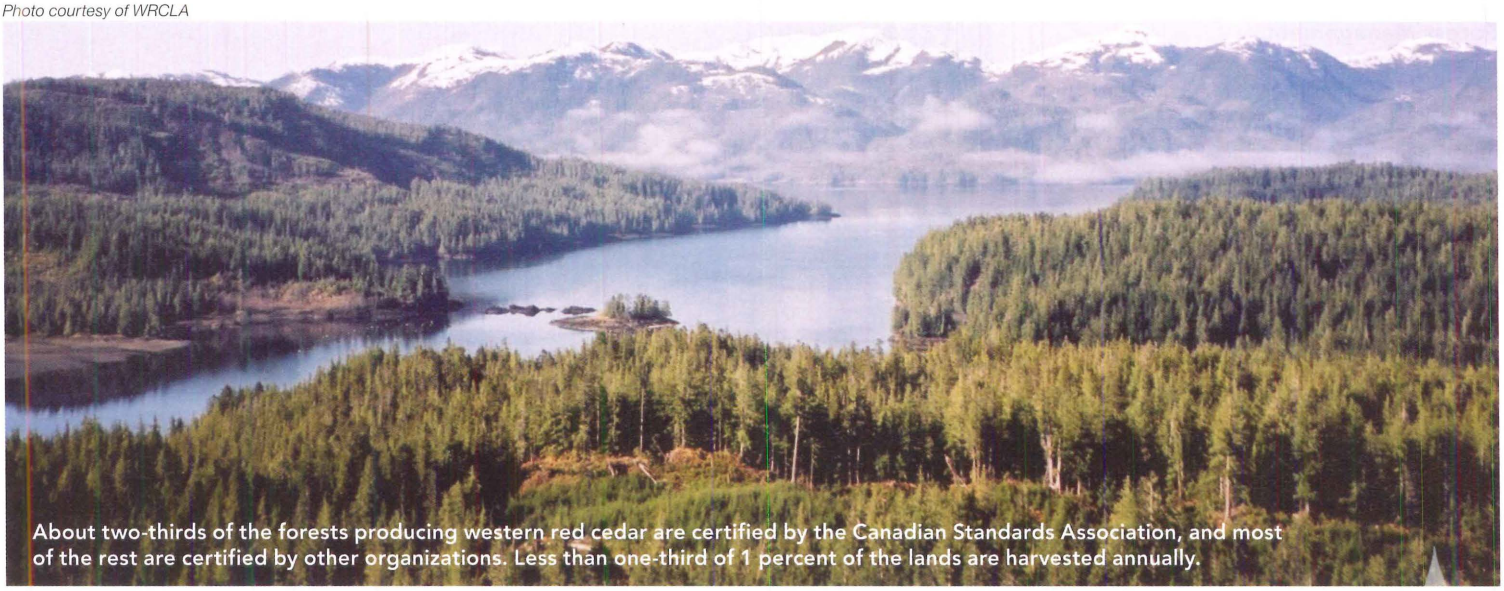
Weight and Density

Western red cedar is also one of the lightest commercial softwoods, due to its cellular structure. It averages about 12 percent moisture content and weighs approximately 23 lb. per cubic foot, with a relative density (specific gravity) of 0.32 as compared to yellow pine at 0.42, walnut at 0.65, and oak (0.6 – 0.9)[1] Western red cedar's light weight and low density make

Photo courtesy of CUC Admin Campus Center, LTL Architects

Western red cedar is a very stable softwood that is also lightweight and affords a high degree of control if desired over a building's aesthetic and construction detailing.

Photo courtesy of WRCLA



About two-thirds of the forests producing western red cedar are certified by the Canadian Standards Association, and most of the rest are certified by other organizations. Less than one-third of 1 percent of the lands are harvested annually.

it easier to handle and more economical to transport than some alternative materials.

Natural Preservative

Western red cedar naturally resists moisture, rot, and damage from termites and other pests due to its *thujaplicin* content and other inherent attributes of the wood. For this reason, it is ideal for cladding, roofing, fencing, decks, and any architectural applications. Compared with the plastic composites used for decks, boardwalks, and rooftop platforms, cedar is often a comparable choice. "Creating plastic in the first place requires far more energy usage than it takes to harvest a tree," according to WRCLA. "Plastic also comes from nonrenewable resources, while trees are replanted and grow back. And plastic breaks down very slowly, while timber is biodegradable."

Fire Safety

Western red cedar exceeds minimum safety classifications for such measures as flame spread and smoke-development ratings, often without any preservatives or added retardant chemicals.

In addition, the track record for cedar around the world demonstrates that the lumber holds its architectural and structural properties extremely well, even after decades of exposure to sun, rain, heat, and cold. This fact was among the top considerations given for its extensive use at Sandy High School, designed by the firm Dull Olson Weekes–IBI Group Architects, which hadn't used the material on its previous nonresidential projects.

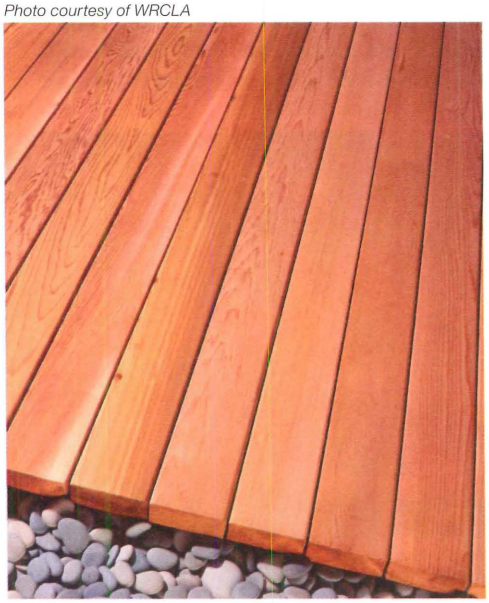
SUSTAINABILITY: SUPPLY AND RESOURCES

Sustainability was another major consideration for Sandy High School, as it is with many projects that employ western red cedar. The architects had designed a number of LEED Gold high schools, including one meeting the criteria for the Living Building Challenge, a rigorous performance standard created by the International Living Future Institute. The firm—which works out of LEED Platinum office interiors it designed in Portland, Oregon's historic Federal Reserve Building—is known for its sustainability action plan and for efficient, green works.

Resource Extraction

Considering the environmental benefits of western red cedar begins with a look at material sources and extraction costs. According to WRCLA, "America grows 30 percent more wood each year than it harvests and has more forestland today than 100 years ago." Mackie adds that the renewable material comes almost exclusively from "sustainably and responsibly managed forests" primarily in British Columbia, with a considerably smaller fraction from Idaho and Northern Oregon. While there is a harvest in Washington State, says Mackie, that stock is almost entirely used for fence boards.

Photo courtesy of WRCLA



Western red cedar naturally resists moisture, rot, and damage from termites and other pests due to its *thujaplicin* content and other inherent attributes of the wood.

"About 95 percent of the forestland in British Columbia is owned by the province and operated under management contracts—tree farm licenses, or TFLs—for large blocks of timberland," says Mackie. "Of those forests, more than 85 percent of the operations are third-party certified as sustainably managed." About two-thirds of the forests are certified by the Canadian Standards Association (CSA) Group Sustainable Forest Management (SFM) System. Of the remaining third, most is certified by the Sustainable Forestry Initiative (SFI) with a small slice of about 5 million acres (2 million hectares) certified by the FSC, the Forest Stewardship Council.

Summing up, Canadian western red cedar sourced for a building project is very likely to be certified; in the United States, certified product is also readily available. Overall, only a sliver of the lands are harvested on an annual basis—in Canada, less than 0.33 percent—and, says Mackie, "Forests are replanted immediately and replanted in kind, meaning that they have to replant exactly the same proportion and mix that came off the land, and the same way it flourished." Western red cedar thrives in the shade and also grows on mountains and riverbanks, yet in the coastal forests of British Columbia it may account for only about 25 percent of the species mix. On Vancouver Island, for example, the timber stand is about 60 percent western hemlock, and the balance divided evenly between fir and western red cedar.

Forest Management

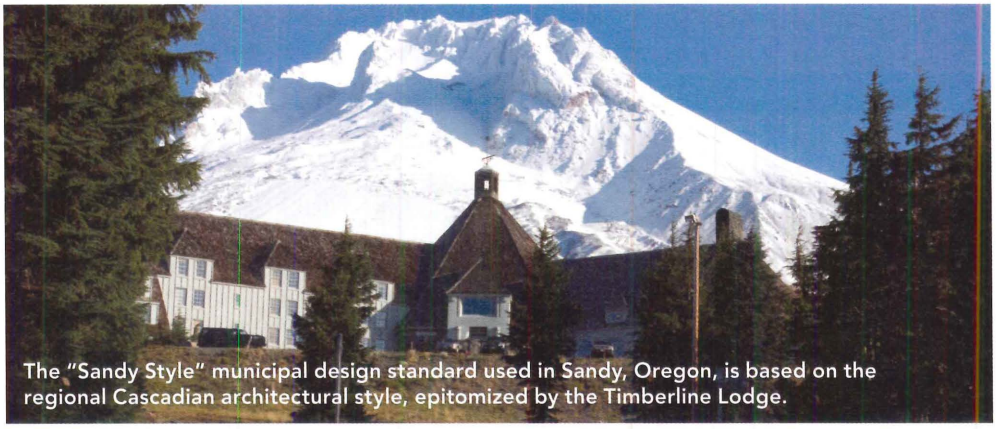
Forest management and harvesting practices have advanced significantly, according to the CSA, which says it certifies more forestland than any other group. CSA released the SFM standard in 1996, and it is promoted through the Program for the Endorsement of Forest Certification, or PEFC. Certified lands must follow six criteria, including:

- Recognition of environmental, economic, social, and cultural values.
- Conservation of biological diversity.
- Ongoing public participation.

For specifiers and buyers of western red cedar, this means significant advances in management practices and harvesting. For example, the average cut block is relatively small, at about 50 acres (20 hectares), and replanted in kind. Using variable retention techniques, forest operators leave clumps of trees across cut areas to provide corridors for habitat and to help prevent erosion. For steep mountainside cuts, most logging companies use helicopters for extraction rather than build roads, which are costly—in some cases, $1 million per mile—and cause soil disturbance and erosion.

Best practices in replanting are also employed to promote biological diversity and environmental balance. In addition, newly planted saplings of two to four years old are protected with a wire-mesh cage to prevent deer and elk from damaging the tender, delicate foliage. Protections for social and cultural values include protecting any mature cedar tree or stand that is culturally modified, meaning for example that bark has been stripped for basketry or clothing, or if the tree is deemed a religious artifact. Because the native tribes are using the trees, the area is set aside, with a buffer left around the zone with evidence of cultural use. Similarly, key species are protected with a buffer; so if a bear den is found, for example, the area is protected.

Photo by Jon Tullis/Timberline Lodge



The "Sandy Style" municipal design standard used in Sandy, Oregon, is based on the regional Cascadian architectural style, epitomized by the Timberline Lodge.

LIFE-CYCLE CONSIDERATIONS

For projects like Sandy High School, these best practices in forest management and conservation may seem distant and exotic, even though they contribute to LEED certification and other green standards. More immediate, however, are questions about green building that affect the occupants, the learning environment, and the long-term fiduciary obligations of the school district. Of increasing urgency, for example, is the use of life-cycle assessment (LCA) and cradle-to-cradle analysis, which "addresses major environmental impacts throughout the complete life cycle of a product, from extraction of raw materials, the processing of those materials, manufacturing of the product, transportation, use and final disposal, reuse or recycling," according to environmental consultant Joel Ann Todd. Under LEED v4, she adds, credits will increasingly support a life-cycle approach in building material choices, particularly in the Materials & Resources (MR) category.

LCAs and EPDs

In recent life-cycle comparison studies, says Mackie, western red cedar compared favorably with vinyl decking and composite decking, as well as in vertical applications as siding when compared to brick, vinyl, fiber-cement, and other materials. The independent LCA study, undertaken by the Canadian forest products researcher, FPInnovations, showed that the use of renewable western red cedar "produces fewer greenhouse gases, generates less water and air pollution, [and] requires less energy to produce than alternatives." These studies will benefit buildings projects, as will an Environmental Product Declaration (EPD) "or another approved form of reporting that discloses the required LCA-based information," says Todd, and can be provided by the manufacturer. Mackie adds that EPDs have been available for western red cedar siding and decking products since April 2011.

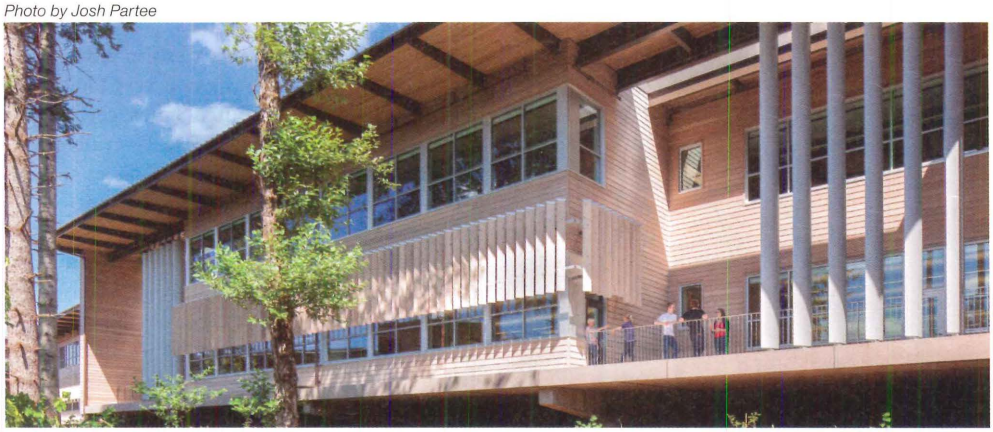
For recent institutional projects like Sandy High School and commercial works like the new six-story mixed-use building AVA Ballard in Seattle, which mixes western red cedar exterior panels with bright orange balcony guardrails, life-cycle performance was essential. But so was installed first cost, a sum of "initial expenditures involved in capitalizing a property, [which] included such items as transportation, installation, preparation for service, as well as other related costs."[2] "In both cases, the architects and owner groups had limited experience with western red cedar, but they wanted to achieve a certain look," says Mackie, who consulted on behalf of WRCLA Architectural Advisory Services. "And when initial cost data was submitted for the exterior skins, they found western red cedar to be surprisingly affordable compared to other materials."

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.

Photo by Josh Partee



The balcony fins of western red cedar create a memorable image for the exterior of Sandy High School, designed by the firm Dull Olson Weekes–IBI Group Architects.

The Western Red Cedar Lumber Association is a Vancouver-based non-profit association representing 17 quality suppliers of Western Red Cedar lumber products in Washington, Oregon, and British Columbia (Canada). Founded in 1954 and known as "the voice of the cedar industry," the WRCLA delivers market programs throughout the United States and Canada to support its members' cedar products with information, education, and quality standards. **www.realcedar.com**

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Product Transparency Declarations

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Resilient floor covering is among the most widely used type of flooring in buildings of all types. It is commonly manufactured to be durable, stain and water resistant, cost effective, and comfortable to walk on, making it a logical and practical choice for many interior design solutions. It is also made from a range of possible materials like cork, vinyl, linoleum, and rubber, which are all known for their long-term attractiveness and ease of maintenance. When specifying resilient flooring, how does an architect or interior designer determine if a product contains ingredients which may pose a human health hazard to building occupants? Does the floor material meet indoor environmental quality standards? Is it truly sustainable and environmentally preferable across the life cycle of the product? These are all legitimate and increasingly important and relevant questions in the day-to-day world of design and construction. Fortunately, there are some well-established standards and programs to help answer these questions while a new, emerging tool should also help architects and designers eliminate any doubt about what is contained in the resilient flooring that they specify.

SUSTAINABILITY AND RESILIENT FLOOR COVERING TO DATE

The Resilient Floor Covering Institute (RFCI) is a nonprofit industry trade association that represents manufacturers responsible for more than 95% of all resilient flooring marketed throughout North America. RFCI serves as a clearinghouse for information on the industry and helps educate specifiers and end-users about resilient flooring including vinyl tile, vinyl composition tile, sheet vinyl, luxury vinyl tiles and planks, rubber, polymeric, and linoleum flooring products. Also included are accessories such as wall base, moldings, and stair treads.

Photo courtesy of Resilient Floor Covering Institute

Manufacturers of all types of building products, including different types of flooring, can use Product Transparency Declarations to publicly disclose the ingredients and any potential health hazards in those products.

Because of the large quantity of materials produced and their ubiquitous presence in buildings, sustainability has emerged as an important and relevant topic being addressed by RFCI and its member companies. During the last decade or so, they have undertaken three initiatives related to sustainability, each of which builds upon the other. First, the FloorScore® system addresses the level of volatile organic compounds (VOCs) in hard surface flooring products. Second, the NSF/ANSI Standard 332 looks at the total process of creating a flooring product from design through end of life. Third, Environmental Product Declarations (EPDs) use a broader measure of life cycle assessment (LCA) and require third-party review and verification of any published declarations. Each of these three initiatives is discussed in more detail.

FloorScore® System

The RFCI FloorScore® Certification Program for Indoor Air Quality was developed together with Scientific Certification Systems (SCS) to test and certify flooring and adhesive products for compliance with indoor air quality emission requirements. SCS is an internationally recognized third-party evaluation, testing, and certification organization. SCS programs span a wide cross-section of the economy, including consumer products, the energy industry, manufacturing, retail, home improvement, and construction.

When it comes to indoor air quality (IAQ), a primary concern is the emission level of specific volatile organic compounds (VOCs). A FloorScore® IAQ Certification means that a flooring product is independently certified by SCS to comply with the volatile organic compound emissions criteria of the California Department of Public Health Standard Practice for the Testing of VOC Emissions, often referred to as California Section 01350.

In addition, as a third-party independent certification firm, SCS audits and determines whether products qualify for the FloorScore® seal by meeting the requirements of SCS-EC-10.2-2007. Under this program, SCS (1) reviews all VOC emissions test reports for particular products generated by independent testing laboratories; (2) determines whether those test results meet the California Section 01350 requirements for listed VOCs; and (3) conducts periodic manufacturing plant inspections to review product formulas, processing, and quality control to ensure the continuing integrity of the FloorScore® seal. To date, hundreds of different resilient flooring materials and their adhesives bear the FloorScore® seal. Any such product that bears this seal is represented to have met the stringent IAQ standards and contribute to good indoor air quality.

In order to earn the FloorScore® seal, a flooring product must satisfy the requirements of the SCS-EC-10.2-2007 Environmental Certification Program – Indoor Air Quality Performance, which includes:

- Testing which demonstrates compliance with emission concentrations for listed VOCs under California Section 01350;
- On-site audits at the manufacturing facility and yearly surveillance audits;
- Product re-testing;
- Product record keeping; and
- A documented quality control plan.

The U.S. Green Building Council (USGBC) has cited FloorScore® certified flooring products as eligible for credits under LEED 2009 and the soon-to-be-released LEED V4. Reflecting the inclusion of FloorScore, the LEED IEQ Credit 4.3 for Low-Emitting Materials has been expanded from "Carpet Systems" to "Flooring Systems" to include hard surface flooring. Several LEED systems specifically cite FloorScore as an indicator of indoor air quality, including New Construction (NC), Commercial Interiors (CI), Core and Shell (CS), Healthcare (HC), and LEED for Homes. FloorScore also is included in other important environmental rating systems such as the Green Building Initiative's Green Globes, Collaborative for High Performance Schools (CHPS), Green Guide for Health Care, and EPA's Tools for Schools.

NSF/ANSI Standard 332 – 2010

NSF International (formerly the National Sanitation Foundation) is an independent, not-for-profit standards organization that has developed a sustainability assessment standard for resilient floor coverings that has also been approved as an American National Standards Institute (ANSI) standard. The NSF/ANSI Standard 332-2010: "Sustainability Assessment Standard for Resilient Floor Coverings" (NSF/ANSI 332) addresses a thorough communication of information that is verifiable, accurate, and not misleading about environmental and social aspects associated with the production and use of resilient floor

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Learning Objectives

After reading this article, you should be able to:

1. Identify the different means of assessing sustainability in resilient flooring products.
2. Differentiate and distinguish between Environmental Product Declarations (EPDs), Product Transparency Declarations (PTDs), and Health Product Declarations (HPDs).
3. Investigate different approaches that manufacturers and suppliers of resilient flooring are taking toward creating sustainable resilient flooring products.
4. Analyze and assess the transparency of specific ingredients and their hazard potential in resilient flooring products.

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.

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Image courtesy of Resilient Floor Covering Institute

coverings. The standard establishes a consistent approach to the evaluation and determination of environmentally preferable and sustainable resilient floor coverings. While the standard is offered as a self-assessment for manufacturers, its credibility is derived from having been developed through the open, consensus-based ANSI process with public review and input. Further, optional third-party certification under this standard offers specifiers the highest level of confidence and credibility in a market that has no shortage of green claims. This standard is intended to be science based, provide transparency, and offer credibility for manufacturers in making claims of environmental preferences and sustainability.

Under NSF leadership NSF/ANSI 332 was developed using the ANSI consensus-based process that included architects, academia, environmental program managers, the U.S. Environmental Protection Agency (EPA), state and federal agencies responsible for procurement practices, and flooring manufacturers. The standard is built upon scientific principles included in the International Standards Organization (ISO) 14000 series Environmental Standards. It took over three years to complete the process that included a two-year public comment and voting period. NSF/ANSI 332 was first released as a draft standard and ultimately received final approval in 2010.

For resilient flooring manufacturers that choose to assess the sustainability performance of their products in accordance with this standard, a point-based scoring system has been developed. The system is based on a 90-point scale with a varying number of points assigned to accomplishing each of the assessment categories. Note that the Innovation category is optional and allows for 10 bonus points beyond the 90 available in the other categories for a total maximum potential score of up to 100 points. The category point breakdown is as follows:

- Product(s) Design – up to 30 points
- Product(s) Manufacturing – up to 29 points
- Long-Term Value – up to 9 points
- End of Life Management – up to 10 points
- Corporate Governance – up to 12 points
- Innovation – up to 10 points

Achievement of conformance with all of the prerequisite and additional criteria allows manufacturers to declare Sustainable Product Achievement declarations based on the specific point score achieved for each individual product assessed as follows:

Conformant: 25 points minimum

Silver: 35 points minimum

Gold: 45 points minimum

Platinum: 60 points minimum

NEW SUSTAINABILITY INITIATIVES FOR FLOORING

The previous section indicates how flooring manufacturers have responded to the issue of VOC emissions and the assessment of sustainability for flooring materials. However, the issue of transparency of product ingredients in building materials and the resulting environmental and human health impacts continues to be raised. In response, there are several new programs which address these issues. (1) Environmental Product Declarations (EPDs) are a single, comprehensive disclosure of a product's life cycle-based environmental impact that has been validated by an independent third party. (2) The Health Product Declaration (HPD) specifies how product ingredients should be listed and defines a series of reference lists to determine if there are any health hazards associated with any of those ingredients. (3) The Product Transparency Declaration (PTD) takes the product ingredient hazard information a step further. It provides specifiers with information on whether a finished product with specific ingredients as manufactured and delivered to a jobsite could actually cause harm to the health of building occupants. Further, PTDs indicate whether an appropriate warning label is required. These new initiatives are discussed in more detail.

Environmental Product Declarations

An Environmental Product Declaration or EPD is a brief, third-party-verified report of product ingredients and their environmental impacts that occur during the manufacture and life of a specific product. In essence, it summarizes all of the basic materials and processes used in a product and their resulting environmental impacts over the life cycle of that product, from raw material extraction, through manufacturing, transport, use, and end of service life recycling or disposal. As such an EPD presents quantified environmental data for products or systems based on information from

a formal life cycle assessment (LCA) conducted according to established ISO standards. EPDs are voluntarily developed by manufacturers but since they are verified by independent third parties, their purpose is to provide quality-assured and comparable information regarding the environmental performance of products.

EPDs for approximately 10 different resilient flooring products have been developed in Europe by the European Resilient Flooring Manufacturers' Institute (ERFMI) and published on the ERFMI website. Each EPD was based on input from multiple flooring manufacturers and published as industry average EPDs. The European Union has mandated that manufacturers declare the environmental impacts of their products and EPDs have been published to fulfill this requirement.

In the United States there has been increased interest in EPDs with some of the attention being driven by federal agencies, such as EPA, to potentially use EPDs as a vehicle to comply with Executive Orders requiring these agencies to purchase environmentally preferable products. Recently the Resilient Floor Covering Institute (RFCI) released five industry average EPDs for the most commonly used resilient flooring materials including: vinyl tile (including luxury vinyl tile), vinyl composition tile, homogeneous vinyl, heterogeneous vinyl, and rubber. These EPDs report the industry average data for each product type, which are calculated by averaging together life cycle assessment data from the participating manufacturers in each product type.

In order to develop an EPD in accordance with ISO standards, it is necessary to have agreement on the reporting rules which would be followed by manufacturers in a specific industry such as the flooring industry. This agreement is reflected in the creation of Product Category Rules (PCRs).

Additionally, to be in compliance with ISO standards, all impacted stakeholders must have an opportunity to participate in the development of the PCRs. Representatives from the resilient, carpet, laminate, ceramic, and wood industries all worked together to develop these PCRs for the flooring industry using the European PCR as the base document. NSF International is the Program Operator for the flooring Product Category Rules and is responsible for the final PCR document.

Hence, the RFCI EPDs follow the industry Product Category Rules released last year. These EPDs were completed in accordance with ISO 14025 guidelines, and were developed by PE International Inc. Then, UL Environment, a leading EPD Program Operator reviewed, verified, and registered the EPDs.

Credits for industry average EPDs are now available in the latest version of the U.S. Green Building Council's rating system LEED Version 4. The Materials and Resources (MR) section has substantial revisions. Points that were previously available for regional materials and recycled content are being rolled into the points available for LCAs and EPDs. Happily, the USGBC is not asking project design teams to conduct LCAs or to become material experts. Instead, the project team will be able to request an EPD (or perhaps another approved form of reporting) that discloses the required LCA-based information. In essence, LEED Version 4 will ask product manufacturers to gather the life cycle information on their products and to disclose relevant portions of that information in the standard EPD format. The new relevant credits are anticipated to affect four out of the five MR credits beyond the prerequisites and earn up to 11 points in the process.

Clearly, EPDs are seen as an important validation tool that allows manufacturers to objectively assess the environmental sustainability of their products, while providing buyers with clear and credible information necessary to make product comparisons. In addition, buyers and product specifiers are increasingly demanding transparent data that supports claims of the environmental sustainability of the products they select, ensuring a growing demand for EPD-backed products. In the increasingly competitive marketplace for environmentally sustainable solutions, EPD-backed products better enable specifiers and buyers to make objective and informed purchasing decisions.

Finally, manufacturers who use EPDs help to create a greater public awareness of the environmental impact aspects of products, thereby contributing to global sustainability efforts.

Health Product Declaration (HPD)

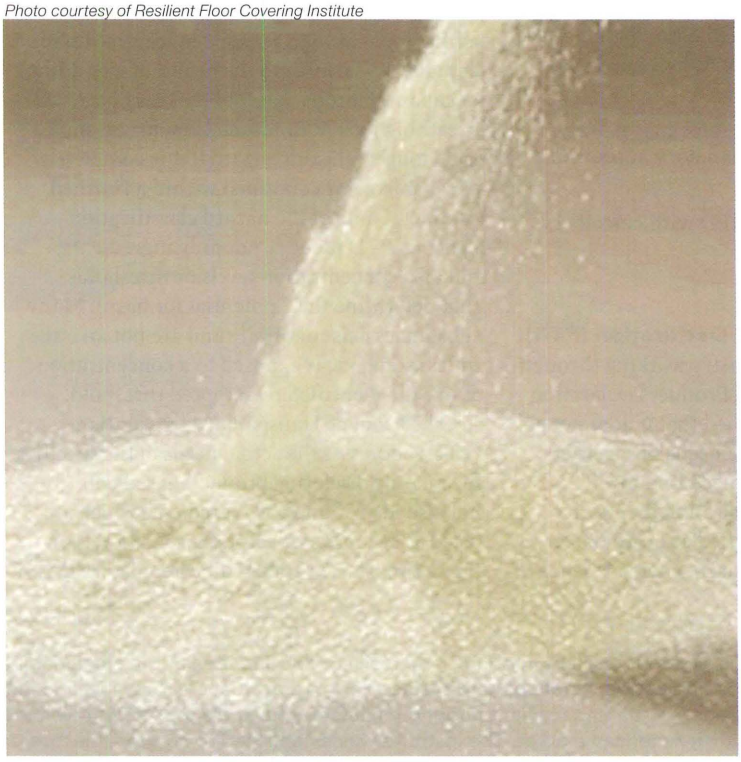
The Health Product Declaration (HPD) is a public statement of product content and the health hazards associated with exposure to its individual ingredients. It is intended to represent a way to gain greater transparency into the ingredients that make up building products. HPDs build on and incorporate the product ingredient information from an EPD but go on to indicate any ingredients which have been identified on more than 30 lists of health hazards.

The anticipated beauty of the HPD is its ability to provide transparency and reduce redundant disclosure demands by referencing existing hazard lists. HPDs use an open-source approach for deciding which criteria are included. This approach and the resulting protocol have been developed by the HPD Open Standard Working Group with participation of many product manufacturers, architectural firms, and reviewers. The HPD Working Group was convened by the not-for-profit Healthy Building Network and publisher Building Green.

The HPD Standard itself is broken into sections to ease the documentation process for product manufacturers. Individuals within the manufacturing company are asked to follow several distinct steps:

Identify: Fill out manufacturer information and product description on the HPD forms.

Photo courtesy of Resilient Floor Covering Institute



Health Product Declarations (HPDs) recognize that all building products are made up of basic ingredients which may include chemicals, elements, metals, gases, or liquids, etc.

Image courtesy of Resilient Floor Covering Institute

Unlike HPDs, the PTD helps specifiers know whether the exposure levels to chemicals in a finished product requires a warning label or not.

Inventory: Collect the documentation and list all product contents.

Assess: Review contents against chemical hazard lists.

Compliance: Provide the details of product testing and demonstrate compliance.

Accessories: Note the installation, maintenance, cleaning, and operations materials needed for the product to function.

Summarize: Confirm the information on a summary page, fill in explanatory notes, and identify a release date.

Publish: Share the final HPD with customers, designers, owners, etc.

Product Transparency Declaration (PTD)

The resilient flooring industry working through RFCI reviewed the Health Product Declaration program and has determined that it does not go far enough in fulfilling the needs of specifiers. They agree that specifiers need to know if a building material contains ingredients or chemicals which are classified as health hazards but they also recognize that the mere presence of an ingredient or chemical does not necessarily result in an actual human health hazard. They concluded that while an HPD identifies the product ingredients and potential hazard classification, there is also a need to provide information to help the specifier determine if the ingredients in a building material are in a final form or high enough concentration to actually be harmful to the health of a building occupant. Fibrous material that may be a breathing hazard in production, for example, is no longer a health hazard if it is completely encapsulated or contained within a finished product. Some of the hazard classification lists in a PTD identify not only ingredients, but also concentration levels or thresholds that determine their potential for harm. Many substances exist naturally and are not an issue unless someone is exposed to a concentration above the identified or accepted threshold.

The Product Transparency Declaration (PTD) addresses the actual needs of the specifier by not only disclosing product ingredients but also identifying any ingredients which are listed as hazards at specific exposure levels on the five most used and credible regulatory lists. These five make up what we will refer to as the "authoritative lists" which include:

- IARC – International Agency on the Research of Cancer Terminology Group 1– Carcinogenic to Humans Group 2A – Probably Carcinogenic to Humans Source: http://monographs.iarc.fr/ with the current list at: http://monographs.iarc.fr/ENG/Classification/index.php
- NTP – National Toxicology Program – Known Human Carcinogen and Reasonably Anticipated Carcinogen Source: http://ntp.niehs.nih. gov/?objectid=03C9AF75-E1BF-FF40-DBA9EC0928DF8B15
- OSHA – Occupational Safety and Health Administration – Regulated Toxic Metal or Carcinogen Source: http://www.osha.gov/SLTC/metalsheavy/regulated.html
- Prop 65 – California Proposition 65 – Known to cause cancer or reproductive toxicity Source: http://oehha.ca.gov/prop65/ prop65_list/Newlist.html
- USEPA TRI – Toxic Release Inventory – Persistent, bioaccumulative and toxic (PBT) chemicals- Known persistent, bioaccumulative, and toxic chemicals and compounds. Source: http://www.epa.gov/tri/trichemicals/pbt%20chemicals/pbt_chem_list.htm

In addition to identifying potentially harmful ingredients on these lists, the most important thing that the PTD tells the specifier is whether or not there should be concern over human exposure to a chemical ingredient within the product. If so, then the PTD indicates whether or not a warning label must be issued for the finished product based on exposure. As such, the PTD helps specifiers focus on chemicals specified as human health hazards and to know whether the exposure levels to these chemicals require a warning label. In contrast, HPDs require only the disclosure of ingredients listed on one or more of over 30 separate product exclusion (or "red") lists without explaining or providing actual exposure thresholds and applicable labeling requirements provided within those lists.

The significant difference between an HPD and a PTD is that the HPD requires the disclosure of ingredients on a variety of multiple lists of chemicals. It is significant to note that many of these chemical lists were developed for very different goals than use in building products and are easily misapplied in the HPD.

Continues at ce.architecturalrecord.com

RFCI Resilient Floor Covering Institute

RFCI is all about resilient flooring...and resilient flooring is all about sustainability, durability, affordability, and style. It encompasses a surprisingly wide variety of hard surface flooring products—from vinyl and linoleum to rubber and cork. RFCI is an industry trade association of leading resilient flooring manufacturers and suppliers of raw materials, additives, and sundry flooring products for the North American market. The institute was established to support the interests of the total resilient floor covering industry—as well as the people and communities that use its products. **www.rfci.com**

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LAX Theme Building, William Pereira, Welton Becket, Charles Luckman, and Paul R. Williams. Theme Building at Los Angeles International Airport (completed 1961), 1960. Pencil, watercolor, and gouache on board. © Los Angeles, Alan E. Leib Collection.

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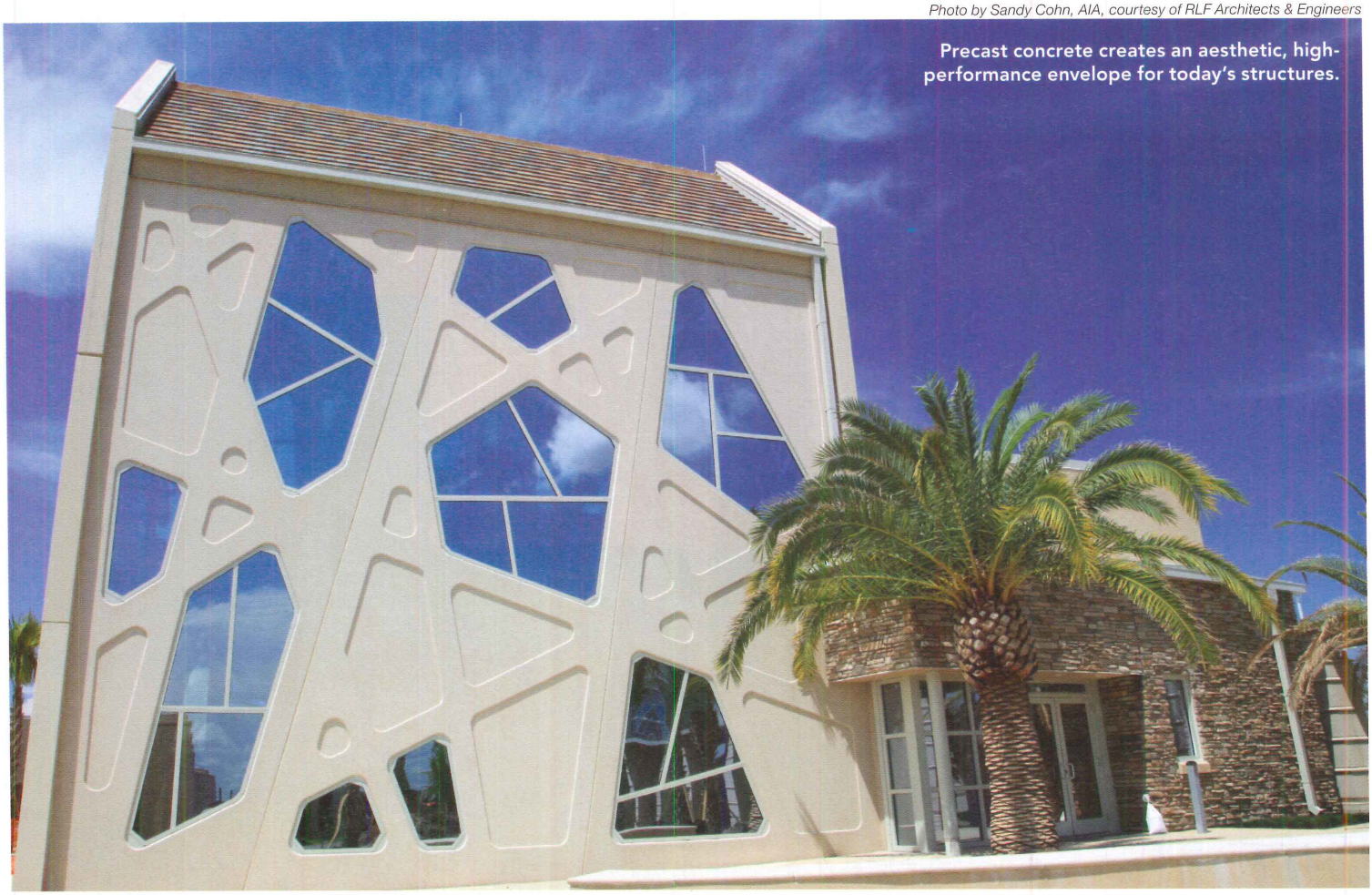

Precast concrete creates an aesthetic, high-performance envelope for today's structures.

Precast Concrete for High-Performance Building Envelopes

This versatile, efficient, resilient option meets increasingly stringent building goals

Sponsored by the Precast/Prestressed Concrete Institute (PCI)

Sustainable. Energy efficient. Durable. For decades, these have been worthy goals for construction materials and systems. Yet as the environmental movement has evolved, these goals become ever more ambitious. Today these attributes—and others—are subsumed in a more all-encompassing term: high performance. The goal of high performance is to design and build structures that optimize all relevant high-performance attributes on a life-cycle basis rather than a solely first-cost basis.

Essential in meeting project goals from environmental to aesthetic to economic, high-performance buildings are being increasingly required by owners and by legislation. Critical to a high-performance building is a high-performance building envelope, that is, an envelope that provides versatility, efficiency, and resiliency. Precast concrete envelope systems inherently offer these attributes, and can be designed to provide many others. This article will provide an overview of what high performance is, and how high-performance precast concrete can help architects meet high-performance goals.

A HIGH-PERFORMANCE STRUCTURE—WHAT IS IT?

According to the United States Government in the Energy Independence and Security Act of 2007 - 401 PL 110-140, a high-performance structure is one that "...integrates and optimizes on a life-cycle basis all major high-performance attributes including energy and water conservation, environmental, safety, security, durability, accessibility, cost benefit, productivity, sustainability, functionality, and operational considerations."

At the heart of this definition is a fundamental shift in perspective from sustainable design and construction to sustainability and performance on a life-cycle basis. The concept of high-performance encompasses the concepts and practices of sustainability. However, it goes beyond a piecemeal approach by requiring optimization of all relevant attributes for a project. Characteristics such as energy and water conservation, safety, security, and durability are no longer just options, but requirements that must be integrated into a structure's overall design, construction, and performance.

High-performance structures are essential to meeting a variety of demands, and accordingly,

green codes and standards, funding entities, and owners are requiring them. Examples include the new International Green Construction Code, LEED (v.4), ASHRAE 189.1, and the mandate by the U.S. Federal Government Executive Order 13514 which requires government buildings to achieve net zero by 2030.

Integral to high-performance structures are high-performance materials and systems—integrated systems that allow for design versatility and are efficient, resilient, and can be optimized to meet the multi-hazard requirements and long-term demands of high-performance structures. Industry watchers maintain that precast concrete is used more and more to help projects meet and exceed their high-performance goals throughout design, construction, and operation.

PRECAST CONCRETE EXPLAINED

Concrete is a mixture of aggregates (typically sand and stone) that are bound together by a binder. Admixtures or modifying agents and additives are sometimes introduced to improve the characteristics of the fresh concrete, the mixing process, and/or the final hardened material. Precast concrete consists of concrete that is cast into specific shapes at a location other than its final in-service position. It is produced by casting high-strength concrete in a reusable mold or form, which is then cured in a controlled environment at a specially equipped plant.

Precast concrete components are reinforced with either conventional reinforcing steel, steel strands with high tensile strength, or a combination of both. Prestressing is a method of reinforcing where steel strands are pretensioned in the form before the concrete is cast. Once the concrete has cured to a specific strength, the strands are cut, or detensioned. Having bonded to the concrete, the strands attempt to regain their original untensioned length, adding tensile capacity to the precast member that complements concrete's natural strength at resisting compressive forces. This "precompression" increases the load-carrying capacity to the components and helps control cracking to specified limits allowed by the building code.

As a fabricated material, precast concrete continues to evolve as new designs require new solutions and members of the design team push the boundaries of what can be achieved. New admixtures, concrete mixes, fabrication techniques, formliners, and other innovations continue to change and expand the applications of the material and its benefits. In recent years, new capabilities have been added to enhance the uses of the medium, including ultra-high-performance concrete, which provides a compressive strength as high as 30,000 psi.

HIGH-PERFORMANCE PRECAST ENVELOPE SYSTEM

Precast concrete is a high-performance material that integrates easily with other systems and inherently provides that versatility, efficiency, and resiliency needed to meet the multi-hazard requirements and long-term demands of high-performance structures.

Left photo courtesy of Downs/Archambault Partners; right photo courtesy of Gate Precast Company

Precast Walls

Precast concrete envelope systems can be used in all types of projects from residential to commercial, to institutional and industrial. They can also be used in everything from low-rise to high-rise construction. Precast concrete wall panels are versatile components that can be used as architectural, structural, or combination elements within a building's design. Wall panels can be designed as loadbearing or non-loadbearing components, and can be used in a number of different structural configurations designed to provide moment and lateral force resistance. Non-loadbearing panels can be attached to any type of structural frame, including precast concrete, cast-in-place concrete, or steel. They can be designed and erected in a horizontal or vertical position.

There are three basic wall types, all of which can be made in essentially any shape, including: window walls, which include "closed" or four-sided fenestration openings; spandrels, which are common for parking structures and ribbon window designs; or column covers, mullions, and other customized shapes.

- **Solid.** Solid precast concrete walls contain no integral insulation, with walls being typically 4 to 8 inches thick. These traditional wall systems require an interior finish wall system with insulation to complete the envelope.
- **Thin shell.** This is a newer concept, with walls made by attaching as little as 1.5 inches of concrete to a back-up frame which, though typically comprised of metal studs, can also be produced in concrete. The two are then joined by thermally resistant connectors. The designer can specify a layer of insulation between the exterior concrete wythe and the back-up frame. The back-up frame system allows for drywall to be attached to provide the interior finish. Glass fiber-reinforced concrete (GFRC) precast concrete panels (typically about 1 inch thick of concrete) are another option in which a mix of concrete and glass fibers is sprayed into a mold. GFRC panels are another example of thin-shell systems, which are often used to produce intricate shapes. Thin shell systems allow for lighter weight and help reduce the size of foundations.
- **Insulated sandwich wall panels.** Typically including 2 inches or more of rigid insulation between two wythes of concrete, insulated sandwich wall panels provide high energy efficiency, meeting the continuous insulation

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Learning Objectives

After reading this article, you should be able to:

1. Explain how sustainability is one of a number of components that comprise high-performance design.
2. Discuss the attributes of precast concrete that contribute to a high-performance building.
3. Define the high-performance building envelope strategies that utilize precast concrete.
4. Describe the aesthetic options available with precast concrete envelope systems.

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.

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requirements of ASHRAE 90.1, as well as an interior concrete wall that can be painted and used as the interior finished surface, avoiding the need for furring strips and drywall. Precast concrete's high thermal mass also minimizes energy consumption naturally. Historically favored for industrial buildings such as distribution centers and warehouses, sandwich wall panels allow a range of finishes and benefits that has expanded the component's applications to schools, offices, retail, residential, and other uses.

HIGH-PERFORMANCE ATTRIBUTES

Precast concrete integrates easily with other systems and inherently provides the versatility, efficiency, and resiliency needed to meet the multi-hazard requirements and long-term demands of high-performance structures.

Material Versatility

A high-performance material provides versatility in design and construction, and optimizes aesthetic, structural, and use considerations.

- **Aesthetic versatility.** In terms of aesthetics, precast concrete provides an almost endless array of colors and textures and allows for subtle variations through different techniques such as varying aggregate and matrix colors, size of aggregates, finishing processes, and depth of exposure. The designer can add pigment to the concrete and provide several tones within one panel by using various surface finishes. The ability to combine multiple finishes within one panel reduces detailing, joints, flashing and maintenance costs, as well as the associated liability risks frequently associated with a combination of traditional materials used in cavity wall construction.

  Because of precast's initial plasticity, it may be economically designed with a combination of concave, convex, and flat sectional shapes that are difficult, if not impossible, to achieve with other materials. The medium's plasticity further enables it to interface smoothly with glass and other modern materials, and it can also be embedded, veneered, or sculpted to resemble a wide range of finish materials, including limestone and brick, ensuring that the building blends with nearby structures, whether contemporary or historic. Through the use of formliners, designers can affordably create supergraphics, custom aesthetic treatments, or realistic stone appearances.
- **Structural versatility.** Precast concrete can serve as structural and cladding/envelope system simultaneously, minimizing material use and accelerating construction. Precast concrete also provides for longer open spans with fewer columns and obstructions, as well as smaller structural cross sections through the use of high-strength concrete and prestressing. Precast hollow-core slabs and double tees, in particular, provide long, clear spans, opening interior spaces in projects from office buildings to parking structures in order to allow designers to maximize leasable or usable space within the building footprint. Loadbearing precast concrete wall panels can reach heights of 55 feet, while double tees can span 80 feet or more. The result of precast's structural versatility is more efficient and less costly construction. The cost savings are greatest for low- to mid-rise structures of three to 10 stories with a large ratio of wall-to-floor area, allowing the owner the ability to more easily adapt floor plans as building functions change.
- **Use versatility.** Precast concrete both uses recyclable material, and is recyclable itself. Several common industrial byproducts, including fly ash, slag, and silica fume, which would otherwise go to landfills, can be incorporated into concrete as supplementary materials, reducing the necessary

Photo by Michael Peck

Colorado's Aurora Municipal Building combines open space with a 286,000-square-foot building and a 241,000-square-foot parking structure. Both projects feature total-precast concrete structural systems, which combined architectural and structural components into single units.

LEED PLATINUM HOTEL GAINS ENERGY SAVINGS WITH PRECAST CONCRETE WALL PANELS

Designed by Centrepoint Architecture, Raleigh, North Carolina, to resemble an old cut-and-sew textile factory, the Proximity Hotel, a AAA 4-Diamond hotel, is the first hotel in the nation to achieve LEED Platinum certification. Featuring over 70 energy and health-related enhancements and earning 55 out of a possible 69 credits for LEED – New Construction, the hotel utilized high-performance, insulated, structurally composite precast concrete wall panels that are durable, impervious, and thermally efficient. The mass wall system includes 3.5 inches of continuous foam insulation at the core that exceeds ASHRAE energy standards, surrounded by exterior and interior precast concrete layers totaling 6.5 inches of concrete. Use of non-conductive wythe connectors virtually eliminated thermal bridging issues. The total material R-value of the wall panels is 15.5, with the panels contributing to a nearly 40 percent energy savings for the total structure, thus allowing the designers to downsize the capacity of the mechanical heating and cooling system for reduced first-cost and life-cycle savings.

Photo by Brian Erkens, courtesy of Metromont Corporation

amount of cement. Formwork and finishing materials used in fabrication can be reused, with wood or fiberglass forms generally reused 40 to 50 times without major maintenance, and concrete and steel forms having virtually unlimited service lives.

Precast concrete members are unique in that they are individually engineered products that can be detached and relocated, facilitating future additions to buildings. When future additions occur, non-loadbearing panels on the end simply are disconnected from the framing, and new panels and framing are added on each side. With the new addition in place, the original end panels can be replaced.

When ultimately removed from service, precast concrete members may be reused in other applications. Because it comes apart with a minimum amount of energy and retains its original qualities, precast concrete is also friendly to downcycling, a process in which building materials are broken down. Concrete pieces from demolished structures, for example, can be reused to protect shorelines, and recycled concrete is frequently crushed and used as fill or road base.

Material Efficiency

Significant efficiencies from both a construction and operational perspective are possible with precast building systems.

▸ **Site efficiency.** Factory-fabricated precast concrete minimizes or eliminates dust, waste, and truck traffic at the construction site. Only the needed precast concrete elements are delivered, with the resultant decrease in vehicular activity and noise particularly beneficial in urban areas. Unlike typical cavity wall construction, often comprised of a number of different products installed by different subcontractors, precast is erected by a single Tier-1 subcontractor. Scaffolding, lay-down space, material storage, and numerous subcontractors' field trailers are typically not required, greatly reducing the construction site requirements and environmental impact on adjacent site areas. Because precast concrete units are normally large components, greater portions of the building are completed with each activity, creating less disruption overall. Optimized structural members, spans, and other components lead to minimal material waste and associated economic and environmental savings.

Perhaps precast concrete's most dramatic benefit, though, may be the speed with which it can be designed, cast, delivered, and erected. Since the prefabrication process does not rely on other critical-path activities to begin, it can be started upon approval of drawings, ensuring components are ready for erection as soon as foundation work and other site preparation are completed, giving contractors a significant head start before the site is even available, and shaving weeks or months from the schedule. This flexibility also allows the building's shell, whether loadbearing or cladding, to be enclosed quickly which, in turn, lets interior trades begin work earlier and reduces overall construction time. The fast enclosure decreases concerns for weather or material damage during erection, reducing the contractor's risks and costs.

Because precast components are fabricated under factory-controlled conditions at the plant, harsh winter weather does not impact the production schedule or product quality, and often eliminates the need to add "cushions" to the timetable to accommodate unforeseen schedule creep due to delays caused by weather or site requirements. Precast components also can be erected through the winter months to meet a tight schedule, cutting overhead costs, reducing the possibility of cold weather-related change orders, and readying the building for faster occupancy.

Continues at ce.architecturalrecord.com

PCI develops, maintains, and disseminates the Body of Knowledge for the precast/prestressed concrete structures industry. PCI provides technical resources, certification, and education, as well as conducts industry events, research and development, and more.
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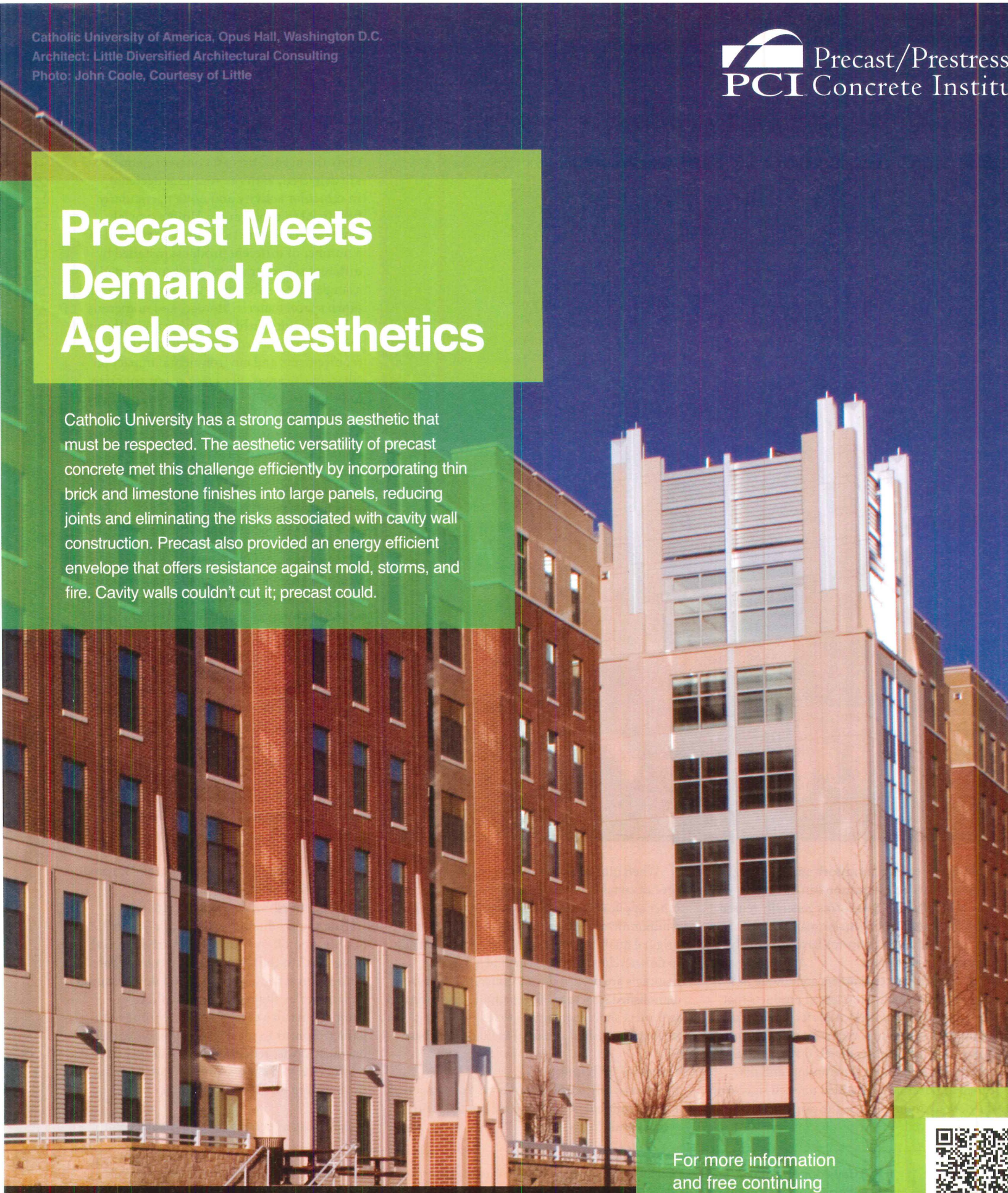

Catholic University of America, Opus Hall, Washington D.C.
Architect: Little Diversified Architectural Consulting
Photo: John Coole, Courtesy of Little

PCI Precast/Prestress Concrete Institu

Precast Meets Demand for Ageless Aesthetics

Catholic University has a strong campus aesthetic that must be respected. The aesthetic versatility of precast concrete met this challenge efficiently by incorporating thin brick and limestone finishes into large panels, reducing joints and eliminating the risks associated with cavity wall construction. Precast also provided an energy efficient envelope that offers resistance against mold, storms, and fire. Cavity walls couldn't cut it; precast could.

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Photo by G. LYON PHOTOGRAPHY, Inc., courtesy of AMICO

Expanded metal mesh provides a unifying architectural enclosure that allows both light and air to penetrate as determined by design.

Expanded Metal Mesh in Architecture

Exciting new uses for a proven material

Sponsored by AMICO – Alabama Metal Industries Corporation | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

Designers routinely use interior and exterior surface materials to provide a visual and sensory experience of a building. Smooth, pristine surfaces create an obviously different design experience than a textured one. Similarly, surfaces that can bend or flow to provide a more three-dimensional experience create buildings with a very different design sense than flat rectilinear structures. Materials that allow air and light to penetrate them provide other design opportunities compared to opaque materials. For each of these design conditions, there is one material that can actually address them all and has seen a surging popularity in both interior and exterior applications. This material is known generically as expanded metal mesh and is a well-known, time-proven material in many industrial and heavy-usage building conditions. It has also recently been discovered as a very flexible, affordable, and customizable material that can create a wide variety of appearances and functions that create exciting design possibilities for buildings of all types.

CHARACTERISTICS OF EXPANDED METAL MESH

As the name implies, expanded metal mesh is fabricated from various types and thicknesses of metal. The "expanded" part means that it is different, however, from punched or perforated metal. If sheet or coil metal has a pattern of holes cut or punched into it, creating loose pieces of scrap that fall from those holes, then that defines punched or perforated metal. By contrast expanded metal mesh is fabricated from sheet or coil metal that is slit and stretched into a non-raveling unit of uniform-size diamond-shaped openings. This process of slitting and stretching means not only that waste or scrap is eliminated, it means that in certain cases a 4-foot by 10-foot piece of metal is actually stretched into a mesh that measures on the order of 12 feet by 10 feet when processed. As such, the final product is inherently very efficient in terms of material usage which translates into great cost-effectiveness.

Manufacturing

The manufacturing process for expanded metal mesh was first patented in Hartlepool, UK, in

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Learning Objectives

After reading this article, you should be able to:

1. Identify and recognize the characteristics of expanded metal mesh for use in architectural applications.
2. Investigate the design potential and innovative opportunities to use expanded metal mesh in different design applications.
3. Assess the functional contributions of expanded metal mesh as it may contribute to green and sustainable design.
4. Specify expanded metal mesh in a variety of buildings and formulate appropriate selections related to specific applications.

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.

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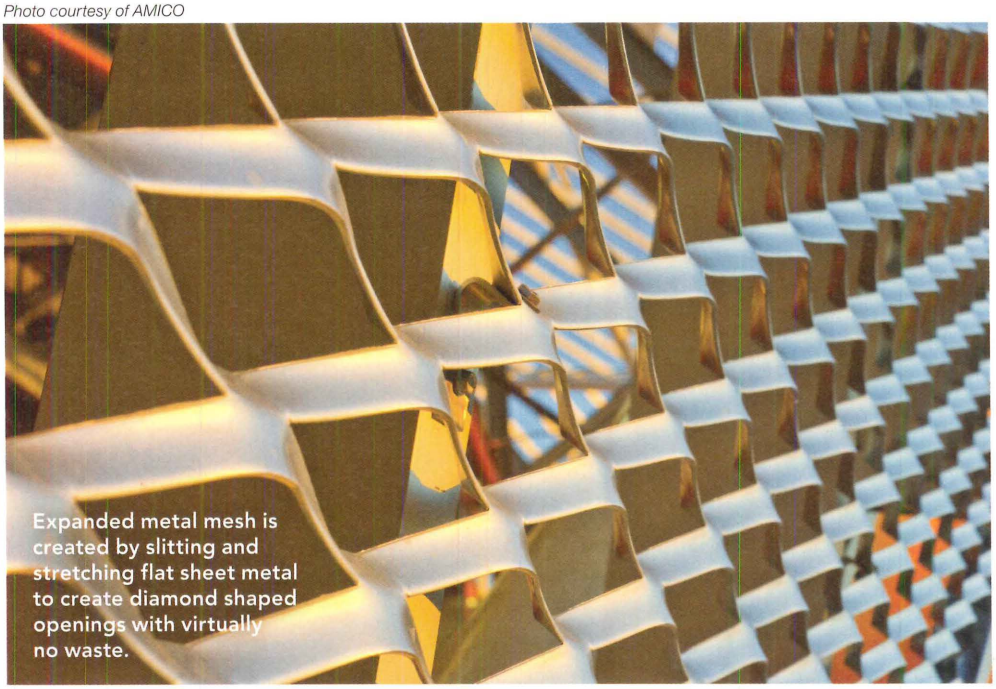
Photo courtesy of AMICO



Expanded metal mesh is created by slitting and stretching flat sheet metal to create diamond shaped openings with virtually no waste.

the 1880s, and despite the amount of time that has elapsed since then, it's current manufacture remains true to the original idea.

The process is simple but incredibly effective. Expanded metal is formed in an expanding press. Either stock size or custom size metal sheet or coil stock is fed into the expanding machine. Each machine is fitted with a unique "knife" dedicated to a particular pattern. The machines are then programmed or manually controlled to ensure that the metal is slit, sheared, and then stretched in a single process creating the apertures and therefore expanding the metal. The base metal is simultaneously slit and cold-formed, which expands the slits into diamond-shaped openings of uniform size and regularity. The diamonds typically range from about 1/8 inch to 3 inches (3 to 76 mm) wide and 1/4 inch to 8 inches (6 to 200 mm) long. Custom knives can be manufactured to create different design patterns of openings. The resulting mesh is then either cut into sheets or wound onto coils ready for shipping or further processing.

The specific metal used to fabricate the expanded metal mesh can come in a range of metal types and thicknesses. Common choices include carbon steel, aluminum, and stainless steel. However, it is also possible to find manufacturers that produce expanded mesh from specialty metals such as brass, weathering steel, copper, titanium, nickel based alloys, and even some types of plastic. The combination of metal type and thickness helps determine not only the final appearance of the expanded metal mesh, it also plays directly into the overall strength, rigidity, and durability of the final product when installed in specific settings.

The manufacturing process and material selections allow for great versatility in the types of expanded metal mesh that are possible and available. The opening sizes or apertures can be made in a full range of dimensions from very small micro mesh openings to very large openings. A variety of depths are also possible to create a rather flat mesh surface or a very three-dimensional surface with considerable depth between the front and rear of the mesh. These variations in openings and depth facilitate the free flow of air, fluid, or light where required at the degree or intensity desired or required.

Industry Standards

Since expanded metal mesh has been available for quite some time, the industry has matured and standards have been developed regarding this product. As would be expected, it is the National Association of Architectural Metal Manufacturers (NAAMM) that has advanced and promoted those industry standards. In fact, they have gone so far to establish a separate division of NAAMM known as the Expanded Metal Manufacturers Association (EMMA) Division.

NAAMM standard EMMA 557-12 was published in 2012 under the title of "Standards for Expanded Metal." It introduces the material, offers some product selection considerations, defines industry terminology, describes the manufacturing process, reviews manufacturing tolerances, and offers some application information. Among the most basic information, the following terms are important to understand from this standard.

Expanded Metal – A rigid piece of metal which has been slit and drawn into an open mesh pattern in a single operation. Conventional mesh is formed in a diamond pattern.

Diamonds – Open area of metal after expanding. Most expanded metal patterns are diamond shaped but may also be hexagonal, louvered, asymmetric, etc.

Design Designations –

SWD. Nominal dimension, Short Way of Diamond.

LWD. Nominal dimension, Long Way of Diamond.

Design size. Actual dimension SWD and LWD. Measured from a point to a corresponding point on the adjacent diamond.

SWO. Short Way of Opening.

LWO. Long Way of Opening.

Strands. The sides of the expanded metal design.

Strand thickness. Thickness of the base metal.

Strand width. Amount of metal fed under dies to produce one strand.

Strand thickness and width. Can be varied to create different openings. The width of the strand should equal or exceed the thickness of the base metal.

Bond – Intersection of two strands.

Fine Mesh – A precise, miniature version of standard expanded metal with SWD openings measuring under 0.140 inch (3.55 mm). Material as thin as 0.002 inch (0.05 mm) can be expanded. Available in a variety of metals and alloys including gold, silver, and platinum, they are often used for retaining filtration material, custom decoration for small appliances, and as battery electrodes.

Edge Configuration – The condition of the edge of an expanded metal sheet. This designation usually refers to "open" (random) or "closed" (bond) diamond edges produced from shearing.

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*

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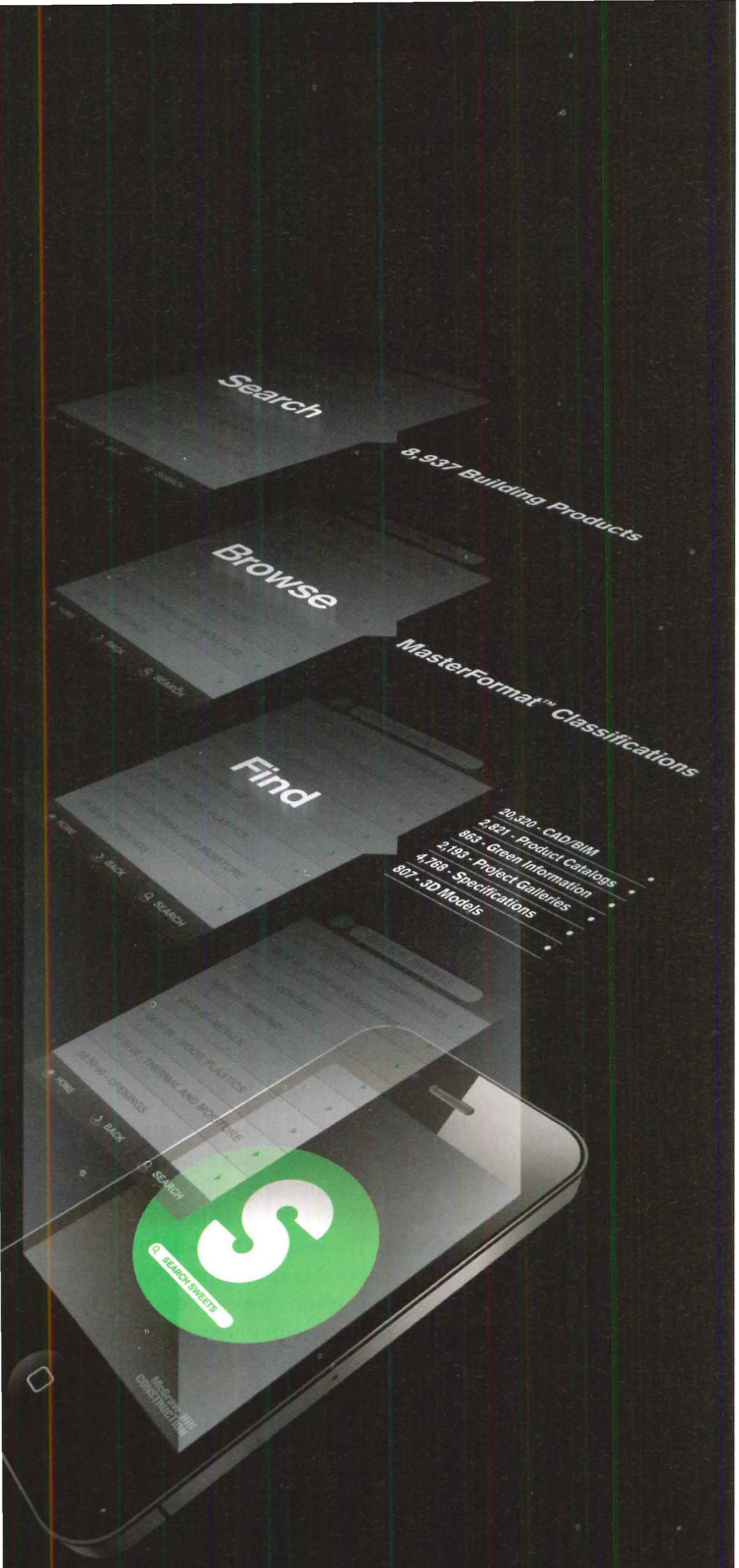

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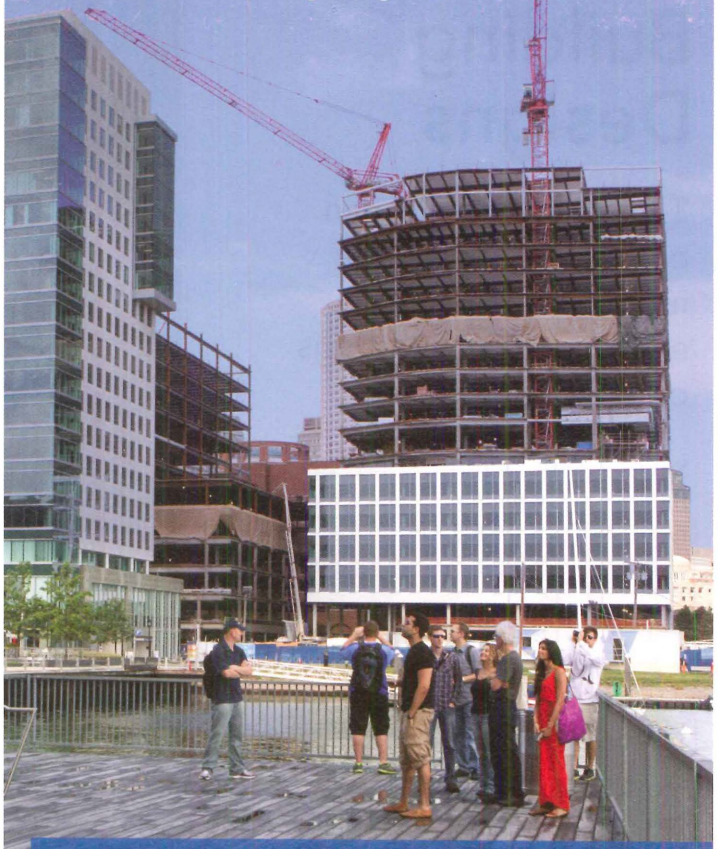

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CIRCLE 70

Spray Foam Insulation in High-Performing Building Designs

This one product can control heat loss, air infiltration, moisture, and sound in buildings of all types

Sponsored by Demilec (USA) LLC
By Peter J. Arsenault, FAIA, NCARB, LEED AP

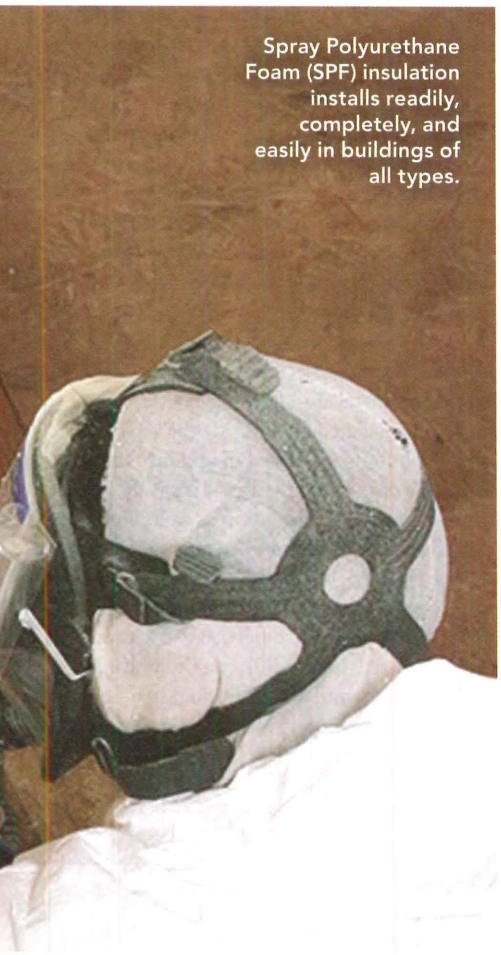
Good building envelope design has received a great deal of attention in recent years for good reason. Creating wall, roof, and floor systems that are durable and long lasting as well as aesthetically and economically appropriate is the usual starting point. But there is also the critically important need to control what flows through those systems, such as heat, air infiltration, moisture, and sound. This is compounded by the fact that different building categories such as commercial, industrial, residential, or institutional will often have different requirements for the degree of control required for any one or all of these things. Further variations occur when looking at buildings in different climate zones or with different operating conditions. The key to a successful building envelope then becomes finding ways to combine the right materials into assemblies that can meet all of these varied requirements. Among the critical choices to be made, the selection of an insulation material used in an assembly will have a significant impact on the total performance of that assembly. In particular, the selection of spray foam insulation systems has been shown to be a very attractive and effective choice that can address all of the control issues related to heat, air, moisture, and sound transmission. Further, it is appropriate for use in wall, roof, and floor assemblies in buildings of all types from low-rise residential, through large-scale industrial or institutional, and mid- to high-rise commercial with equal abilities to perform very effectively in all cases.

OVERVIEW OF SPRAY POLYURETHANE FOAM INSULATION

As the name indicates, spray polyurethane foam (SPF) insulation is a polyurethane product that is sprayed into openings or cavities in building envelope assemblies. It is in fact a two-component system of liquids that are mixed in the field and then spray applied where the resulting foam expands in place to fill cavities completely. This foam also has an adhesive quality that means it readily sticks to the substrate where it is applied. This combination of adhesive and expansion properties creates a very effective sealant against air infiltration as well as providing very good thermal performance. In fact, according to the Air Barrier Association of America (ABAA), many spray foam insulations, regardless of type, are classified as air barrier materials and recognized as the key component in tested air barrier assemblies.

SPF insulation is generally regarded as an environmentally responsible product primarily due to its excellent energy-efficiency benefits both as an effective thermal insulation and air sealant. The manufacture and application of these products is also accomplished with a zero-ozone depletion process, meaning that the outdoor environment is not unduly impacted. When it comes to indoor environmental quality, SPF insulation is in fact a type of in-organic plastic, so it has no food value for mold or mildew to grow and develop. This reduces the chance of mold occurring in the first place which cannot be assured with organic materials.

The field application process is really quite comparable to typical in-plant applications that have been used since the 1960s to insulate appliances such as dishwashers, refrigerators, and freezers. The only difference is that the equipment is placed into trucks and trailers to essentially make mobile factories. This highly specialized equipment commonly includes things like plural component proportioning units, compressors, a generator, and 200-300 feet of hose for applications in the field. These mobile factories can range from $60-$100K and the applicators that operate them need to be highly skilled technicians, definitely not from



Spray Polyurethane Foam (SPF) insulation installs readily, completely, and easily in buildings of all types.

All images courtesy of Demilec (USA) LLC

the local day labor shop. Across the spray foam insulation industry, quality control standards and training programs have been developed to train applicators, improve installation quality, and help SPF installations meet design and specification requirements.

While all SPF insulation shares these general qualities, there are two distinct product types that are used in buildings: Low-Density, and Medium-Density. Each one has their own specific set of characteristics as described:

Low-Density SPF

Low-density SPF is first defined by its installed weight which is commonly 0.5 – 1.0 pound per cubic foot or rather light. The make-up of the foam is in the form of many air cells that are open to each other in their configuration—simply referred to as "open cell" insulation. This creates a resultant installed material that is semi rigid, very soft, and easily cut or manipulated. It is also recognized as a green building product because the blowing agent used during installation is typically water with zero ozone depletion potential. These products also do not contain any CFCs, HCFCs, urea-formaldehyde, asbestos, or any cellulosic material.

The make-up of low-density SPF insulation gives it several appealing characteristics. First, the cost of open cell spray foam insulation is generally very attractive and competitive when compared to labor and materials for other types of insulations. From a thermal standpoint it achieves an R-value of approximately 3.2 – 4.5 per inch of depth. This makes it comparable to or better than most other lightweight insulation materials commonly used in cavity wall construction. Its comparatively softer make-up means that it effectively air seals around the edges and perimeter of stud cavities and any penetrations, thus making it an effective air barrier in a wall assembly. It also means that it can flex and adjust to continue to provide an ongoing effective air seal even as the building may settle, expand, or contract.

Excellent sound attenuation properties have also been achieved with low-density open cell foam because it has a tendency to absorb sound waves, thus reducing typical airborne noise. Specific tested assemblies by different manufacturers offer STC ratings from 49 to 52. So, for example, a wall assembly with a 2x6 common base plate with staggered 2x4 studs and 3½ inches of open cell foam, has been shown to obtain an STC 50 rating. Similarly, a floor assembly with 2x12 joists, 3½ inches of open cell foam with resilient channels also achieves an STC 50 rating.

One thing to be aware of with low-density, open cell insulation is that, while it can serve as an air barrier, it does allow water vapor to permeate through it. This can be an advantage in that any moisture that finds its way into an assembly can migrate out. Nonetheless, in cold climates a warm side vapor retarder such as vapor retardant paint over gypsum board will be needed to control vapor diffusion in an exterior assembly. Some approved vapor retarders can be painted directly onto the insulation.

Medium-Density SPF

As would be easy to guess, medium-density foams are a bit heavier than low-density foams, typically ranging from 1.7 to 2.5 pounds per cubic foot with 2.0 pounds being the norm. They also differ from low-density foam in that medium-density SPF is produced in a "closed cell" configuration such that each air cell is isolated from the others around it. This configuration and weight makes medium-density SPF much more rigid and stronger than low-density SPF. Due to their rigid nature, these products are very popular in metal framed buildings or installations where they might be exposed during construction or even occupancy. Medium-density SPF is also recognized as environmentally friendly in that they use non-ozone depleting blowing agents (not water in this case) and can also be manufactured with agricultural oil and recycled content in some cases.

Medium-density SPF has some notably different characteristics from low-density foam. Thermally it is actually superior with R-values

The two types of SPF insulation have different physical properties. Low-Density Open Cell SPF is suitable for interior and above-grade applications only. Medium-Density Closed Cell SPF is suitable for all interior and exterior applications.

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Learning Objectives

After reading this article, you should be able to:

1. Investigate the building code-compliant performance of spray foam insulation.
2. Describe the positive effects of spray foam on the indoor environment.
3. Explain the impact of spray foam insulation on a building's energy performance through control of both heat transfer and air infiltration.
4. Formulate a basic life cycle assessment of spray foam insulation and simple economic payback periods.

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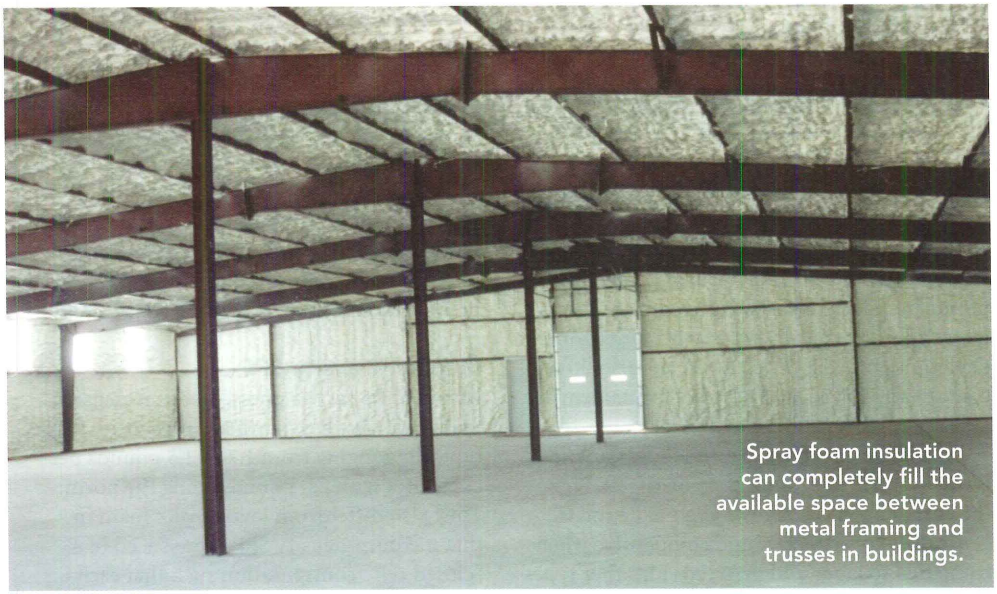

Spray foam insulation can completely fill the available space between metal framing and trusses in buildings.

available up to R-7.4, meaning that higher building energy performance can be achieved in thinner assemblies. This trait can help make up for the fact that, not surprisingly, denser foam costs more per cubic foot than lower-density foam. Also helping the cost performance, medium-density foam does not require a separate air barrier since it is also an effective air sealing foam. Perhaps most notably different, medium-density SPF has tested as a class II vapor retarder meaning it has very low permeance, much more so than open cell low-density spray foam. That means that the cost of installing a separate vapor barrier can be eliminated.

In considering which type of spray polyurethane foam insulation to select, there are some notable limitations on its use that need to be recognized. First, low-density foam is not a flotation foam, it should not be used as a vapor barrier and it is not designed for contact with bulk water. If any of these concepts are design parameters, then medium-density closed cell foam is the product of choice. Second, low-density foam has no inherent structural capability while medium-density SPF can actually add some rigidity and structural strength to a framed assembly.

When installing SPF, regardless of type, it should not be used on wet, dirty, or oily substrates in order to avoid potential adhesion issues. In ceiling applications, it needs to be carefully installed around recessed can lights, even those designated "IC" for insulated installations. The reality is that the excellent thermal properties of the foam compared to other insulation may not allow enough heat from the light to escape and can lead to overheating and flickering of the lamps. This is typically only an issue in vaulted ceiling applications, where fiberglass can be used in contact with the IC cans to provide the typical 3-inch gap between the can and the foam.

A few other general limitations include avoiding any spray foam from finding its way inside of electrical boxes—the boxes will have to be properly prepped or cleaned to remove all necessary foam. Finally since the maximum continuous operating temperature for most spray polyurethane foams is approximately 180 degrees Fahrenheit, this typically means no direct contact with fireplace flues, but domestic hot water pipes are usually acceptable since they are typically about 120 degrees F.

APPLICATIONS OF SPF INSULATION

One of the benefits of SPF insulation is that the same material is suitable for all building types including commercial, industrial, institutional, residential, and even agricultural buildings. The places within the buildings where it can be installed make it equally versatile. It has been shown to perform effectively in wall assemblies, roofing systems, and below grade, including under concrete slabs. And from a construction ease standpoint, it has the ability to provide multiple levels of control in one layer of only one installed product. Hence, low-density SPF will insulate, air seal, and provide sound control all in one properly installed application. Medium-density SPF will provide greater thermal control per inch of thickness, a complete air seal, a full vapor barrier, and in certain cases will contribute to the rigidity and durability of the assembly.

To gain a greater insight on this versatility, common applications of SPF insulation are discussed further.

Interior Applications

Wood and metal stud framing cavities are normally insulated from inside the building after the building is closed in and mechanical/electrical work is roughed-in. This is the ideal time to install SPF insulation as well. The exterior wall sheathing or roof deck acts as the outermost surface for the SPF to be sprayed against with the studs commonly defining the depth of the sprayed material. When sprayed between structural framing or trusses, the SPF can be sprayed to the depth required and any additional structure depth can simply remain outside of the insulation.

One of the differences between SPF insulation and other types of insulation (batt, board, etc.) is the ability of the SPF to completely fill and seal around all openings and penetrations in the cavity. This assures that the cavity can perform to its full design potential receiving the fully intended thermal value as well as completely sealing against unwanted air infiltration. Further, traditional batt insulation is often compromised by the presence of mechanical and electrical lines, boxes, etc. Insulation is often compressed, cut away, or pushed aside in those cases. Spraying the SPF after the mechanical/electrical rough-in is complete means that the insulation covers fully and appropriately around them. This further helps to assure that the full performance of the wall as designed is actually being constructed.

When it comes to SPF, it is important to recognize that the building code treats all foam plastics the same.

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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

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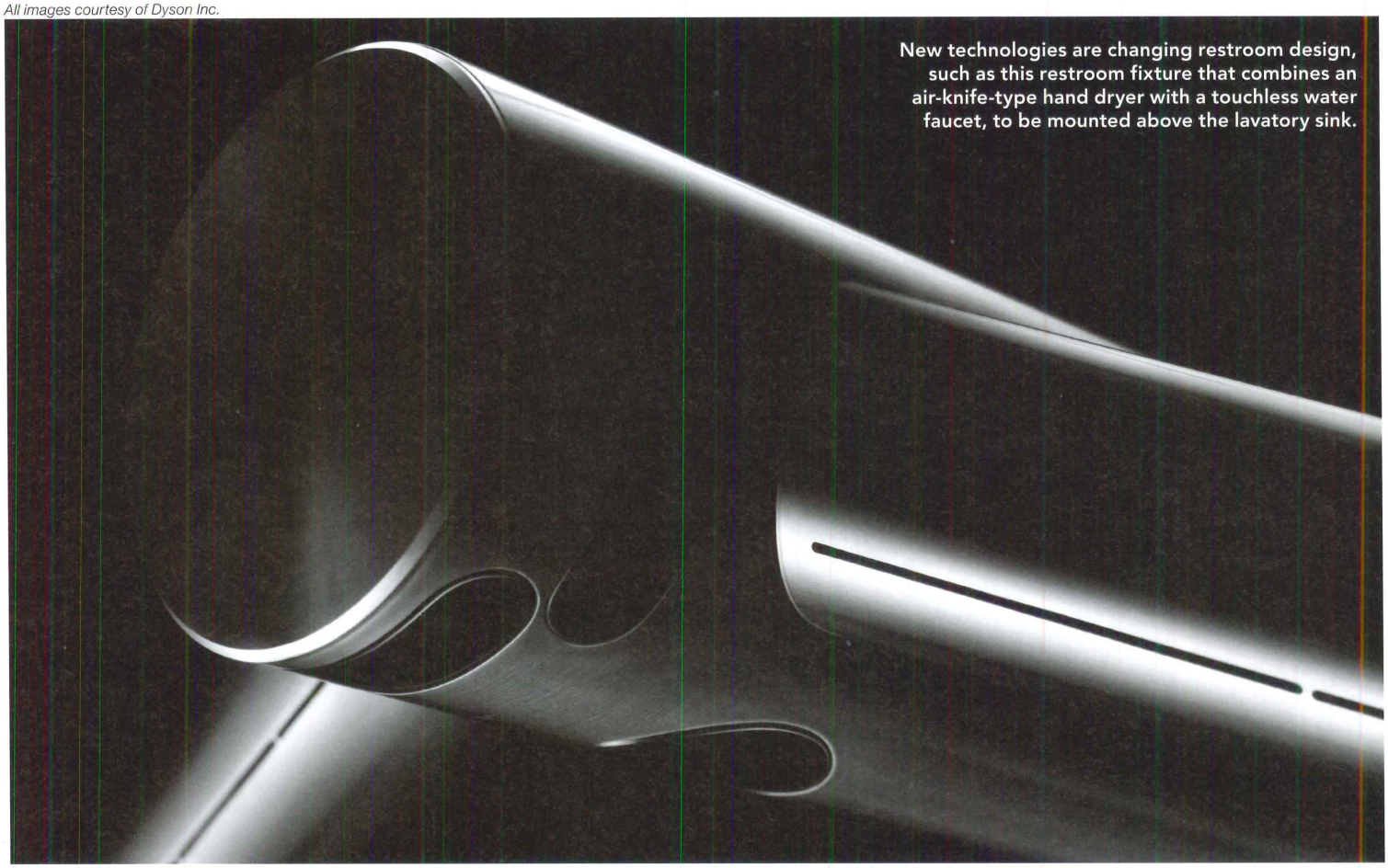

New technologies are changing restroom design, such as this restroom fixture that combines an air-knife-type hand dryer with a touchless water faucet, to be mounted above the lavatory sink.

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Learning Objectives

After reading this article, you should be able to:

1. Discuss technological advances in commercial restrooms, and best practices for restroom design.
2. Summarize the requirements outlined by the ADA and others for restroom accessibility.
3. Describe considerations for the design of restroom lavatory and sink areas, with attention to issues of hygiene and sustainability.
4. Outline the relative merits of various hand-drying solutions, as they impact accessibility and universal design, sustainability, hygiene, performance, and aesthetics.

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Hand Dryer Technology and Accessible Restroom Design

Innovative technologies and design best practices create accessible, efficient, and healthy commercial restrooms

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The short history of commercial and public restroom design is largely linked to developments in our understanding of hygiene and public health. One major example is the Occupational Health and Safety Act signed into law in late 1970, which placed requirements on employers nationally for sanitary facilities for workers.[1] These include determinations of the number of water closets based on the number of employees, among other requirements for sanitation and health, although it did not include rules on such variables as hand-drying methods and practices.

Architects have designed solutions to meet the rules over the years, clearing budgetary and aesthetic hurdles and conforming to law, building code, good hygiene, and common sense. One rarely sees marble partitions in public restrooms any longer, for instance, not only because of the expense but also because of maintenance issues and the availability of newer, better materials. Even floor-mounted toilet bowls, once the rule, are rarely specified for new commercial restroom projects with multiple stalls.

Yet no single law or code precipitated as much innovation for the design of U.S. commercial restrooms as the Americans with Disabilities Act of 1990 (ADA). Along with updates to building and energy codes and standards for sustainable design, ideas and rules promulgated through the ADA drive design teams to high-performing, efficient restroom systems that require little maintenance and are relatively easy to use for all occupants and visitors. Restroom product manufacturers have responded with thousands

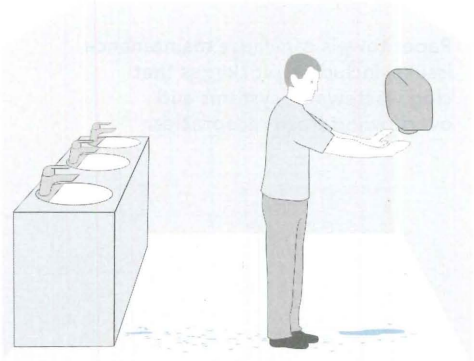
of innovations supporting these goals, from partitions to flush systems to hand dryers.

Of the myriad issues surrounding commercial restroom design, the development of novel high-speed unheated electric hand dryers, including air-knife technology, is an emerging opportunity for continued innovation. A look at the context in which it plays an increasing role is a valuable start.

CURRENT BEST PRACTICES

Restroom design is too often left as an afterthought, when project teams reason the spaces don't claim much time or attention from occupants. Yet, efficient, hygienic, and enjoyable restrooms can boost occupant and visitor experience, while improving occupant and public health. It can also dramatically impact operating costs for common areas and energy and water loads. According to a 2011 Harris Interactive survey, 94 percent of U.S. adults said they "would avoid a business in the future if they encountered dirty restrooms."[2] Key concerns for restroom design include:

- **Layout.** Appropriate planning should address privacy and likely user habits to improve aesthetics and reduce the number of surfaces users touch. The use of doorless public restrooms with "maze entries" ensure privacy and eliminate the hygiene issues associated with door handles.
- **Fixture count.** Building and plumbing codes require a certain number of toilet, urinal, and sink fixtures based on expected occupancy and usage. Historical use data and context on health provide guidance on whether minimum code requirements are appropriate. Public assembly venues, for example, have strict "potty parity" rules in many states, meaning a typical 2-to-1 ratio of women's toilets to men's fixtures, to prevent long lines at event times.
- **Maintenance.** Certain fixtures, components, and hardware may be relatively self-cleaning or -maintaining, like electric hand dryers. Architects and their clients should consider the likely maintenance staffing and schedule during occupancy, and specify to suit.
- **Ventilation.** Inappropriate venting can lead to odor-related dissatisfaction with the facility, as well as moisture-related problems with mold and mildew. There's also a rule of diminishing returns—overventing with high-speed fans that run for too long increases operating energy loads without a commensurate payoff in air-change performance.
- **Vandalism.** Often considered a maintenance issue, vandalism can be reduced by concealing valves and using tamperproof materials and hardware. A bathroom free of apparent vandalism is likely to leave a more positive impression of the host facility.



Many commercial restroom designs meet minimum code requirements but the layout of use points is impractical, for example, where hand-drying equipment is away from the sink.

With these general rules, architects then look to the specifics of the building types and occupancy needs. Restroom design is complicated issue with no single best solution; the flush fixture used successfully for multiple-stall restrooms of sports arenas, for example, may not deliver the same performance benefits in the locked-door, single-occupancy restrooms of a medical office building. In all cases, the role of the facility manager in restroom operations may be a benefit for understanding usage and occupant preferences. Yet a facilities director at a small college may have preferences or standard specs for restroom accessories that have worked well in certain building types, that do not work well for new or renovated buildings with a change of use. In these cases, architects may opt for the standard the client prefers; but often it's wise to stress consideration of the most appropriate solutions, even if they are not the college standard.

That said, the most important factors for restroom facility design are universal: efficiency and economic impact, sustainability, safety, hygiene, accessibility, and comfort. Minimum acceptable levels for these variables are codified—except for comfort—and the codes vary by jurisdiction. The factors significantly impact the occupant population as well as the buildings, their owners, and the indirectly affected populations, such as other people in the community.

Consider for a moment a conventional public restroom that meets minimum code requirements, in which the hand-drying equipment is placed just a few feet away from the sink. This may meet code, but it will lead to users dripping water on the floor between the two stations, creating a possible slip hazard. The distance between the two *use points* may be especially frustrating for a wheelchair occupant, who must operate her chair with just-washed hands in order to reach the towel dispenser or electric dryer.

This defeats the purpose of washing in the first place: leaving the facility with sanitized hands. Savvy architects look to avoid this kind of design error, for example by drastically reducing the distance between the sink and the drying accessory, or by designing to avoiding situations where hand dryers blow water from wet hands down and onto a wheelchair user's lap, as is the case with like conventional warm-air hand dryers. As an alternative, state-of-the-art restroom products often address these issues, such as novel "hands-in" electric hand dryers or new touchless water faucets with integral electric hand dryers that have recently come onto the market.

Solutions like this combined fixture/accessory system help incorporate best-practice design thinking with new opportunities for end-user ease and convenience. Though currently such solutions are rare, they will advance as they bring long-term payoff on the triple bottom line of

A recently introduced alternative restroom product combines automatic, touchless water faucets with integral electric hand dryers—a combination fixture/accessory system that limits dripping on the floor, encourages drying, and boosts user convenience and ergonomics.

economic, environmental, and social benefit. They provide a simplified solution with reduced operations costs, improved green performance, and even improved accessibility or use for the wheelchair-bound, while providing all of the required hygienic properties.

THE ADA AND ACCESSIBILITY

As applied in ADA, *disability* is a broad term, not limited by the legislation, describing those considered physically or mentally challenged. The entire purpose of the act, in fact, is to eliminate barriers to access for those with disabilities, prohibiting any discrimination by word or deed that prevents any American from equal access to goods and services. Since its passage, the law has been applied more liberally to groups of Americans not necessarily considered disabled or handicapped.

Although there has been some controversy around what can legally be considered sufficient access and who is disabled, the response to the legislation overall has been positive. The design community continues to strive to provide equal access for Americans facing many types of challenges, including:

- those with stability and balance impairments
- the short (including children) and the tall, large, or heavy people
- those with temporary impairments involving casts, slings, crutches, and the like
- mobility equipment users (power wheelchairs, scooters, walkers)
- the elderly
- the blind and vision-impaired
- the deaf and hearing-impaired
- individuals who need assistance in the restroom.

In fact, discussion in the design community has shifted from ADA compliance and accessibility to *universal design*. This relatively new concept describes spaces, furnishings, and tools that are equally usable by all. Though the term has a distinct meaning—not about compliance with ADA, but rather for an approach to design—they may be used interchangeably to describe the intent of a scheme or component. In addition, state and local jurisdictions do not all agree what constitutes proper access. ADA provides a minimum, and some authorities and agencies raise the bar for accessibility beyond what is outlined federally, as with building codes, energy-efficiency requirements, and green-building standards.

California, Massachusetts, and Texas are three states that determine and publish their own statewide accessibility guidelines, intended to improve upon the ADA and make the state's public facilities even more broadly and uniformly accessible for all users. The state-specific standard may use ADA compliance as its baseline, but this is not the same as a state building code simply referring to ADA requirements and ANSI/ICC guidelines. Even if the differences are minor, as they are often described in reference to the Texas Accessibility Standards, for instance, the state's decision to apply its own standard means that violations can be met with enforcement and regulation by state agencies.

Paper towels can cause maintenance issues, including blockages that clog wastewater systems and overflowing trash receptacles.

EQUAL ACCESS FOR ALL

To be ADA-compliant, a restroom must meet strict criteria, a summary of which can be found in the table below. For detailed compliance requirements, architects refer to *ICC/ANSI A117.1 – Accessible and Usable Buildings and Facilities*, which is referenced in the International Building Code (IBC).

ANSI/ICC guidelines for compliance also

Clear Floor Space	ADA standards designate at least 30" x 48" for accommodation of a single wheelchair, positioned for either parallel or forward approach to toilet, sink, etc. A portion of the floor space may be located under fixtures that provide required knee and toe clearance.
Turning Space	Either a 60" circular area (for 180° or 360° rotations) or a T-shaped area with a 36" base and 60" arms (for a three-point turn) will satisfy this requirement. A portion of the floor space may be located under fixtures that provide required knee and toe clearance.
Mounting Heights	Varies, depending on the location of accessories and direction of reach. Generally, operable parts of accessories must be located no more than 48" above the floor. Accessories located over obstructions are required to be located between 44" and 48" above the floor. Operable portion of dispensers located in toilet stalls must be no lower than 18" above the floor.
Reach Range	Faucets, soap dispensers, and their operable parts should be installed with a reach depth of no more than 11". Altered installation heights and locations for towel dispensers and hand dryers are required for obstructed reach areas—operable parts may need to be as low as 34" above finish floor.

outline reach ranges and mounting heights for restrooms to be utilized primarily by children, and requirements for installation of elements to allow approach and use by both the left- and right-handed. Furthermore, these guidelines also address planning and layout for bathroom space and entryways. These planning guidelines are similar to those for other rooms, halls, and areas with certain adjustments for maneuvering clearances that may be unique to restroom spaces.

The accessibility standards for bathroom planning are complex, but the goal is always the same: *equal access for all*. Keeping this goal in mind helps to make sense of the standards and to translate them into design. For instance, it is clear that an open vestibule provides the freest access to all users. If that is not possible in the given application, the designer must then consider the best door configuration (single-door, opposing door, etc.) and manage the requirements for maneuvering clearances. Modern accessible restroom design should be free of raised thresholds at entry points, though beveled thresholds of no more than 1/2 inch in height can be considered compliant, depending on the relationship of the height and incline. The ICC/ANSI standard also addresses maximum force needed and hardware types and mounting heights for operating doors.

The ANSI/ICC standard for accessible restroom design is exhaustive and addresses requirements for space, reach, maneuvering, force, and access in numerous configurations, including everything from single-occupancy facilities to large multi-fixtured public restrooms to bathing facilities. Yet it is just a start. New best practices and technologies can be harnessed to deliver restrooms that are not only accessible, but also comfortable, attractive, sustainable, efficient, and hygienic. One of those areas with rapidly changing technology is the lavatory and sink area.

HANDWASHING AND DRYING AREA

Handwashing presents a special challenge for both accessibility and comfort. For example, a lavatory arrangement may meet accessibility requirements and even include low-flow water fixtures. But the reductions in water usage (and associated operations and water utility costs) may be offset by frustrated building occupants experiencing an outsize negative impact due to the specification—such as handwashing in an industrial setting, where low-flow simply may be inappropriate and even lead to wasted water. The same is often true for certain combinations of faucet-operating hardware and low-flow plumbing.

Ultimately, the best design will result first from establishing likely user habits before designing the lavatory. Second and as with all design efforts, thorough planning is essential.

ADA Guidelines

The ADA outlines certain requirements and clearances for lavatories and sinks. These include:

- The highest point of the rim or counter surface 34 inches above the floor
- Knee clearance a minimum of 27 inches between the floor and the bottom of the sink apron
- Knee clearance under the lavatory at least 8 inches deep from the front
- Minimum toe clearance of 9 inches above the floor
- Forward approach requires 30-inch by 48-inch clear floor space, as described earlier.

These and other guidelines address various configurations and possible overlaps in application. As an example, lavatories in commercial and institutional single-occupancy restrooms may not occupy the space above any portion of clear floor space for toilet access. Any exposed plumbing and hardware under the lavatory must be covered and protected, as exposed pipes cause injuries and burns to wheelchair users in some cases.

The ADA places requirements on installation of such items as soap dispensers, mirrors, towel rolls and dispensers, waste bins, and electric hand dryers. These are important minimums to follow, but they are insufficient to creating a high-performing restroom. Consider for instance what ANSI/ICC 117.1 requires for reach with respect to hand dryers and paper towel dispensers:

Table 606.7 Maximum Reach Depth and Height for Operable Parts

Maximum Reach Depth	Maximum Reach Height
0.5" (13 mm)	48" (1220 mm)
2" (50 mm)	6" (1170 mm)
5" (125 mm)	42" (1065 mm)
6" (150 mm)	40" (1015 mm)
9" (230 mm)	36" (915 mm)
11" (280 mm)	34" (865 mm)

Operable parts on towel dispensers and hand dryers shall comply with Table 606.7.

This is crucial information, but it does not mandate the relationship between them, including distances between these elements and the lavatory or waste receptacle. It does not consider the issue of water on the floor, which can cause slip-and-fall accidents, or the experience of water dripping into one's sleeves or a wheelchair user's lap. Although a number of valuable recommendations are included, many other relationships are largely left to the architect's better judgment.

See endnotes in the online version of this article.

Continues at ce.architecturalrecord.com

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CIRCLE 97

Rubber Flooring for Athletic Facilities

Surfacing materials can have a big impact on athletic performance

Sponsored by Everlast fitness flooring with Nike Grind

Educational institutions have increasingly placed the design of its athletic facilities high on their list of priorities. Strong athletic programs are often central to the institutional identities of many colleges and universities. Even K-12 schools and private learning organizations have increasingly made athletics, movement, and physical conditioning a central part of the overall educational experience they provide. This focus on athletics often elevates several areas—including gymnasiums, weight rooms, training rooms, fitness facilities, locker rooms, climbing centers, fitness classrooms, aerobic dance and movement centers, and indoor tracks and indoor courts—to a much higher level of campus prominence than the design community has previously seen. Sports and fitness areas are largely defined by the open areas—tracks, courts, performance spaces—and play surfaces, which play a key role in determining the athletic performance, safety, acoustics, aesthetics, and overall usability of the space.

This course will examine a range of sports surface features—including environmental

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After reading this article, you should be able to:

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3. Evaluate the sustainability of athletic-surfacing materials.
4. Describe aesthetic options and durability requirements for rubber flooring.

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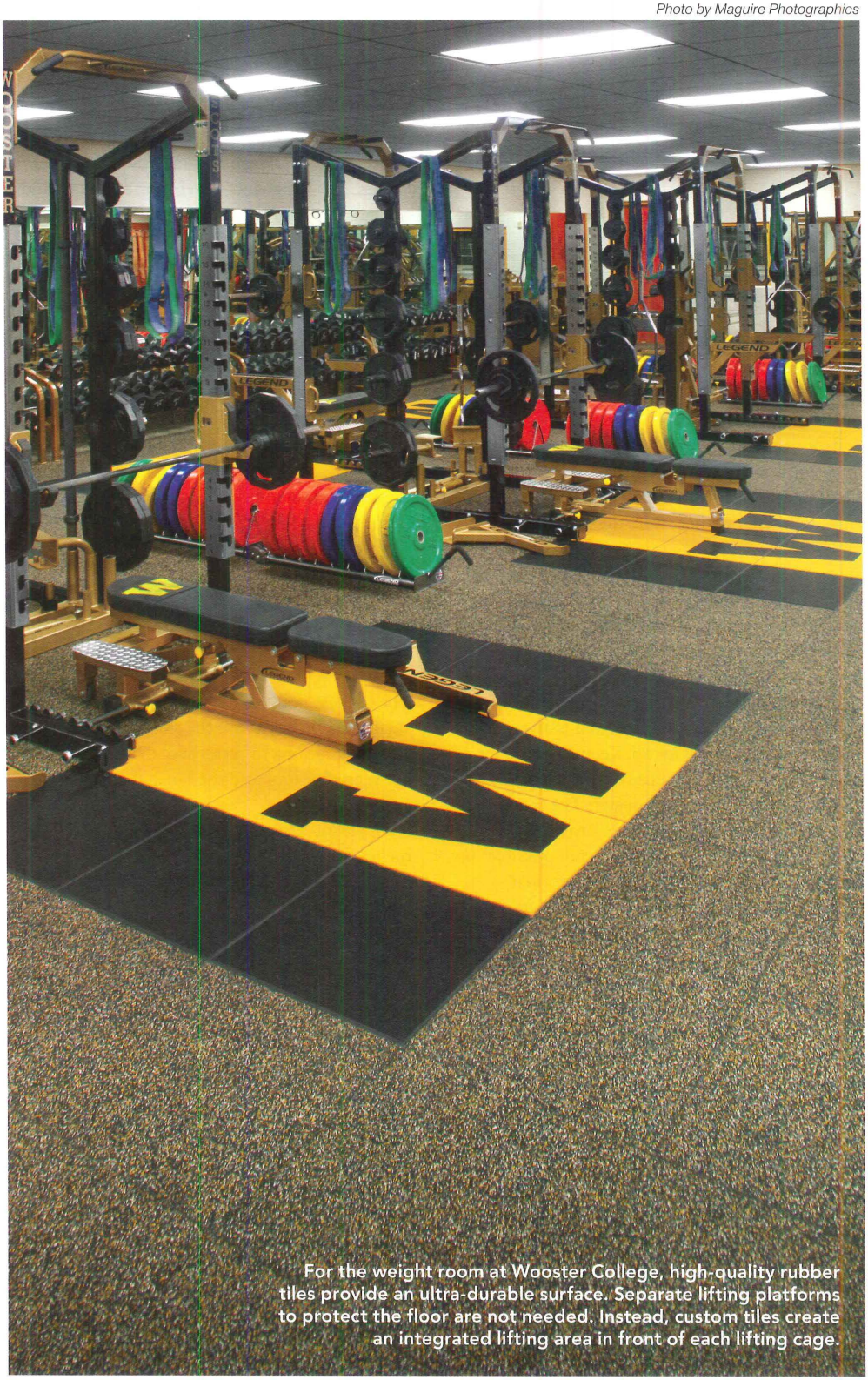

For the weight room at Wooster College, high-quality rubber tiles provide an ultra-durable surface. Separate lifting platforms to protect the floor are not needed. Instead, custom tiles create an integrated lifting area in front of each lifting cage.

Photo courtesy of www.henryambrose.com

The D1 Sports Athletic Training Facility in Knoxville, Tennessee, installed rolled rubber flooring because it's ideal for fitness applications, specifically in areas with weights.

sustainability, material strength, durability, appearance, and the surface's impacts on athletic biomechanics and safety—all features that architects need to understand when selecting flooring materials for an athletic facility.

MATERIAL OPTIONS

Most sports surfacing breaks out into three material categories: hardwood, synthetic turf, and resilient flooring options. Carpet, a fourth option, is also used but is not strongly recommended.

Hardwood. For basketball courts, some athletic directors will accept nothing but hardwood, preferably maple. It is hard enough to provide good ball bounce, and (if installed over the appropriate grid sleeper system) also provides area resiliency and shock absorption. However, hardwood requires a lot of maintenance and the finish is vulnerable to abrasion, limiting its use for multifunction spaces. Rubber tiles and rolled products can be used to temporarily transform the space, provided there is storage space available when the tiles are not in use. A relatively new alternative to hardwood uses a vinyl wear layer that looks like wood fused to a recycled rubber backing.

Synthetic turf. For indoor installations, synthetic turf made with a recycled rubber backing is available in both rolls and interlocking tiles. The grass-like wear layer is typically nylon (polyethylene and polyethylene-blend fibers are more common for outdoor installations). Interlocking synthetic-turf tiles don't require adhesive. This option works well for multipurpose areas, enabling occupants to transform a basketball court, cafeteria, or auditorium into a portable playing surface without damaging the floor underneath. Unlike synthetic turf used for outdoor applications, these products do not include a granular fill. However, they may be installed over a resilient underlayment to increase shock absorption. A resilient underlayment also reduces compaction of the composite material, increasing the life-span of the surfacing.

Resilient flooring. Rubber is the premium choice among resilient flooring options, which also include PVC (polyvinyl chlorate) and polyurethane. It's hard to beat the resiliency, durability, slip-resistance, and moisture-resistance of rubber, making it the flooring of choice for weight rooms, locker rooms, aerobic rooms, training areas, and multipurpose gyms. Rubber can withstand incredible abuse—be it impacts from dropping free weights or the repetitive concussion of exercise machines. Available in rolled sheet goods and interlocking tiles, rubber provides the most design flexibility. Polyurethane, typically poured in place over a rubber mat, is an alternative.

Vinyl fused to a recycled backing is a good option for basketball courts and other surfaces that require a durable surface with area resiliency. The vinyl can be imprinted to provide the look and feel of a hardwood surface without the intensive maintenance issues required for hardwood. The stiff vinyl surface provides optimal foot slide characteristics (to reduce foot overturning accidents) and excellent ball bounce, while the rubber backing provides good force reduction to reduce the incidence of ankle and knee injuries due to impact.

Carpeting is a low-end option sometimes used for fitness rooms and recreation centers, but it is seldom a good choice. While it provides some cushioning and helps dampen interior room acoustics, rug burns are a common safety concern for any active sports or fast-motion exercise. Carpet absorbs spills and sweat and holds odors, and does not fare well underneath exercise equipment. It may be appropriate for offices and classrooms in an athletic center, but not for any area where exercise, training, or sports activities will take place.

SPORT APPLICATIONS FOR RECYCLED RUBBER

The variety of sports and fitness programs available at educational institutions today is, in a word, rich. The sheer variety of indoor spaces allocated for sports and fitness presents tremendous opportunities for architects. Areas requiring sensitivity to athletic and fitness requirements include gymnasiums, indoor tracks, playing courts, weight rooms, training rooms, climbing and bouldering centers, fitness classrooms, movement centers, and locker rooms. When institutions mix-and-match programming, they create an even greater variety of multipurpose athletic areas on its campuses.

Continues at ce.architecturalrecord.com

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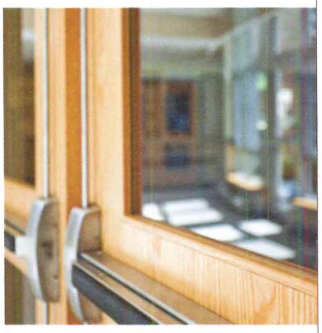

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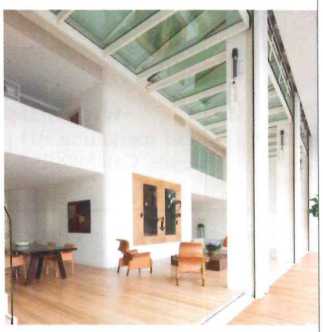

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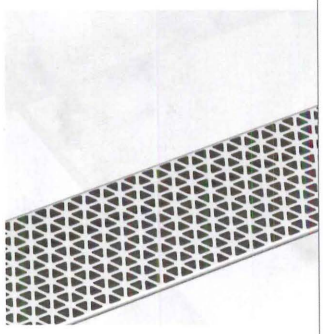

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New & Upcoming Exhibitions

Global Citizen: The Architecture of Moshe Safdie
Los Angeles
October 22, 2013–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 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 around the world, as far flung as Marina Bay Sands in Singapore and the United States Institute of Peace in Washington, D.C. At the Safdie-designed Skirball Cultural Center. For more information, visit skirball.org.

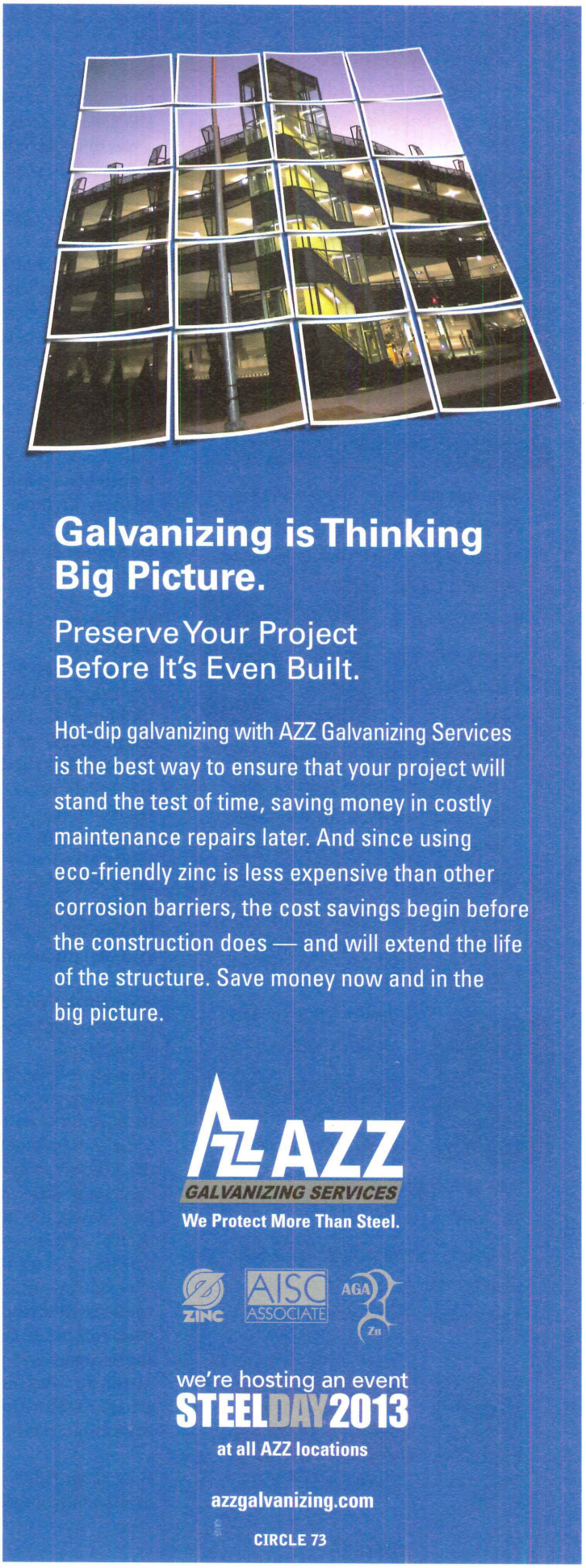
Ongoing Exhibitions

Ice Lab: New Architecture and Science in Antarctica
Glasgow
Through October 2, 2013
From the newly opened British Antarctic Survey's Halley VI Research station to the speculative Iceberg Living Station, *Ice Lab* will give visitors a unique view of the inspiration, ingenuity, and creativity behind architecture in the coldest, windiest, driest, and most isolated place on earth. The first exhibition of its kind, *Ice Lab* will include architectural drawings, models, photographs, and films that give the visitor a sense of what it takes to live and work in Antarctica. For more information, visit ads.org.uk.

Eastern Promises: Contemporary Architecture and Spatial Practices in East Asia
Vienna
Through October 6, 2013
One of the most dynamic and multifaceted centers of construction in the world, Asia is attracting the interest of architectural practitioners on a global scale. Bearing in mind the manifold cultural and regional references, the Museum for Applied Arts exhibition *Eastern Promises: Contemporary Architecture and Spatial Practices in East Asia* presents as its theme the promise of a future-oriented trend in architecture specifically associated with such countries as China, Taiwan, South Korea, and Japan. For more information, visit mak.at.

Nomadic Furniture 3.0 New Liberated Living
Vienna
Through October 6, 2013
In today's world, do-it-yourself culture is practically everywhere–be it in fashion, furniture, cooking, or communication, hardly a single area of everyday life and our material culture has not been swept up in the DIY revolution. With its emphasis on the field of furniture design, *Nomadic Furniture 3.0 New Liberated Living* is the first exhibition to examine this movement and take a look into its historical context. At the Museum for Applied Arts Exhibition Hall. For more information, visit mak.at.

Theaster Gates: 13th Ballad
Chicago
Through October 6, 2013
For the *13th Ballad*, Chicago-based artist Theaster Gates creates a new large-scale installation in the Museum of Contemporary Art Chicago's (MCA's) Kovler Atrium that comprises objects and materials from the Huguenot House, along with a monumental double-cross sculpture and carved wooden pews that create an ecclesiastical ambience to suggest



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that art museums, like churches, are sites of pilgrimage and thoughtful contemplation. *13th Ballad* is accompanied at the MCA by a series of collaborative performances. For more information, visit mcachicago.org.

Archaeology of the Digital
Montreal
Through October 13, 2013
This exhibition at the Canadian Centre for Architecture delves into the genesis and establishment of digital tools for design conceptualization, visualization, and production at the end of the 1980s and beginning of the 1990s. Featuring the work of Frank Gehry, Peter Eisenman, Shoei Yoh, and Chuck Hoberman, *Archaeology of the Digital* highlights the dialogue among computer sciences, architecture, and engineering–a dialogue at the core of the early experiments performed by the featured artists. For more information, visit cca.qc.ca.

The Future is Here
London
Through October 29, 2013
The Design Museum is collaborating with the UK's innovation agency, the Technology Strategy Board, to deliver a major new exhibition about the sweeping changes in manufacturing that are transforming our world. New manufacturing techniques will involve the users of products as never before, revolutionizing the role of the consumer. How we manufacture, fund, distribute, and buy everything from cars to shoes is progressing fast. *The Future is Here* shows what that means for all of us. For more information, visit designmuseum.org.

Nakashima Woodworkers: An Evolving Legacy
Philadelphia
Through November 2, 2013
New custom-made furniture from Nakashima Woodworkers will be featured at Moderne Gallery in Philadelphia this fall, continuing the gallery's long history of presenting the iconic works of the legendary George Nakashima, the Keisho line of his daughter Mira Nakashima, and now the studio craft furniture emerging from a new generation of woodworkers at the famed Nakashima studio in New Hope, Pennsylvania. *Nakashima Woodworkers: An Evolving Legacy* will display approximately 25 pieces of original furniture from the Nakashima Woodworkers' group. For more information, visit nakashimawoodworker.com.

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

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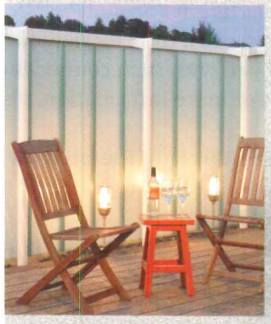

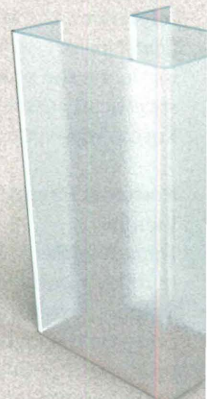

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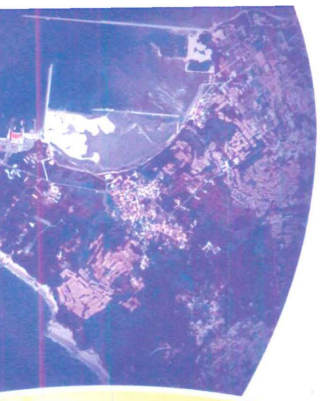
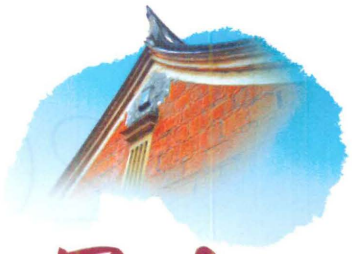




金門港
水頭客運中心

Port of Kinmen
Passenger Service Center
International Competition

國際競圖

尋找擘建和平風華意象的建築大師

Searching for a master architect to create a splendid icon for peaceful era

Invitation

The Port of Kinmen serves as Taiwan's national gateway for maritime via "mini-three links" with Mainland China. A new passenger service center will be constructed here to service the burgeoning volume of passenger traffic across the Taiwan Strait and anchor the local tourism industry. The project, covering roughly 5.2 hectares in site area, will link the nearby aquatic parks and seaside ecological corridors. The program includes the following major spaces: customs clearance area, departure/arrival lobbies, tourist information center, offices, dining area, duty-free shops and other auxiliary spaces.

Kinmen has seen its share of turbulent wartimes and now it is the time to shine. Its future passenger service center, well-equipped and accommodating a high capacity, will enhance the quality of passenger service and become an impetus for tourism development. We cordially invite outstanding design teams from home and abroad to join us in sculpting a maritime national gateway for cross-Taiwan-Strait transportation.

Budget

The total construction procurement budget is about NT$ 1,874,000,000. (about US$ 62,000,000)

Service Fees

The service fee for this project is a fixed fee in the total amount of NT$ 200,000,000. (about US$ 6,660,000)

Qualifications for Participation (for Stage One)

1. Any licensed architect of Taiwan (R.O.C.), alone or in joint tender.
2. Any licensed architect (or Firm / Corporation) of foreign country, alone or in joint tender.
3. Joint tender of licensed architects of Taiwan (R.O.C.) and licensed architects (or Firms / Corporations) of foreign countries.

For more information, please visit our website or refer to tender notice.

Timetable

Stage One Material Submission Deadline	2014/01/20
Stage One Jury Session	2014/01/23 ~ 2014/01/24
Announcement of Shortlist Tenderers	2014/01/24
Stage Two Material Submission Deadline	2014/04/22
Stage Two Jury Session	2014/04/24 ~ 2014/04/25
Announcement of Winning Tenderers	2014/04/25

For more information, please visit

www.PKPSC.com.tw

Official launch on October 22 nd , 2013

Host Organization

Kinmen County Government, Taiwan (R.O.C.)

Coordinator

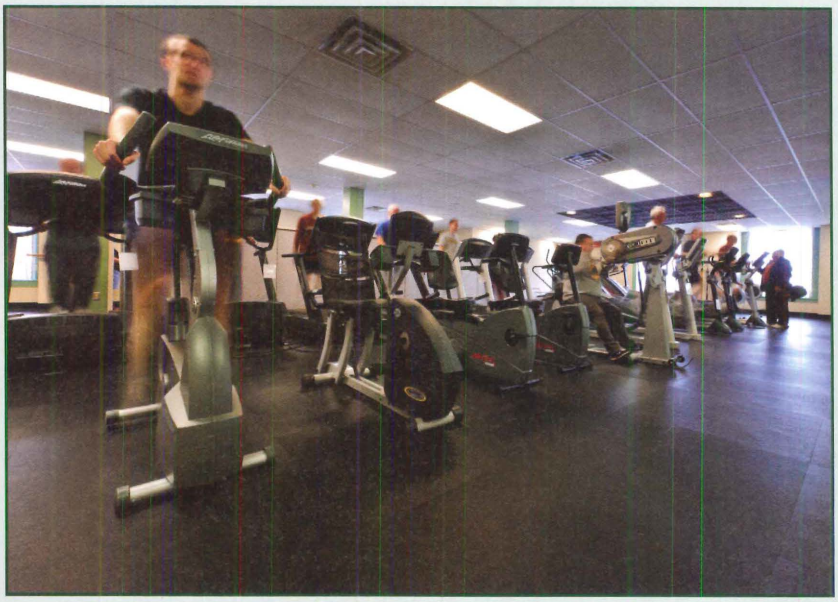
Barry Cheng Architect & Associates
TEL: 886-4-2326-1799 FAX: 886-4-2326-5212
Email: barry-cheng@umail.hinet.net

2014 CALL FOR ENTRIES Record Houses

The editors of **ARCHITECTURAL RECORD** announce the **2014 RECORD HOUSES** awards program. Entry is open to any architect registered in the U.S. or abroad. Of particular interest are projects that incorporate innovation in program, building technology, materials, and form. Projects must be built and inhabited. They may be new construction or renovated and adaptive-reuse projects.

The fee is US$75 per submission. Download the official entry form at architecturalrecord.com/call4entries.
E-mail questions to arcallforentries@mcgraw-hill.com.
Please indicate **Record Houses** as the subject of your e-mail. SUBMISSION DEADLINE: **1/7/2014**

RUBBER SPORT FLOOR



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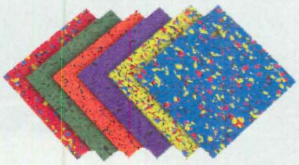

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Visit www.flyash.com for answers to the most common questions about fly ash. You can also contact your expert Headwaters Resources technical support representative for advice on your specific sustainability opportunities.

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CIRCLE 49

Woven Wire Fabric

Cascade Coil Drapery's flexible round weave woven wire fabrics are catching the eyes of today's designers. With its versatility, unique texture, variety of colors, flexibility and durability, Cascade Coil Drapery is a long term solution for today's modern style. Designers and architects around the world are creatively using this material for a wide range of applications including lighting, partitions, window treatments, and other ornamental applications. Woven wire mesh offers many advantages over conventional drapery. Besides being durable, fireproof, and virtually maintenance-free, the material diffuses and enhances lighting without blocking views or ventilation. Save energy by reducing heat loss and gain using Cascade Coil's woven wire fabric for interior and exterior window applications. For over 25 years, Cascade Coil has offered round weave woven wire fabrics that have fueled the imagination of architects, designers and other creative people in the design community. Cascade Coil proudly manufactures their products in the USA and distributes them globally.

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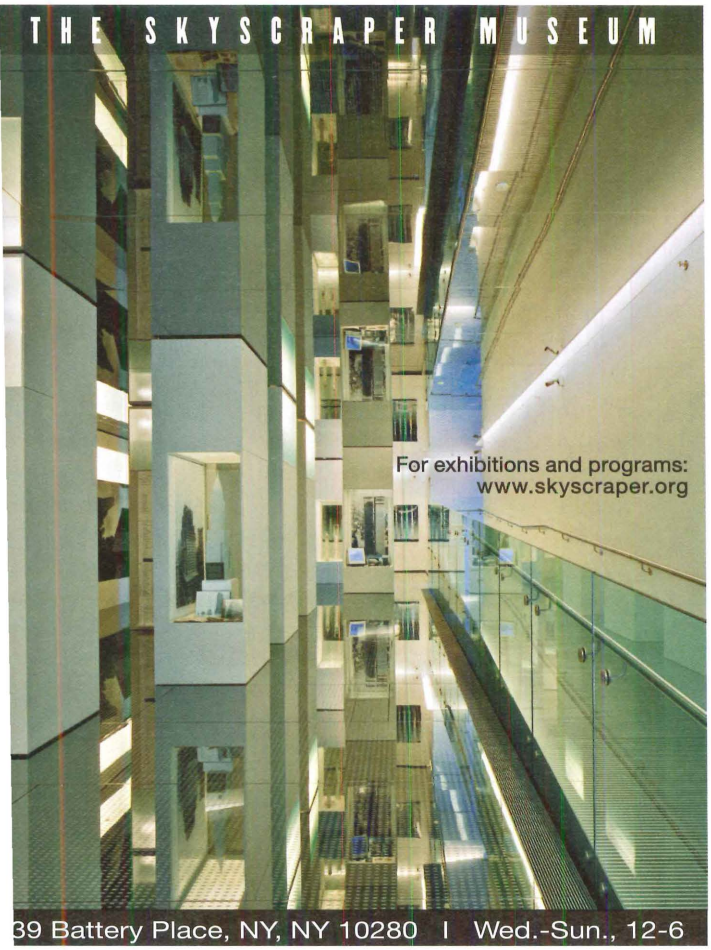
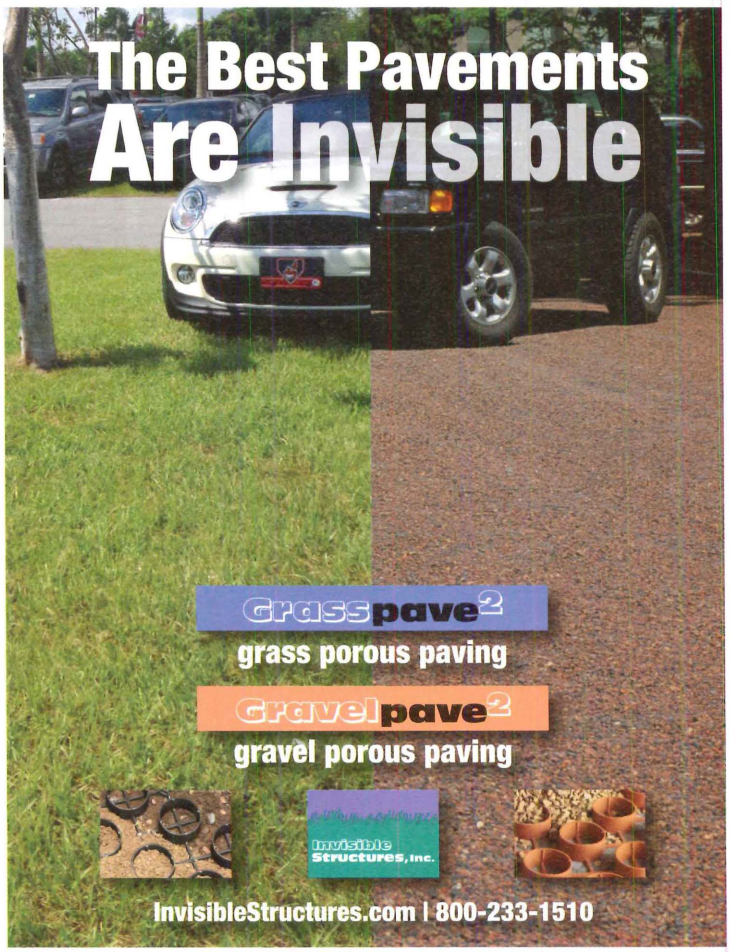


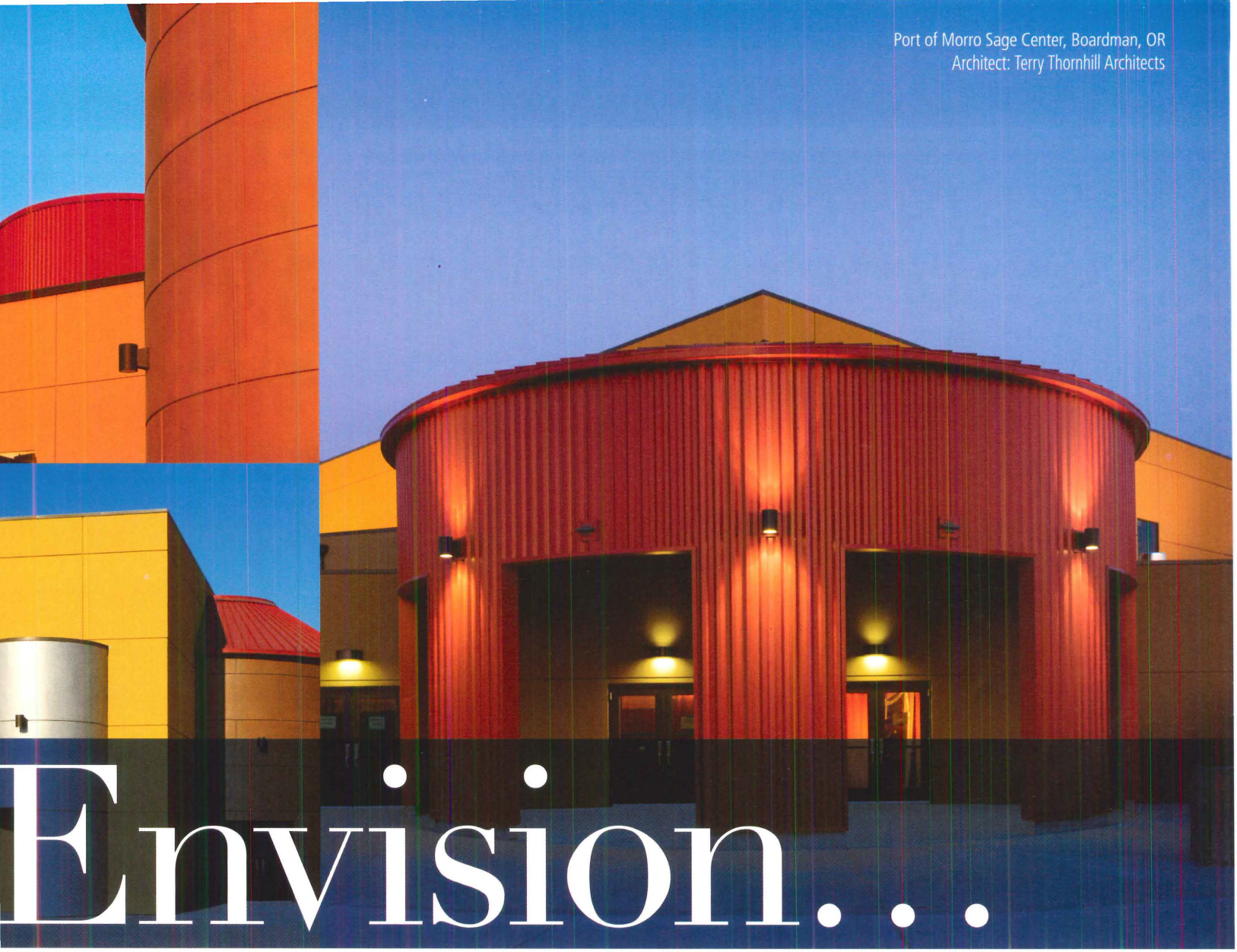


CIRCLE 46

snapshot

PROJECT SHERATON HUZHOU HOT SPRING RESORT
LOCATION HUZHOU, CHINA
DESIGNERS MAD ARCHITECTS

WHEN MAD architects was approached by the city of Huzhou, China, to design a landmark hotel, the Beijing-based firm aimed to create more than an icon. "I wanted to make the building feel like an art installation," explains MAD founder Ma Yansong, who has collaborated with artist Olafur Eliasson. "It's about the lights, it's about the space." Evocative of a ring, a moon, or a traditional Chinese bridge, the Sheraton Huzhou Hot Spring Resort, completed in 2012, looms nearly 400 feet above Lake Tai. The dramatic arch echoes the nearby mountains and, at night, creates a glowing, otherworldly reflection on the lake's surface. The building forms a continuous loop but was constructed as two interconnected towers—one leg planted on land, the other anchored below the water's surface—joined by an underwater passageway and supported by twin columns of lightweight, earthquake-resistant concrete. Protruding balcony railings produce a striated exterior that lends ambiguity to the 650,000-square-foot building's scale, a quality that was important in MAD's design. "I was thinking that instead of just making one big object, I could also bring an emptiness," Ma says. "The building becomes like a frame so people can look at the sky and water beyond the building." *Anna Fixsen*



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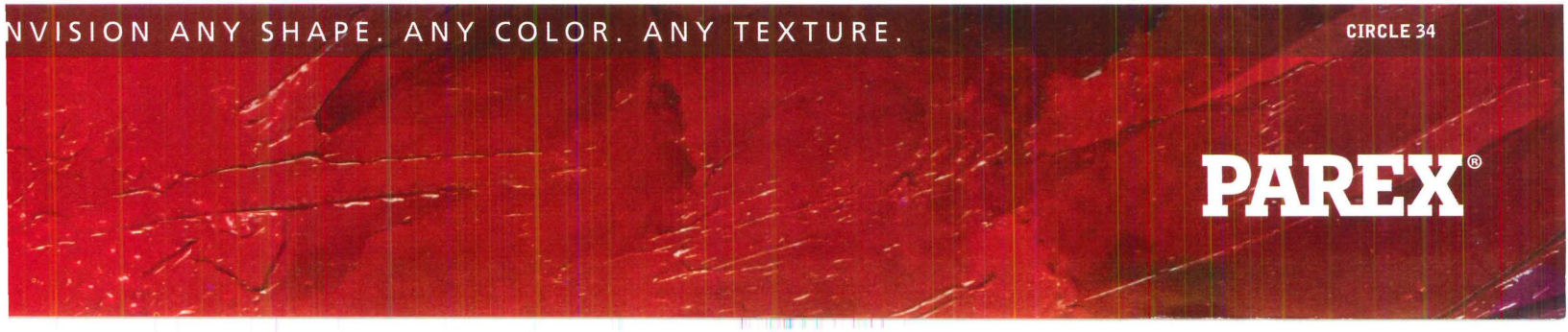

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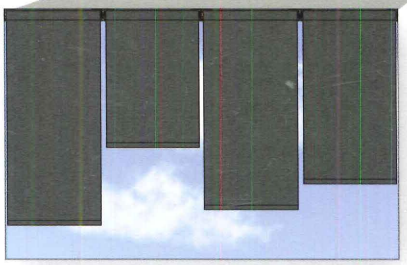
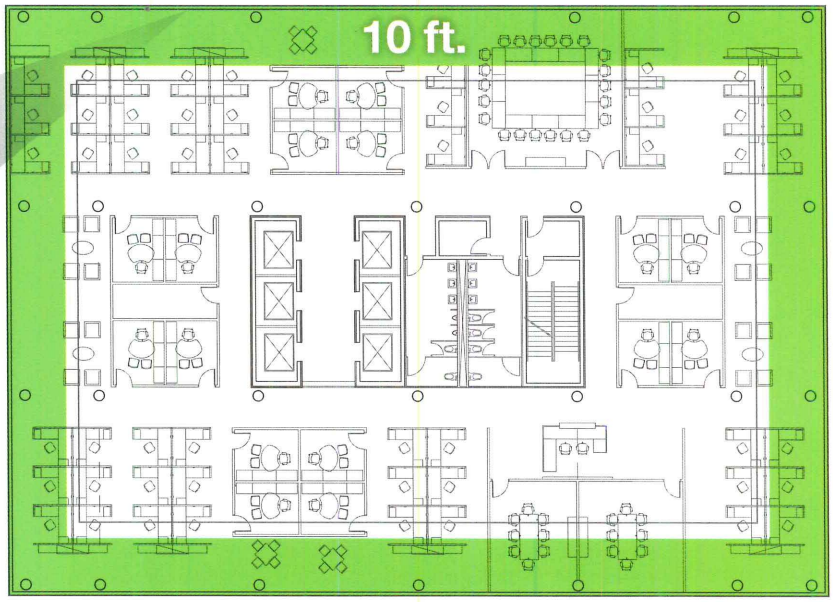
Using Lutron Hyperion® shading solutions can save up to 1.6 kWh/ft² per year of lighting energy.*

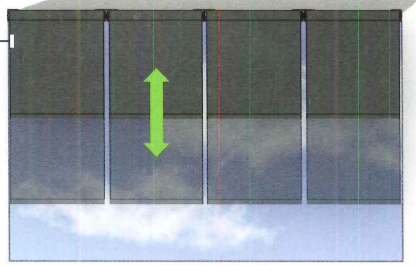
Manual shades provide a useful daylight zone up to only **10 ft.**



Manual shades are rarely adjusted and usually misaligned.



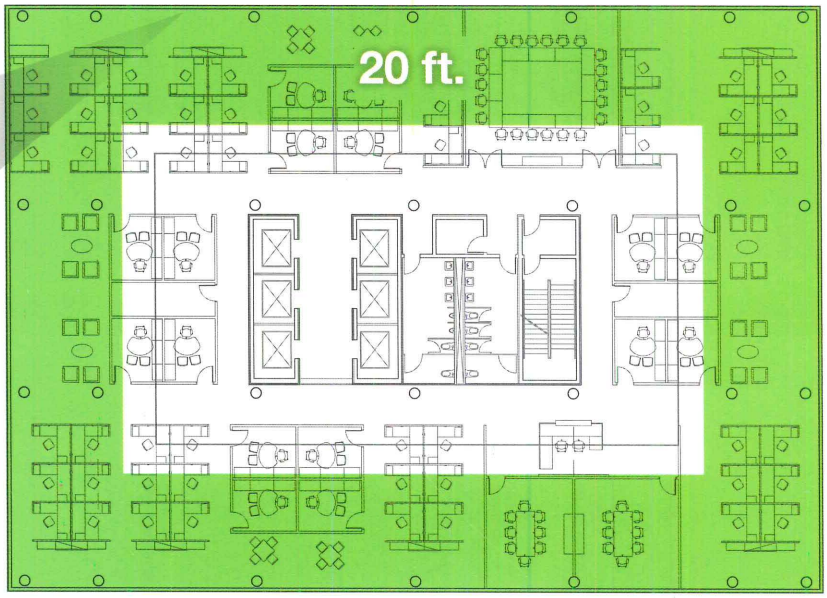
Lutron shading solutions extend the useful daylight zone up to **20 ft.**



Sensor adjusts automated shades according to daylight conditions.

Maximizes useful daylight entering a space, reducing electric light usage.

Wireless window sensor (discreet mullion mount)



See how it works:
www.lutron.com/daylightautonomy
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* Lutron Electronics Co., Inc. worked with Purdue University to analyze the benefits and savings potential of Lutron's Hyperion automated shading systems. The results showed the impact of how automated shades significantly reduce annual lighting energy usage. Savings are based on energy simulation of a perimeter private office with a lighting power density of 0.9 W/ft², a standard clear double pane glass, and a shade fabric with 5% transmittance and a 76% reflectance. Manual shades were simulated by closed shades. Values shown are the average of three window to wall ratios: 20%, 40%, and 60%. Daylight harvesting system required.