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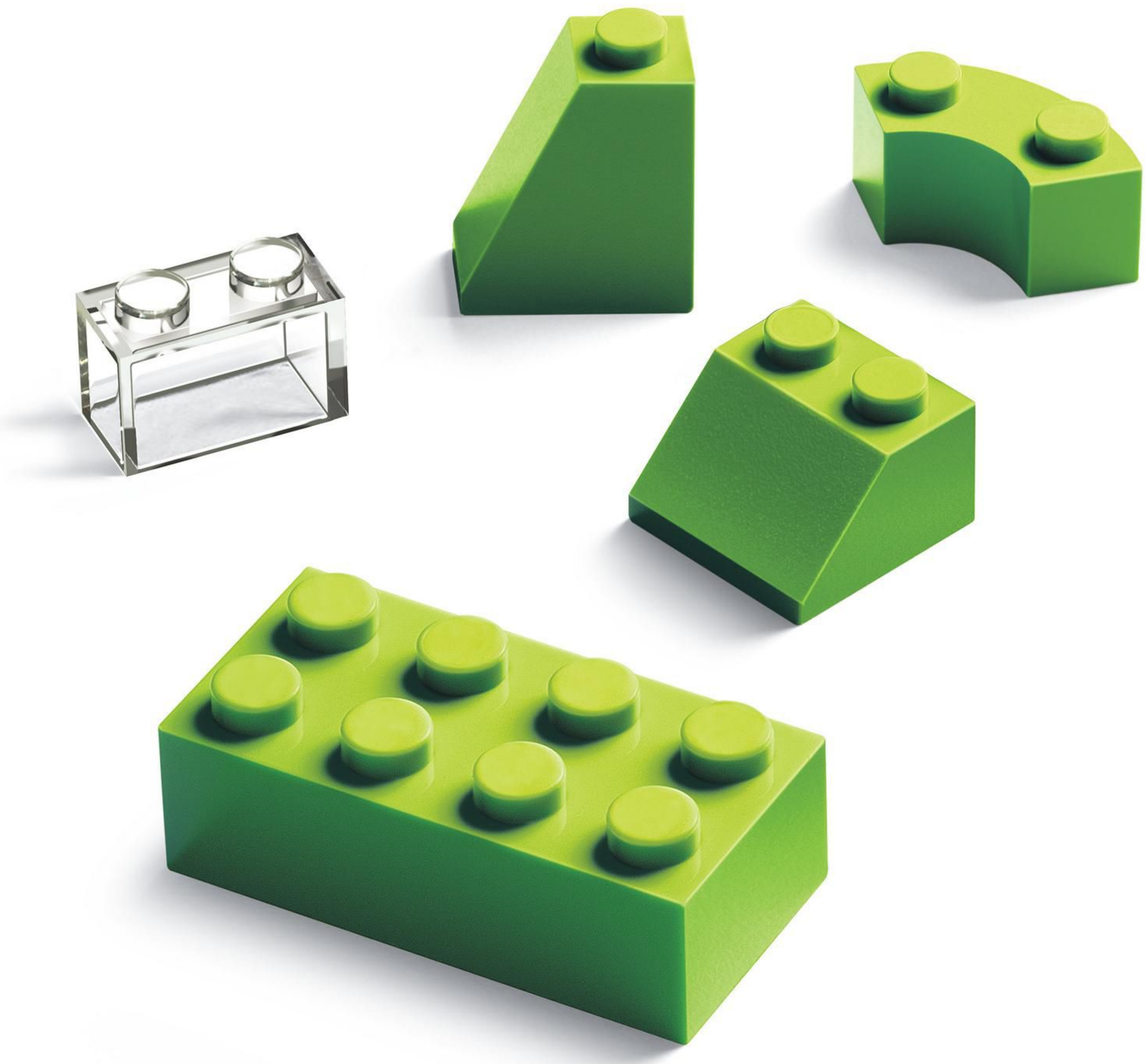


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ARCHITECTURAL RECORD (ISSN: Print 0003-858X Digital 2470-1513) November 2018, Vol. 206 No. 11. Record is published 12 times annually by BNP Media II, LLC., 2401 W. Big Beaver Rd., Suite 700, Troy, MI 48084-3333. Telephone: (248) 362-3700, Fax: (248) 362-0317.
ANNUAL RATE FOR PRINT, DIGITAL AND COMBO SUBSCRIPTIONS TO INDIVIDUALS IN THE U.S.A.: Print $72.00, Digital $18.00 and Print Digital Combo $81.00. Annual rate for subscriptions to individuals in Canada: Print $129.00, Digital $18.00 and Print Digital Combo $138.00 (includes GST & postage); Annual rate for individuals outside of U.S.A.: Print $199.00, Digital $18.00 and Print & Digital Combo $208.00. Payable in U.S. funds. All rates are in USD. Single Copy sales $9.95; Foreign $11.00.

Periodicals Postage Paid at Troy, MI and at additional mailing offices.
FOR SINGLE COPY SALES OR BACK ISSUES ONLY: contact Ann Kalb at (248) 244-6499 or KalbR@bnpmedia.com.
POSTMASTER: Send address changes to: ARCHITECTURAL RECORD, P.O. Box 16387 North Hollywood, CA 91615.
CANADA POST: Publications Mail Agreement #40612608. GST account: 131263923. Send returns (Canada) to IMEX Global Solutions, P.O. Box 25542, London, ON N6C 6B2.
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EDITORIAL OFFICES: 646/849-7124. 350 Fifth Avenue, Suite 6000, New York, NY 10118. **WEBSITE:** architecturalrecord.com.

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ARCHITECTURAL RECORD

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WEBSITE: architecturalrecord.com. **SUBSCRIBER SERVICE:** 877/876-8093 (U.S. only); 818/487-2077 (outside the U.S.). Website Registration: 844/652-8994. E-mail: *AR@pubservice.com*. If the Post Office alerts us that your magazine is undeliverable, we have no further obligation unless we receive a corrected address within one year. **INQUIRIES AND SUBMISSIONS:** Letters, Beth Broome; Practice, Suzanne Stephens; Books, Suzanne Stephens; Lighting and Interiors, Linda C. Lentz; Architectural Technology, Joann Gonchar; News, Anna Fixsen. **REPRINTS:** *architecturalrecord@theygsgroup.com*.

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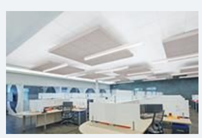
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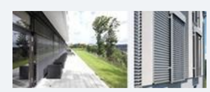
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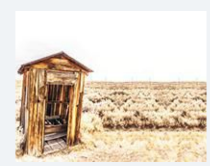

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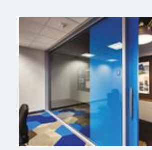

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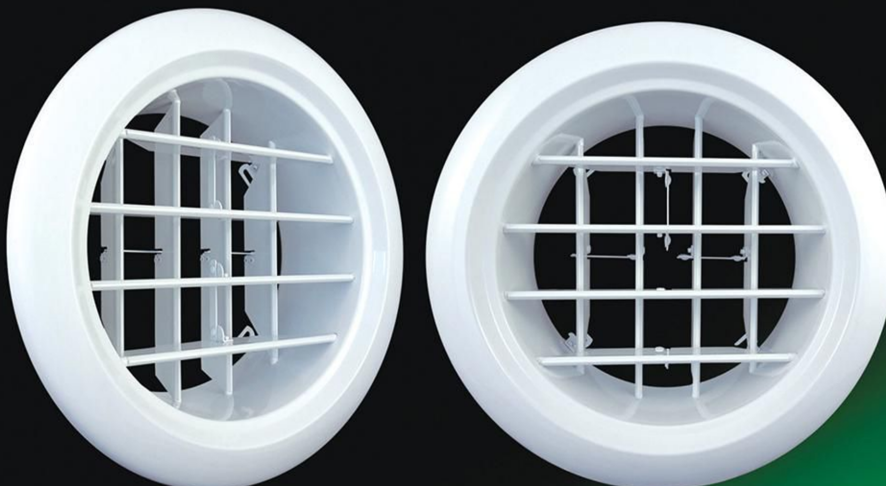

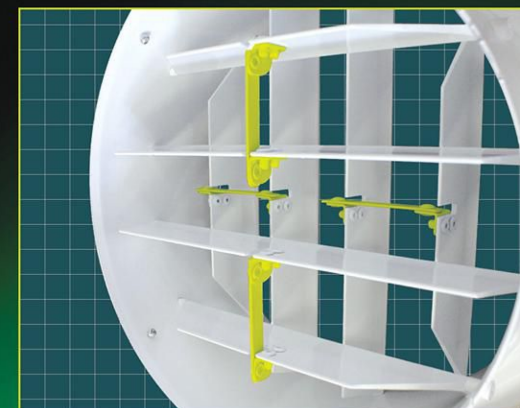

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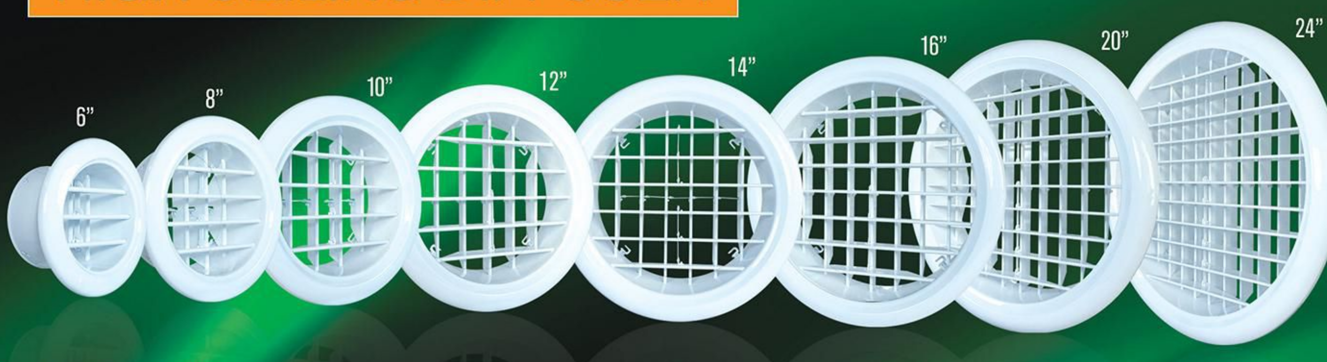

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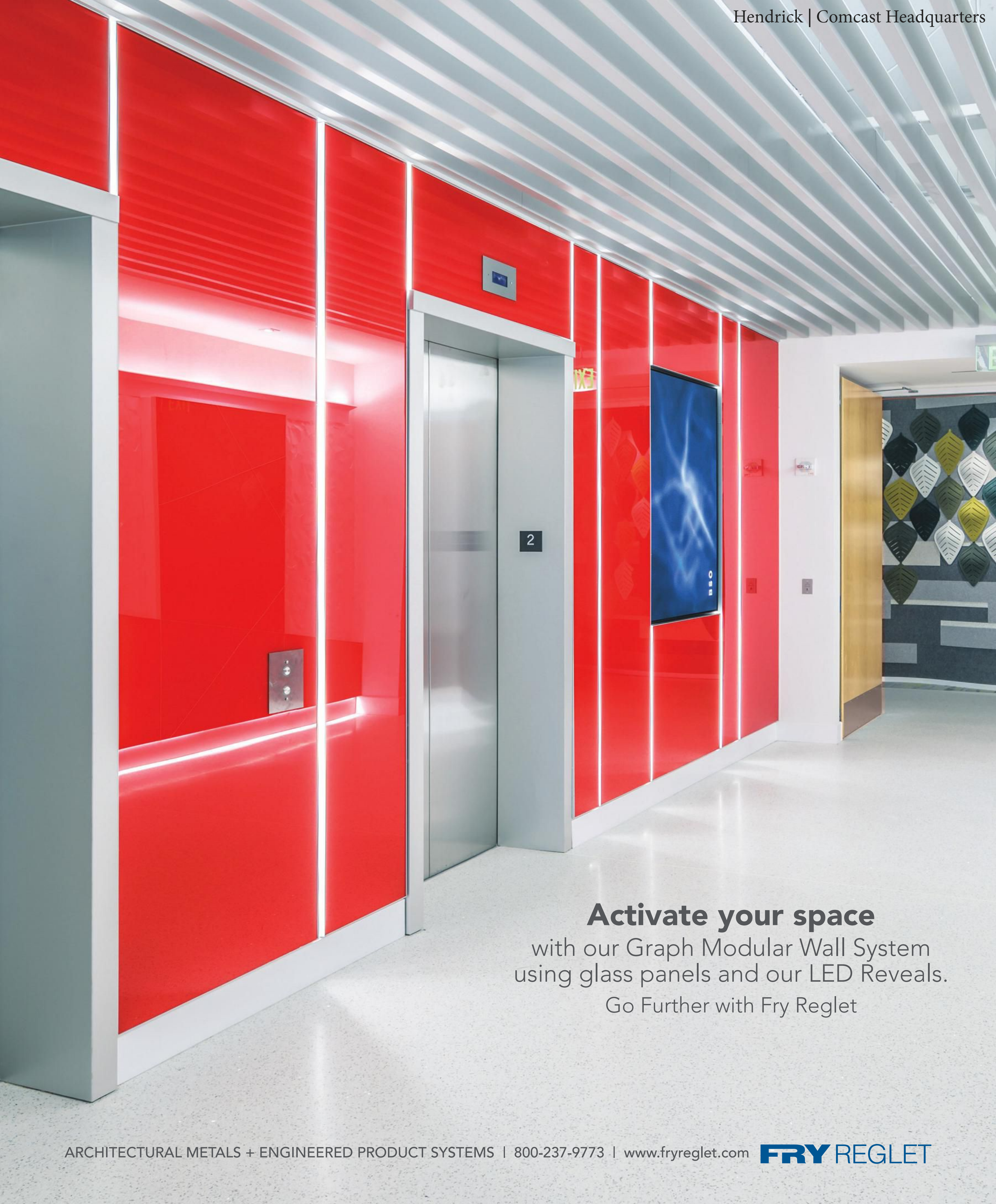
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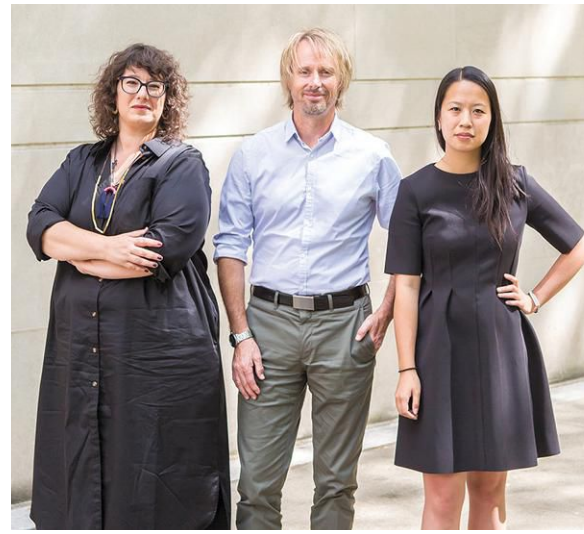
LIGHTS IN MOTION

View a short video of Art in the Mart in action. A project by Valerio Dewalt Train Associates and Obscura Digital, the riverside installation in Chicago will run five nights a week, 10 months of the year, for 30 years. [LIGHTING]



PACKING UP THE PAVILION

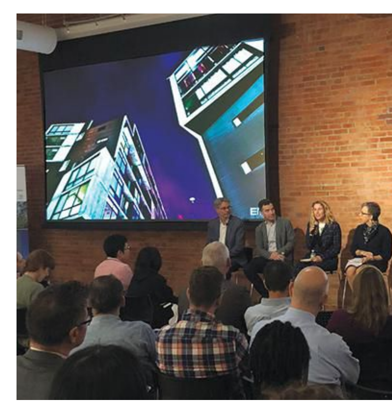
As the Venice Architecture Biennale draws to a close at the end of this month, Record revisits the U.S. Pavilion through a series of short video interviews with curators Mimi Zeiger, Iker Gil, and Ann Lui (left to right) and the design teams behind each installation.

VISIT AND VIDEO

Deputy editor Suzanne Stephens (left) and senior news & web editor Miriam Sitz (right) chatted with architect Thomas Phifer (center) while visiting Glenstone Museum, which opened last month, in Potomac, Maryland. View our new video for a virtual tour of the project.

ON THE ROAD AGAIN

In late September and early October, Record on the Road held panel discussions at the Center for Architecture in Philadelphia (right), led by senior editor Joann Gonchar (at far right); and at the Central Library in Austin, Texas (below), moderated by editor in chief Cathleen McGuigan (at left).



INNOVATION & WOMEN IN ARCHITECTURE
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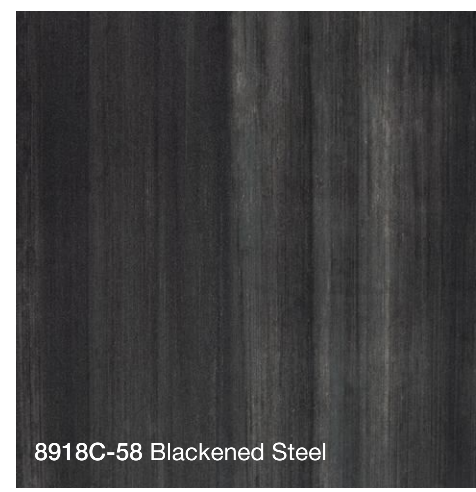

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The #MeToo Movement, One Year Later

A new survey from Record and *ENR* gives a snapshot of the experience of sexual harassment in the architecture, engineering, and construction industries.

IT HAS been a year since multiple allegations against Hollywood producer Harvey Weinstein for sexual assault and harassment (which he has denied) reignited the simmering #MeToo movement. Accusations of sexual misconduct in other professions—television, academia, performing arts, publishing, and journalism—quickly followed, with many high-profile men terminated from their jobs. And now #MeToo has spawned what may have been an inevitable backlash, as was clear in the contentious aftermath of the confirmation hearings for Supreme Court justice Brett Kavanaugh.

Yet a serious reckoning in the architecture profession has been slow to emerge. Last March, I asked in this column, "Where is Architecture's #MeToo Movement?" Just weeks later, *The New York Times* broke the story of five women who accused the Pritzker Prize–winner Richard Meier of sexual harassment over many years. Meier responded by apologizing—sort of—and offered that "his recollections may differ" from those of his accusers, but he immediately took a six-month leave from his firm. Now his office has announced that he is stepping down permanently from "day-to-day" operations, though the name on the door will still be Richard Meier & Partners, and he remains "available to colleagues and clients." (The clients outside the U.S., where the firm reportedly has quite a bit of work, may be less concerned about the tainted brand than those in this country.) Meier has continued to send mixed signals by telling the *Times* in an interview that "people can say whatever they want . . . I focus on the work."

One of his accusers, Stella Lee, who worked at Meier's firm when she was 21 and said the architect exposed himself to her, recently published a *Times* op-ed piece asking, "Why Doesn't Architecture Care About Sexual Harassment?" Indeed, after the Meier allegations, there have not been more substantive accusations against other architects (anonymous charges directed at a number of architects were made online last spring, but the posts were subsequently taken down). That doesn't mean, of course, that women—and some men—have not been suffering from harassment and discrimination in the profession and the wider construction industry.

In August, ARCHITECTURAL RECORD joined its sister publication *Engineering News-Record* (*ENR*) in launching a survey about sexual harassment, and the results are now in (page 25 and at architecturalrecord.com), with 1,200 responses from people working in engineering, construction, and design. Half were architects or architectural designers, of whom roughly two-thirds reported they had experienced sexual harassment, in the form of inappropriate personal requests, questions, jokes, or innuendo, and 30 percent of those said the harassment included inappropriate physical contact. Some expanded on their responses. "Not much has changed in 40 years," wrote one woman with a long career in the Southeast, "except that more women are exposed to it, and there is a dismissive, 'anti-PC' sentiment spoken with derision."

How can the culture of architecture ultimately change course? Lee (who went on to cofound the firm Bureau V), as well as others, argue that essential change must begin with professional training. Women students and faculty at some architectural schools have been organized for quite a while, but the momentum has increased with #MeToo. This month we take a look at activism to advance the cause of women and fight discrimination in every form at several top schools (page 27).

Also in the pages ahead are examples of great contemporary architecture. RECORD launched its special feature, the Building Type Study (BTS), 81 years ago, and we know that many readers use a particular BTS as their reference when they design in that specialty. This month, we celebrate our 1,000th BTS, with our annual portfolio of new college and university buildings (page 81). And we are pleased as well to showcase two stunning new museums, one for the Menil Collection in Houston by Los Angeles architects Sharon Johnston and Mark Lee, and the other a dramatic outpost for the Victoria & Albert in Dundee, Scotland, by the Tokyo-based Kengo Kuma.

Cathleen McGuigan

Cathleen McGuigan, Editor in Chief

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perspective

Ornithologists believe that between 350 million and a billion birds in the United States die every year from flying into buildings.

— Philadelphia Inquirer *architecture critic* Inga Saffron *in a recent story on architecture-related avian mortality.*

In Record Survey, 66 Percent of Architects Report Harassment

BY MIRIAM SITZ

ON OCTOBER 9, Richard Meier's firm announced a spate of promotions and named a new managing principal while declaring that the founder, who was accused of sexual harassment by five women in a bombshell *New York Times* story this March, would "step back from day-to-day activities," but remain available to colleagues and clients.

The allegations against Meier marked the start of the architecture community's public reckoning with gender-based harassment—months after the #MeToo movement rocked Hollywood, the media, and sports—though the largely male profession has long faced strong undercurrents of sexism.

To get a picture of the impact of sexual harassment on the fields of design, engineering and construction, ARCHITECTURAL RECORD and its sister publication *Engineering News-Record* (*ENR*) launched a survey in July. More than 1,200 people responded, with architects and architectural designers (referred to here as "architects," though not all are licensed) representing about half the participants. Here, we present selected findings, with more complete information available on both publications' websites.

Roughly two-thirds of all architects surveyed reported having experienced sexual harassment on a jobsite, at work, or in another location. Women accounted for just over two-thirds of the respondents, with 85 percent saying they have experienced harassment; among the men who replied, 25 percent indicated they have been harassed. Nearly 64 percent of those who alleged harassment characterized it as inappropriate personal requests, questions, jokes or innuendo; for almost 30 percent, it included inappropriate physical contact.

"I was just out of grad school, working in a small firm, where I was the only woman other than the office manager," said a middle-aged Midwestern architect. "The boss showed up at the office late one night when I was working alone and asked me for a 'kiss goodnight.' I declined and said I was uncomfortable with the request. He laughed it off. Then

IMAGE: © GETTY IMAGES

two weeks later I lost my job. My boss said, 'This has nothing to do with the other day,' but, given the workload and the praise I had received, it didn't ring true."

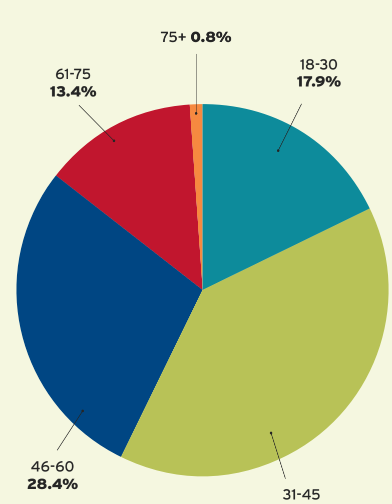
People responded to harassment in various ways: 12 percent reported it to human resources and almost 19 percent reported it to a manager; nearly 34 percent only shared the experience informally with a colleague. Fewer than half a percent of people who were harassed either filed a lawsuit or a claim with the U.S. Equal Employment Opportunity Commission; 26 percent neither took action nor spoke publicly about the incident.

A woman in the Southwest remembers "being propositioned for dates and sex from clients, a boss, and coworkers during work hours," as well as hearing offensive comments about women and sex, including the firm's principal using vulgar sexual terms "followed by laughs from the guys." But despite her discomfort, she kept quiet. "As a new intern just out of college in an architecture firm with very few female coworkers, there was no way I could speak up and hope to gain the professional experience I needed."

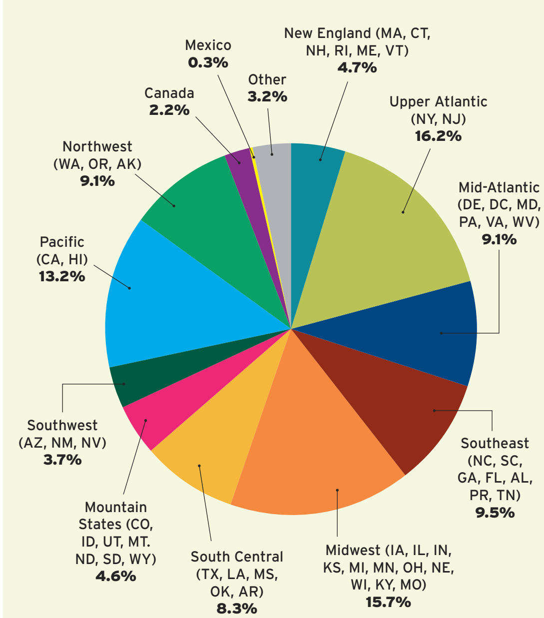
Some victims reported incidents of harassment to their employers, and just under a third indicated that management responded to their concerns.

Of those who confronted their alleged harassers (just 135 of 599 total respondents),

AGE RANGES OF SURVEY RESPONDENTS



GEOGRAPHIC LOCATIONS OF SURVEY RESPONDENTS



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about 46 percent said the accused denied the allegations and became defensive.

For instance, an architect in the Southeast, with four decades of professional experience, said her male colleagues told her to "lighten up, enjoy the attention" after she confronted them about their inappropriate comments to her. "Not much has changed in 40 years," she said, "except that more women are exposed to it, and there is a dismissive 'anti-PC' sentiment, spoken with derision, like, 'Don't get all PC about it.'"

Our survey also asked whether architects had witnessed incidents of sexual harassment; about 56 percent of those who responded reported witnessing sexual harassment, and 74 percent said they had heard secondhand or been told about an incident.

One example is an older man who runs a small practice in the Southwest with his wife, who reported that "she has been repeatedly subject to gender-different responses from contractors and has stopped doing construction-side work," where both "subtle and blatant" sexism continues to occur. "We do not condone it and coldly turn away when inappropriate comments or jokes are made," he said.

As a new intern just out of college, there was no way I could speak up and hope to gain the professional experience I needed.

The human-resources manager of a small firm in the south-central U.S. contends with such "jokes" and patronizing remarks on a daily basis. "I hear a lot of 'pet names'—sweetheart, sweetie, or simply 'woman.' Here at this small office," she said, "the only thing that has helped us women is other men coming to our defense and calling out harassment when it happens around them. If we point out obvious harassment ourselves, we are told to laugh it off. If I say it's not a joke to me, then I'm being too serious."

A mid-career architecture educator in Canada described the "man-to-man sexual harassment" that he witnessed at the beginning of his career on a jobsite in the New York area, where a supervisor displayed pornography in a construction trailer "as a way to trivialize and mock design drawings—'You want to show me pictures, I'll show you pictures.'" He calls that episode an instance of "the macho animosity that some in the construction trades harbor toward architects."

Overall, about two-thirds of those who responded to the survey felt the profession is moving too slowly in addressing sexual harassment. "The AIA has only recently enacted a policy," said a middle-aged West Coast man, referring to recent changes to the Code of Ethics and Professional Conduct. He believes he was fired from a senior position by his firm's principals for his sexual orientation,

But the broader cultural awakening does leave some feeling hopeful, including a woman at a New England firm who has faced comments about her appearance, work, and cultural background. "Above all, I am grateful to the people who have spoken up." The #MeToo movement, she says, has "dramatically improved the quality of my psyche, confidence, and self-worth, because of this new societal awareness and alertness." ■

Architecture Students Address Sexual Harassment on Campus

BY HEATHER CORCORAN

WHEN AN anonymously sourced spreadsheet alleging inappropriate behavior by men in architecture went viral earlier this year, the national dialogue about sexual harassment had already reached a fever pitch. Gender bias, many argue, is particularly rampant in the profession—a problem illustrated by the archetype of the architect as a lone (white) male genius. It is underscored by the oft-cited statistic that although women and men graduate architecture programs at roughly the same rate in the United States, women represent just 20 percent of licensed professionals, according to a 2018 NCARB report—a figure that dwindles even more among the top leadership positions and when it comes to awards and recognition.

Underwhelmed by top-down initiatives—changes to the AIA Code of Ethics and Professional Conduct and countless roundtable discussions—some people are proposing a drastic, intersectional rethinking of how architecture operates, beginning in the place where many make their first forays into the field.

"To really effect change, we need to focus on culture and where it is solidified—in education," argued Stella Lee, founding principal of Bureau V, in a *New York Times* op-ed this October. Earlier this year, Lee was among a handful of women to come forward with allegations of sexual harassment against Richard Meier. "Architectural education is plagued by the mentality that suffering is a necessary part of its practice," Lee wrote. "The acceptance of suffering easily slips into normalizing sexual misconduct and its suppression as simply part of the practice."

"Institutional and organizational change is slow, but what's been happening recently is a really important wake-up call," says Jennifer Wolch, dean of the College of Environmental Design at the University of California, Berkeley, which recently faced its own allegations of sexual misconduct by a star faculty member. "A lot of the behavior that we find very problematic today was business-as-usual for many, many decades," Wolch explains, and now the culture at large is in the difficult process of "re-norming." Much of the official response to sexual misconduct on campuses has been spearheaded by university-wide Title IX teams that take a reactive approach, requiring victims to break the so-called "open secret" problem, and focusing on the adjudication process for abuse allegations. Students, on the other hand, are arguing for a more proactive approach.

Yale's Equality in Design group promotes dialogue through events such as student debates (above) and exhibitions like *A Seat at the Table* (bottom).

"It's not just these huge cases," says Cynthia Deng, a cochair of the Women in Design (WiD) group at Harvard's Graduate School of Design, "There's a whole spectrum of acts that are systemized forms of discrimination." The problem can start with microaggressions—commonplace actions that, whether intentionally or not, reveal unconscious bias. (These can range from labeling women in leadership positions "bossy" to using gendered words like "businessman.") Add to that the current nature of the field, which can leave many vulnerable to misconduct due to a mix of factors that affect myriad professions, including power differentials between professors and students, the intimate environment of the studio, and the pervasive blurring of work/life boundaries.

This month, WiD at Harvard—one of many equity-advocacy groups to form at architecture schools in recent years, from GSAPPXX, Columbia's chapter of the national women's group ArchiteXX, to Women in Architecture and Design at Washington University—is hosting a two-day program, A Convergence at the Confluence of Power, Identity, and Design (November 2–3). It features a schedule of talks, workshops, and activities meant to break down conventional ideas about the structure of the industry, from the siloing of design disciplines to macho studio culture—issues that seep out from academia into the profession and society at large. "When we go out and build the world, we perpetuate the emotional violence or the positive experiences we learn," Deng says.

One difficulty in addressing issues of bias and harassment has been simply defining the terms used to discuss unacceptable behavior, which is why so much of the nationwide

PHOTOGRAPHY: © EQUALITY IN DESIGN (YALE SCHOOL OF ARCHITECTURE) (2)

Earlier this year, after an anonymous list of "Shitty Men in Architecture" circulated online, students at the Harvard Graduate School of Design hung banners throughout the building. This month, the GSD group Women in Design will host a two-day symposium to further the conversation.

conversation has focused on the worst examples. (Rape is clearly defined by law; bullying and favoritism can be more subjective.) The Equality in Design (EiD) group at the Yale School of Architecture has started an orientation program for incoming students to empower them, as a normal procedure, to call out biased behavior when they see it. It also provides tools for dealing with arguments—false analogies, downplaying, condescending explanations—that can derail these difficult encounters.

This fall, EiD surveyed architecture students, faculty, and alumnae/i from approximately 86 schools around the world, garnering some 779 responses to questions on everything from the role of ego in architecture to comfort with taking on leadership roles on campus. They exhibited the results—which touch on issues of class, race, sexual orientation, and mental health, to name a few, in addition to gender—this October in *A Seat at the Table*, a show and program series designed as an "inquiry into embedded discrimination and biases that exist at scales large and small within spheres of education." A key component was providing a forum for further discussion, including a masculinity workshop for male-identifying students to consider their role within the topic of gender discrimination.

"What it really boils down to is being a good person, and providing space that allows for everyone, no matter their background or identity, to take full advantage of the education experience," says EiD member Rhea Schmid. "How do we make sure that everyone has the opportunity to reach their full potential? By addressing behavior that stops them."

When some of the most important dialogue surrounding equity, diversity, and inclusion is focused on just that—visibility, representation, and simply starting to talk about the problem—students may have something to teach the educational establishment. As Sarah Diamond, an MLA student and cochair of Harvard's Women in Design group puts it, "It's about a base level of acknowledgment that there are problems. The acknowledgment that there is something to be fixed creates a sense of responsibility to fix it." ■

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UK Firms React to and Prepare for Brexit

BY CHRIS FOGES

SIX MONTHS after the United Kingdom's surprise decision in June 2016 to leave the European Union, a membership survey by the Royal Institute of British Architects (RIBA) revealed the immediate impact on the construction sector: 60 percent of architects had seen work delayed, and 37 percent reported canceled projects. This initial wobble did not turn into a full-blown crash, and the latest data from the influential research firm IHS Markit shows continued expansion in the sector, albeit with slowed growth attributable to Brexit uncertainty. Now, with less than six months remaining until the scheduled withdrawal date of March 2019, the UK's future economic prospects remain hotly contested, but there is also growing concern that the terms of departure will be damaging to its architectural profession—with one of the country's most prominent firms, Foster & Partners, even thinking about relocating.

There is, as yet, no agreement on new rules on trade, migration, or regulation to replace those enacted over the last 45 years. For the UK's construction sector as a whole, this raises the threat of costlier imported materials and labor shortages. More than a quarter of London's construction workers come from elsewhere in the EU, though the proportion is lower outside the capital. For architects specifically, there are unanswered questions over matters ranging from the mutual recognition of qualifications across the EU to the tariff-free trade in services within the single market.

Perhaps most significant is the threat to recruitment and to the diverse composition of the profession. One in five architects working in the UK are from other EU countries, but of the "four freedoms" enjoyed by EU members—the free movement of goods, services, capital, and persons—it is the last that the UK government is most determined to end. In October, Prime Minister Theresa May announced that EU citizens would no longer enjoy preferential immigration status after Brexit and must apply for work visas. Until now, architects have often avoided recruiting staff who require visas, due to the cost and administrative overhead and the poor chance of success. In the six months before April 2018, only 5 percent of visa applications by non-EU architects were accepted, according to law firm Eversheds Sutherland. A new minimum salary threshold proposed by the UK government will increase the difficulty of hiring early-career architects.

Even if EU architects were permitted to work in the UK, Brexit may already have lessened their desire to do so. Recent data from the Architects Registration Board shows a 42 percent fall in the number of European architects registering in the UK since the referendum. "The number and quality of international applicants has dropped very significantly since the vote," says Friedrich Ludewig, director of London-based Acme. He employs over 90 people, of whom fewer than 20 percent are from the UK. "We don't believe that bureaucratic hurdles are putting applicants off—at least not yet. Rather, there seems to be a growing sense abroad that the UK isn't such a friendly place anymore, and so people might be choosing Paris, Berlin, or Zurich instead."

More than a quarter of all construction workers London (opposite) come from elsewhere in the European Union. Norman Foster's firm (right) has indicated it would consider relocation if Brexit hurts recruitment.

PHOTOGRAPHY: © @GILLYBERLIN (OPPOSITE); NIGEL YOUNG/FOSTER + PARTNERS

Concern that firms many not have the same access to talent has led some to consider contingency planning. Matthew Streets, managing partner at Foster & Partners, told the *Architects Journal* in June that the firm would, regrettably, have to consider relocation "if Brexit means we can't attract world talent." Around half of its 1,061 UK staff are from other EU countries. Newcastle-based Ryder Architecture announced in October that it will shortly open an Amsterdam outpost. The firm carries out less than 10 percent of its business in the EU but hopes to increase that figure, says managing partner Mark Thompson. "Brexit is the catalyst for us though—the opening of a Dutch office will head off the threat of losing EU staff in the wake of a 'No Deal.'"

Pragmatic architectural practices may adapt and even thrive following Brexit. But to lose the diverse experiences and perspectives contributed by people from the 27 remaining EU states would be a major blow to the culture and character of the architectural profession in the UK. ■

perspective**news**

[NEWSMAKER]

Susan Saarinen

BY LAURA RASKIN

"WELCOME TO my father's church." This is how Susan Saarinen commenced a lecture at Eero Saarinen's 1964 North Christian Church in Columbus, Indiana, where design professionals and enthusiasts gathered in late September for Exhibit: Columbus, an annual symposium on architecture, preservation, and art. Now in its third year, the event has brought renewed energy to the small city that has an abundance of architectural gems.

The daughter of the Finnish American architect Eero Saarinen and the sculptor Lilian Swann, Susan spent her early years at Cranbrook, in Bloomfield Hills, Michigan, where her grandfather, architect Eliel Saarinen, was the director. After resisting going into the family business, she came late to landscape architecture—a field that melds, she says, her love of natural materials and inherent design sensibility. She earned a Certificate of Landscape Design from Radcliffe College in 1986 and, in 1993, a Master of Landscape Architecture from the University of Colorado Boulder, near where she now lives and has her own firm. RECORD sat down with Susan in a rear pew at Eliel's First Christian Church (1942).

The 2016 documentary *Eero Saarinen: The Architect Who Saw the Future* seemed like a way for your brother Eric, the coproducer, to reckon with your father's workaholic tendencies, his divorce from your mother, and his early death at 51. Did you have a similar reckoning, professional or otherwise?

Eric had a very difficult relationship with our father. My relationship with him was not quite as difficult. That said, we both felt a great deal of pressure from the fame and the requirement of excellence that we grew up with. I wanted nothing to do with architecture because I didn't like concrete or steel or glass. But I loved my grandfather's architecture—it was brick and stone, and my grandmother's textiles made everything warm and soft and friendly. I was 30 when I came to the realization [that landscape architecture was right for me]. So there was a lot of resistance, but once I understood that design of a different sort fit me perfectly, then I began to embrace the ideas that I grew up with in terms of design, drawing, balance, and proportion—things that started to come back into my consciousness.

We kind of lost our parents early: my mother was in a TB sanatorium for two years, and my father was working; then they divorced, and then my father's death happened. There was a lot of losing along the way. It's been both a tough journey and a strengthening one, and I'm so happy to see my brother come to terms with his early experience and to understand his father better now.

You're currently working on your memoirs. Why did you decide to write them, and how far along are you?

I'm probably halfway through. I went to Finland in 1995 to learn more about my family, and I realized that, not only were they very talented designers and artists, but they were also really good people, and I decided that I wanted to share that with the world. When I left for Finland, I thought my family was unique. I got to Finland and I went, "Wait a minute, it's Finnish!" When my family and I would walk into my grandfather's house in Cranbrook, we would walk into Finland.

You mentioned after your talk at Exhibit: Columbus that the redevelopment of the TWA terminal at JFK into a hotel is heartbreaking for you. What would you rather see happen?

I don't have an answer to that question, partly because I see the TWA building more as a sculpture, although it was a functional sculpture. If you chop off the back half of a sculpture, it's a changed piece. But I'd rather have it there with the back half chopped off than not at all.

Tell me a bit about your style as a landscape architect and about a favorite project.

My approach is to meet the needs of my clients, stick to climate-appropriate plantings, and design the landscape, garden, courtyard, or campus to fit with the surroundings at every scale, as my father and grandfather taught me. My style tends to be comfortable, clean, and somewhat curvilinear. My favorite project was to create a welcoming, accessible entrance to Foothills Art Center in Golden, Colorado, incorporating an event terrace, sculptures, seating, and lighting. It was a community project with wonderful participation and cooperation. ■

noted

Bloomberg HQ in London by Foster + Partners Wins RIBA Stirling Prize

The Royal British Institute of Architects has named the 10-story structure the United Kingdom's best building, marking the London-based firm's third win. A pedestrian street separates the two volumes of the 1.1 million-square-foot project, which is billed as the world's most sustainable office.

Inga Saffron and Robert Campbell Receive 2018 Vincent Scully Prize

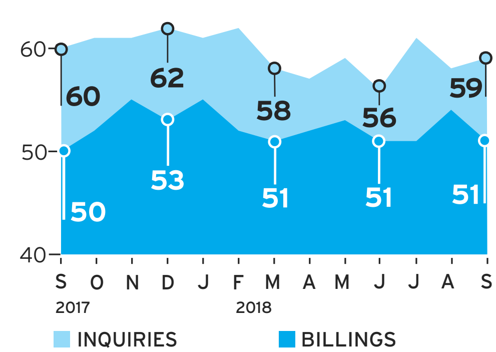
The National Building Museum honored the Pulitzer Prize–winning architecture critics (of the *Philadelphia Inquirer* and *Boston Globe*, respectively) with this accolade for exemplary practice, scholarship, or criticism in architecture, historic preservation, and urban design.

Zaha Hadid Architects Tapped to Design Concert Hall in Russia

ZHA won an international competition to design the new Sverdlovsk Philharmonic Concert Hall in Yekaterinburg, Russia. The project will include a 1,600-seat concert hall, a 400-seat chamber music hall, and a public plaza. The facility will serve as the home of the Ural Philharmonic Orchestra.

Nicholas Grimshaw Wins RIBA Gold Medal for Lifetime's Work

The British architect is known for modernist public buildings and infrastructure projects, including the International Terminal at London's Waterloo station and the Eden Project in Cornwall, England, an ecological attraction with dome-like ETFE-clad biomes.



Billings Rise for a Full Year

According to the AIA's most recent Architectural Billings Index data, billings have risen for 12 straight months. The ABI dipped from 54.2 in August to 51.1 in September, but scores over 50 indicate an increase in billings. The projects inquiries index rose by 0.8 point, while the design contracts index jumped by 4.5 points.

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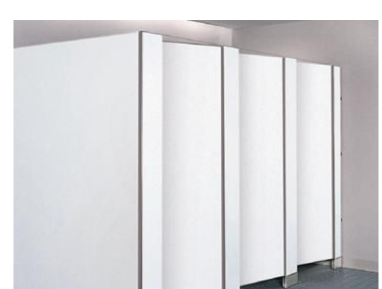

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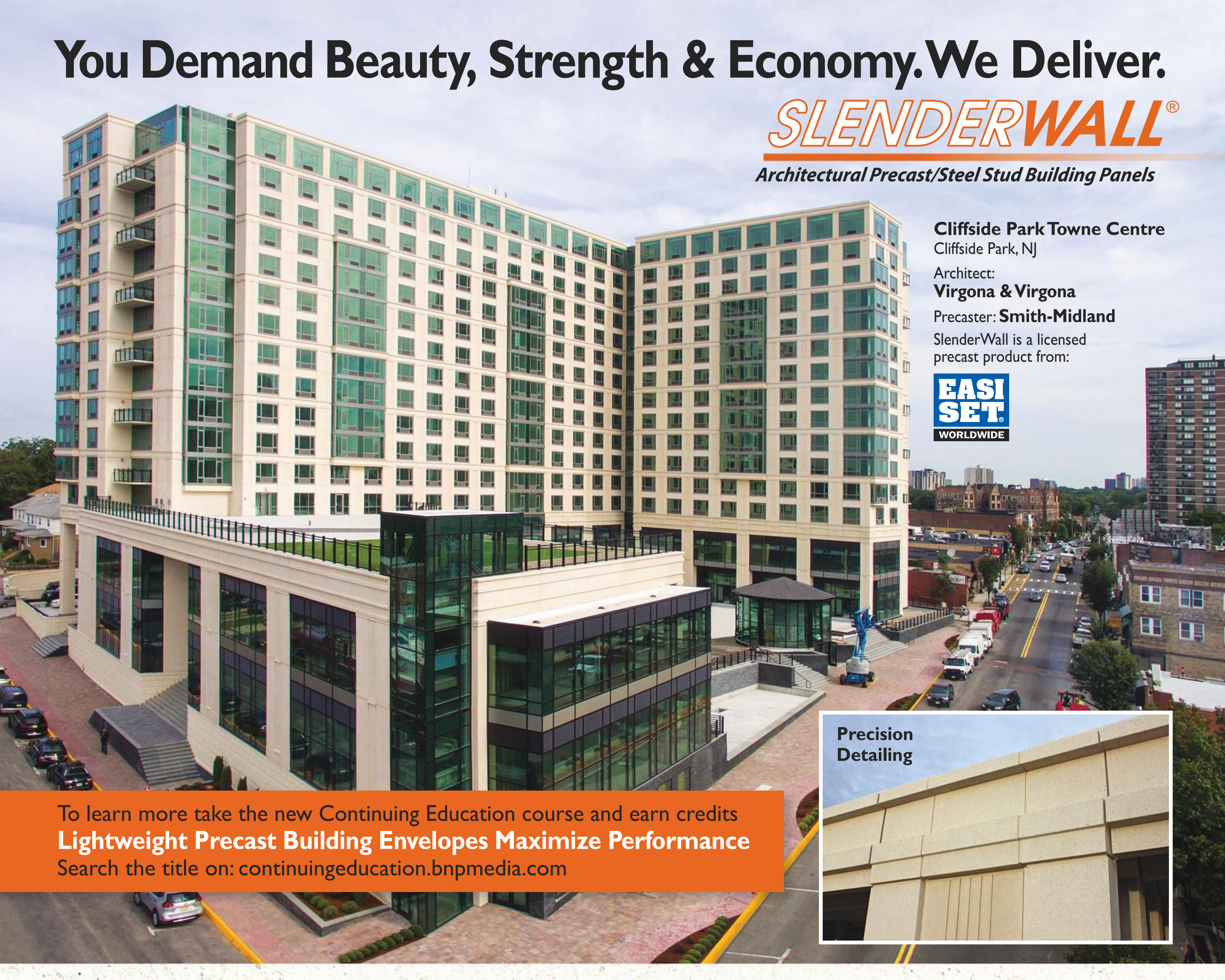

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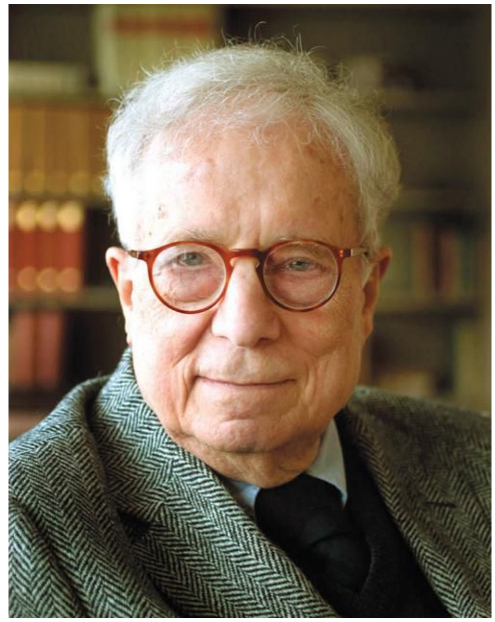
Robert Venturi: 1925–2018

BY PAUL GOLDBERGER



Robert Charles Venturi Jr. (above) died September 18 at 93. The house (below) designed for his mother Vanna in Chestnut Hill, Pennsylvania (1964), proved revolutionary.

"IF I HAD KNOWN that architecture is a performing art, I never would have gone into it," Robert Venturi once said to a colleague after a particularly grueling hearing before the Fine Arts Commission in Washington, D.C. That hearing resulted in the evisceration of several key elements of his design for Western Plaza (1980; later named Freedom Plaza) on Pennsylvania Avenue. The truth is that Venturi was not a performer. He was not a showman, and he was not a celebrity architect. He was a quiet, thoughtful man who loved music, Rome, books, and tranquility. Ada Louise Huxtable once referred to him as the "guru of chaos" because of his love of vernacular architecture and the American commercial strip, but Huxtable mistook Venturi's intellectual interest in the visual disarray of the cityscape for a personal quality that he did not have at all. In his own life, he was a contented intellectual who preferred pondering the implications of unruliness to making it; his own buildings were highly studied, mannered commentaries on the vernacular, and they tended to appeal more to the tastes of the cognoscenti than the masses.

That was but one of the paradoxes of Venturi, who died on September 18 at the age of 93—one of the most famous architects in the world, and one of the most misunderstood. (Read more about his life and projects at architecturalrecord.com/venturi.) He was known, first, for *Complexity and Contradiction in Architecture*, the 1966 treatise that Vincent Scully famously called "the most important work on architecture since Le Corbusier's *Vers Une Architecture*, of 1923," which was followed by *Learning from Las Vegas*, written with his wife and partner, Denise Scott Brown, and their colleague Steven Izenour. *Complexity and Contradiction* set out a cogent argument against the limits of the modernist aesthetic and helped to launch the Postmodern movement; *Learning from Las Vegas* argued for the importance of signs over space, and classified buildings into what Venturi and Scott Brown memorably called ducks or decorated sheds. More presciently, the book offered the beginnings of a rationale for the importance of media and electronic signage as makers of architectural form.

Yet few things annoyed Venturi more than being thought of as a theorist first and an architect second—unless it was to be called the father of the Postmodern movement, much of which he rejected as superficial and silly. He thought of himself as a modern architect, just one who embraced a far wider range of influences than orthodox modernists had, and who tried in his work to show the qualities of, yes, complexity and contradiction that he had perceived in the great architecture of the past that he so loved. But the one thing he would never do was mimic what had come before. He believed, in his own way, always in making it new.

My own professional life as an architecture critic began with Bob and Denise, whom I met through the good graces of Scully, my professor at Yale. In 1971, when I was a junior, he encouraged me to do something absurd—to propose a piece on these architects (at that point barely known outside the profession) to *The New York Times Magazine*. Bob and Denise received me graciously—I did not have much street cred yet as a journalist, but I was Vince's student, so it was okay. They talked with warmth and candor about their work, about their lives in Philadelphia, and about the firm that was just beginning to be known for more than Venturi's book. Venturi had described *Complexity and Contradiction* as a "gentle manifesto," and that exquisite phrase, with its knowing contradiction, perfectly sums up the combination of refinement and determination that he possessed. His thinking was as radical as his manner was kind; His son Jim reminded friends at a family service after his death that his mother, Vanna, for whom Venturi designed the unforgettable little green cottage that came to be an icon of 20th-century architecture, was a pacifist and a socialist who loved Bertrand Russell and George Bernard Shaw.

Our first meeting for that *Times* article was so long ago that *Learning from Las Vegas* had not yet been published—it would appear soon thereafter—and Scott Brown was not yet widely recognized as Venturi's equal in thought. (Another sign of how long ago it was is that, when the piece was published, the copy editors at *The New York Times* changed all my references to "Scott Brown" to "Mrs. Venturi," which now makes me cringe.) The *Times*'s sexism regardless, not the least of the reasons the piece was notable is that it made an effort to treat the two of them as true partners. It would take a long time for the world to agree: 20 years later, in 1991, Venturi alone was awarded the Pritzker Prize. It was not until 2015 that the AIA saw fit to give him its Gold Medal, happily this time along with Denise Scott Brown. (By then the AIA had changed its rules to allow partners to share the award, a change brought on in part by supporters of Venturi and Scott Brown, who did not want to see the AIA compound the error of the Pritzker.) The AIA understood that, while Robert Venturi was the greatest mannerist of our age, his career could not have unfolded as it did without Denise Scott Brown, and that together they had truly figured out a new way of seeing—one shaped by irony, technology, realism, wit, and connoisseurship.

It is possible that, of all his work, only his mother's house will last in the canon of key architectural works of our time, although I think that several others, including the Fire Station #4 in Columbus, Indiana (1968), the Sainsbury Wing of the National Gallery of Art

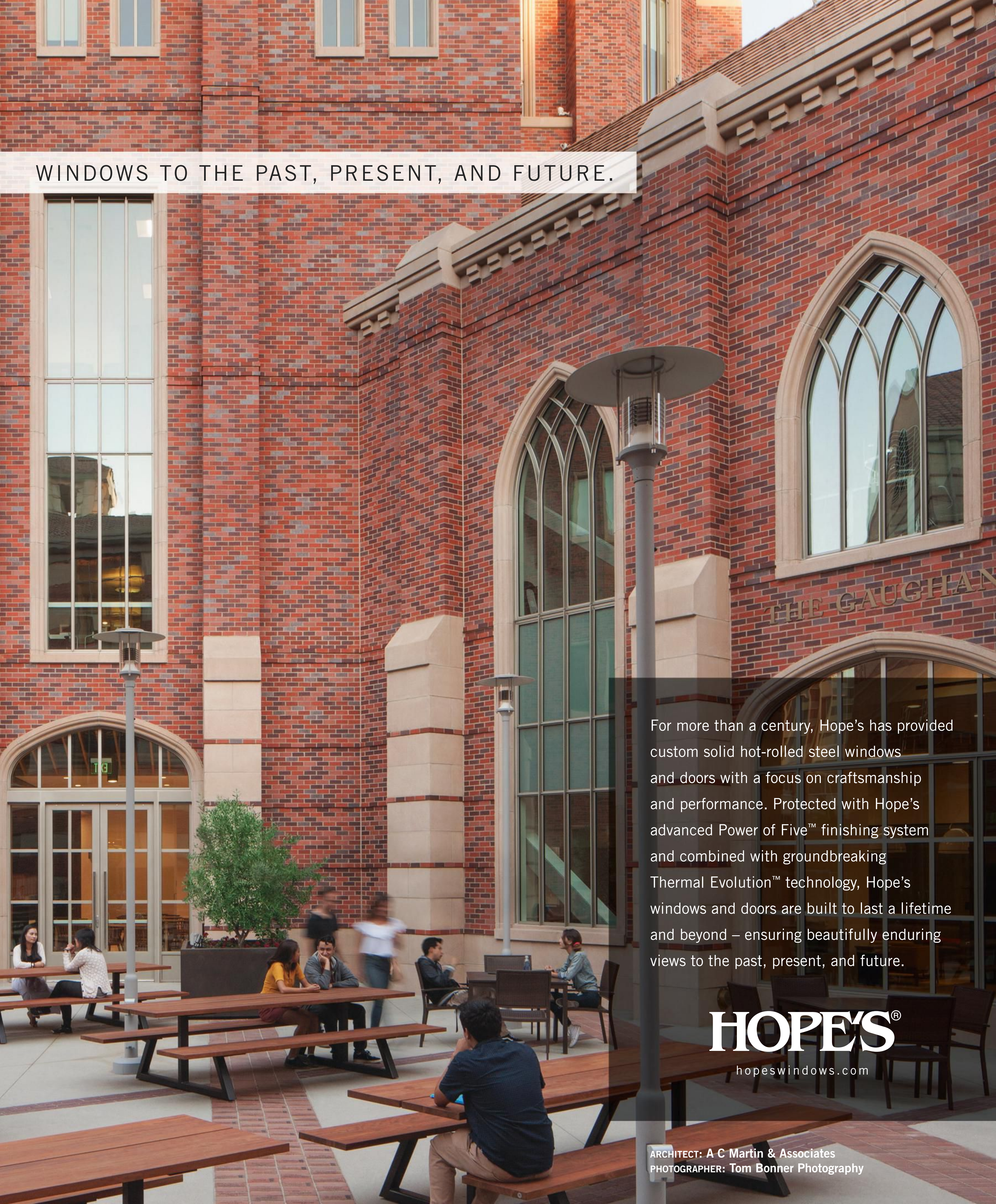
PHOTOGRAPHY: © FRANK HANSWIJK (TOP); CAROL M. HIGHSMITH, LIBRARY OF CONGRESS (BOTTOM) in London (1982), the Children's Museum of Houston (1992), the Carll Tucker III house in Westchester County, New York (1975), and the Trubek and Wislocki houses in Nantucket (1971) deserve places there as well. So do a few unbuilt projects, like the "Bill-Ding-Board," a brilliant proposal for the National Football Hall of Fame that envisioned a merger of electronic media and architectural form. Venturi designed that in 1967, long before Elizabeth Diller and Ric Scofidio built their architectural practice around what the MacArthur Foundation, in 1999, called a combination of "design, performance and electronic media." By the same token, Venturi showed us, long before Frank Gehry designed his famous house in Santa Monica (1978), that purism could take us only so far, and that there could be—that there had to be—a richer, more emotionally resonant form of modernism that acknowledged the architecture of the past, even as it moved beyond it.

Venturi is shown circia 1968 with his partner and wife Denise Scott Brown (above). The firm's Children's Museum of Houston (right) opened in 1992.

PHOTOGRAPHY: © ROLLIN LAFRANCE (LEFT); MATT WARGO (RIGHT)

Despite its surface playfulness, Venturi's architecture always had an air of intellectualism that prevented it from being as wildly popular as Gehry's would become—which is a great sadness, because Gehry stands, in part, on the shoulders of Venturi's modernist critique. Venturi's sheer love of buildings, his brilliant eye, his understanding of the street, his wry wit combined with his glorious enthusiasm, his belief that the ordinary things we build can tell us as much about who we are and what we want as any monuments we erect—all these still matter. They matter in the way they did when *Complexity and Contradiction in Architecture* was first unleashed upon the world. Venturi's influence is vast, and deep. His architecture will resonate beyond our time, just as *Complexity and Contradiction* and *Learning from Las Vegas* are books that will be read again in each generation, to new meaning. Joan Didion once said, "The everyday is all there is." Robert Venturi showed us what this concept meant for architecture and the profound understanding, the noble aspirations, and the civilizing instincts that lay within it. ■

Paul Goldberger is a New York–based architectural critic and author.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ARCHITECT: A C Martin & Associates
PHOTOGRAPHER: Tom Bonner Photography

perspective **house of the month**

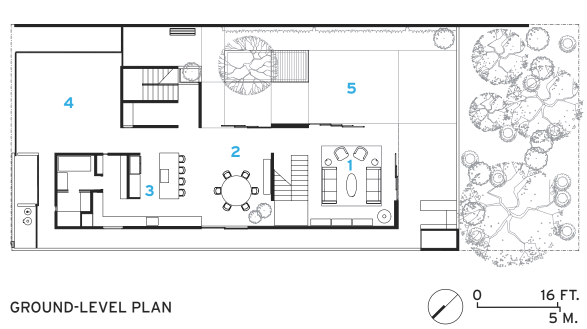
A MEXICAN ARCHITECT DESIGNS A PERSONAL HAVEN FOR HIS YOUNG FAMILY IN TIJUANA. **BY ALEX KLIMOSKI**

The house's most prominent material is ipé, which wraps around the exterior (top), and interior ceilings (left and above). The living and dining spaces spill out to a semi-enclosed patio, hidden from the street and neighboring residences (above).

PHOTOGRAPHY: © ONNIS LUQUE

IN 2004, dangerous living conditions prompted architect Jorge Gracia and his wife to move from Gracia's hometown of Tijuana to San Diego to raise their young family; there, Gracia, a 2012 Record Vanguard choice, established his own practice. The once-notorious border town has since sought to shed its reputation for drug violence and raucous spring break parties, positioning itself as a burgeoning tech hub. With the idea of founding a new graduate school for architecture there, as well as a second office, Gracia returned with his family in 2016, in need of a house for two by then adolescent children and a new baby on the way.

For the site, Gracia chose a lot in a newly developed yet largely vacant residential neighborhood. Citing a Midcentury Modern influence for the house's rectilinear form, the architect clad the two-story steel-and-concrete structure's upper level—portions of which are cantilevered—with ipé. The ipé extends to the interior, covering the ceilings to provide a warm contrast to exposed-concrete walls. Given the lack of views, says Gracia, it was important to create a personal oasis, hidden from the neighbors and the street: a lush, walled-off, rear patio is linked to the interior via fully glazed sliding doors that wrap around the living and dining rooms. Two discreet entrances—tucked away in a side alley or inside the ground-floor garage—enhance a sense of privacy. In addition to providing seclusion, these informal entries offer insight into Gracia's personal design philosophy, which eschews spatial hierarchy: "There's no distinction in social class," he says, "and I like that." ■



1 LIVING ROOM
2 DINING AREA
3 KITCHEN
4 GARAGE
5 PATIO

GROUND-LEVEL PLAN

Ultra-efficient DC Motor | 2 or 3 Blades | Nickel, White or Dark Finish | Solid Color, Wood Grain or Clear Blades | Optional LED Lighting


Fields Residence, Downers Grove, IL   Architect: Kuklinski+Rappe Architects   Installing contractor: Complete Flashings
General contractor: Roberts Design & Build   Photography: ©Tom Harris   Profile: Redi-Roof   Color: Weathered Zinc

ARCHITECTURAL RECORD

Guess the Architect Contest

ENTER NOW!

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

CLUE: **THE ARCHITECT FOR THIS UNIVERSITY BUILDING LEFT AN INDELIBLE STAMP ON THE CAMPUS OF HIS ALMA MATER THROUGH THE CONSUMMATE EXPRESSION OF A COLLEGIATE GOTHIC STYLE. THE VERTICAL AND HORIZONTAL MASSING OF THIS PARTICULAR EXAMPLE, WITH AMPLE STONE CARVING AND LEADED WINDOWS, ASSURED ITS ENDURING POSITION AS A LANDMARK.**

The architect for Lafayette Park in Detroit in the October issue's contest was **Ludwig Mies van der Rohe,** who completed the urban-redevelopment project in 1959. The mix of townhouses and court houses with high-rise apartment buildings, plus a school, retail space, and a park on its 46 acres, helped guarantee its success.

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

PHOTOGRAPHY: © MICHAEL MARSLAND (TOP); MICHELLE AND CHRIS GERARD (BOTTOM)

JUNYA ISHIGAMI FLOATS A DARING STRUCTURAL SCHEME FOR A NEW JINS EYEWEAR SHOP IN SHANGHAI. **BY NAOMI R. POLLOCK, FAIA**

PHOTOGRAPHY: © EIICHI KANO

While seeming to defy gravity, a series of cantilevered concrete counters provide a visually open, uncluttered environment within a new JINS Eyewear shop designed by Junya Ishigami at the Shanghai World Financial Center.

LOCATED WITHIN the Shanghai World Financial Center (SWFC), a new shop for the Japanese company JINS Eyewear designed by Tokyo-based architect Junya Ishigami has neither street frontage nor facade. It doesn't even have a front door. Instead, the entrance opens completely to the building's internal mall, with shutters for nighttime security. In effect, the public corridor serves as the shop's circulation, since customers must exit into it to move between the counters—thick slabs of concrete that appear to float effortlessly above the floor. Creating a fluid retail space, these suspended surfaces enable people to roam freely with unobstructed views of the inventory: 1,000 pairs of trendy frames.

There are five concrete counters, measuring 26, 36, or 39 feet long; three are designated for display, while the other two are for the sales and "while-you-wait" assembly of the glasses. Mirrors and an eye-exam area hug the rear walls, with a back office occupying the only enclosed space.

"Normally in retail shops, the interior design is just surface treatments and furniture," says Ishigami. But this shop consists of elements that are architectural in scale and materiality, and were made by a conventional building contractor. More than skin-deep, these components needed their own supports, since the SWFC's existing structure could not be touched. Ishigami rose to the challenge by incorporating a self-contained prestressed system, reinforcing the cantilevered counters with H-beams that connect to additional H-beams, which he'd embedded in the wall. In turn, these are welded to an expansive steel sheet that sits on top of the entire shop floor. Bowed slightly, this heavy plate offsets the weight of the 10-inch-thick poured-in-place-concrete counters.

More architectural fit-up than room furnishing, the counters hover 32 inches off the floor and are lit from above by suspended luminaires emitting a cool 4,000-Kelvin color temperature. This strong light accentuates the eyewear as well as the shop's spare interior. Enclosed by chalky mortar walls and exposed piping overhead, it is a stark contrast with the bright colors and garish signage of the neighboring stores. "I wanted to make a void space within a shopping mall," says Ishigami.

This unexpected and unprecedented scheme aptly represents the JINS mission of producing "eyeglasses that create personality." For creating their boutiques—as well as their eyewear frames—JINS routinely hires independent designers. "I prefer working with architects on a space because they make more of an impact," explains JINS founder and CEO Hitoshi Tanaka. The fashion-forward company strives to keep up with the latest styles—and, of course, that could mean that, after five years, even a shop as original as Ishigami's will need a fresh look. ■


ELEVATOR →
RESTROOMS →
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Off the Wall

Drawing on Architecture: The Object of Lines, 1970–1990, *by Jordan Kauffman. MIT Press, 361 pages, $34.95.*

Reviewed by George Baird

AUTHOR JORDAN KAUFFMAN documents an important moment in recent history when architecture reasserted its cultural status through the showcasing of particular drawings. The episode begins in 1972 with the publication of *Five Architects*, which introduced the work of Peter Eisenman, Michael Graves, John Hejduk, Richard Meier, and Charles Gwathmey, and ends with the 1988 *Deconstructivist Architecture* exhibition at the Museum of Modern Art (MoMA). The significance of *Five Architects* for Kauffman is that, while many of the projects included were intended to be built, they were mostly illustrated by abstract, graphic drawings. The 1988 exhibition, with guest curators Mark Wigley and Philip Johnson, "displayed the drawings with reference to the creation of buildings, not as independent" artworks. (After 1990, as Kauffman's title indicates, computerization gradually reduced the significance of hand-drawing altogether.)

Significant milestones in Kauffman's 20-year history are the exhibition *The Architecture of the École des Beaux-Arts* at MoMA in 1976 by curator Arthur Drexler, and three pioneering exhibitions mounted at the Leo Castelli Gallery between 1978 and '84 that offered architectural drawings for private sale, through which they came to be viewed as artworks and began having a monetary value independent of the buildings they depicted. Kauffman documents this in detail, including prices for drawings and personal interviews with such key players as Kristin Feireiss, who founded the Architecture Forum Aedes in Berlin in 1980; John Harris, curator emeritus at the Royal Institute of British Architects; Barbara Jakobson, organizer of the Castelli exhibitions; and Max Protetch, the owner of the gallery that became the longest-lasting exhibitor and dealer of such drawings. Despite this thoroughness, the result is not completely satisfactory. While the book is sumptuous and extensively illustrated, only the reproductions of individual drawings stand out; the numerous photographs of exhibition installations are disappointing, since the drawings are barely visible.

Even though this period enhanced the cultural stature of architectural drawings, their content was sometimes criticized from a political perspective. The third Castelli show included drawings of historicist garden follies designed by Quinlan Terry for the country estate of the then deputy chairman of Britain's Tory party. Kauffman relates that a "humorous inscription" suggested that the funds used to build them "would otherwise have fallen to" the government. This kind of attitude, during a time when Margaret Thatcher was gutting public services to benefit her wealthy backers, did not go unnoticed by American critics, who, Kauffman writes, also gave "scathing" reviews to the show's follies catering to the "idle rich" in Reaganite America.

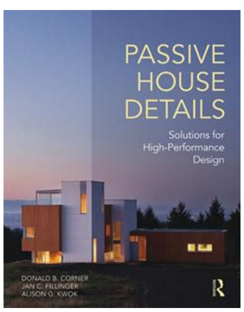
Perhaps the most positive legacy of the period was the establishment of new institutions devoted to architectural culture, such as the Canadian Centre for Architecture in Montreal (founded in 1979), the Architecture Forum Aedes, and the German Architecture Museum in Frankfurt (established in 1983). All have gone on to make major international contributions to this discipline. ■

George Baird is an architect, educator, and author based in Toronto.

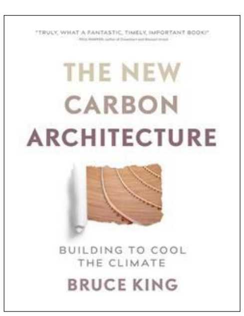
Green and Greener: Nature, Health, and Sustainable Design

Reviewed by Michael Cockram

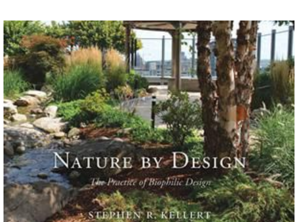
Healthy Environments, Healing Spaces: Practices and Directions in Health Planning and Design, *edited by Timothy Beatley, Carla Jones, and Reuben Rainey. University of Virginia Press, 296 pages, $70.*
Beginning from the stance that health is more than just the absence of disease, the book's dozen essays illustrate how we can design environments in which people thrive in mind and body. The editors address a range of issues such as the benefits of exposure to nature, access to various modes of transportation, and planning cities for healthy food systems. They discuss "evidence-based design" founded on, for example, research in the Netherlands showing that "disease clusters" are more prevalent in neighborhoods lacking access to green space. The book is a valuable primer for designers and planners concerned with shaping environments that foster well-being.



Passive House Details: Solutions for High-Performance Design, *by Donald B. Corner, Jan C. Fillinger, and Allison G. Kwok. Routledge, 332 pages, $49.95.*
For Passive House, the high-performance building-certification system developed in Germany, achievement is in the details. The standard's stringent energy-use requirements necessitate a superinsulated, extremely snug envelope. As Passive House gathers momentum in the U.S., this timely guide should help building professionals in improving efficiency. More than a collection of strategies, the tightly organized book lays out the principles of Passive House and illustrates how to attain the energy targets with clearly detailed graphics and an array of case studies from different climates, site conditions, and architectural styles.



The New Carbon Architecture: Building to Cool the Climate, *by Bruce King and others. New Society, 176 pages, $29.99.*
Climate change has sparked exploration of how future technologies could extract and store carbon from the atmosphere, but the authors of this collection take the position that a solution already exists in plants, which absorb and retain carbon for the life of the plant-based material. For example, they discuss the potential of mass timber and components made of straw and other agricultural by-products to lock up the embodied carbon—the carbon emitted during the life cycle of a building from material manufacture through demolition. Although the book would have benefited from more in-depth case studies, it succeeds in refocusing the debate beyond energy efficiency to sequestered carbon, a topic that will become more critical as the earth warms.



Nature by Design: The Practice of Biophilic Design, *by Stephen R. Kellert. Yale University Press, 224 pages, $35.*
The late Stephen Kellert, a professor of social ecology at Yale University's School of Forestry and Environmental Studies, took a thoughtful look at architecture through the lens of biophilia—our affinity for nature and the processes of life. His premise, that biophilic design is essential to creating desirable human habitats, is supported by research showing that people are healthier and more productive when built environments have a direct connection to nature—or even an indirect one, through use of natural materials, art, and organic forms. Compelling photos and line drawings of historic and contemporary examples reinforce the argument and appeal to various audiences. ■

CERSAIE 2018

Bologna, Italy's annual trade show, held in September, showcased a welcome return to color, pattern, and texture, along with technology-driven larger formats.

By Linda C. Lentz

Dark Edition

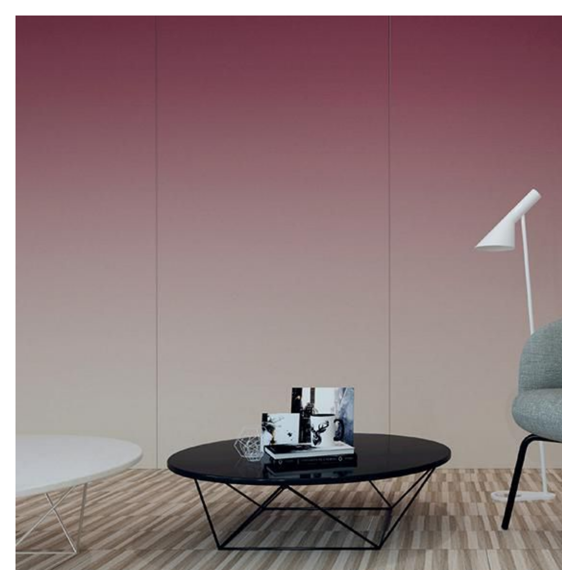
These digitally printed ceramic "wallpapers" from ABK's Wide&Style collection evoke the comforts and charms of an Italian nonna's home, but in the form of durable ¼"-thick porcelain slabs as large as 5¼' x 10½'. The series of lush nature motifs includes Sicily (left), Wild Berry, Tropicana, Rain Forest, and Papillion.
abk.it

Shades

A contemporary variation on traditional majolica, this line by Milan-based designer Gordon Guillaumier for Ceramiche Piemme captures deft watercolor effects and textures with digital printing on high-performance porcelain tiles and slabs. The urbane color palette ranges from shades of white, beige, and gray to rich earth tones, blues, and black.
ceramichepiemme.it

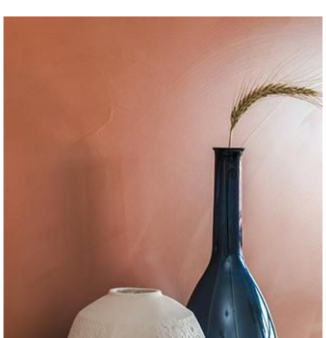
Pittorica

Designed by the Milan-based Studiopepe for Ceramica Bardelli, these rectified indoor tiles are made of glazed stoneware with a silky finish. Available in a range of solid colors and three shapes—10" square, 2½" x 10" rectangle, 10" x 10" x 14" triangle—Pittorica can be arranged to create myriad patterns on floors and walls.
ceramicabardelli.com



Gradient

D-Segno Studio's Davide Tonelli developed the ombre effect of these porcelain-body wall slabs, for Ornamenta, based on current Pantone hues. Measuring 4' x 8' at about ⅓" thick, the line comes in five chromatic blends, including Sand (above), all in a natural finish.
ornamenta.com



Creos

Ceramiche Refin captures the sensuous sheen and slightly irregular hand of a resin finish in this versatile group of ¼"- to ⅓"-thick large-format tiles and porcelain slabs. Sizes range from 2' x 2' up to 4' x 9'. Colors, for walls only, include coral (above), teal, and lime green. Neutrals for floor and wall round out the line.
refin.it

3D Wall Design

This range of white-body ceramic wall reliefs by Atlas Concorde includes the new 3D Twist, in Sage (left). Inspired by braided ropes on moored boats, this three-dimensional wall surface comes in three rectified formats and four colors, including white, in matte and gloss finishes.
atlasconcorde.com

products Ceramics of Italy

Titan
Over is a new brand specializing in large-format porcelain stonewear slabs at Fincibec, and Titan is among the first of its offerings. Mimicking the appearance of concrete and popular metals like Corten (shown), Titan is available in 4' x 8½' and 5¼' x 10½' formats, at approximately ¼" and ½" thicknesses, respectively. Appropriate for indoor and outdoor applications in residential and commercial projects, this versatile material can even be used as cladding.
overfincibec.it

Kuro
The Emilgroup's Viva brand has taken its design cues from Japan's Yakisugi charred-wood preservation techniques to develop Yaki, its new interior collection. There are two plank sizes–8" x 48" and 4" x 12"–and four finishes. Kuro (above) resembles the deep black of burnt cedar, while Shiro has the look of scorched wood with a coat of white paint. Beju appears burnt and brushed; Guré simulates burnt, brushed wood painted gray.
emilgroup.it/viva

Dot
Fioranese Ceramica collaborated with architect Andrea Maffei to develop this unique interpretation of a popular reinforced-concrete surface in three shades of through-body gray porcelain. Available in 24"-square and triangular shapes as well as 12" x 48" and 24" x 48" formats, Dot is only appropriate for wall applications. To compensate, the company offers plain coordinating field tiles for floor use.
fioranese.it

Slimtech Delight
While stone lookalikes in porcelain are not new, advanced printing technologies are enabling manufacturers to offer larger slabs with more realistic detail and options such as book-matching and continuous chained veins. Delight, from Lea Ceramiche's Slimtech range, features realistic Marquina Nero, Calacatta Oro, and Venato Bianco (right) designs. These are approximately ¼" thick and come in three sizes: 48" square, 48" x 102", and 2" x 48". A traditional glossy, and two matte finishes, are available.
ceramichelea.it

Artwork
Designed to emulate an array of terrazzo techniques–surfaces found in Venetian palazzos, Art Deco hotels, or Memphis-style apartments–Artwork, from Florim's Casa Dolce Casa-Casamood brand, is a collection of through-body porcelain tiles and slabs, 12 with glasslike inserts, in a choice of five formats, two thicknesses, seven colors, and three particulate sizes–micro, basic, and macro. Glossy and matte finishes are available.
florim.com/en/casadolcecasa-casamood

The Menil Drawing Institute | Houston | Johnston Marklee

Sculpted Form

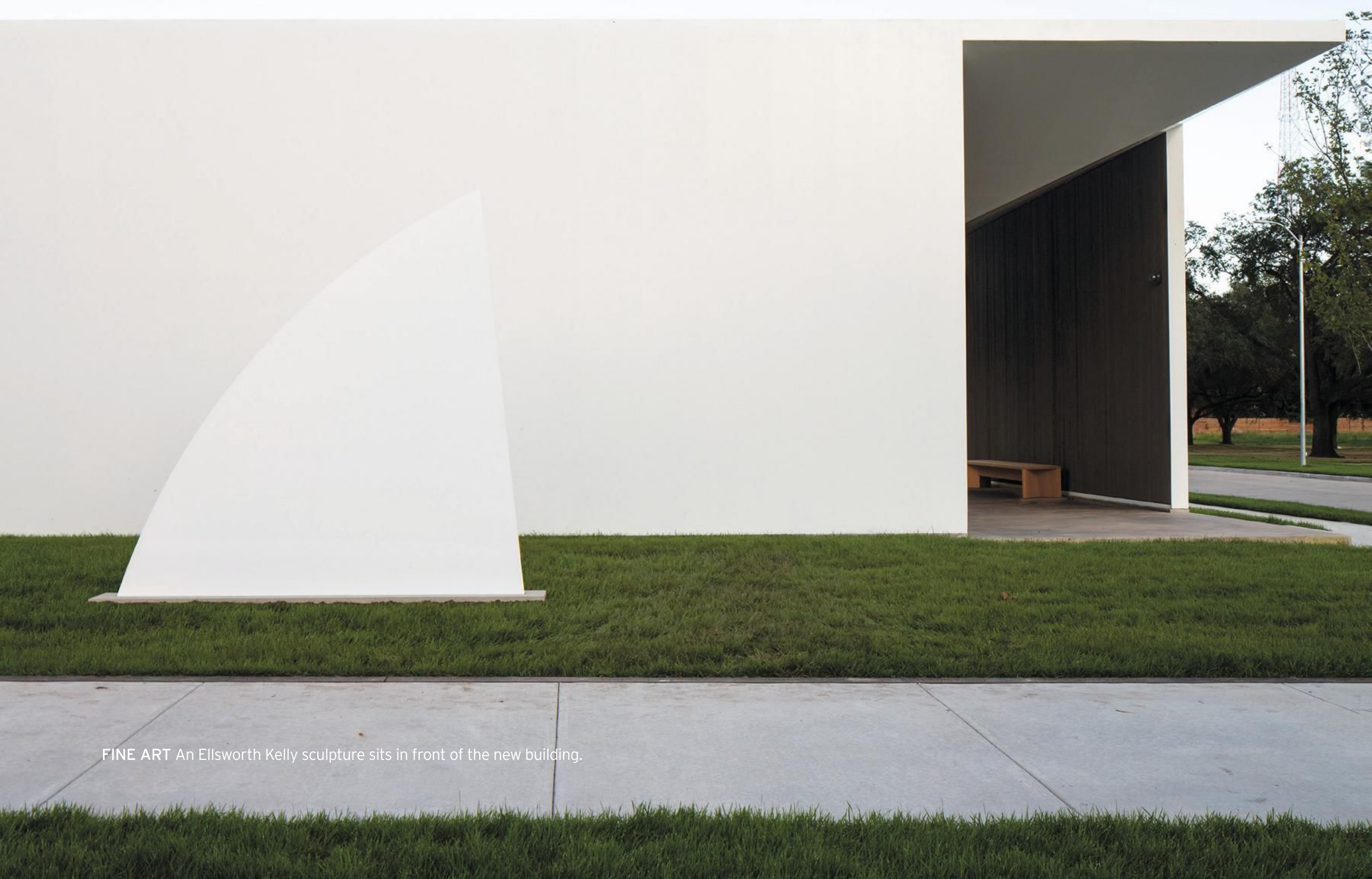
The Menil Collection welcomes a new addition.

BY JOSEPHINE MINUTILLO

PHOTOGRAPHY BY RICHARD BARNES

There's been a lot happening at the Menil Collection's art campus in Houston. The newly renovated main building, designed by Renzo Piano in 1986, which reopened to the public in September, displays recently acquired work by contemporary artist Leslie Hewitt. Her white powder-coated sheet metal sculptures, folded and bent at different angles, are particularly arresting in this setting. Just a few yards away is another new addition to the campus that bears a striking resemblance to those minimalist forms, the Menil Drawing Institute.

Opening this month, this is the first freestanding building in the U.S. dedicated to modern and contemporary drawing. Designed by Los Angeles–based Johnston Marklee, it is a stunning composition of bent steel that is outwardly subtle but at



FINE ART An Ellsworth Kelly sculpture sits in front of the new building.

moments quite dramatic. The long, low structure sits opposite and slightly east of Piano's building. Johnston Marklee's design takes cues from Piano's then revolutionary structure—wood cladding; top-lit spaces; an in-between scale that, at 16 feet tall, is slightly lower than Piano's and slightly higher than the nearby houses. But it achieves a quiet monumentality through radically different measures from Piano's elaborate, now instantly recognizable, detailing.

In some respects, the new structure is more akin to sculpture than architecture. In a rare type of constructon, vertical walls and sloping canopies that hover over two exterior courtyards are composed of an assembly of welded ½-inch- and ⅝-inch-thick white-painted steel plate, reinforced every 2 feet with internal steel-plate stiffeners that appear like thin ribs, and additional steel box beams, forming a rigid frame. The building's structural engineer, Guy Nordenson, likens those roofs, inclined 66 degrees from the wall, to "floating Richard Serras."

This comparison should not be surprising, given that the architects, Sharon Johnston and Mark Lee, have a strong affinity for, and often collaborate with, contemporary artists. As directors of last year's Chicago Architecture Biennial, they presented work that blurs the line between disciplines. As builders, they've completed a series of bold and sculptural—in the more typical sense—houses.

The 30,150-square-foot Drawing Institute, Johnston Marklee's most significant work to date—they recently revamped the interior of Chicago's Museum of Contemporary Art—has the scale of a large house. In fact, Lee cites the single-story Houston residence that Philip Johnson configured around a courtyard for art patrons John and Dominique de Menil (1950) as a strong influence on their design.

Like this surprisingly petite brick de Menil house a couple of miles away, the museum buildings Dominique began to commission long after John's death reflect both her desire for viewers to have an intimate relationship with art, and for the 30-acre Menil Collection campus to respect the overall small scale of the residential neighborhood in which it is located.

Though the streets here are lined with prewar bungalows, the exception was a hulking apartment complex on the site where the new Drawing Institute now sits. (Houston is notori-

ABOUT FACE The textural Port Orford cedar contrasts with the smooth, white-painted steel plate along the building's facades (top and opposite, top). The East courtyard features tropical plants (left). An octagonal ottoman near the entrance was inspired by a prized piece of furniture couturier Charles James designed for the de Menils (opposite, bottom).

ous for its lack of zoning restrictions.) When that building came up for sale, the Menil Collection grabbed it for fear something even bigger would be built there, impeding daylight from entering Piano's famous light scoops and destroying the rapport with the other structures, which include: the Cy Twombly Gallery (1995, also by Piano); the Rothko Chapel (1971, by Philip Johnson, Howard Barnstone, Eugene Aubry); a concrete pile that originally displayed a Byzantine fresco (1997, designed by John and Dominique's son François de Menil), and a 1930's grocery store that now houses a Dan Flavin installation, as well as several large-scale sculptures. There is also a bookstore and a bistro in two of the bungalows, one of which was preexisting, the other newly constructed by Houston-based Stern and Bucek. Razing the apartment building allowed the institution to reorganize its grounds. It hired David Chipperfield to do a master plan, which inserted a new street and more green space. "You can still meander—you just can't get lost," says Menil Collection director Rebecca Rabinow.

In 2012, Chipperfield's firm, along with SANAA and Tatiana Bilbao, competed with Johnston Marklee to design the Drawing Institute, which, like all the other buildings, is free to the public. But, unlike most of the other buildings, this one has a number of spaces for more than just the display of art. Aside from a 2,800-square-foot gallery, it comprises strong research and conservation components. There are spaces that feel domestic, religious, and, yes, even institutional.

The simple plan includes two offset rectangular blocks—the 31-by-91-foot gallery with two outdoor courtyards, one on either end on the south side; and, on the north, a conservation lab, library, offices, a seminar room, a wood-lined salon, and restrooms (clad to striking effect in the same Vermont marble that is arranged in hefty slabs on

credits

ARCHITECT: Johnston Marklee

ENGINEERS: Guy Nordenson and Associates, Cardno Haynes Whaley (structural); Stantec (m/e/p); Lockwood Andrews Newnam (civil); Simpson Gumpertz & Heger (building envelope)

CONSULTANTS: Michael Van Valkenburgh Associates (landscape); George Sexton Associates (lighting); Arup (acoustical, AV, and IT)

GENERAL CONTRACTOR: Gilbane Building

CLIENT: The Menil Collection

SIZE: 30,150 square feet

COST: $40 million

COMPLETION DATE: November 2018

SOURCES

STEEL CANOPIES: United Structures of America

SKYLIGHTS: Super Sky

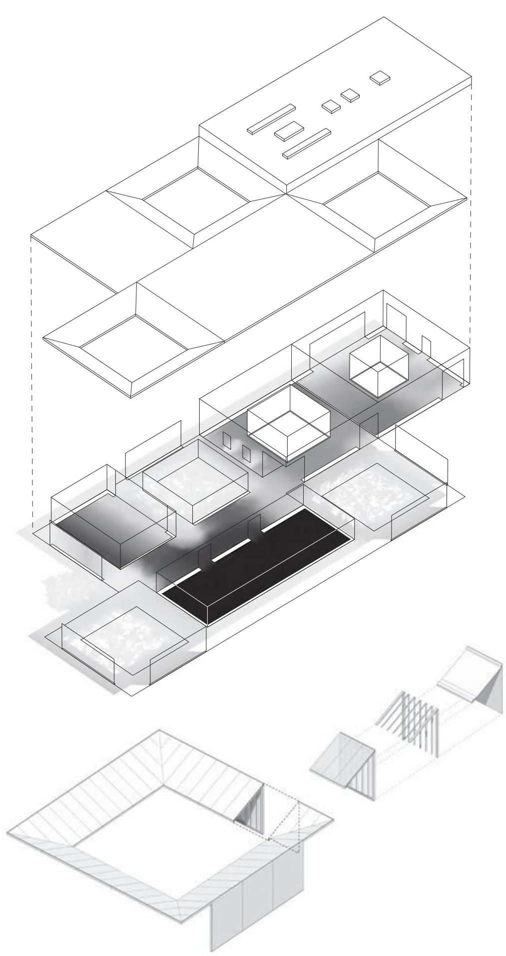
VERTICAL WOOD SIDING: G.R. Plume Company

WOOD FLOORING: Woodwright Hardwood Floor

ACOUSTICAL CEILINGS: Pyrok

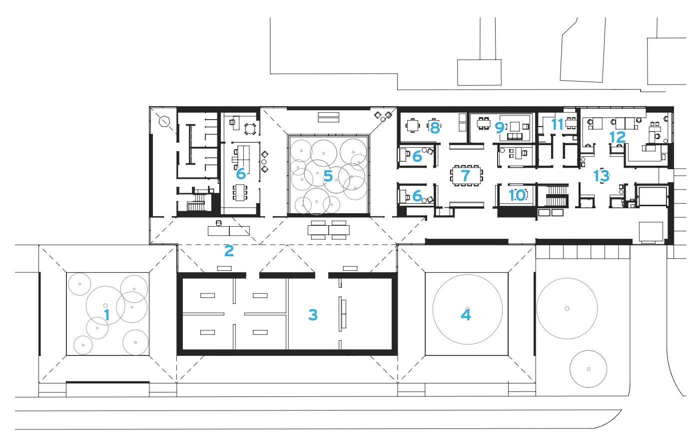
MECHANIZED SHADING: Mecho

CARPETING: Kasthall

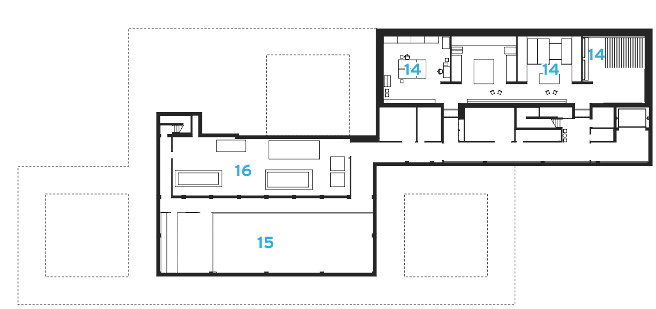


SPATIAL & STRUCTURAL DIAGRAMS

1 ENTRY COURTYARD
2 LIVING ROOM
3 GALLERY
4 EAST COURTYARD
5 SCHOLARS' COURTYARD
6 OFFICE
7 DRAWING ROOM
8 SALON
9 COLLECTOR ROOM
10 SEMINAR ROOM
11 BREAK ROOM
12 CONSERVATION LAB
13 LIBRARY ATRIUM
14 ART STORAGE
15 NON-ART STORAGE
16 MECHANICAL

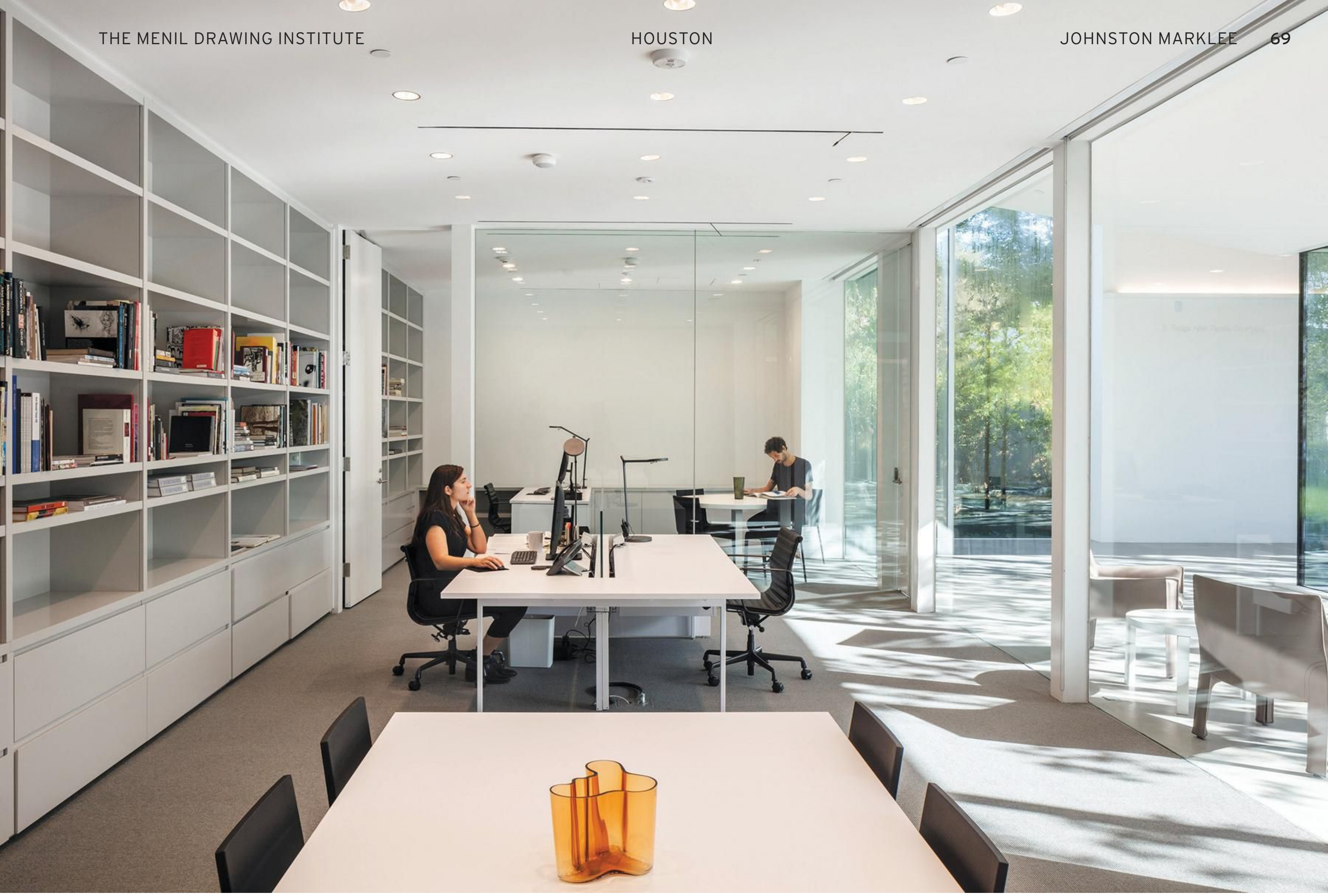


FIRST-FLOOR PLAN



BASEMENT PLAN

0 30 FT.
10 M.



SHADOW AND LIGHT The entry courtyard features slabs of Vermont marble (opposite). The interior scholars' courtyard brings dappled light to the offices and study areas around it (above and right).

the ground of the entry courtyard), as well as a third, interior courtyard.

The gallery is dimly lit, to preserve the delicate works on display. Though it contains two windows, they are covered up for the inaugural exhibition of drawings by Jasper Johns. From the exterior, the glass appears like long mirrors facing the entry courtyard on one side and the east courtyard—planted with tropical trees and shrubs, more similar to the gardens in Piano's main building—on the other.

The 12-inch-wide European white oak floorboards of the gallery are carried through to what Johnston Marklee calls the "living room," at the center of the two rectangular blocks. Not originally part of the program, it's a space the architects felt was necessary, both for visitors to gather or just relax in and for the institution to host lectures and display artworks less sensitive to light. (A drawing by Roni Horn is installed on one wall of the living room for the opening.)

WOODWORK The large, gabled drawing room is a place to view and study the collection (opposite, top). A custom collection of tables and benches the architects designed with Jeff Jamieson, who fabricated Donald Judd's furniture, is in the "living room" at the building's entry (opposite, bottom). The gallery features reconfigurable walls and 12-inch-wide European white oak floor planks (above).

Mimicking the folds of the courtyard canopies, triangular cutouts along the ceiling of that long room, one with clerestory glass, anticipate a series of skylights throughout the north side of the building—some more straightforward, like the peak-shaped one at the apex of the gable in the large drawing room, and others that have the enigmatic feel of a James Turrell light well. Johnston says the courtyards "create a shadow prelude" to the various qualities of light within the building, which culminate with the sun-drenched interior courtyard. Referred to as the scholars' courtyard, it has the feel of a cloister, offering dappled light to the offices and study spaces surrounding it. Because its canopy, inclined like the other two steel-plate ones, encloses interior space, it is composed of thin tube trusses with insulation sandwiched between the roof and its gypsum board underside.

Piano clad his building in narrow bands of gray-stained cypress. Johnston Marklee chose 2-foot-wide laminated boards of dark-stained, bead-blasted Port Orford cedar to face parts of the building not composed of the smooth, white-painted steel plate walls. Beneath the building, a basement stores the over 2,000 drawings in the Menil collection. It is protected by double layers of structure and waterproofing, as well as a passive system that detects water infiltration. Still under construction last year when Hurricane Harvey hit, the basement was unaffected, though that catastrophic storm impeded progress on the already delayed building—especially unfortunate timing since the Piano building was scheduled to be closed for seven months for its refresh. But that's all in the past.

Of course, Johnston and Lee looked to earlier buildings on campus, to contemporary sculpture, to different building types from houses to monasteries to Shaker meeting rooms. After all, the biennial they curated last year was all about looking at history. But it was also about creating something completely new from that, which they've managed to do here with a single-story structure that has more sectional diversity than ones twice or three times its size. More than anything else, though, they created a building based upon the thing that it houses, studies, and displays–overwhelmingly, works on paper. As with origami, in which paper becomes sculptural when it is folded and bent, the design and materials here create a building where architecture and art come together. ■

V&A Dundee | Scotland | Kengo Kuma & Associates

Full Steam Ahead

An architect energizes a waterfront with a dynamic scheme for a museum.

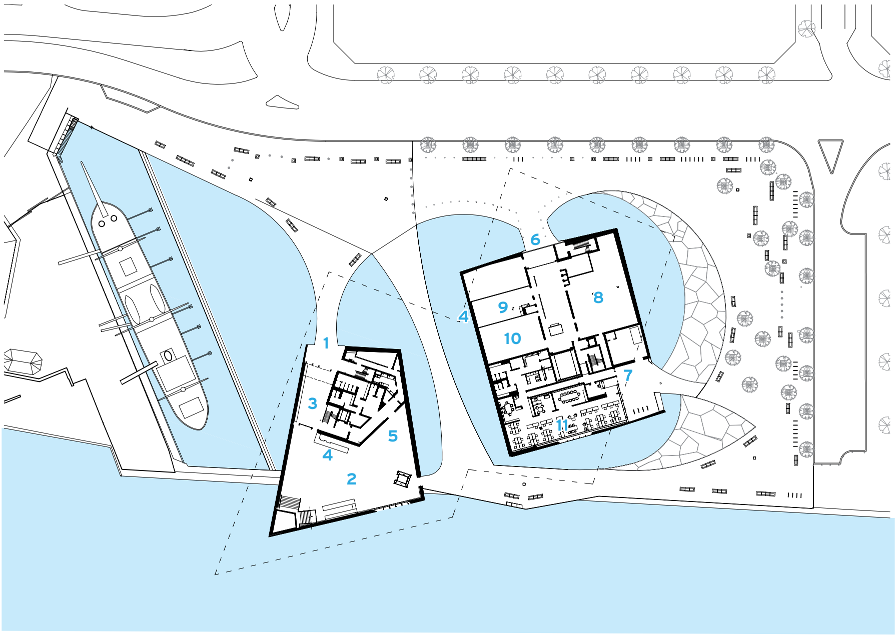
BY TIM ABRAHAMS

PHOTOGRAPHY BY HUFTON + CROW

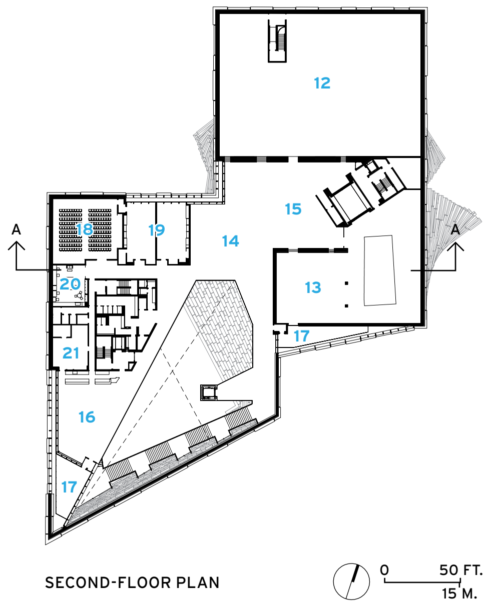
NATURAL INCLINATION The museum was in part inspired by the cliffs of northeast Scotland. It stands adjacent to the *Discovery*, a vessel originally launched in Dundee in 1901.

Signature buildings by internationally successful architects are often derided as being alien—lacking a relationship to context. Yet the V&A Dundee, which just opened in this Scottish waterfront city, is an affirmation of universal design values. In conceptualizing the museum, Kengo Kuma turned to his cultural heritage. “One of the ideas behind the building is that it is like a torii gate in Japan,” says the architect, “which usually connects a village to the mountains.” Indeed, in a visual sense, the V&A Dundee does act like this element: it is composed of two inverted pyramids that create an archway, framing the adjacent River Tay. As Kuma himself suggests, these volumes share the serrated profile of early Buddhist temples such as those at Hōryū-ji. The museum, which looks a little Japanese, shows how architectural solutions indicative of a specific culture can successfully be reinterpreted in a broader context.

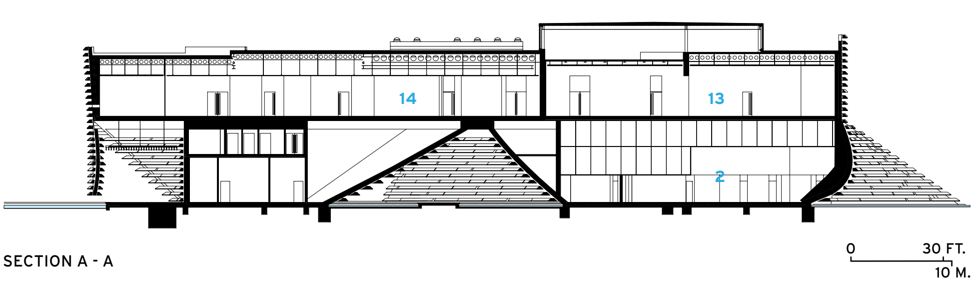
The $100 million project was conceived to continue the mission of the first Victoria and Albert museum, which opened in 1899 in London to celebrate the role of design in modern society. The new building addresses the riverfront of a postindustrial city on the North Sea coast of Scotland in vigorous fashion: poured-concrete walls wrap twin structures, one for public access, the other for administration. From their inclined surfaces, 2,429 precast-concrete panels, into which hooks have been embedded, hang off brackets bolted into channels. Downriver stand the mighty frames of several jack-up oil rigs that were towed here from the North Sea for decommissioning. Kuma’s robust building looks neither small nor slight in comparison.



SITE PLAN



SECOND-FLOOR PLAN



SECTION A - A

1 PUBLIC ENTRANCE
2 MAIN HALL
3 LOBBY
4 INFORMATION
5 SHOP
6 LOADING DOCK
7 STAFF ENTRANCE
8 OBJECTS PREPARATION
9 WORKSHOP
10 COLLECTIONS
11 OFFICE
12 TEMPORARY EXHIBITIONS
13 SCOTTISH DESIGN GALLERY
14 MICHELIN DESIGN GALLERY
15 FOYER
16 RESTAURANT
17 TERRACE
18 AUDITORIUM
19 EDUCATION
20 DESIGN STUDIO
21 KITCHEN

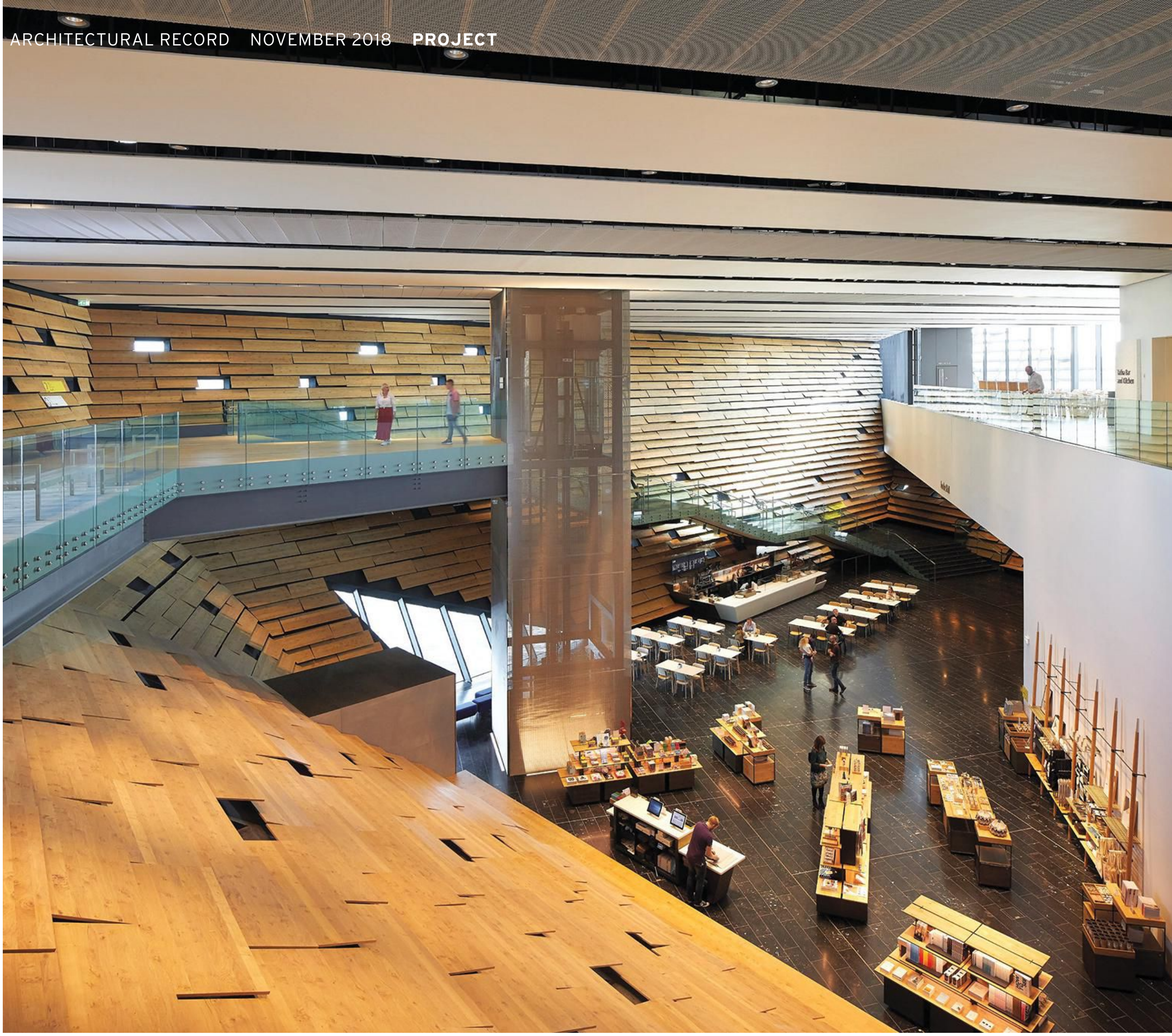
This is a demanding site in many ways. As project architect Maurizio Mucciola (who initially worked on the project as part of Kuma's team and completed it as a consultant under the auspices of his own practice, PiM. studio) puts it, the building acknowledges its "very strong marine environment," exposed to the wind from the North Sea and pounded by the salt water of a tidal estuary. The barrage of elongated, textured-concrete panels with which Kuma meets this—far bolder than his timber buildings in Japan—is a weighty response. Some may despair at the raw appearance of the concrete panels hanging off brackets in a manner that is visible to passersby, but in their slight irregularity they communicate heft and informality.

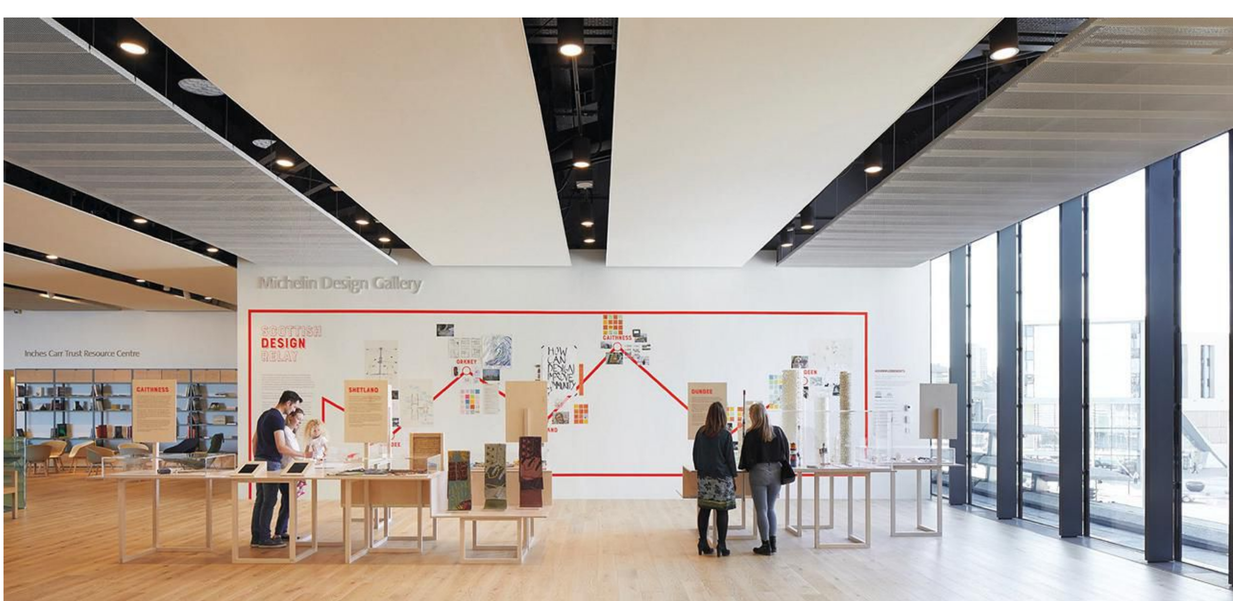
Often, the analogies made by famous architects between well-known but distant geographic features and new showpiece cultural buildings are trite—Steven Holl's reference to the Giant's Causeway in his winning proposal for a gateway to the University of Dublin being a recent example—but here Kuma's analogy with the cliffs of northeast Scotland is persuasive. Viewed from the far shore, the museum's striated bands create a gentle visual transition in shades of gray, from the mass of the city beyond down to the water. Up close, the twin volumes are at the same grand scale as the Victorian civic buildings of Dundee, albeit with a more sculptural effect.

The three-story building reacts to its environment in a kinetic sense too, stepping forward and back on each side. It dramatically cantilevers out over the fast-moving Tay to the south and east; presents a vertical facade to the city to the north; and, to the west, curves away from its close neighbor, the RSS *Discovery*, the ship in which the British explorer Robert Falcon Scott sailed on his doomed voyage to Antarctica. It is "an amphibious, seminautical building," says Tristram Hunt, director of the V&A London. An initial attempt to place the museum farther out in the river was ultimately rejected, so it now sits within the $1.3 billion publicly funded waterfront-revitalization scheme, 10 times the cost of the V&A itself, making the connection to the city center literal as well as visual.

Inside, the soaring lobby, whose inclined walls are clad in oak panels installed at irregular angles, emphasizes the building's important role within Dundee. While at first the space seems strangely jumbled, it actually has the effect of creating a certain casualness. Kuma calls the lobby a "room for the city," and, indeed, it provides a public amenity for an urban center that has lacked one. The largest public building in Dundee is the Caird Hall, a grand Neoclassical concert hall often used for

SEAWORTHY
Built on land reclaimed from the River Tay, the V&A Dundee protrudes into the tidal waters of the saltwater estuary (opposite). A pathway between the two inverted-pyramid volumes (above) creates the effect of a torii gate. The building is clad in precast-concrete bars (left), each entirely unique, weighing up to 3.3 tons.





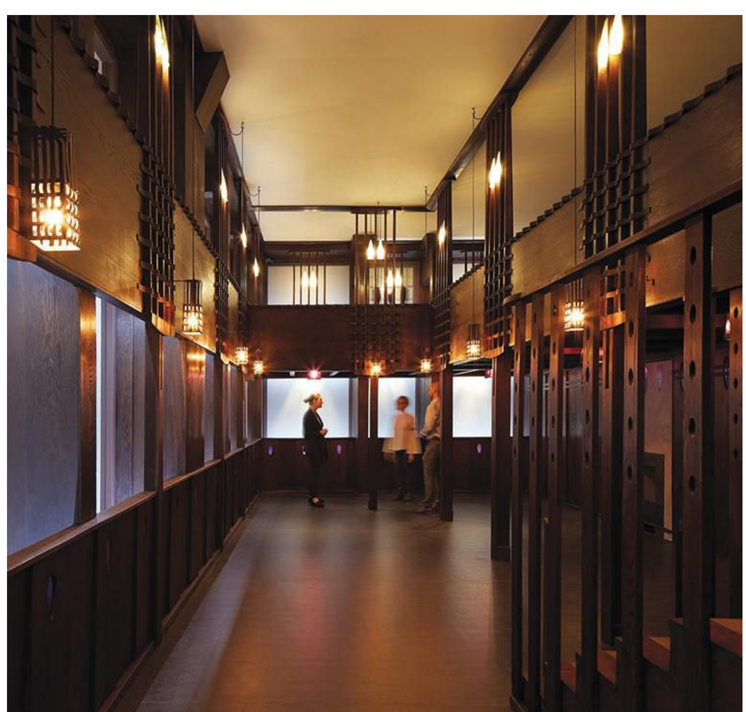
WARM WELCOME
The lobby (above) is clad with wood panels, attached to the interior walls by a system similar to the one that connects the concrete panels to the exterior. The upper floor contains 17,760 square feet of exhibition space (left) in two large, enclosed galleries, as well as an interstitial space between.

trade shows that is closed most of the time.

Upstairs, the museum has two galleries, separated by a wide foyer. The first, for temporary exhibitions, at almost 12,000 square feet, is the largest in Scotland; the other, the Scottish Design Galleries, houses a permanent exhibit of 200 pieces that outline the history of design in Scotland. These artifacts were largely taken from the V&A collection down in London but have been curated to express the constant and varied international influences on the country's modern design culture. Key amongst these is the Oak Room, a tearoom interior by Scottish architect Charles Rennie Mackintosh that has been in storage for over 50 years. It is an astonishingly intimate and serene interior and, in its almost sacred simplicity, it comes across as very Japanese.

Kuma remembers first learning about Mackintosh the year he graduated from the University of Tokyo in 1979. "I opened a book of his work, and it made a big impression on me. I couldn't believe he wasn't Japanese," said the architect at the opening of his new museum. Given Mackintosh's restraint and economy of gesture, it is unsurprising that Kuma borrowed from his work, particularly his furniture—just one more example of how great architects have always sought to engage in cultural discourse, despite huge divides. The building in which Mackintosh's room stands—outspoken, though comfortable in its exotic character—is another successful example. ■

Tim Abrahams, a former editor at the Canadian Centre for Architecture, is a critic based in the UK.



HISTORY LESSON The Scottish Design Gallery (above), by London-based architects and exhibition designers ZMMA, displays 200 objects, which tell the story of the nation's design. At the heart of the museum is the Oak Room (left), a reconstruction of a tearoom interior by the Scottish architect Charles Rennie Mackintosh.

credits

ARCHITECT: Kengo Kuma & Associates – Kengo Kuma, Yuki Ikeguchi, Teppei Fujiwara, partners in charge; Maurizio Mucciola, project architect

EXECUTIVE ARCHITECT: James F Stephen Architects

DELIVERY ARCHITECT: PiM.studio Architects

ENGINEER: Arup (structural, maritime, civil, m/e/p/f, acoustic, facade, lighting)

CLIENT: Dundee City Council

SIZE: 91,000 square feet

TOTAL PROJECT COST: $105 million

COMPLETION DATE: July 2018

SOURCES

PRECAST CONCRETE: Techrete

CURTAIN WALL, STEEL-FRAME WINDOWS, SKYLIGHTS: Glass Solutions

ALUMINUM-FRAME WINDOWS: Schüco

FLOORING: Kingspan, TileCraft, Plyboo

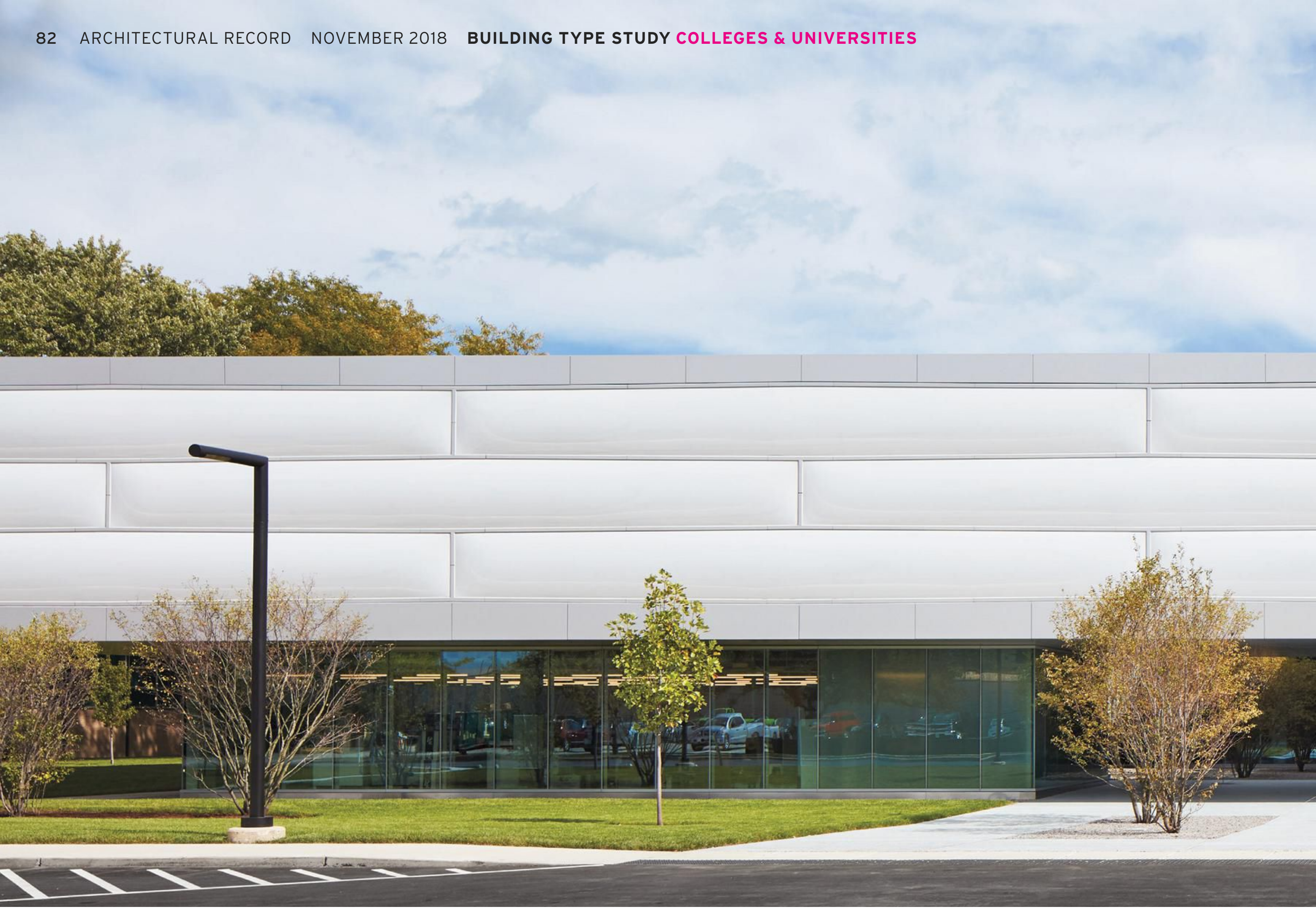
ACOUSTICAL CEILINGS: Sto

ELEVATORS: Orona

COLLEGES & UNIVERSITIES

With this issue, RECORD celebrates its 1,000th Building Type Study, just over 81 years after publishing the first one. The current type is higher education, and the buildings featured on the pages that follow all engage the past, through an exploration of time-honored materials–or by the contemporary tweaking of traditional forms.

DANIELS BUILDING, UNIVERSITY OF TORONTO, NADAAA



Ed Kaplan Family Institute for Innovation and Tech Entrepreneurship | Chicago | John Ronan Architects

Mies en Scène

A rare new building at IIT channels the spirit of the master while looking to the future.

BY JOSEPHINE MINUTILLO

PHOTOGRAPHY BY STEVE HALL

It's a big deal for any architect to build at the Illinois Institute of Technology (IIT). It was a big deal when Rem Koolhaas did in 2003—the last major construction on Mies van der Rohe's celebrated Chicago campus until now. In designing the latest addition, John Ronan, a Chicagoan and professor at the school's prestigious architecture program, has more skin in the game. But Ronan wasn't afraid to take risks, from a technical point of view, and with respect to history; his just-opened building embodies the spirit of Mies while at the same time representing a complete break.

The Ed Kaplan Family Institute for Innovation and Tech Entrepreneurship—which hosts a variety of collaboration spaces for IIT's team-based endeavors, contains state-of-the-art prototyping and fabrication facilities, and serves as the new home for the formerly downtown Institute of Design—is the first academic building completed at IIT in over 40 years. (Rem designed a student center; Helmut Jahn built residence halls the same year.) Dimensionally, the innovation center, as it's more succinctly known, is a perfect fit within Mies's orthogonal master plan, and it follows Mies's 24-foot-square grid that served as the structural module. The low, rectangular building is similar in footprint and height to its neighbor to the south, Hermann Hall, a 1962 SOM version of Mies's campus buildings from the 1940s and '50s, including Crown Hall (1956), considered among his master-

works. In terms of appearance however, the innovation center is nothing like the originals or later facsimiles.

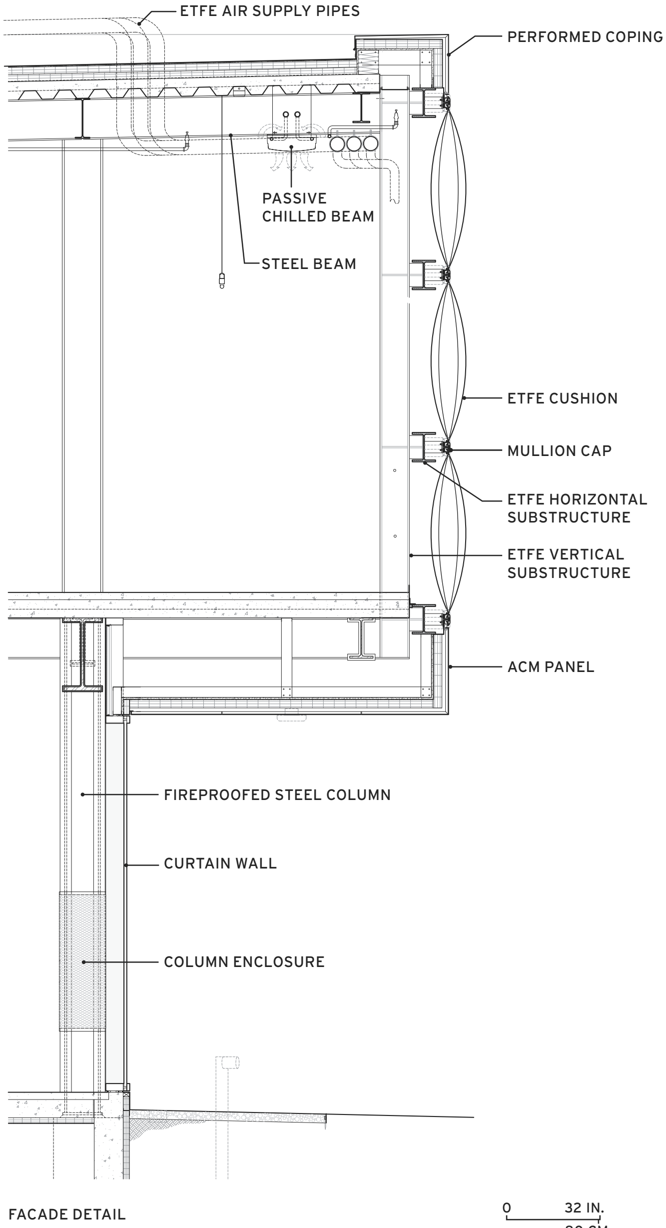
Most obviously, Ronan's building is all white—the only such one on campus—and a sharp contrast to the strong black palette to which even Koolhaas and Jahn adhered, and the 19th-century redbrick buildings originally part of the Armour Institute, IIT's predecessor. And while Mies obsessed over the curtain wall, and integrating the structure into it—which SOM's later buildings failed to fully do despite mimicking the roof girders of Crown Hall—Ronan turned the whole thing on its head with a startling choice for the facade. His puffy ETFE envelope is a first not just for this campus, but for the city. Says Ronan, "I wanted it to be like a cloud against the heaviness of Crown Hall."

Indeed, while the other campus buildings seem so firmly rooted in both the ground and Mies's rigid plan, the innovation center—its ETFE-wrapped upper level slightly cantilevered over the glass-enclosed ground floor to provide sunshading—hovers above the quad on one side and a parking area on the other. Though employed more prevalently in buildings in other parts of the world, ETFE's architectural use in the U.S. has been limited mainly to sports and transit facilities. Fortunately for Ronan, his client, then president of IIT John L. Anderson, is a chemical engineer. As Anderson puts it, "ETFE is a hybrid of teflon and polyethylene. I like it."

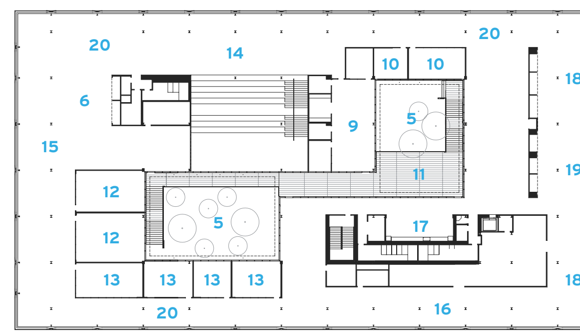
ETFE is also a material that was unavailable to Mies, which made it appeal to Ronan. The long bands of ETFE flowing along the exterior and interior of the 302-foot-long building remain permanently puffed, while two inner layers of the polymer membrane move back and forth pneumatically, responding to the amount of daylight. When the inner layer is pressed against the fritted outer layer, the offset dot patterns overlap to reduce light transmission. A building automation system "talks" to the facade, triggering fans, similar in size to those in CPUs, that circulate low-velocity air within the layers to mitigate glare and heat gain. The dynamic facade adapts throughout the day to changing weather in real time to minimize energy usage and maximize daylighting potential. As an assembly, the ETFE walls retain a rather opaque outward appearance during the day while providing somewhat transparent views from the inside. At night, they becomes more translucent, the luminous floating bands like a giant lantern on campus, according to the architect.

Ronan intentionally designed the 72,000-square-foot building to be so horizontal to make it easy for students and professionals from different disciplines to collaborate, resulting in vast areas not unlike Mies's "universal space." Given the choice of several locations, Ronan selected this site on the north end of campus because it was the only one that allowed him to spread out, and because of its proximity to buildings for various academic departments. The lot was once used for parking but was then planted; the mature trees, which had to be felled in any case because of emerald ash borers, were turned into wood for tabletops in the new LEED Gold–accredited building.

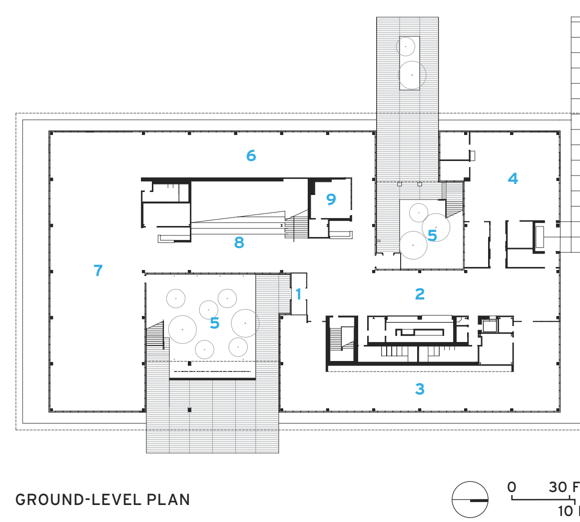
Within that long two-story volume, Ronan inserted two courtyards that bring daylight deeper into the structure. They are faced with a



FACADE DETAIL



UPPER-LEVEL PLAN



GROUND-LEVEL PLAN

1 MAIN ENTRANCE
2 CAFÉ
3 IDEA SHOP
4 MAKER SPACE
5 COURTYARD
6 CRASH PODS
7 INNOVATION ALLEY
8 TRIBUNE STAIR
9 OFFICE
10 CONFERENCE ROOM
11 TERRACE WALKWAY
12 CLASSROOM
13 PROJECT ROOM
14 EXHIBITION
15 STUDIO
16 OPEN FACULTY OFFICES
17 COMMUNITY KITCHEN
18 TEAM WORKSPACE
19 DIGITAL STUDIO
20 LOUNGE

credits

ARCHITECT: John Ronan Architects – John Ronan, principal and lead designer; Marcin Szef, project architect; Danielle Beaulieu, Sam Park, Eric Cheng, Laura Gomez Hernandez, project team

ENGINEERS: Werner Sobek (structural); dbHMS (m/e/p/fp, sustainability); Terra Engineering (civil)

CONSULTANTS: Arup (acoustics, AV, IT); Charter Sills (lighting)

GENERAL CONTRACTOR: Power Construction Company

CLIENT: Illinois Institute of Technology

SIZE: 72,000 square feet

COST: $29 million

COMPLETION DATE: August 2018

SOURCES

ETFE: Vector Foiltec

GLASS: Oldcastle BuildingEnvelope, Guardian

CURTAIN WALL: Wausau

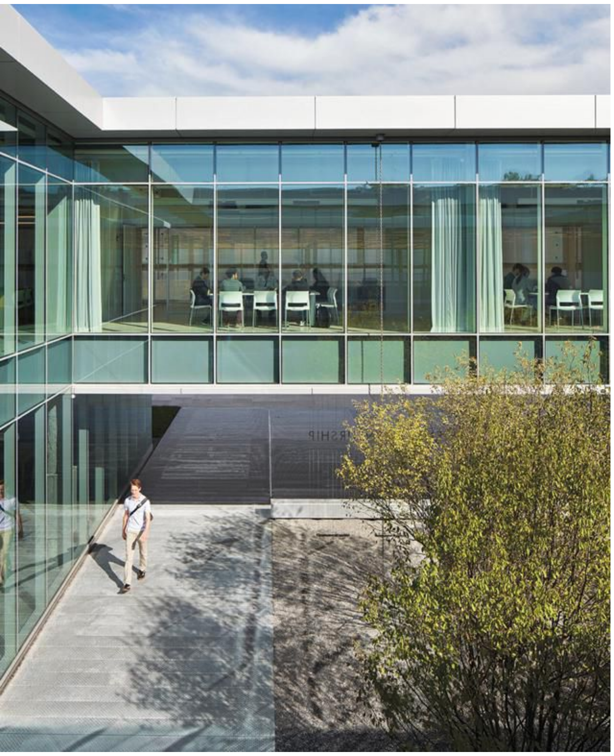
FURNITURE: Steelcase, Turnstone, Coalesse, Vitra, Casprini, Emeco, Blu Dot, Kristalia, Knoll, Quinze & Milan

INTERIOR AMBIENT LIGHTING: Birchwood Lighting, Lithonia Lighting, Luminii, ALW

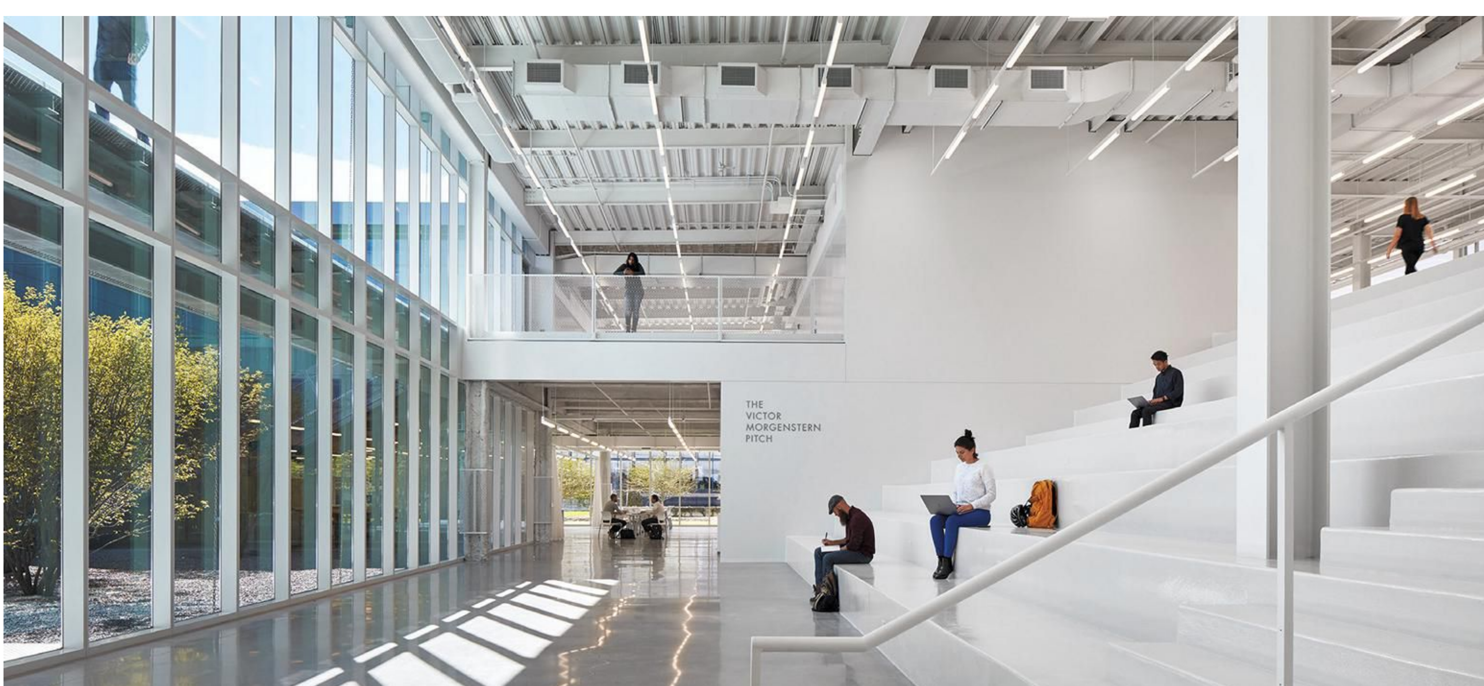
CUSTOM WOODWORK: Parenti & Raffaelli

ELEVATORS: Otis

SOLID SURFACING: DuPont Corian



SENSE OF PLACE An aerial view of the school grounds (opposite) shows Crown Hall in the foreground with the white innovation center on the opposite edge of campus. The ETFE facade appears opaque during the day (top). The building contains two planted courtyards; a stair leads to an upper-level terrace walkway (left and above).


THE
VICTOR
MORGENSTERN
PITCH

WHITE OUT On the second level, open spaces line the ETFE walls while, deeper inside, project rooms are enclosed (opposite, top). The Tribune Stair is a gathering space on the ground floor (opposite, bottom). The building becomes a lantern at night (right).

unitized curtain wall clad in low-E-coated insulated glass. These areas also provide stormwater detention by means of openings in the gutter around the courtyard, letting water run unrestricted down rain chains to the gravel-covered surface below, which is planted with serviceberry, hornbeam, and eastern redbud trees. On the upper level, a terrace walkway of galvanized-steel industrial planks wraps around the courtyards.

Despite its renown, IIT is not a wealthy university. Construction costs were kept to under $400 per square foot. Finishes are raw—concrete floors, visible steel columns sprayed with fireproofing, and exposed metal deck ceilings—though all cabling is white to maintain the cloudlike aesthetic inside and out. (Pops of Post-It Note colors enliven the Tribune Stair, an assembly space on the ground floor, and furnishings throughout the building.) In another sustainable move, Ronan merged HVAC systems with the structure by way of water-filled tubing embedded in the building's floor slabs, to provide radiant heating and cooling. The ETFE foil is approximately 1 percent of the weight of glass, reducing the amount of required structure, and, when used as an exterior wall assembly, significantly less expensive than one in glass. Layered as it is here, it also has a higher insulation value than glass. One drawback of ETFE is its inability to serve as an acoustic barrier. Open studios and lounges, which are less disrupted by outside noise, line the perimeter of the upper level along the ETFE walls, where it does indeed feel like being in a cloud, or at least Bubble Wrap. Enclosed spaces for offices, conference rooms, classrooms, and project rooms are located within the core.

With so little construction at IIT, each addition is especially significant. Ronan's choices for this building, even if surprising, were good ones. The first structures after Mies were inferior copies. A new wave of more daring construction had Koolhaas and Jahn simultaneously introducing curves to what was until then an inflexible campus aesthetic. Seventy-five years after Mies's first building at IIT, Ronan is pushing things further. His design addresses 21st-century needs for collaborative space, sustainability, and cost efficiency while experimenting with materials and systems to channel the pursuit of innovation that its users aspire to and that Mies so memorably brought to the campus. ■

Daniels Building | Toronto | NADAAA

Dissonant Dialogue

An architecture school in Toronto forcefully combines two vocabularies in one structure.

BY SUZANNE STEPHENS

PHOTOGRAPHY BY NIC LEHOUX

A challenge architects constantly face in designing contemporary additions to historic buildings is how to meld old and new vocabularies so each has its own integrity. The Boston firm NADAAA confronted this dilemma in renovating and enlarging Knox College, a Presbyterian seminary built in 1875, for the John F. Daniels Faculty of Architecture, Landscape, and Design at the University of Toronto, an expansion of the graduate school, previously located in an existing building nearby.

NADAAA's solution is both ingenious and off-putting. To create a dialogue between the historic and the contemporary, NADAAA principals Nader Tehrani and Katherine Faulkner veered toward dissonance —particularly on the elevations where the two architectural expressions come together. While inventive architects often consider discordant motifs to be integral to modernity's aesthetic ethos, these can be discombobulating. Nevertheless, NADAAA's reputation is based on its exploration of that often uncomfortable dynamic, which explains a lot about the firm's approach here.

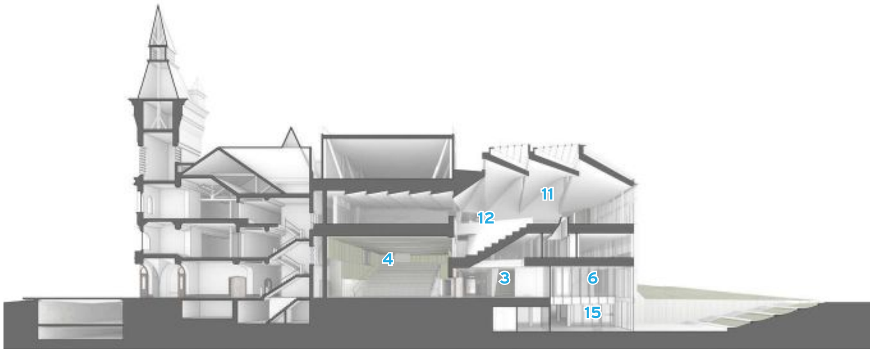
The design concept owes much to the prominent, unusual site, One Spadina Crescent, a circle in the middle of north–south Spadina Avenue, near downtown, where the smaller Russell Street forms a cross axis. There, in the middle of a traffic roundabout, sits Knox, the monu-

EAST SIDE, WEST SIDE In expanding the Daniels Faculty from the south-facing Knox College, NADAAA reoriented the main entrances to the east (opposite) and west elevations (above, right), and brashly emphasized the juncture. A serene glass curtain wall (right) extends across the north side.

mental neo-Gothic pile, designed by Toronto architects Smith & Gemmell and acquired by the university in 1972; most recently, it had been a laboratory. The building majestically faces south—the avenue splits and flows entirely around it. In expanding the U-shaped landmark, the architects wanted to complete the circle with a strong north-facing identity.

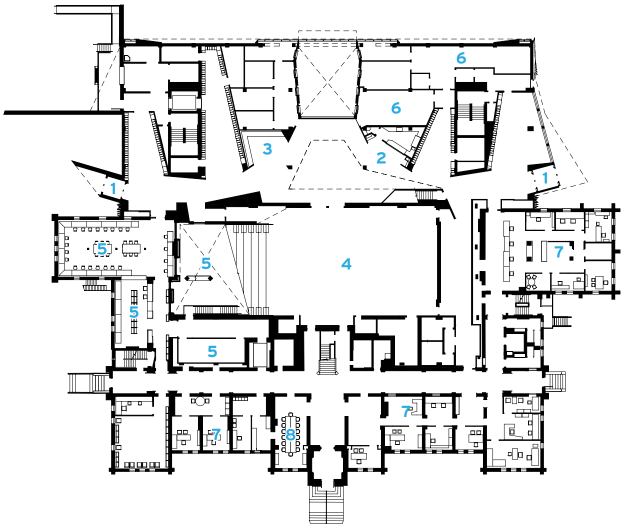
Here the architects placed a Miesian curtain wall, with fritted glass, to present a calm, elegant demeanor unlike the busier 19th-century brick facade facing south. A sloped walk, excavated from the ground plane and edged by earth berms, takes students and faculty down to a lower level, where folding glass doors open up to bright yellow–painted workshops and fabrication labs—energetically announcing the architecture school's 21st-century program. Overall, the expansion, a bold steel,

PHOTOGRAPHY: © MICHAEL MURAZ (BOTTOM, RIGHT)

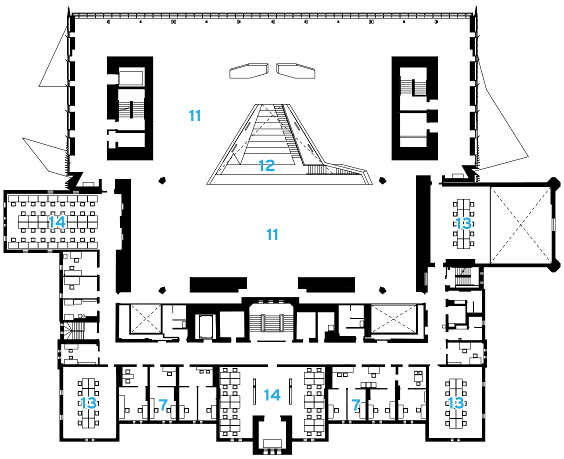


SECTION A-A

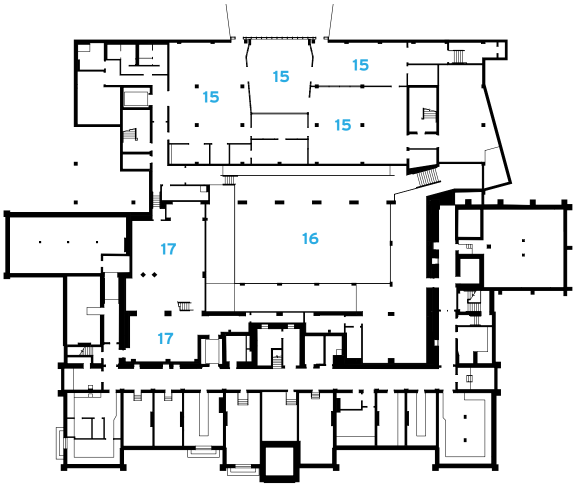
1 MAIN ENTRANCE
2 CAFÉ
3 LOUNGE
4 MAIN HALL
5 LIBRARY
6 I.T./PLOTTING/LASER
7 OFFICES
8 BOARDROOM
9 UNDERGRADUATE STUDIOS
10 MÉDIATHÈQUE
11 GRADUATE STUDIOS
12 STAIR SEATING
13 CLASSROOM
14 STUDIO CRIT
15 DIGITAL FABRICATION/SHOP
16 GALLERY
17 GENERAL COLLECTIONS



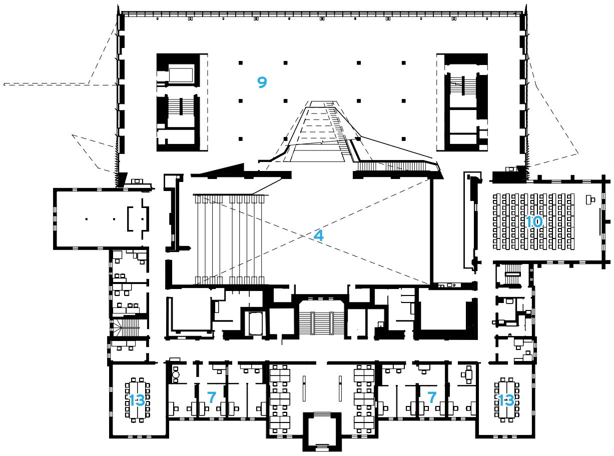
GROUND-FLOOR PLAN



THIRD-FLOOR PLAN



LOWER-LEVEL PLAN



SECOND-FLOOR PLAN

0 30 FT.
10 M.

SVELTE FIT In expanding the 1875 Knox College (opposite), NADAAA filled in a rear courtyard to create a polychromed central hall (above). Upper-level spaces provide visual access to its activities. On the ground floor, a "street" with angular openings connects east and west entrances (right).

concrete, and glass structure with open and flexible spaces for studios, discussion areas, lounges, and labs, now totals 155,000 square feet, including the Knox. Working with preservation architects ERA, NADAAA sensitively renovated the old building for a library, classrooms, and offices.

On the east and west sides of the building are the junctures where the golden-ish brick of the original building ends, and the gray high-performance concrete panels cladding the new wing begin. The encounter is fractious. While Tehrani and Faulkner have abstractly echoed the vertical lines and scale of the neo-Gothic Knox building in their expansion, the discordant schism is primarily due to the drab color and flatness of the concrete panels. The architects regard the skin's texture as akin to gray flannel: this observer sees it looking more like a thick gray cardboard.

Since there are now four facades with entrances—the former main one on the south will soon have a generous terrace, a "belvedere," to welcome visitors to the administrative portion of the school—the first-time visitor might be confused about where to enter. The landscaping, by the Toronto firm Public Work, is meant to give a subtle clue (maybe too subtle) by the way it changes from native grasses on the south to more formal yew, white birch, and oak, among other trees, near the new main entrance on the east facade. Public Work's principals, Adam

THE BIG WOW The third-level design studio (opposite) is a column-free space topped by four scissor trusses; between the ceiling's warped surfaces, the cat's-eye clerestories admit daylight (bottom). A triangular stepped seating area (left and bottom) spills down to the second level's passage bordering the hall.

Nicklin and Marc Ryan, sought a range of local plants to provide a laboratory for the landscape students at the school.

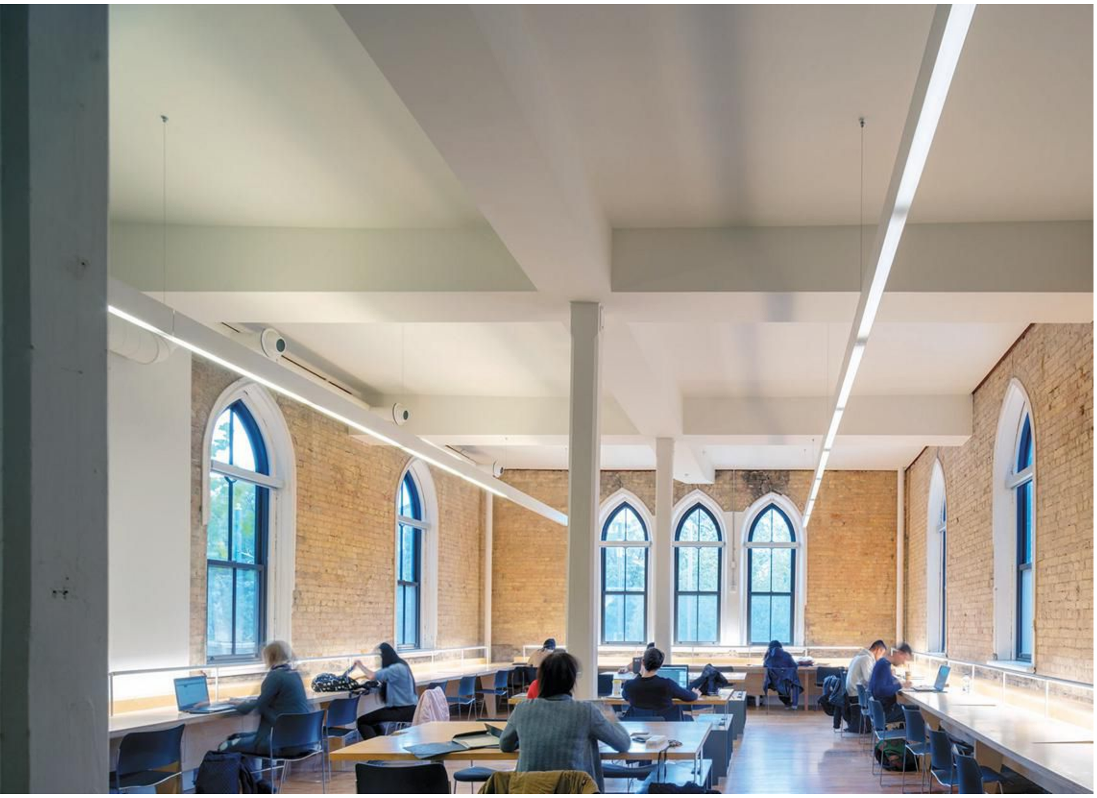
As you enter on the east of this three-story complex, you find that, inside, a corridor or "street" extends through the new addition to the door on the west side. The street widens on the north for a café and lounge, while the south is walled off where the architects filled in the existing Knox College courtyard with a two-story-high multipurpose hall.

This double-height central hall, seating over 400 with the help of bleachers, is sparked up by colorfully painted plywood strips on the walls. A triangular section of stepped seating, like an open stair outside the volume, between the second and third floors, overlooks the hall and simultaneously connects to the design studio for graduate students at the top. This idiosyncratic gesture raises a question about the triangular seating area's function. Seeing and hearing anything in the central hall below from these bleachers/stairs may not be easy. (This visitor saw it when the hall wasn't in use.) But it does provide an informal meeting space—and it makes a great Instagram shot.

The architectural coup de théatre is, without a doubt, the third-level design studio. The large, open space, extending across the entire north face, is column-free and suspended from four scissor trusses. (Tehrani cites the Firth of Forth Bridge in Scotland as an engineering inspiration.) The sculptural ceiling's warped gypsum board folds admit daylight from cats-eye-shaped clerestories in the serrated roof.

Throughout the interior, cutout ceilings with glimpses of other floors create an architecturally dramatic spatial experience that heightens the sense of interconnectivity between the levels. As Tehrani says, "The section is where it is happening. The plan is dumb." And the section delivers in spades. For example, if you are standing in the old renovated library on the main level, you can peer down into the book stacks on the floor below, where V-shaped braces support the load of the bleachers in the central hall.

Aside from the trusses, the structure is conventional—steel columns and concrete deck—except that the concrete floors make use of a voided-slab system that incorporates hollow plastic spheres, reducing the weight of these elements and providing long spans with less of a carbon footprint. These decks are also



GUARDING THE PAST Along with ERA, the preservation architects, NADAAA renovated Knox College for the library, study rooms (above), and offices. On the ground level, the Knox hallway (above, right) can accommodate informal crits. On the lower level, V-shaped braces help support the bleachers in the main hall above (opposite).

fitted with hydronic tubing for radiant heating and cooling. Such energy-efficient and sustainable characteristics apply to the roof as well, which serves as a laboratory for testing green roof planting and irrigation systems. Next the school hopes to integrate photovoltaic panels into this lab.

NADAAA, which grew out of Office dA (with partner Mónica Ponce de León) was selected in 2009 to renovate the original architecture school from a short list that included Steven Holl Architects in New York and Sauerbruch Hutton in Berlin. But a new dean, Richard Sommer, convinced the university school to bring together all 375 graduate students in architecture, landscape, and urban design with 1,000 undergraduate architecture and art/visual-studies majors into one school, or "faculty," and move to another site: Knox College.

Office dA's imaginative renovation of the Fleet Library at Rhode Island School of Design in 2006 (where Tehrani studied architecture before going off to Harvard Graduate School of Design, as did Sommer) no doubt helped win the commission. Now Tehrani has the distinction of working on three architecture schools recently, all with the similar focus of dynamism born of structure. The first completed was the renovation (replete with suspended mezzanine) of the 1930s modernist Hinman Research Building for the architecture school at Georgia Institute of Technology in Atlanta in 2011, the year Tehrani and Ponce de León dissolved their partnership and Tehrani formed NADAAA. Then his office collaborated with the Australian firm of John Wardle Architects on the School of Design at the University of Melbourne (2014), where studios are suspended within an interior tower.

The third architecture school—Toronto's—completed in the fall of 2017, is considered a success. According to Sommer, increasing the scale and budget of the project—the construction cost was almost $47 million—was worth it: graduate school applications, he says, have doubled since Daniels opened. The new building, despite some details that are rough around the edges, shows NADAAA's ability to think big—in terms of technology, sustainability, and deployment of space. All the firm's buildings, particularly its architecture schools, exemplify its adventurous and unabashed approach. Although the results may be jarring in places, they are hardly timid or boring. ■

credits

ARCHITECT: NADAAA – Katherine Faulkner, Nader Tehrani, principals; Richard Lee, Tom Beresford, John Houser, Amin Tadj, Tim Wong, Alda Black, Marta Guerra, design team

ARCHITECT OF RECORD: Adamson Associates

CONSULTANTS: ERA Architects (heritage); Public Work (landscape); Barry Sampson (professor, architect, special advisor to dean); Entuitive (structural, building envelope); Mitchell Partnership (m/p); Mulvey Banani (electrical/data/av/lighting design); Acoustics Engineering (acoustics); A.M. Candaras Associates (civil); Terraprobe (geotechnical)

CLIENT: University of Toronto, John H. Daniels Faculty of Architecture, Landscape, and Design

SIZE: 155,000 square feet

CONSTRUCTION COST: $47 million

COMPLETION DATE: September 2017

SOURCES

CONCRETE CONSTRUCTION PRODUCTS: W.R. Meadows

VOIDED SLAB: Bubbledeck North America

PRECAST-CONCRETE EXTERIOR WALLS: TAKTL

PRECAST CEILING PANELS: Prestressed Systems

RADIANT FLOORING SYSTEMS: Rehau

METAL/GLASS CURTAIN WALL: Alumicore

ROOFING: Sarnafil, Fibergrate, Vegetal I.D.

GLASS: Oldcastle BuildingEnvelope

SKYLIGHTS: IBG Canada

SECURITY DEVICES: Honeywell

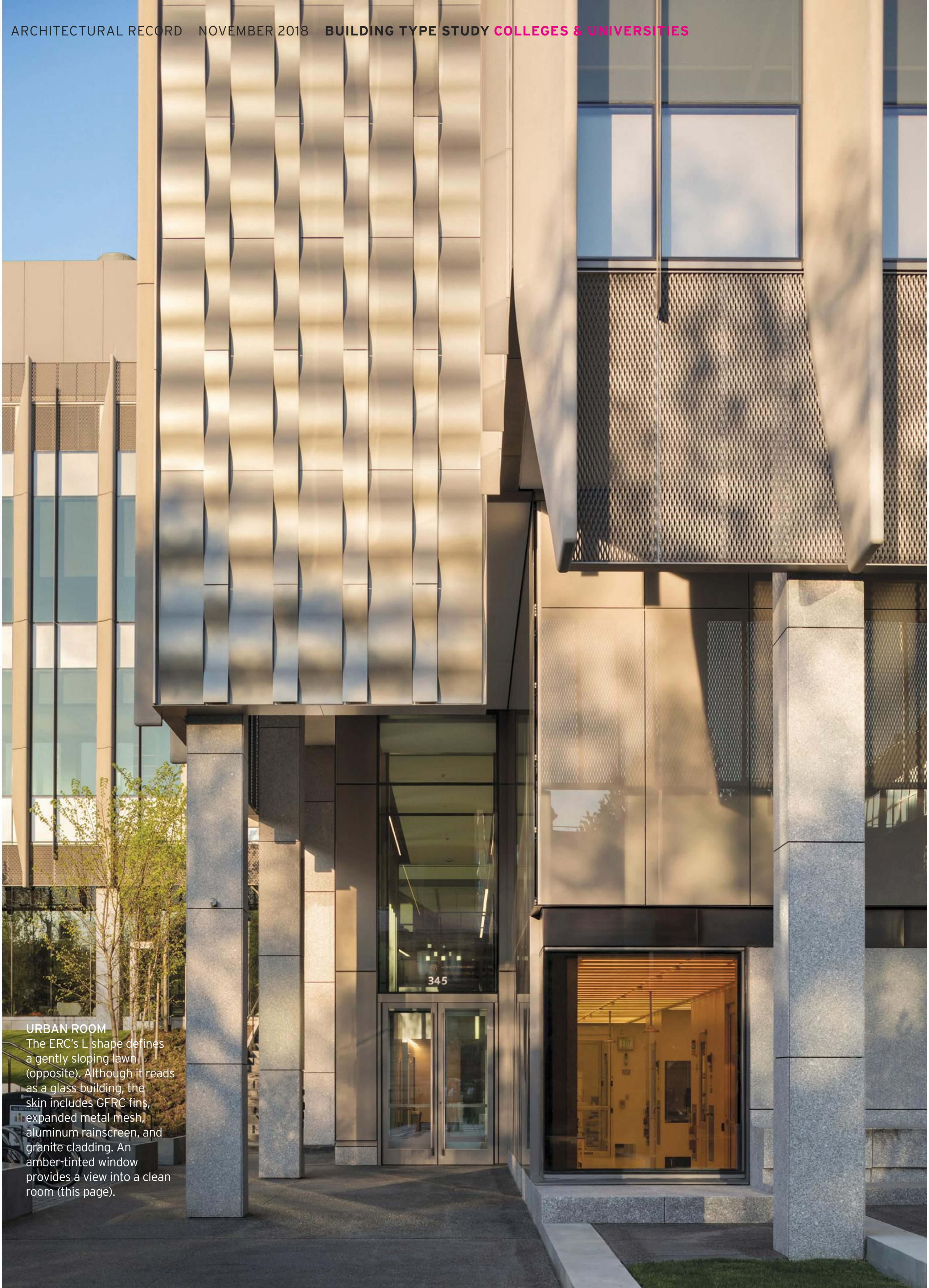
ACOUSTICAL DRYWALL: Armstrong

DIMMING SYSTEM: Lutron

ELEVATORS: Kone

INSULATION: Roxul, Johns Manville

PLUMBING: American Standard, Delta, Centoco, Chicago Faucets, Acorn Engineering, Stern-Williams, Bobrick



URBAN ROOM
The ERC's L shape defines a gently sloping lawn (opposite). Although it reads as a glass building, the skin includes GFRC fins, expanded metal mesh, aluminum rainscreen, and granite cladding. An amber-tinted window provides a view into a clean room (this page).

PHOTOGRAPHY: © PETER AARON/OTTO, EXCEPT AS NOTED

Brown University Engineering Research Center | Providence, Rhode Island | KieranTimberlake

Social Engineering

A laboratory building advances science and creates the newest quadrangle on its venerable New England campus.

BY JOANN GONCHAR, FAIA

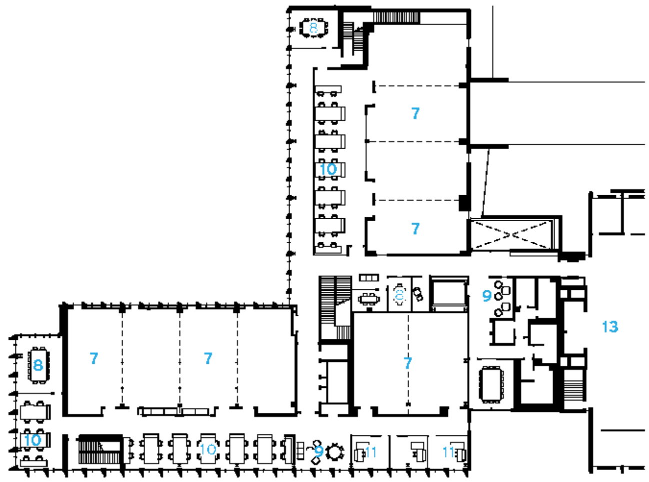
You could assume that a new laboratory building for an Ivy League institution would be state-of-the-art. So it is not surprising that Brown University's recently completed $88 million Engineering Research Center (ERC) provides top-notch facilities. The three-story, 81,000-square-foot building, designed by the Philadelphia firm KieranTimberlake, sits near the eastern edge of the Providence, Rhode Island, campus and contains 22 highly flexible laboratories, a set of clean rooms for the study of nanoscale materials, microelectronics, and photonics, and a high-performance imaging suite.

Yet what makes the ERC stand out is not its inventory of sophisticated equipment but the project's lofty goal to contribute to the larger campus environment. The ambition, says Larry Larson, the engineering school's dean, "was to enhance community *and* enhance research."

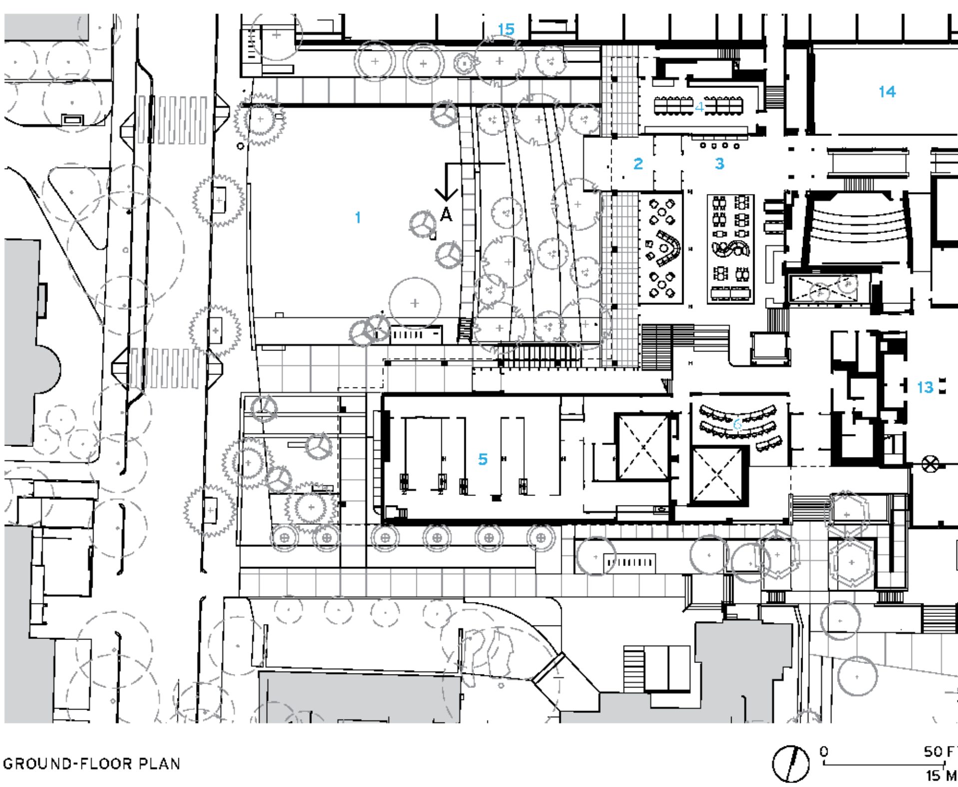
For the architects, this meant making the most of the ERC's location at the terminus of a series of contiguous quadrangles leading from Brown's main green, where the 250-year-old university's most historic buildings are clustered. "A site at the end of this axis seemed like a real obligation," says Stephen Kieran, KieranTimberlake partner. Taking this responsibility seriously, Kieran and his team opted to extend the succession of green spaces. Together with the low-slung 1960s Prince Engineering Lab (one of three existing structures to which the new building is attached), the L-shaped ERC frames a grassy, gentle slope.

The new research facility and its outdoor public space replace four late 19th- and early 20th-century single-family dwellings that had housed various academic departments. But what dominated the site before construction of the ERC was the seven-story windowless brick end elevation of Barus and Holley, a lab and faculty office building from the same era as Prince. Now, however, instead of a looming, blank masonry wall, anyone approaching from the older campus on a mild day

1 ENGINEERING QUAD
2 MAIN ENTRANCE
3 COMMONS & CAFÉ
4 TEACHING LAB
5 CLEAN ROOM
6 CLASSROOM
7 RESEARCH LAB
8 MEETING ROOM
9 COLLABORATION SPACE
10 COLLAB OPEN OFFICES
11 PRIVATE OFFICES
12 MECHANICAL PENTHOUSE
13 BARUS & HOLLEY HALL
14 GIANCARLO HALL
15 PRINCE LABORATORY



SECOND-FLOOR PLAN



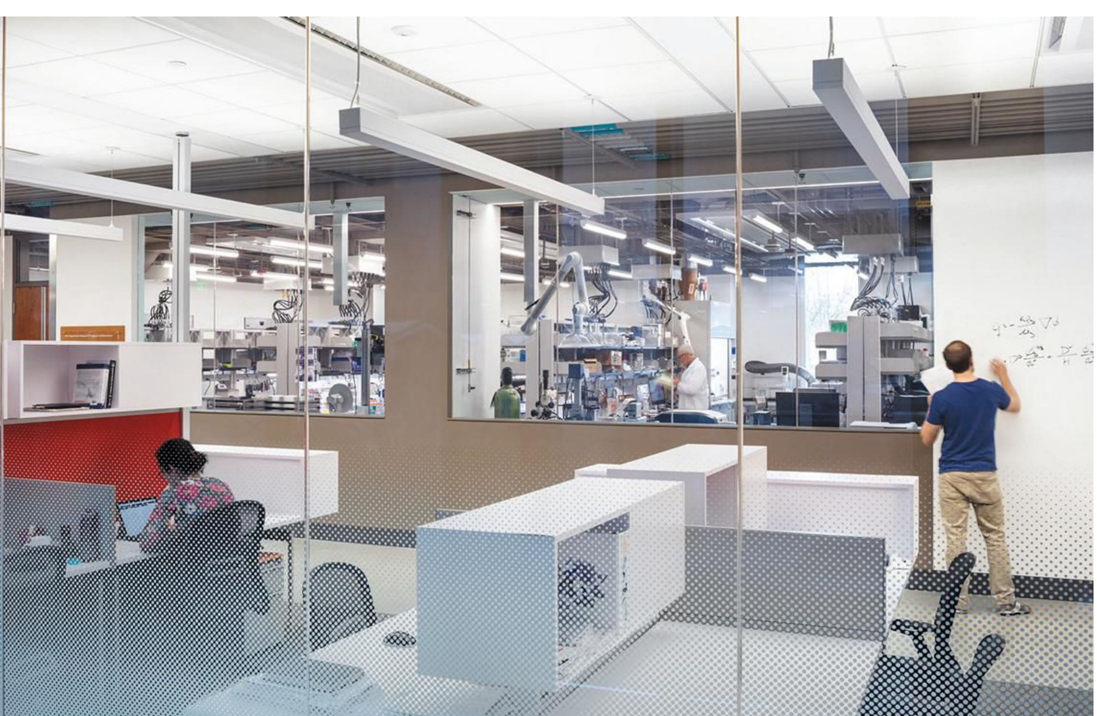
GROUND-FLOOR PLAN

encounters students lounging on the lush lawn and an inviting transparency: the ERC almost completely obscures the much taller older building with a lively facade that includes vertical glass fiber reinforced concrete (GFRC) shading fins, expanded metal mesh scrims, aluminum composite panels, and insulated spandrel glass, along with clear glazing. And as people get closer, elements like a window into a ground-floor clean room—with its glowing, UV-filtering amber glass—provide clues about what kind of work goes on inside. “So many science buildings are mute,” says Kieran, “and they don’t need to be.”

Just beyond an arcade of granite-clad columns, the social space continues inside the building with a generous commons and café that occupy most of the ground floor. Here the exposed steel structure and 15-foot-tall ceilings create a loftlike feel, while tables and chairs and cushioned seating provide areas for studying or taking a break overlooking the new quad. According to Larson, the spot—named for engineering professor emeritus Barrett Hazeltine, whose course on entrepreneurship

SECTION A - A

STUDY HALL
Much of the first floor is devoted to a commons space (bottom) that looks out onto the new quad. The ERC connects to three existing engineering-department structures, including the 1960s Barus & Holley Hall (at right in photo, right). The GFRC fins (opposite) vary from 12 to 30 inches deep, according to their solar orientation.



was hugely popular with liberal arts students for decades—attracts graduate and undergraduate students from all over campus, not just engineers.

Upstairs are most of the real workhorse spaces, including easily reconfigurable labs flanked by "collab" open-office research areas. Here, polished concrete floors highlight circulation, while HVAC systems and the copious utilities for the laboratories are neatly organized and visible overhead. But Kieran says he would not have had the confidence to leave these elements exposed had it not been for the integrated project delivery agreement among client, firm, and contractor, which allowed closer collaboration with trade partners and enabled successful meshing of design intent and constructability.

The architects clearly made sure the less than sexy aspects of the building were right, but not at the expense of the architectural details, such as an open stair that connects all levels. It skillfully combines balustrades of glass or folded steel plate with wooden handrails and open-riser terrazzo treads.

ART AND SCIENCE One of nine pieces created by artist Spencer Finch for the ERC occupies a double-story clean room corridor (right). Upstairs, utilities run exposed above circulation spaces (opposite, top) while researchers' open office areas flank the labs (opposite, bottom).

The intense study that went into the building envelope is also obvious. The depth of its GFRC fins, which help control heat gain and glare, have been tuned through solar analyses to each facade's orientation. KieranTimberlake built the first of many visual and performance mockups in the firm's own fabrication shop in its large Philadelphia office (in a former beer-bottling plant). Although the assembly appears to be primarily glass, it is in fact an unusual hybrid of a unitized curtain wall and a rainscreen system, thus improving its thermal properties. The skin is one of several features that have put the ERC on track to earn LEED Gold, including active chilled beams, outdoor air heat recovery, and an all-LED lighting system controlled by occupancy and daylight sensors.

This focus on energy savings is just one more facet of the smartly designed and expertly realized ERC. It is another way the building goes beyond promoting the most advanced engineering to create an amenity for the entire university community and to enhance—with contemporary architecture—an historic New England campus. ■

credits

ARCHITECT: KieranTimberlake – Stephen Kieran, Jason Smith, Laurent Hedquist, Mark Davis, Elizabeth Kahley, Steven Johns, Rachel Stoudt, Eli Allen, project team

CONSULTANTS: BuroHappold Engineering (m/e/p, structural, facade); Vanasse Hangen Brustlin (civil); Research Facilities Design (laboratory/clean room); Gustafson Guthrie Nichols (landscape); Vidaris (sustainability)

CONSTRUCTION MANAGER: Shawmut Design and Construction

CLIENT: School of Engineering, Brown University

SIZE: 81,000 square feet

COST: $88 million

COMPLETION DATE: November 2017

SOURCES

GFRC FINS: Arc Limited

RAINSCREEN: QC Facades

CURTAIN WALL: United Architectural Metals

LIGHTING: Philips, Cree, V2 Lighting Group, ALW, Ecosense, BK Lighting

ACOUSTICAL CEILINGS: Armstrong

DEMOUNTABLE PARTITIONS: DIRTT

ELEVATORS: ThyssenKrupp

PHOTOGRAPHY: © WARREN JAGGER (THIS PAGE AND OPPOSITE, BOTTOM)

High Street Residence Hall | Carlisle, Pennsylvania | Deborah Berke Partners

Split Personality

A dormitory brings a contemporary edge to a campus of traditional stone.

BY ALEX KLIMOSKI

PHOTOGRAPHY BY CHRIS COOPER

Chartered in the rural town of Carlisle, Pennsylvania just days after the American Revolution ended in 1783, Dickinson College claims to be the first school established in the newly independent United States. Now considered among the state's top liberal arts institutions, Dickinson has maintained a small, quaint campus defined by three leafy quadrangles, its beating heart a limestone Federal-style building designed in 1803 by Benjamin Henry Latrobe, architect of the U.S. Capitol.

With many quarries nearby, limestone is the campus's unifying architectural element—nearly all its buildings, from Georgian-inspired to Midcentury Modern, have stone facades. The school's newest addition, a 130-bed dormitory designed by New York–based Deborah Berke Partners, keeps this tradition, but with a modern twist. Viewed from the main campus road on which it sits, the High Street Residence Hall appears as an elongated masonry monolith, handsome yet staid, and candid about its utilitarian function. As you walk around the building's perimeter, however, stone pivots to a satiny zinc that cloaks the south facade in a silvery blue sheen.

The new, 42,000-square-foot residence hall is the last phase of a six-year campus enhancement effort that included the construction and renovation of several academic buildings, plus a new athletic field. Now all 2,400 enrolled students can be accommodated in college-owned or -leased residences. Although the architects had no previous dormitory experience, the project was a "logical melding," says Berke, of the firm's portfolio, which includes hotels, private residences, and other higher-education projects. The High Street dorm, she says, was an opportunity to set a new bar for 21st-century

PAIR OFF
Facing the street, the building is clad in limestone, reflecting the campus's historical design language (opposite, right). Mahogany accents indicate common spaces while adding warmth. The south facade, clad in zinc, looks out onto a patio and lawn (left and above).

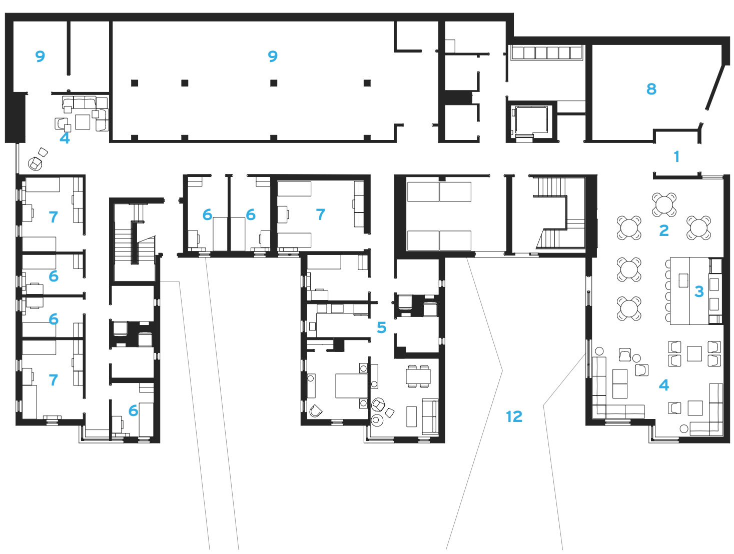
residential life on the Dickinson campus while riffing off its historical design language.

The building's split material expression emerged from its siting on the south side of High Street—a stretch of highway that runs through Carlisle and cuts across campus, separating the academic quad to the north from the residential quads to the south. As a buffer between this transient public zone and the halcyon grounds where students and faculty reside, it made sense for the building, which uses a hybrid structural system of concrete block and plank with steel framing, to have two different faces: a formal articulation of Dickinson's legacy to the north, and, to the south, something friendlier, expressed in a "more forward-thinking language," as project lead Rhoda Kennedy puts it. The architects chose zinc after considering its use as cladding in the local agricultural vernacular, as well as in other campus buildings; they arranged standing-seam panels in alternating vertical layers for a contemporary interpretation of the material.

Although the contrast of smooth and uniform metal with rugged and imperfect stone could result in a discordant whole, the design achieves a peculiar harmony. It is also dynamic. On both facades, windows are punched out at irregular intervals—some are skinny and short, some are tall and wide, others wrap the corners—adding variation to both the interior and exterior, plus the apertures are more deeply set on the stone side than on the metal one, emphasizing the different weights of the two materials. And, over time, the limestone will lighten and the zinc will weather. "The idea of making the building's skin something that is active and evolving is exciting," says Kennedy. "We thought it really matched the way that Dickinson was conceiving of this project."

Typically, given the need for durable, easy-to-maintain surfaces—and with limited budgets—dorms tend to have bland interiors. And, unsurprisingly, the interiors here are not as exciting as what's on the outside. But they are thoughtful. According to Kennedy, the key considerations were high ceilings and lots of light. An E-shape plan maximizes the number of bedrooms and daylight. The design team organized rooms

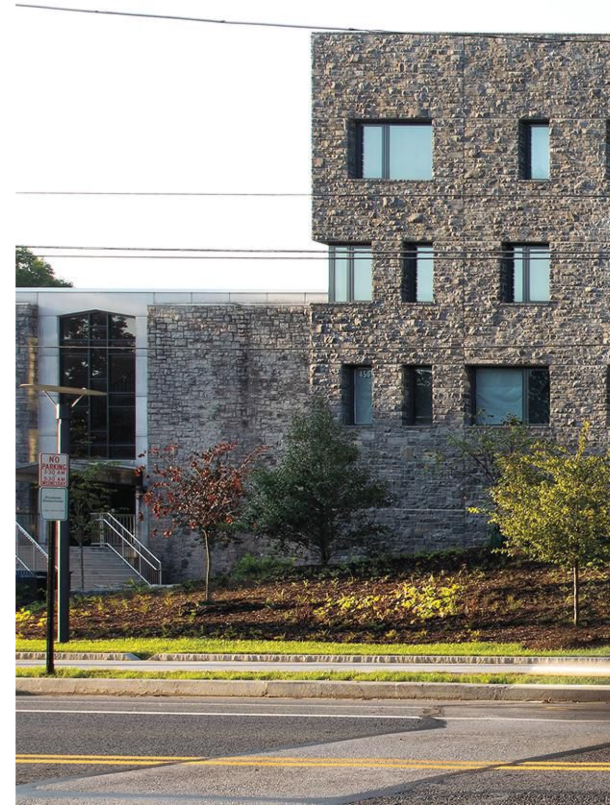
TYPICAL-FLOOR PLAN



GROUND-FLOOR PLAN

0 16 FT.
5 M.

1 ENTRY
2 DINING
3 KITCHEN
4 LOUNGE
5 FACULTY APARTMENT
6 SINGLE
7 DOUBLE
8 BIKE STORAGE
9 MECHANICAL
10 POCKET LOUNGE
11 MEETING SPACE
12 PATIO



along the three "fingers" and created "pockets" with café tables off the north side of the main east–west hallway. Suites of bathrooms and single and double rooms surround the alcoves. Often in suite layouts, such lounge spaces are behind closed doors, but the intention here was to "democratize these areas," says design partner Maitland Jones, by making it clear that they don't belong solely to those living adjacent to them. By opening the lounges to the main corridor, "students are allowed to cruise by and negotiate a decision about where they will hang out," says Jones.

On the second-through-fourth levels, floor-to-ceiling windows cap the ends of the "finger" corridors, bringing daylight into the core as well as each of the ends of the main circulation passage, where movable lounge chairs signal a quiet place to study or reflect. Here, the architects exposed the building's concrete planks, to give the ceiling more height. From outside, these lookout nooks are identified by a sliver of mahogany cladding that visually links the two facades and, at the east end, announces the main entry.

In lieu of game rooms, quiet study and conference rooms with fully glazed walls are located on each of the building's top floors—a preference that students emphasized during the programming phase. "The idea that everyone prefers a ping-pong table is less and less true," says Berke. "I don't think students these days want their activities to be prescribed to them—they want flexibility and places to shape ideas." The residence hall's main amenity is a large daylit kitchen and lounge on the ground level; this area opens out to a patio and courtyards formed by the building's E-shape, which also breaks down the scale of the south facade.

Since September, the new residence has been housing its inaugural group of occupants—a mix of sophomores, juniors, and seniors. During the design process, the students who weighed in were adamant about having high sustainability standards for the building. In line with Dickinson's goal to be carbon-neutral by 2020, the project is on target to be the campus's first LEED Platinum building, and, says Kennedy, it is currently meeting Passive House standards for airtightness, even though it is not seeking certification.

STONE FACED From the main campus road, the residence hall formally expresses itself as part of the Dickinson campus with its limestone cladding (top). Mahogany cladding visually links the two facades; a high-performance landscape wraps around the building's perimeter (above).

On a recent early fall day, shortly after move-in, tables and chairs were already being shuffled, and whiteboards were covered in scrawls, showing signs that occupants were getting comfortable; individuals and quiet study groups had formed on the patio and inside the first-floor lounge. "Students gravitate toward a coffee shop mindset," says Berke. "This building reflects that." As the first dormitory to be built on campus in over four decades, High Street Residence Hall's unique form succeeds in encouraging new ways for students to be engaged with each other and with their living environment; the two-toned exterior looks toward the future while acknowledging the past. "As a whole, it exemplifies what we think this project is all about," says Kennedy: "the transformation from old to new." ■

credits

ARCHITECT: Deborah Berke Partners – Maitland Jones, design partner; Rhoda Kennedy, project lead; Aaron Plewke, project manager; Kiki Dennis, interiors lead; Virginia Gray, Jason Hill, Andrew Ledbetter, Emily Martyn, Thao Nguyen, Scott Price, Tal Schori, Alex Stinchcomb, project team

ENGINEERS: Kohler Ronan (m/e/p); Providence Engineering (structural); Nutec Group (civil)

CONSULTANTS: PHT Lighting (lighting); Steven Winter Associates (sustainability); Andropogon Associates (landscape)

GENERAL CONTRACTOR: Benchmark Construction

CLIENT: Dickinson College

SIZE: 42,000 square feet

COMPLETION DATE: July 2018

SOURCES

MASONRY: Alverson Limestone

METAL PANELS: Rheinzink

WOOD: Duratherm

GLAZING: Vitro Architectural Glass, Wasco Skylights

COME TOGETHER
The building's E-shape plan was driven by a program that emphasizes casual socializing. A large kitchen and lounge area serves as a flexible living and working space (opposite, bottom). Floor-to-ceiling windows are placed at the end of corridors for maximum daylight (opposite, top). A patio encourages residents to get outside.

Coastal Biology Building and Marine Sciences Campus | Santa Cruz, California | EHDD

Surf and Turf

An oceanfront research center borrows from farm vernacular.

BY LYDIA LEE

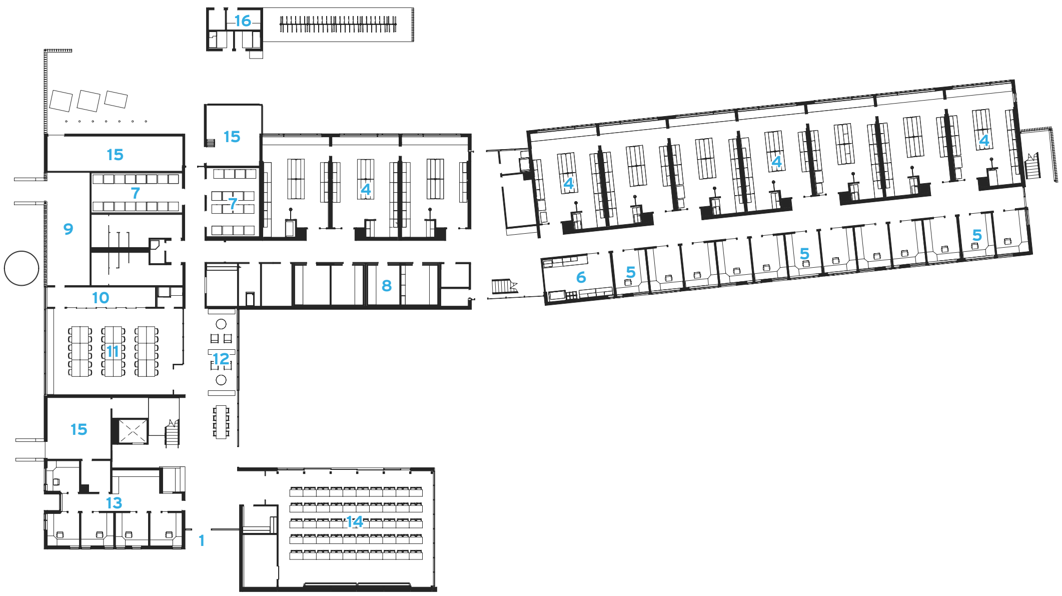
PHOTOGRAPHY BY MICHAEL DAVID ROSE

About an hour and a half's drive south of San Francisco, the University of California at Santa Cruz is a world apart, with its eclectic mid-rise buildings hidden among clusters of towering redwoods in the foothills of the Santa Cruz Mountains. However, its satellite Coastal Science Campus, on a windswept bluff along the Pacific Ocean a couple of miles away, called for a different architectural response. Designed by San Francisco–based firm EHDD, the new Coastal Biology Building, for research and teaching on coastal conservation, ecology, and climate change, reconciles a context-appropriate agricultural vernacular with modern lab requirements and the demand for collaborative spaces.

The two-story, 40,000-square-foot building brings together faculty, researchers, and grad students of the Ecology and Evolutionary Biology department, previously split between the main campus and an older building at the coast-side campus. It is designed to support 25 researchers and their teams of students, with 20 laboratories, 44 offices, and a specialized seawater research lab.

Because of the sensitive nature of the 98-acre campus, which encompasses a former Brussels sprouts field and a protected lagoon, the university commissioned a comprehensive land-use plan by BMS Design Group and EHDD, in preparation for a major expansion of its existing facilities. The location and size of the Coastal Biology building, along with future planned development, is strictly limited by the plan, which also incorporates an extensive stormwater drainage system of swales to preserve the seasonal bogginess of the marine terrace. In addition to their clients, the architects consulted the state's Coastal Commission, which has jurisdiction over coastal development—and which asked for a gabled, barn-style structure to reflect the area's history of farming. "Our goal was to embrace the agricultural form and make the building really simple and elegant," says Scott Shell, a principal at EHDD. "The design isn't necessarily breaking new ground so much as being super-respectful to the client and the task we were given."

BARN RAISING
This modern version of an agricultural building emphasizes outdoor connectivity with operable windows, a glass-enclosed stairwell, and a sheltered courtyard (above). A wall of Western red cedar near the entrance (left) features a subtle pattern of a tidal chart.



1 MAIN ENTRY
2 COASTAL BIOLOGY BUILDING
3 COASTAL BIOLOGY GREENHOUSES
4 LAB
5 OFFICE
6 ANALYTICAL LAB
7 EQUIPMENT
8 ENVIRONMENTAL ROOM
9 TANK FARM
10 TRAY ROOM
11 CORE SEAWATER LAB
12 MEETING
13 ADMINISTRATION
14 SEMINAR
15 MECHANICAL
16 CHEMICAL AND CHEMICAL-WASTE STORAGE

GROUND-FLOOR PLAN

0 30 FT.
10 M.

SITE PLAN

credits

ARCHITECT: EHDD – Scott Shell, design principal; Ken Powelson, project manager; Jessica Lane, project architect; John Christiansen, director of construction administration

ENGINEERS: Mar Structural Design; Cammisa & Wipf (electrical); Taylor Engineering (mechanical); GHD Engineering (civil)

GENERAL CONTRACTOR: Swinerton Builders

CLIENT: University of California, Santa Cruz

SIZE: 50,300 square feet

PROJECT COST: $72 million

CONSTRUCTION COST: $51.5 million

COMPLETION DATE: August 2017

SOURCES

WOOD: Cudahy Lumber Company

METAL PANELS: Alucobond

MOISTURE BARRIER: GCP Applied Technologies

CURTAIN WALL, METAL FRAME WINDOWS, ENTRANCES: Kawneer

GLAZING: Vitro Architectural Glass, Oldcastle BuildingEnvelope, Wasco, 3form, Saint-Gobain

PAINTS AND STAINS: Benjamin Moore

FLOOR AND WALL TILE: Heath Ceramics

FLOORING: Mondo Contract Flooring, Nora, Interface

OFFICE FURNITURE: Steelcase

CONVEYANCE: ThyssenKrupp

ACOUSTICAL PANELS: Conwed Designscape

The biology building is EHDD's second opportunity to affect the architectural tenor of the campus. Back in 1978, one of the firm's founding partners, Chuck Davis, designed the first buildings there: two small one-story labs that are still in use today. With their pitched roofs and weathered wood siding, they appear to be simple sheds, but, in fact, contain a complex system for seawater research. In some ways, the new Coastal Biology Building is a throwback to Davis's original labs, with a deliberately spare form and a rainscreen of Western red cedar that will weather naturally to gray. The familiar barn shape has been updated with operable steel-framed windows (the building has no air-conditioning), walls of glazing, and skylights for balanced daylighting.

To provide sheltered outdoor space for the researchers, the architects designed the building as an asymmetric "U" (with one long leg and one short one) around a courtyard to block the continuous coastal winds. The long leg of the building contains the labs and offices; the

WAVE ACTION The second-floor meeting room's wraparound glass windows (above) provide views of the neighboring lagoon. The lobby (right) has a sculptural ceiling modeled on wave forms.

individual labs are stacked on the north side to allow for large windows while mitigating direct sunlight, and the offices face the south, with views of the ocean. To break up the mass of the lab/office wing, the architects inserted a glass stairwell volume that connects the two wood-clad segments. The building's interiors are simply finished, with concrete floors, drywall, and acoustical metal decking (duct-work is hidden rather than exposed).

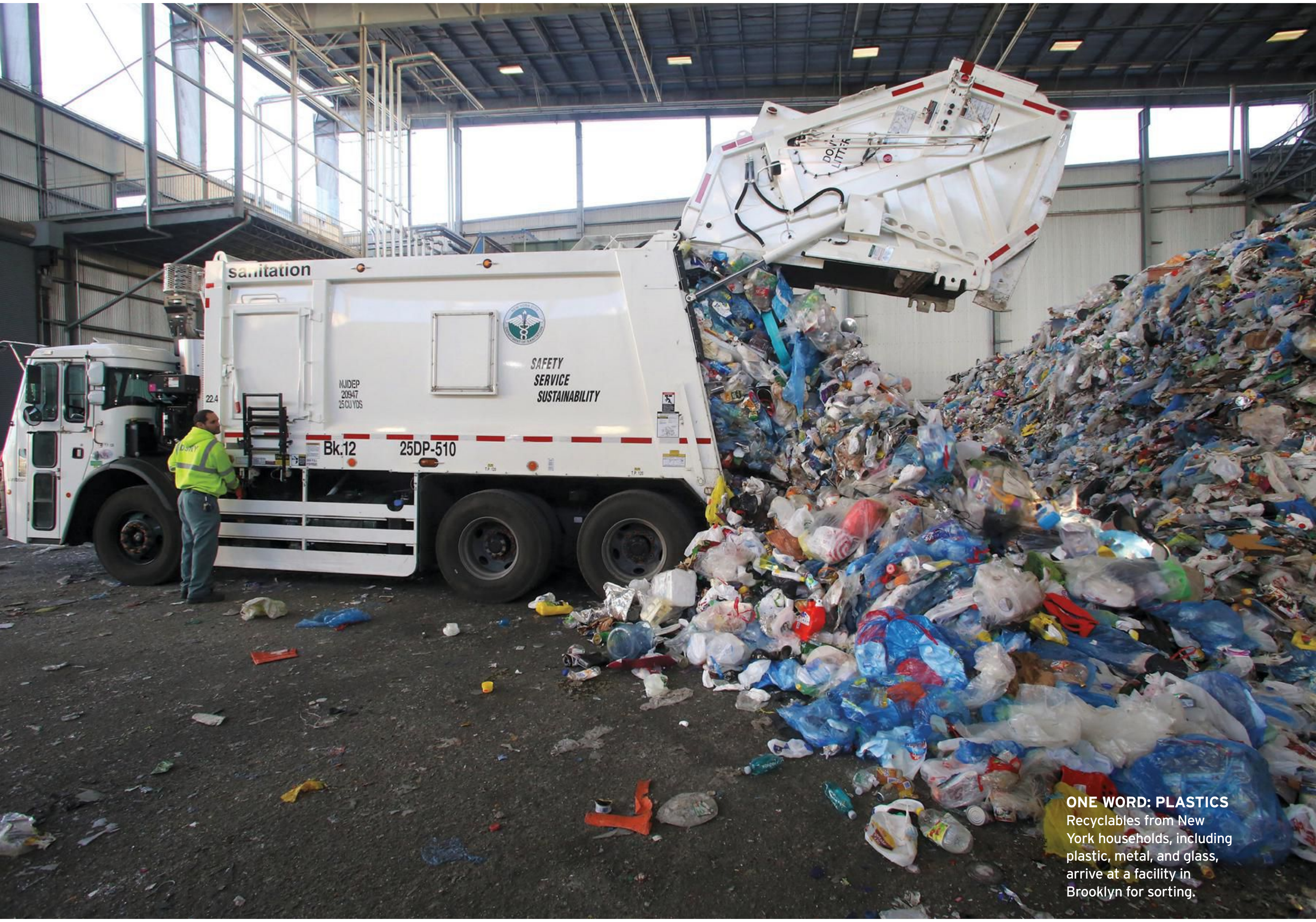
The short leg of the building contains the main seminar room, which opens on to the courtyard. Linking the two wings is the building lobby and ground-floor dissection classroom; above is a meeting room that overlooks the neighboring lagoon. The relatively narrow volumes of the courtyard building support a sense of connectivity to the surrounding environment. "It's so nice to be here with all the windows, and to walk down the hallway and be able to say hi to professors, now that we're all in the same building," says Kate Cary, a doctoral candidate in ecology and

BALANCING ACT The exposed wood-and-steel structure creates an impression of lightness in the seminar room (top). The architects consulted with Portland's BetterBricks Daylighting Lab early in the design process to achieve even light in the labs (above) and other spaces.

evolutionary biology, who moved here from the main campus a year ago.

For improved energy efficiency (a priority for EHDD: it is one of a small handful of firms on track to reach a net zero portfolio by 2030), the architects employed a steel frame structure but opted for wood instead of steel studs for the walls to prevent thermal bridging and improve comfort. The seminar room, a large space for teaching and lectures, also uses a mix of structural materials, but for different reasons. "To keep the courtyard side of the room as light and transparent as possible, we continued the wood roof trusses down to the ground with wood columns," says Shell. On the other side of the room, where the large presentation screens are mounted, steel columns discreetly handle all the shear stresses. Overhead, the bottom chords of the wood trusses are made of thin steel rods—a combination of materials that, like the larger building, speaks both of tradition and modernity. ■

Lydia Lee is a freelance writer in the San Francisco Bay Area, focused on architecture and design.



ONE WORD: PLASTICS Recyclables from New York households, including plastic, metal, and glass, arrive at a facility in Brooklyn for sorting.

PHOTOGRAPHY: © MICHAEL ANTON/COURTESY DSNY

Talkin' Trash

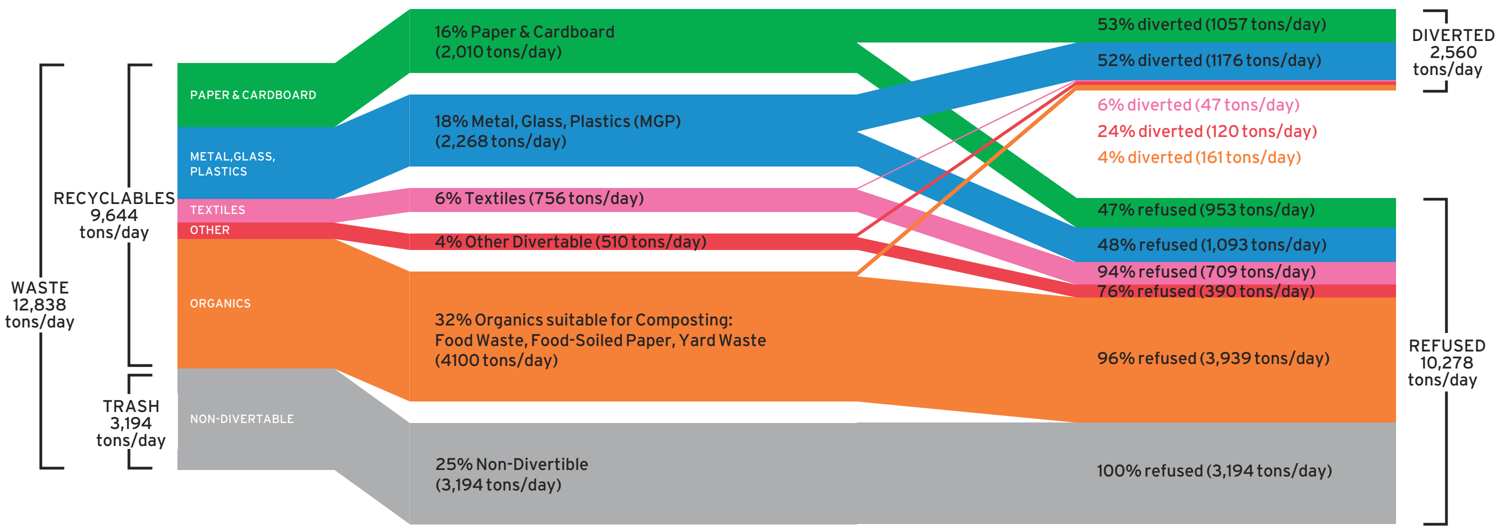
Architects and their clients turn to the next frontier in building operations—garbage.

By Joann Gonchar, FAIA

ARCHITECTS—EVEN THOSE who don't call themselves super-green—by now are obliged to design buildings that conserve energy and water. But do they expect to create structures that allow occupants to better manage and reduce the waste they produce? Not so much. Nevertheless, that is what a number of zero-waste champions say is needed.

How can architects help? First, the background: every day, Americans create mountains of trash. We toss food scraps, garden clippings, dog-eared magazines, soiled take-out containers, threadbare clothing, and broken furniture. In 2015, the U.S. generated approximately 262 million tons of municipal solid waste, according to the most recent figures available from the Environmental Protection Agency. But, of that, only 91 million tons, or less than 35 percent, was recycled or composted. The majority was sent to landfills or incinerated.

As everyone knows, trash and recyclables clutter loading docks and obstruct basements. Garbage bags clog sidewalks and attract vermin, while the collection of this refuse exacerbates traffic and has an adverse impact on air quality. Municipalities and



NEW YORK - CURRENT WASTE FLOW

businesses spend huge sums to dispose of their waste, often shipping it to distant states or even internationally to landfills or recycling centers.

Less well known, perhaps, is the relationship between the disposal of waste and global warming. Since landfill gas is in large part methane—a greenhouse gas that is many times more potent than CO_2—effective resource and waste management are needed to slash heat-trapping emissions. According to the Green Business Certification Institute (GBCI), increasing the national recycling rate by just 8 percent and reducing the amount of waste we generate by only 5 percent could eliminate the equivalent of 20 million metric tons of carbon.

Many progressive cities, of course, do recognize better management of their refuse as a powerful climate-change mitigation tool and have adopted ambitious waste-reduction targets in their long-rage environmental plans. This summer, 23 cities signed on to an "advancing towards zero waste declaration," sponsored by C40 Cities, a global environmental non-profit organization. The signatories, which included seven U.S. cities, pledged that by 2030 they would reduce the amount of waste generated by each inhabitant by 15 percent and cut the amount sent to landfills or incineration by half.

What does the term "zero waste" actually mean? The Zero Waste International Alliance defines it as "designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of water and materials, conserve and recover all resources, and not burn or bury them." In practice, however, absolute zero is a tough mark to attain,

The design of a facility "is absolutely critical to zero-waste success," says Stephanie Barger, TRUE's director of market transformation and development.

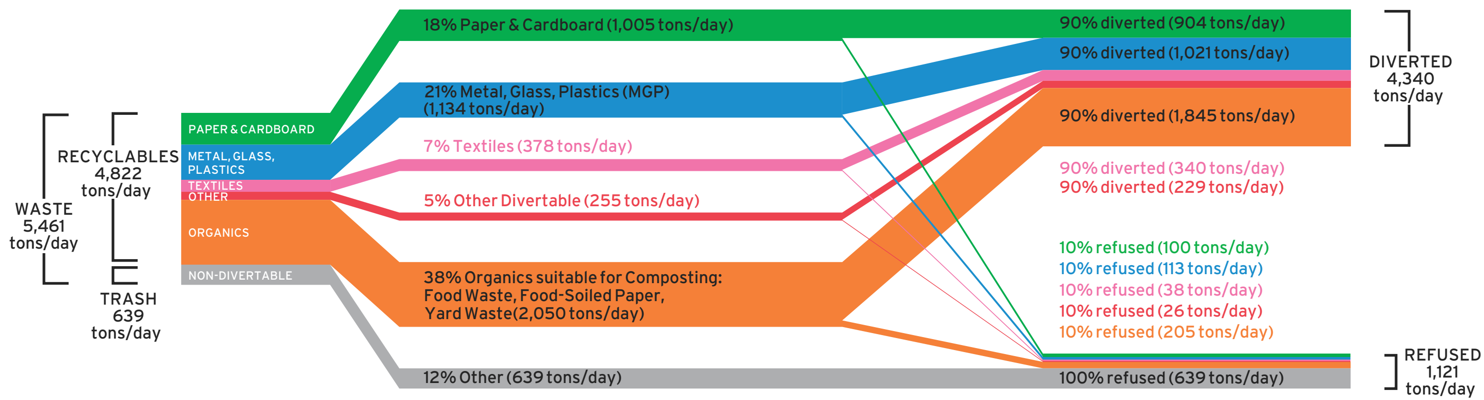
especially for industrial economies, and many international and U.S. organizations recognize a 90 percent diversion rate from incinerators, landfills, or the environment as zero waste.

New York is one city whose zero-waste goals call for reducing what it sends to landfills and incinerators by 90 percent by 2030 (compared with a 2005 baseline of 3.6 million tons). Now, however, only about 20 percent of the garbage the city produces each day is diverted, and just over half of the metal, glass, and plastic that inhabitants discard is collected for recycling. A meager four percent of food scraps and other organic waste is collected for composting, through a voluntary program. To have any hope of reaching its targets, the city will have to drastically reduce the amount of waste generated and dramatically ramp up recycling and composting rates.

Architecture and design can help remove some of the roadblocks in the way of achieving goals like those adopted by New York, according to zero-waste advocates. One way is through clearer messaging. "People don't recycle, because it is confusing," says Ushma Pandya Mehta, cofounder of Think Zero, a waste-reduction and diversion consultant. The rules are constantly changing, and they are different from place to place, she says. But facilities with good signage and well-placed receptacles—along with education—typically see strong participation, adds her Think Zero partner, Sarah Currie-Halpern.

That's what San Francisco International Airport (SFO) is banking on. As part of its goal to reach zero waste by 2021, it examined all aspects of airport operations, including offices, maintenance shops, and terminals. Then it reached out to Gensler for help. Sustainability director David Briefel describes the firm's role as one that was "graphics heavy" but also involved coordinating with SFO management and custodial staff and assisting with studies of waste-diversion rates and sorting accuracy at security screening points, food concourses, gates, and at back-of-house areas. The physical product of this exercise was new trash receptacles and signage intended to help airport users and employees better differentiate the various waste streams. The graphics and bins have so far been installed in Terminal 2, but will ultimately be implemented airport-wide.

Reducing waste and recovering more for recycling and reuse can also entail infrastructure-scale strategies, such as the installation of pneumatic tube systems. Powered by turbines that generate a vacuum, these whisk away trash at high speeds to a central terminal. The technology reduces the amount of space that individual buildings must devote to storage of



NEW YORK: WASTE FLOW 2030

ZEROING IN One way New York could meet its 2030 goals (above) is by cutting the current amount of trash produced (opposite) by 80 percent, reducing the quantity of recyclables generated by 50 percent, and ramping up diversion of recyclables to 90 percent.

waste and eliminates the need for piling trash bags at the curb. Best-suited for new, multi-building complexes, the first systems were installed in Sweden in the 1960s and now exist all over the world.

Although they are still rare in the U.S., the apartment buildings on New York's Roosevelt Island have a single-stream system that has been in continuous operation since 1975. It has been expanded several times and now serves 12,000 residents in 16 buildings. By the middle of the next decade, the city could have another complex relying on pneumatic waste collection. Plans for the primarily residential second phase of Hudson Yards—the megadevelopment rising over rail lines on Manhattan's far West Side—include a pneumatic network with dedicated tubes for landfill items, recycling, and organics that would connect to seven buildings with a total of 4,000 apartments.

New developments can also provide resources that serve a much larger surrounding urban district. Clare Miflin, an architect and founder of ThinkWoven, a New York–based urban-ecology consulting firm, points to Ménilmontant, an 85-unit social-housing complex under construction in Paris' 11th arrondissement. In addition to incorporating a community garden and neighborhood sports facilities, it will include a below-grade *espace tri*—a staffed facility that will accept items that Parisians are not permitted to dispose of at curbside, such as appliances, furniture, and household hazardous waste. As part of its long-range environmental plans, the city aims to establish such a bulk waste center in every arrondissement by 2020. Ménilmontant's *espace tri* will be the first in a residential complex. According to Pierre Maurette, a partner at Vincent Lavergne Architecture Urbanisme, the integration of the facility with the other neighborhood

VISUAL AID As part of San Francisco International Airport's zero-waste by 2021 initiative, Gensler designed new receptacles and graphics to be used throughout the facility to help increase sorting accuracy and diversion.

amenities was one of the reasons his firm was selected for the project.

Tools are starting to emerge that can help architects and their clients better manage the waste stream. Last year, AIA New York and a host of collaborators, including the Rockefeller Foundation, published a set of Zero Waste Design Guidelines, a 270-page examination of commercial and residential building design, urban infrastructure, collection methods, and policy. Already the document is influencing design decisions. The guidelines helped persuade the project team for Sendero Verde—a 655-unit mixed-income housing project for the Harlem neighborhood—to include a second trash chute for recyclables, according to Lauren Zullo, director of environmental impact for developer Jonathan Rose Companies. The three-building complex, by Handel Architects, slated for completion in 2021, is targeting Passive House certification, but also has a goal of waste-stream optimization, she says.

The guidelines are focused on solutions for New York, its unique building typologies, and its dense urban condition, but organizations in other locales are taking notice. Groups in Seattle are among those interested in adapting the recommendations to their circumstances, according to ThinkWoven's Miflin, the document's lead author. She cautions, however, that it "is still very early days."

Another framework for the design and operations of facilities that minimize waste is the rating system TRUE, short for Total

MENILMONTANT HOUSING – SECTION

MENILMONTANT HOUSING - AXONOMETRIC

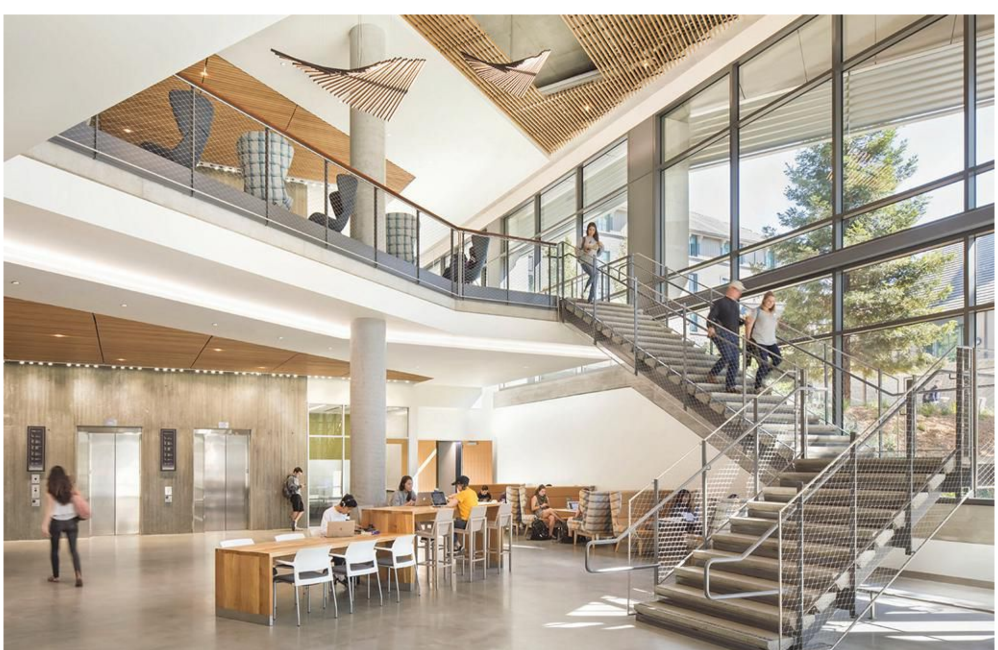
BURIED TREASURE Paris plans to have a bulk waste facility, or *espace tri*, in every arrondissement by 2020. Vincente Lavergne Architecture has included one below a sports field in an 85-unit social-housing complex it has designed for the 11th arrondissement.

IMAGES: COURTESY VINCENT LAVERGNE ARCHITECTURE URBANISME

Resource Use and Efficiency. Previously known as Zero Waste Facility Certification, it was acquired two years ago by GBCI, which also oversees LEED and WELL (an occupant-health-focused standard). Similarly to those two systems, TRUE has a point-based structure and graded recognition levels, in this case Certified, Silver, Gold, and Platinum. Minimum requirements include demonstrating at least 90 percent diversion from landfills, incinerators, and the environment, and submittal of diversion data annually to GBCI.

Since Stephanie Barger, TRUE director of market transformation and development, maintains that the design of a facility "is absolutely critical to zero-waste success," it is ideal for ambitious targets to be adopted early in the life of a project. But such commitments can also be made later, as was the case with Chou Hall, a 76,000-square-foot, six-story classroom building for the Haas School of Business at the University of California, Berkeley. Designed by Perkins+Will, it is pursuing the certification trifecta of LEED, WELL, and TRUE. Although certification under LEED and WELL was decided upon during the design phase, the third rating system was added just a few months before opening, in August 2017. Administrators felt that Chou Hall should be the first TRUE-certified building on campus as part of the University of California's system-wide goal for zero waste by 2020. "The idea was to create a blueprint that other Berkeley buildings could follow," says Jessica Heiges, a master's candidate in the College of Natural Resources, and one of the leaders of Chou's TRUE-certification effort.

Chou Hall has many advanced and integrated features for energy efficiency, water conservation, and health, such as a high-performance building envelope, extensive daylighting, rainwater collection, and an inviting central stair to encourage students to forgo the elevator. Aspects of the design that should help with its TRUE certification include water-bottle filling stations and waste-sorting bins that are clev-



TRIPLE CROWN Perkins+Will's Chou Hall at the University of California, Berkeley, a classroom facility for the business school, is on track to be the first academic building to earn LEED, WELL, and TRUE certifications.

PHOTOGRAPHY: © BLAKE MARVIN (2)

erly integrated into niches on each floor.

But since formally adopting the zero-waste goal, the multidisciplinary faculty, staff, and student TRUE team has closely examined Chou Hall's operations, establishing new initiatives that had not been part of the design brief. One area of particular scrutiny is the building's café and the catering for its top-floor events space. "Food is the single largest generator of waste," says Heiges. Some of the practices intended to shrink this footprint include collecting coffee grounds separately from other organics and sending them directly to a nearby farm; selling snacks from bulk containers, from which customers dispense the desired amount themselves into paper bags (to reduce the amount of uneaten food and eliminate plastic wrappers); and relying on reusable tableware and utensils for people who eat in and compostible ware for those who carry food out.

But all of these initiatives require space for storage and equipment, which is at a premium, says Danner Doud-Martin, the assistant director of operations for Haas's international business-development program and the faculty leader for the TRUE certification effort. "Real plates and dishwashing capabilities were just not in the plans three or four years ago." Despite these space constraints, Chou Hall is on track to achieve both True Platinum and LEED Platinum, along with WELL Silver, which would make it the first academic building to be certified under all three systems.

Such an intense focus on minimizing trash, like that exhibited by the Chou Hall certification team, may be relatively new, but it is an important aspect of building operations. TRUE's Barger calls waste the "next frontier" in facility design. Let's hope it is widely explored and embraced by architects and building owners. Getting to zero depends on it. ■

Continuing Education

To earn one AIA learning unit (LU), including one hour of health, safety, and welfare (HSW) credit, read "Talkin' Trash," review the supplemental material found at architecturalrecord.com, and complete the quiz at continuingeducation.bnpmedia.com or by using the Architectural Record CE Center app available in the iTunes Store. Upon passing the test, you will receive a certificate of completion, and your credit will be automatically reported to the AIA. Additional information regarding credit-reporting and continuing-education requirements can be found at continuingeducation.bnpmedia.com.

Learning Objectives

1 Explain the relationship between the management and disposal of waste and global warming.

2 Define "zero waste" and other terms relevant to the topic of waste minimization.

3 Discuss how building design can help or hinder minimization of waste and maximization of recovery of materials for recycling or reuse.

4 Describe guidelines and standards that can assist architects and clients develop zero-waste facilities.

AIA/CES Course #K1811A

Special Effects

A trio of surprising projects, each illuminated to establish a sense of place.

126 *The Constellation* at the Founder's Memorial Park, Abu Dhabi

128 Société Privée de Gérance, Geneva

130 Art on the Mart, Chicago

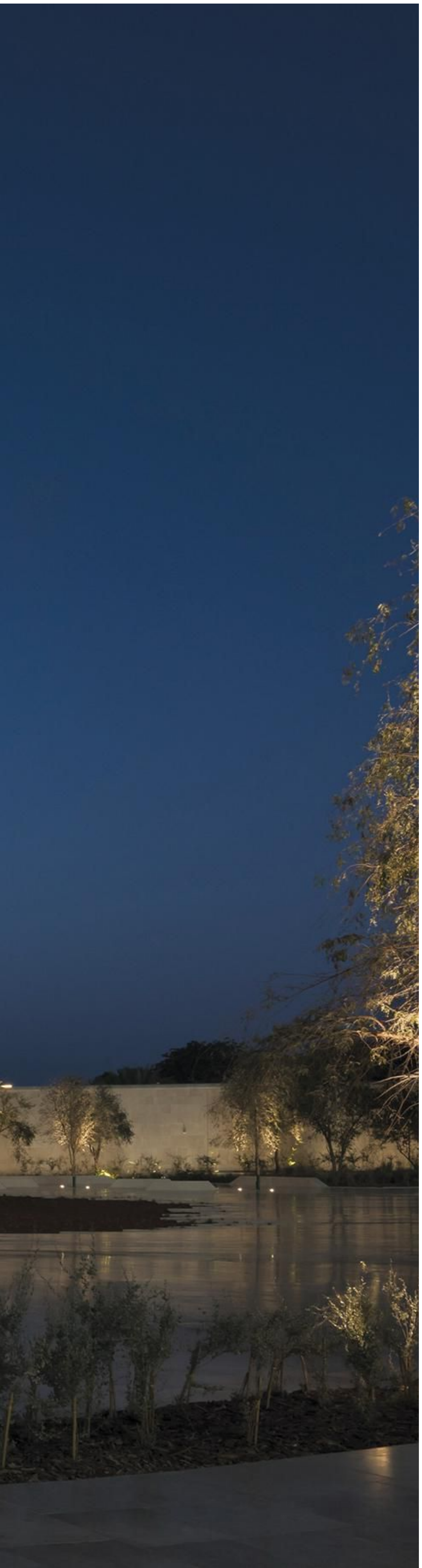
132 Products

PHOTOGRAPHY: © ALEX J EFFRIES PHOTOGRAPHY GROUP

THE CONSTELLATION *AT THE FOUNDER'S MEMORIAL PARK*

The Constellation at the Founder's Memorial Park

Ralph Helmick
dpa lighting consultants
By Chris Foges



PHOTOGRAPHY: © ALEX JEFFRIES PHOTOGRAPHY GROUP

SUBTLETY IS a surprising quality to find in a sculpted head similar in size to those on Mount Rushmore, but that is the impression achieved by Boston-based artist Ralph Helmick in a new Abu Dhabi monument to Sheikh Zayed bin Sultan Al Nahyan, the late emir and first president of the United Arab Emirates (UAE). Formed of 1,327 football-sized geometric solids suspended on 1,110 cables in a 100-foot-high open-sided triangular prism, the disaggregated portrait "employs a kind of 'active perception,' where we as viewers help to create the image," says the artist. To view it, visitors enter a tranquil eight-acre public garden planted with desert trees and grasses, leaving behind the bustle of the beachfront Corniche Road. Walkways that ring the pavilion provide vantage points from which the abstract assembly resolves into Zayed's familiar features. For the full effect, however, viewers must wait until dusk, when electric lighting makes the stainless-steel polyhedrons shine like stars, giving the artwork its title, *The Constellation*.

"It looks simple, but the design process wasn't," says David McNeil, director of dpa lighting consultants, who spent six years working on the scheme. The challenge was to cast the desired amount of light on each of the Platonic solids without illuminating other parts of the structure or surrounding area, and to do so while concealing the source. "As architectural-lighting consultants, we want people to see what we're lighting, not the lighting itself," says McNeil.

Design development proceeded primarily through physical models because "computer simulation wouldn't show us the richness or depth of the lighting," says McNeil. As the project progressed, Helmick built a 1:10 scale mock-up, and the dpa team traveled from the firm's Dubai office to Boston to test hundreds of fixtures. Washes and floodlighting were ruled out, as they offered too little control and lent a "flat" quality to the work. Instead, using a large number of narrow-beam point-source fixtures to illuminate the solids individually was "the right way to go," says McNeil. "We wanted them to sparkle and could only achieve that with narrow-beam fixtures."

It was also important that the luminaires provide a warm color temperature of 2700 Kelvin, dpa having decided that cooler whites appeared "too clinical," and be small, with an adjustable aim. "We knew that we'd have to do extensive on-site commissioning, spending a lot of evenings molding the image with light to pick up the details of the face," says McNeil. Since no off-the-shelf lighting system met all of these criteria, a custom fixture was developed by Lumascape, in two slightly different variations.

From the triangular plinth of the pavilion, 1,203 uplights illuminate the solids from below. They are buried up to the aperture in sandstone gravel. Another 782 luminaires are installed in the canopy, positioned to finish flush with the steel soffit. Each fixture is fitted with a 3.5-watt LED and integral DMX control to allow variations in the intensity of light. Their warm, white hue lends a soft golden glow to the jewel-like stainless-steel solids, which have a matte finish to minimize unwanted reflections.

STARRY NIGHT Artist Ralph Helmick's monument in Abu Dhabi (opposite) is a glowing tribute to the UAE's first president. Discreet fixtures in the base and canopy illuminate its floating, starlike steel outline (above), revealing the form of his visage.

The location of the cables precluded regular grid arrangements for the fixtures, so their positioning "is tailored to where the focus should be," says McNeil. "Denser parts are concentrated around the features of the face, and there's less lighting where his headdress tails off at the back."

As the monument is little affected by light pollution, dpa could "get away with very low light levels," says McNeil. "The park is supposed to be a quiet, relaxing space, so we wanted to bring the levels down as much as possible without losing the intensity." The brightest of three programmed "scenes" fades up about 10 minutes before the sun drops below the horizon. The light dims as the evening darkens and again after midnight, when the park is closed to visitors, to save energy.

Such restraint, and the designers' success in disguising the effort behind the effect, lends a sense of serene simplicity to the work, a fitting finish to a presidential portrait that seeks to evoke affection, not awe. ■

credits

ARTIST: Ralph Helmick

ARCHITECT OF RECORD: Meticulous Architecture + Design

LIGHTING DESIGNER: dpa lighting consultants – Barry Hannaford, David McNeil, Lee Sweetman, directors

ENGINEER: Meinhardt Group

FABRICATOR: Stage One

CONSULTANT: Estidama (energy code compliance)

CLIENT: United Arab Emirates Minister of Presidential Affairs

SIZE: 63,200 square feet

COST: withheld

COMPLETION DATE: May 2018

SOURCES

LIGHTING: Lumascape

Société Privée de Gérance

Giovanni Vaccarini Architetti
Simos Lighting Design

By David Sokol

TO MARK 50 YEARS in business in 2010, the real-estate services company Société Privée de Gérance organized a worldwide design competition to reclad its 1970s-era Geneva, Switzerland, headquarters. Of the several dozen teams invited to submit design concepts for the new envelope, the winning entry by Pescara, Italy–based Giovanni Vaccarini Architetti (GVA) envisioned a birthday makeover with functional benefits. The scheme added three floors to the existing structure and replaced the strip-window facade with expansive triple-glazed units to maximize daylight penetration in the workspaces. A cloak of vertical fritted glass fins shields occupants against solar heat gain and glare.

The eight-story office building's new envelope includes 100 tons of glass in total, with 2,900 glass fins in three sizes. The architects collaborated with Anières, Switzerland–based lighting designer Simon Simos on the solar analysis. Simos also suggested that they create a distinct nighttime presence for the headquarters by transforming the building into a literal haze of LED-emitted light after dusk. "A lighting project should always complement and reveal the architectural concept—sometimes in different ways from what the architect imagined," says Simos, who determined that a lantern-like effect would underscore both the ethereality and weight of GVA's design.

In order to achieve the desired blur of illumination, "our first concern was to create two slightly divergent 8-degree lighting beams to maximize reflection on the frit pattern while avoiding vertical light pollution," Simos explains. The design team simultaneously calibrated the spacing between the fins to a minimum width of about 2 inches, so that they could insert uplights between them, positioned to graze the fritted fins without the fixtures' appearing visible from the street, and to prevent light from leaking into the interior.

Rather than settle for off-the-shelf equipment, the design team worked with the engineers of a German architectural-lighting company to adapt an outdoor wall-washer that would meet its specifications. The resulting 290 custom luminaires—in 8- and 12-inch lengths, each with six or nine LED nodes, respectively—correspond to the dimensions and spacing between the fins. The manufacturer finished the waterproof devices in an anodized silver color to match the structural brackets that hold the glass fins, and it provided snap-fit clips for embedding the lights within the brackets, out of sight of passersby.

The modified luminaires are installed along three levels of the new facade, emitting a soft glow—at a color temperature of 3000 Kelvin—after dark. Simos devised multiple scenes that SPG can orchestrate via a custom building-automation platform. With several laptop keystrokes, the building can transition from a uniformly illuminated beacon to one with a surface on which blocks of light appear in a stairstep pattern.

Whatever the composition or sequence, Simos hopes the work will challenge perception, stir emotion, and even appeal to an onlooker's desire for belonging. A successful "nocturnal signature," he says, "not only influences the illuminated object but also its surroundings, defining the spirit of a particular place and its community." ■

credits

ARCHITECT: Giovanni Vaccarini Architetti – Giovanni Vaccarini, principal

ARCHITECT OF RECORD: Fabio Fossati Architectes

LIGHTING DESIGNER: Simos Lighting Design – Simon Simos, principal

ENGINEERS: Wintsch & Cie (structural); BCS (facade)

CONSULTANT: Atelier R2D2 (lighting controls)

CLIENT: Société Privée de Gérance

SIZE: 33,150 square feet

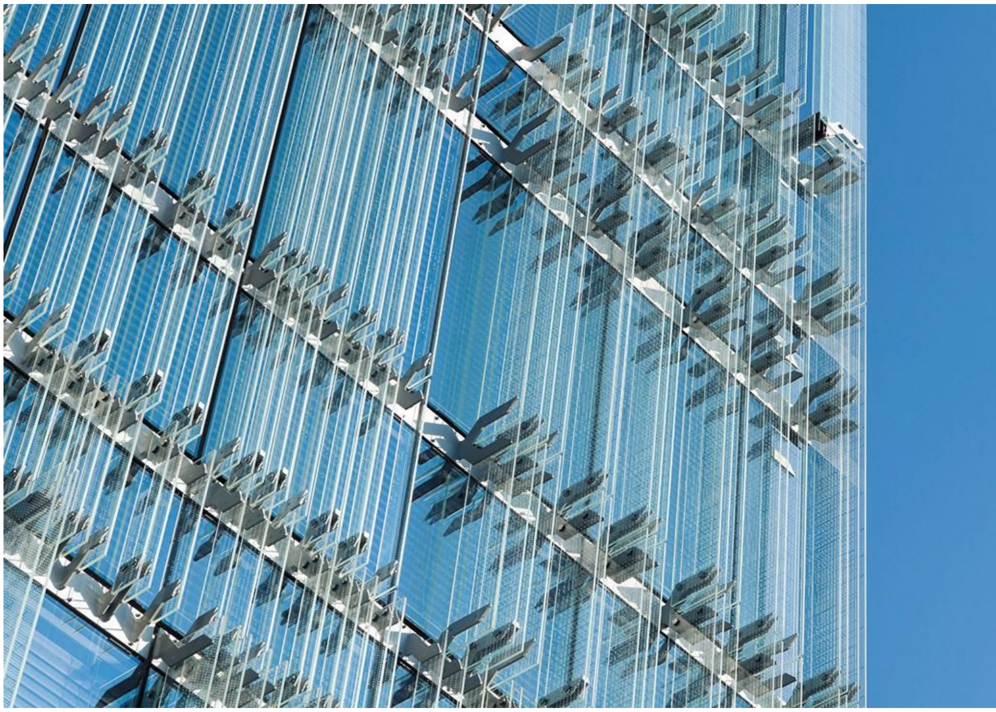
COST: withheld

COMPLETION DATE: December 2016

SOURCES

EXTERIOR LIGHTING: Erco

CLADDING: Stahlbau Pichler (fin anchors)



ALL A BLUR
During the evening, the SPG headquarters (opposite) emits an ethereal glow that can be varied by the client via custom controls. Fritted glass fins shade the workspaces during the day (top). The LED luminaires (left) are configured to prevent glare indoors when the facade is lit (above).

PHOTOGRAPHY: © ERCO GMBH/MORITZ HILLEBRAND

PHOTOGRAPHY: © TOM HARRIS

Art on the Mart

Valerio Dewalt Train Associates
Obscura Digital

By Zach Mortice

THE SILVERY, room-sized box peeking out from the Chicago Riverwalk's limestone balustrade is perhaps the least obvious and scrutinized part of this new spine of green space, which is changing how the city considers its other great waterfront (RECORD, October 2015). As the projection room for a video-art installation beaming images onto the gargantuan expanse of the Merchandise Mart across the river, "Its design had to blend into the background," says architect Mark Dewalt, of Valerio Dewalt Train Associates (VDTA), who designed the structure.

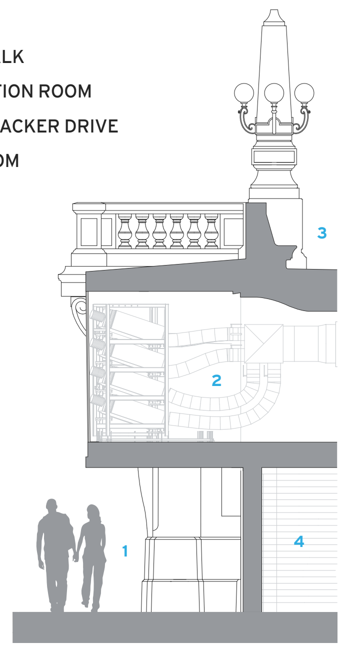
"You wouldn't even notice it unless someone pointed it out for you," says Will Chase, of Obscura, the digital art and media company that partnered with VDTA to create it. But there's no missing the installation this structure enables. In its first week, hundreds of Chicagoans lined the Riverwalk to see the world's largest permanent digital art projection, currently showcasing the works of four different artists.

Art on the Mart comes with a historically superlative canvas for the show. Chicago's Merchandise Mart was the largest building in the world when it was completed in 1930. At 340 feet tall, it offers 91,000 square feet (more than two acres) of facade as a projection screen. The show will run five nights a week, 10 months of the year, for 30 years. Vornado Realty paid $8 million for the entire endeavor, delivered with no advertisement or branding, adding yet another experience to the Riverwalk's amenity parade of public sculpture, restaurants, and wine bars.

But the size of this installation is a counterweight to the diminutive dimensions of the projector box that contains its equipment, and a lack of space was the most intense technical challenge faced by designers. The projection room contains 34 Christie Boxer projectors, each about the size of a toddler but weighing 300 pounds and trailed by air ventilation-exhaust tubes. This cozy space (about 800 square feet) is hemmed in by clearance for pedestrians below on the Riverwalk and by Upper Wacker Drive, which runs above it. Clad in reflective zinc, its steel structure cantilevers over the Riverwalk, slotting into its retaining wall. "There's no fluff or extra space left," says Dewalt. "The toleranc-

DAZZLING DISPLAY
An 800-square-foot projection room (left) tucked under the balustrade of Chicago's Riverwalk is the source of a new series of digital art installations displayed over the expansive facade of the Merchandise Mart (opposite).

1 RIVERWALK
2 PROJECTION ROOM
3 UPPER WACKER DRIVE
4 RESTROOM



SECTION OF THE PROJECTION ROOM

credits

ARCHITECT: Valerio Dewalt Train Associates – Mark Dewalt, prinicpal; Heather Salisbury, architect; Susan Crockett, design team

CREATIVE STUDIO: Obscura Digital

ENGINEER: IMEG

GENERAL CONTRACTOR: Berglund Construction

CLIENT: theMart

SIZE: 1,800 square feet

COST: withheld

COMPLETION DATE: September 2018

SOURCES

METAL PANELS: Rheinzink

GLASS: Prelco (art glass)

CURTAIN WALL: Oldcastle BuildingEnvelope

LIGHTING: Protean; Lithonia (interior); Eaton (exterior)

DOORS: Assa Abloy; Nystrom; Acudor

HARDWARE: Schlage; Norton

CEILINGS: USG

es," says Chase, "were down to a half inch or less."

The permanent nature of this installation also provided maintenance and management challenges. For instance, Obscura custom-built a content-management system so that Art on the Mart staff can upload any video art they wish, by themselves. They and the architects tested 15 kinds of glass for transparency and durability, to stand up to the intense weather cycles of Chicago's seasons, settling on a double-paned low-iron ultratransparent glazing that prevents the collection of condensation.

Accessed via a stairstep ladder, the projection room is filled with the exhaust tubes, which are wrapped in chrome-toned insulation and hang like thick, fleshy tendrils. The projectors are stacked on a steel rack that can be cranked to provide 30 inches of space for maintenance staff to clean in. Afterward, the projectors have to be digitally recalibrated.

"It's extremely precise, because if the projector is off by a millimeter, by the time if gets across the river it [could be] a foot, and you'd see a lot of distortion and blurriness," says VDTA's Heather Salisbury, the installion's project manager.

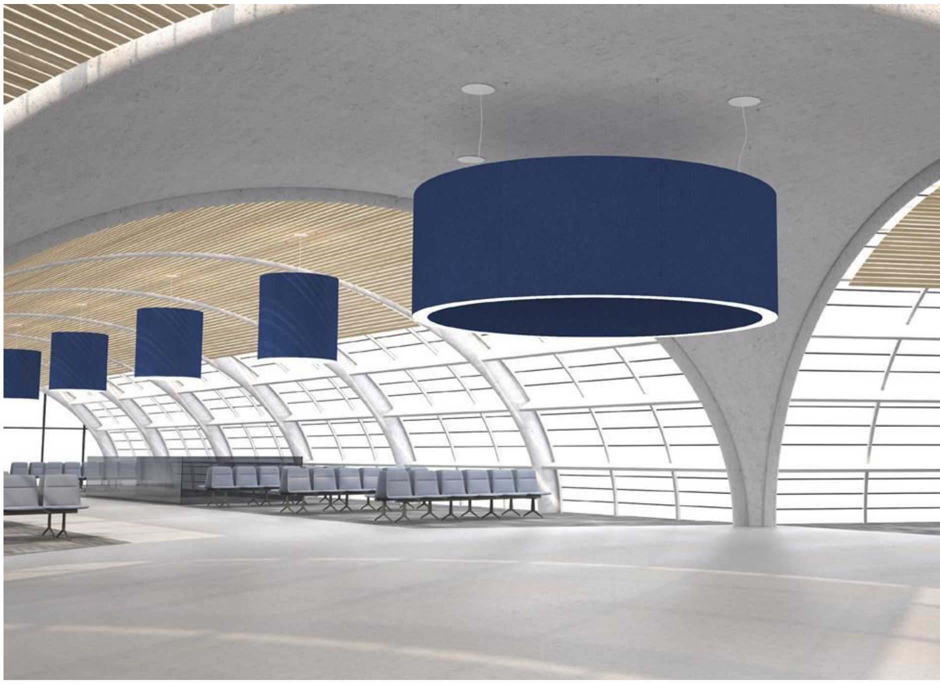
This rack is set on rubber footings that protect against vibrations emanating from the nearby "el" train and traffic on Wacker Drive. The ventilation units are hung from the ceiling with spring assemblies, which also dampen vibration.

Obscura digitally mapped the entire Merchandise Mart's southern face, so that the show's programming wouldn't shine a single light into the facade's 1,000-plus windows. As to the show itself, the projector array proves able to render images in sharp, digital abstraction; in photo-realistic documentary video; and in Impressionistic, flowing strokes. The most effective sections of the inaugural run, which opened on September 29, use the sheer scale of the Merchandise Mart to communicate subtle bits of narrative, like a red harvest moon that quietly drifts across the horizon while all manner of plant life explosively envelopes this iconic Chicago building in the painterly effects of Jan Tichy's *Artes in Horto—Seven Gardens for Chicago*. Conversely, Jason Salavon's *Homage in Between (Chicago Art, 20th Century)* is native to our era of algorithmic aggregation and collage: a stream of paintings, illustrations, and photographs—from artists with strong Chicago connections—broken down to their component parts and montaged into digital psychedelia. In a city that steadfastly takes well-deserved pride in its architecture, it's a new reason to keep looking up. ■

Bold Moves

Versatile luminaires bring a glow—and some surprising new features—to commercial spaces.

By Kelly Beamon



Acoustic Shapes
This line of suspended PET felt–wrapped fixtures from LightArt expands the company's integrated acoustic-lighting solutions by adding more than 40 sizes, ideal for large-scale commercial spaces. Acoustic Shapes LEDs (part of the Acoustic Collection) are dimmable and available in Box, a line of square and rectangular fixtures, and in Drum, or in wide-shade Ring, in diameters ranging from 30" to 16'.
lightart.com

Zume
Available in a 16" or 20" diameter with custom laser-cut patterns in its spun aluminum cap, Zume is built for rigorous outdoor settings such as public parks and boardwalks. The LED pendant is listed for wet locations and tested to withstand vibrations according to the American National Standard for Roadway and Area Lighting Equipment. Designers can specify the fixture mounted to a junction box under an existing structure or strung between two posts by a cable.
visalighting.com

Pursuit
Pursuit by Architectural Area Lighting (a Hubbell Lighting brand) can be specified in L-, T-, and X-shaped modules or connected to form a 150' ribbon of illumination capable of wrapping a building or space. Invisible end-to-end connections on the copper housing and a flexible acrylic lens diffuser, which ships coiled and can be installed on-site, enable designers to achieve longer runs delivering up to 145 lumens per watt.
aal.net

Flindt Wall

Based on the sculptural lines of Louis Poulsen's Flindt Bollard, the moon-shaped Flindt Wall is meant to evoke a solar eclipse. The powder-coated sconce, available in Corten, White, and Aluminum (shown) finishes, is the latest in a collection from the Danish lighting manufacturer, which is all by Copenhagen-based designer Christian Flindt. Mounted to interior or exterior walls, the profile projects from its mounting hardware to allow two LEDs to emit light from an egress in back and from its gently curved hood in front.
louispoulsen.com

Harvest Luminaire

Landscape Forms collaborated with Duluth, Minnesota–based Loll Designs on a line of communal outdoor tables and benches with optional 3200K LED tasklights built in. The furniture and light fixture are built from extruded aluminum bolted to steel supports and finished in the manufacturer's special weather-resistant polyester-based powder-coating. The surfaces are made of high-density polyethylene. The standing-height table, with its optional 14"-tall light fixture (shown), measures 37" deep x 95" wide, in heights of 46" or 54". A 6"-tall tasklight is available for dining-height versions.
landscapeforms.com

Duraflex Neon

What appears to be neon is actually an adaptable and budget-friendly low-voltage LED. Designers can mount the extruded silicone luminaire using clips or an aluminum mounting channel, available in lengths of up to 30', to create a continuous line of illumination around architectural features. Options range from a 2700K to 4000K glow in Red, Green, Blue, Yellow, White, and Static White.
targetti.us

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In this section, you'll find 12 compelling courses highlighting creative solutions for tomorrow's buildings brought to you by industry leaders. Read a course, and then visit our online Continuing Education Center at ce.architecturalrecord.com to take the quiz free of charge to earn credits.

Photo courtesy of Construction Specialties

Facades: Beauty Starts Skin Deep

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The Renaissance of the Restroom

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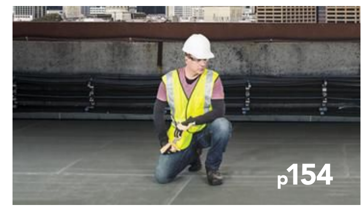
Photo courtesy of Georgia-Pacific Gypsum



Selecting Rigid Cover Boards in Commercial Roofing Systems

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Daylight Autonomy 101

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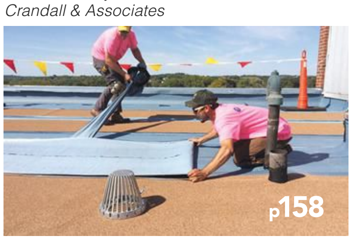
Photo courtesy of CertainTeed and Paul Crandall & Associates



Low-Slope Roofing: Specifying a Quality, Cost-Effective Roof System While Considering the Skilled Labor Shortage

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Innovations That Drive Sustainable Ceramic Material Selection

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Prefabricated EIFS-Clad Wall Panel Assemblies

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Sustainable Material Selection Delivers Better Spaces

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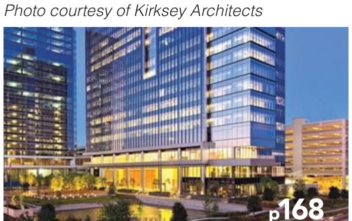
Photo courtesy of Kirksey Architects



Improving High-Performance Facades Through Post-Occupancy Evaluation

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ACC	ACCESSIBILITY	**IN**	INTERIORS	**ST**	STRUCTURAL
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EM	ELECTRICAL AND MECHANICAL	**RR**	RENOVATION AND RESTORATION		

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Building facades are key elements in both the design and performance of a building with many choices available in products, materials, systems, and solutions.

Photo courtesy of Construction Specialties

Facades: Beauty Starts Skin Deep

The first chance a building has to make a statement is with its exterior. What that statement is partially depends on the materials and systems used, and how they're incorporated into the designer's vision.

Sponsored by CL-TALON®, Construction Specialties, Guardian Glass, and New Millennium Building Systems
By Peter J. Arsenault, FAIA, NCARB, LEED AP

The facade of a building plays a key role in the overall design perception of a building as well as its ability to perform favorably. As the visible public "face" of a building, it provides a means for design expression that can range from traditional to innovative, planar or three dimensional, static or dynamic, colorful or not. Architectural critics in multiple media platforms expound on the relative merits and deficiencies of particular building facade designs while the general public reacts with vernacular zeal for what it likes or doesn't like. From a performance standpoint, facades often provide the largest surface area of the building enclosure, thus having a very direct impact on the long-term durability and energy performance of the building. Of course, the particulars of the facade need to be based on the local conditions to respond not only to design preferences but to performance issues as well. The Architecture 2030 organization defines this point by saying, "A climate-based building facade is a filter between exterior and interior that creates comfortable internal living conditions."[1] As such, a facade design determines what filters in (e.g., sunlight, fresh air, etc.) and what is filtered out (e.g., excess heat, noise, etc.) all in the context of good design principles.

In the quest for a high-performing, well-designed building facade, architects need to rely on their understanding of the plethora of available materials, products, systems, and solutions on the market. In this course, we will look at some of those commonly available choices with an eye toward achieving innovation and high performance in building designs.

INTEGRATING STRUCTURE AND FACADE

In a three-dimensional building exterior, sometimes it is the design intention to connect the inside with the outside, blur the visual sense of the enclosure, and provide daylight and views while still providing shade. By expanding the definition of a facade to encompass the entire outward expression of a building, its exterior form, its extended parts, and overhangs, the aesthetic and architectural value can be enhanced. Interconnected three-dimensional exteriors can provide opportunities for light sources to play with interior

CONTINUING EDUCATION

1 AIA LU/HSW

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

1. Identify and recognize the range of performance requirements of a facade as part of the overall exterior design and building enclosure.
2. Assess the design and performance aspects of building facades, particularly related to structure, support, glazing, and specialty integration.
3. Explain the integration of facade materials and systems as they relate to energy-efficient and high-performance building design.
4. Determine ways to incorporate the principles discussed as related to the design and performance of buildings as shown in case studies.

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Photo courtesy of New Millennium Building Systems

While the facade of this education facility is a window wall, the windows, ceilings, and roof extensions become the "face" of building. The deep ribbed, non-acoustical roof deck seamlessly flows to the interior, where it is factory installed with acoustical mitigation. Both are surface finished at the factory.

spaces, create an artistic continuation of themes from the outside to the inside, and generate overall impressions that delight the users and visitors to a building. Achieving these design results does not need to be elaborate or complicated. In fact, some of the best solutions often rely on simple, elegant design approaches and common building materials. One example that we will explore here is the use of structural steel decking systems to create innovative and high-performing facades.

Horizontal Projections

Steel decking has been used successfully to extend out horizontally past the exterior wall system to create an overhang or other design feature. A range of steel decking systems are available to address both structural and aesthetic objectives. Among these are deep ribbed or "dovetail" shaped steel deck profiles that offer enhanced structural strength plus an attractive pattern on the underside of the deck. When left exposed, this deck becomes integral to the overall aesthetic, whether serving as uniquely designed roof extensions or as integrated screens and canopies. They can also provide acoustical control when used for ceiling applications. Further, they can be longer in their span than standard steel deck, up to 35 feet in many cases. For simplified construction, lighting, electrical, plumbing, and fire suppression can all be readily integrated in the system. Of course, proper detailing is needed to assure thermal bridging is avoided, but that can be very straightforward to achieve.

Cladding

In addition to horizontal uses, vertical, angled, curved, or sloped steel facades can be created using steel roof deck profiles as a cladding material. One of the ways to do this is by using structural steel decking (i.e., found in specification Division 5) for facade cladding in lieu of the typically more expensive architectural metals (i.e., found in specification Division 7). The attachment and field installation processes are well known and can produce a consistent, controlled performance related to loading conditions. Further, the appearance can hold up well over time. It should not be a surprise, then, to realize that this steel decking is being used not only for the underside of horizontal canopies on building exteriors but also for vertical facades.

Such structural steel decking is engineered for strength and durability and comes in a variety of profile shapes and depths with a range of visual effects. These include dramatic deep flutes, ribbed patterns, a lineal plank appearance, or a clean, smooth look. When used as cladding, steel decking can uniquely address the facade objectives of function, form, and cost control. This comes about because these systems contribute both structurally as well as aesthetically to the building. They serve to transfer loads and forces into the main building structure to maintain the integrity of the building while helping to weatherproof the exterior—and they can provide the finished cladding surface all in one product.

Standard profile deck along with long-span deck can be readily installed vertically, minimizing joint lines and creating an attractive exterior cladding. The engineered corrugations in the decking can be sized to hold up against wind, weather, and usage as appropriate to the project location, making it suitable for a permanent or sacrificial skin or a rainscreen on a facade. It can also serve as a sun screen or solar shading device where appropriate.

Finished Appearance

One of the aspects of using steel decking either for roof/ceiling designs or cladding is the ability to conceal the fasteners. This helps with the overall appearance of the system but also helps assure greater weathertightness. With an uninterrupted surface to work with, the exposed surface of the deck system can be coated or textured to suit a variety of design needs. Steel deck is typically galvanized, but there are also options for variations like using stainless steel. Coatings can also be introduced to contribute to the durability of the material and longevity of the facade. Such coatings can be used to provide statements of color and texture that give a building its visual personality.

Recognizing the suitability of steel deck in exposed exterior locations, manufacturers offer a range of prefinished options using a variety of coatings. If primer and paint are factory applied on galvanized steel, it can provide years of protection that outlasts other options to keep the material looking good longer. This can be true even in aggressive environments, like swimming pools with corrosive chlorine, saline climates, or areas of high humidity. They are also effective at handling extreme environments such as marine locations and full ultraviolet exposures. Even in these situations, the prefinished coating systems can carry warranties and withstand chalking and fading over the years.

These prefinished products also give architects a broader design palette, allowing color, pattern, and texture to be selected to suit particular aesthetics. Regardless of the final look, these new prefinished deck options eliminate on-site painting or finishing, thus saving time during the construction process. The prefinishing also helps to assure a consistent and uniform appearance.

Building Applications

Steel decking systems used in facades are often considerably less costly when properly evaluated from the standpoint of total cost to a project. This makes them attractive not only for their design and performance characteristics but also for their ability to address project budgets. As such, architectural steel decking is increasingly being used as ceiling and cladding solutions for such applications as stadium exteriors and roofs,

natatorium ceilings, open-air walkways, screens, and canopies. They are also being used in higher education and other commercial and institutional buildings in a variety of locations around the country.

HIGH-PERFORMING FACADE SUPPORT SYSTEMS

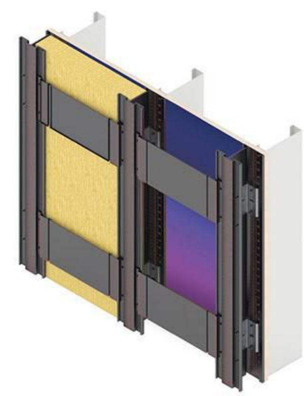
Many commercial building facades are constructed by using a panelized cladding made from an appropriate material that is held in place by a frame or substructure. The significance of that substructure cannot be overlooked since the visible facade will be only as precise in its alignment and location as the substructure is. Therefore attention needs to be given during the early design and construction documents phase of a project focused on the cladding support systems and their specifications, which need to be defined in detail. Without enough clarity or detail, the contractors/installers are left to interpret the project requirements on their own, which often results in the most economic option for them, but not necessarily the best option for the building.

Beyond the fundamental purpose of supporting cladding, facade substructure systems can play an important role in the energy performance of the building. Increasingly, continuous insulation is called for between the exterior sheathing and the cladding in a wall assembly. Most substructures use aluminum as their primary material for their characteristics of being lightweight, non-ferrous, and strong. When these aluminum members interrupt the continuous insulation, however, they can create thermal bridges that compromise the effectiveness of the insulation and reduce the energy performance of the building. Therefore, an effective means to thermally isolate the members on either side of the insulation is called for. In order to better understand the issues, let's compare conventional cladding support systems to high-performance ones.

Conventional Facade Support Systems

A number of problems have been experienced related to the installation of conventional subframing and cladding materials. First are alignment issues between and across substructure members that can result in potential structural deficiencies of the system. Second is the labor-intensive process of creating a level, plumb, and true cladding support surface across the entire facade. Third are installation errors that can occur when the installers deviate from the intended design or when field conditions are different than expected during design. Finally, any of the above conditions can require additional adjustments to fix or properly realign the subframing, which is often not realized until the installation of the cladding has already begun.

Images courtesy of CL-TALON®



Integrated cladding support systems provide a complete, adjustable, and easy-to-install means to allow for continuous insulation and fully tested cladding support.

In that case, any installed cladding needs to be removed or the design needs to be changed to remedy the flaws.

Any of these issues can translate into additional construction costs associated with conventional subframing. As such, conventional systems have been found to cost more than newer, integrated cladding support systems both in terms of product cost and additional labor costs. Conventional systems are also prone to need additional material to fabricate custom parts, which causes the potential for waste that is built into the fabrication cost. Over the life of the building, the reduced thermal efficiency of conventional subframing reduces the energy performance and return on investment (ROI) while increasing building operating costs.

Integrated Cladding Support Systems

Recognizing the issues and limitations of conventional support systems, new cladding support systems have emerged on the market that incorporate simplified, accurate installation guidance and thermal isolation within the system. These new systems have been designed to work with any type of cladding material for both interior and exterior applications. They can be installed both vertically as well as horizontally depending on the project requirements using specially designed attachment configurations that allow different fastening and connection techniques. Some even provide a coplanar, zero-sightline surface based on minimizing the depth of the members to match the thickness of continuous insulation.

During installation, these advanced systems provide a number of time-saving benefits to the contractor/installer. First, standard sizing of the components is available based on common 10-foot lengths spaced every 16 inches on center. Second, some include integrated measurement scales (in inches) to allow for quick, hassle-free placement and adjustment of other components and cladding. Similarly, leveling and plumbing of the system is accomplished with lightweight interlocking levels into the framing to ensure the system is plumb and true. In terms of sequencing, portions of the system can be staged and partially assembled prior to being installed on the wall or ceiling surface, saving time and ensuring proper placements of components. Finally, integrated attachment grooves allow for quick placement and adjustability of cladding attachment components. All of this creates a precise substructure on which the final facade cladding material can be attached faster, easier, and with potentially fewer errors compared with conventional systems.

High-Energy Performance

In order to assure the effectiveness of continuous insulation between the cladding and the exterior sheathing surface, the inner and outer members of the substructure are connected but kept separate using a clip system. In a high-energy performance system, these clips are available in adjustable depths, allowing the system to accommodate a wide range of exterior continuous insulation of various depths to meet project specifications. For best performance, these connection clips should be made from a material with a low thermal conductance such as polyamide, which is a common nylon composite material. Polyamide is routinely used in

curtain walls and window industry products for its low thermal conductance, enhanced durability, and strength. It is also fire rated and will not crack, splinter, or warp. Engineering analysis, based on computer modeling, has been done on such high-performance systems in exterior wall assemblies with continuous insulation between the cladding and sheathing interrupted only by the polyamide clips. The conclusion of that analysis states, "The effectiveness of the overall assembly (thermal transmittance of assembly with thermal bridging vs. thermal transmittance of the assembly with no thermal bridging) ranges from 77–91 percent effective depending on insulation thickness and component spacing."[2] In terms of life-cycle energy impacts, most of the system components are responsibly sourced and 100 percent recyclable, allowing them to contribute toward various LEED credits or other green and sustainable building rating systems.

Testing and Code Compliance

High-performance cladding support systems often need to be tested in conjunction with the other materials in a facade assembly to demonstrate performance to meet or exceed minimum code requirements. These include NFPA 285 Standard Fire Testing, which must be done on the entire assembly, not just on individual products. Nonetheless, such high-performance systems have been shown to work exceptionally well with many common exterior wall assemblies when tested. Similarly, Air Pressure, Water Penetration, and Structural Performance testing, (ASTM E-283, ASTM E-330, ASTM E-331) has demonstrated performance beyond the levels required by building codes. This helps ensure that the cladding support system will function in normal as well as extreme weather conditions. Structural testing also indicates the ability of the cladding support system to safely transfer the imposed loads from both gravitational and wind forces affecting it to the structural members of the building.

Space Savings

One of the design and long-term financial benefits of high-performance cladding support systems is the ability to be compact and thus save space. This can come about in three ways. First, prior to installation, the compact nature of the system components require only a small space for staging and storage on site. Second, the design and strength of these systems remove the need for additional layers of cross bracing or cladding attachment rails to be installed. And third, due to the vertical and horizontal coplanar zero sightlines of the system face, the overall envelope footprint can be reduced, thus maximizing the usable/rentable square footage of a project. This thinner profile also helps to avoid encroaching upon the lot lines and air rights of any surrounding structures.

Overall, high-performance cladding support systems, are being recognized as the next generation of cladding support due to the multiple positive attributes discussed. Stewart Jeske, MS, PE, is a principal and senior glazing systems engineer at JEI Structural Engineering, says, "I'm impressed, and I think that this [type of] product will soon become the standard in the industry." Facade contractors are weighing in too, including Erick J. Prifti of Albco, who says, "We installed a high-performance system in only three days, whereas with a traditional installation, it would have taken two weeks. We are very impressed with the speed and simplicity of the system." All of this points to the need for architects to be aware of this technology and evaluate it for their particular projects.

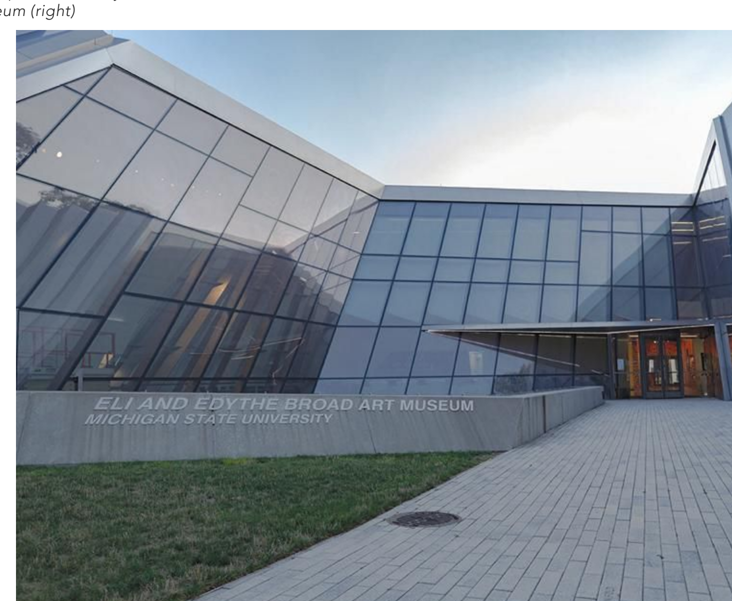
GLASS AND ENERGY PERFORMANCE

All occupied buildings require or desire natural daylight and views, hence the use of glass in building facades is ubiquitous. Indeed, some design approaches focus on "building with light" to create facades that capitalize on daylighting and views. The positive human effects of doing so have been documented in numerous studies that indicate the presence of glass in a building facade is essential for occupant health and well-being. There are also functional performance aspects of glass in a building facade related to occupant comfort and energy needs for artificial lighting, heating, and/or cooling in a building. Depending on the system installed, daylighting can lower energy use for lighting and related HVAC use up to 80 percent.[3] In the process, the proper selection of glass can offer occupants comfortable, functional spaces that meet the program needs of the building and achieve the sought-after health and energy benefits.

The advancement of glass technology in the past few decades has addressed all of these building and facade aspects. That now means architects who are seeking to build with light needn't sacrifice design intent and window-to-wall ratio in the name of energy performance. High-performance, low-e glass coatings can be used to help ensure buildings are able to manage HVAC loads while still offering the aesthetic needed with clear views for occupants. In order to fully achieve the intended results, facade design that incorporates glass must consider the following:

- **Building shape and orientation:** Natural sunlight will hit building elevations in very different ways depending on the shape of the building and the compass orientation of each facade. Direct and indirect daylight will also enter the building differently at different times of day and during different seasons, all of which will impact energy use and occupant experience. The use of different glass coatings on different facades is one solution for managing solar heat gain, glare, and other factors in a consistent manner, regardless of these variables.

Photos courtesy of Guardian Glass/© Luc Boegly; photo courtesy of 5+1AA Alfonso Femia Gianluca Peluffo architectures (left); photo courtesy of Eli and Edythe Broad Art Museum (right)



Selecting glass for a building facade requires consideration of a number of factors, including building shape, climate, energy codes, color, reflectivity, and panel size. Such was the case for the Broad Art Museum (right) designed by Zaha Hadid Architects.


GLASS WORTHY OF A
LANDMARK
Salesforce Tower
SAN FRANCISCO, CALIFORNIA
with SunGuard® AG 50
Photo © Tim Griffith

- **Climate-based energy codes:** The International Energy Conservation Code (IECC) identifies eight different climate zones around the United States and prescribes performance criteria specific to each climate zone. Such criteria includes glass and glazing, thus requiring architects to identify the appropriate climate zone where the building is located and select glass according to the minimum criteria of that climate zone. Whether new construction or retrofit, the design team can select a high-performance, low-e coated glass product that will deliver the needed performance characteristics most appropriate to the climate needs.
- **Color and reflectivity appearance:** Coated glass comes in many tints and offers different degrees of reflectivity, sometimes affected by the glass substrate used and sometimes by the coating. For new construction and retrofits, a range of clear, blue, green, and grey colors are available to suit different design schemes. For existing buildings, it is possible that the facade color and/or reflectivity of replacement glass, or new glass that is part of a new addition, needs to match or be consistent with existing glass. In those cases, large-size samples viewed at the building site will help the building team identify the best coated glass product.
- **Glass panel size:** While it is possible to manufacture glass in a variety of sizes and thicknesses, the equipment to add coatings has had historical size limits. That has changed with the availability of new coated glass in jumbo sizes on lites up to 217 square feet. Standard jumbo coated glass products can now be specified up to 130-by-204-inch sizes, with special orders available at 130 by 240 inches. The lites are available in 6-, 8-, or 10-millimeter thicknesses and on jumbo float glass that is clear, tinted, or low-iron.

The larger-size jumbo glass in particular has become appealing for many commercial buildings because it opens up possibilities to architects by delivering expansive views while maintaining high performance. It amplifies all of the benefits and the impact of glass facades by making indoor spaces feel more expansive and giving people inside the buildings access to extraordinary, uninterrupted views of the outside scene. With large-scale jumbo glass, the boundaries between indoors and outdoors recede, and the illusion—the connection—is complete. Further, by using clear, low-iron glass as the substrate for jumbo lites, those expansive views are free of the green tint that exists in standard glass. It also delivers clean lines, true colors, and clear views with no distractions, maximizing light transmission to bring natural light deep into interiors. Darijo Babic, director of architectural sales, North America for Guardian Glass, observes, "While the trend of architects designing projects with larger glass sizes continues to grow, we also see architects designing large projects with very high volumes of coated glass. Architects can now capitalize on 20 years of jumbo coated glass experience combined with our high-performance low-e coated glass."

Glass product lines for commercial applications give architects a range of excellent solar control capabilities and a wide variety of colors and performance levels. Those glass products offer innovative, leading solutions for appearance and energy efficiency in facades and are commonly available through local fabricators.

DESIGNING EXPANSION JOINT COVERS INTO FACADES

Commercial buildings of any size require expansion joints between sections of the structure to allow a building to expand, contract, or shift laterally due to imposed forces. Those movements can come from temperature changes, causing materials to expand or contract, winds that move or sway the building, settlement over time, or seismic events. A well-designed series of expansion joints will allow sections of the building to move independently of each other without damaging either the structure or the finish materials.

In addition to allowing for movement, expansion joint covers also need to be able to insulate and protect the joint opening from outside elements. If water or moisture make their way into the joint opening, then the building could be susceptible to leaking, moisture damage, mold, or other deterioration that could cause failure. Therefore, metal covers with a water and vapor barrier installed behind the cover are common, as are fully watertight solutions that fit into a joint opening. Similarly, if airborne dust, dirt, or other objects get in behind the expansion joint cover, then it may not function properly since the anticipated movement or sliding of components could be impaired. Hence the expansion joint cover needs to seal against such penetration of foreign matter as well.

From a design standpoint, architects often look for ways to hide or integrate expansion joint covers into the overall design of the facade. Fortunately, such integration is entirely possible without compromising either performance or aesthetics. Manufacturers routinely provide multiple options for covers that can be infilled with the same materials as the facade thus creating a continuous appearance. The metal of the expansion joint cover itself can also be custom colored to match a building's facade and become virtually undetectable.

Photos courtesy of Construction Specialties

A design challenge at Parkland Hospital in Dallas was determining how to integrate the expansion joint covers directly into the facade system. This involved incorporating the glass finish and accommodating movement all while being water- and airtight to maintain building performance.

When an expansion joint cover type is identified that meets the aesthetic criteria for a project, architects can then work with manufacturers to verify that the performance criteria is met. Some provide considerable technical assistance and, when applicable, they can conduct cycle testing on a joint cover to verify their performance. From that standpoint, architects should have confidence that the solution they specify will both perform well and blend into the overall facade design in a minimally invasive way.

Kevin Smith, PE, is the engineering manager at Construction Specialties and provides technical assistance to architects on a regular basis regarding expansion joint covers.

Continues at ce.architecturalrecord.com

Peter J. Arsenault, FAIA, NCARB, LEED AP**, is a nationally known architect, consultant, continuing education presenter, and prolific author advancing building performance through better design.* ***www.pjaarch.com www.linkedin.com/in/pjaarch

PRODUCT REVIEW

Facades: Beauty Starts Skin Deep

CL-TALON®

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CL-Talon – Sustainable, Energy-Efficient, Adjustable Cladding Support System Provides Labor Savings

Where other attachment systems rely on rails to be anchored through the substructure and insulation into the building frame, thus creating thermal bridges, CL-Talon minimizes thermal bridging. This provides optimal thermal performance through a combination of exterior insulation and thermal clips, which reduces thermal bridging and therefore additional thermal breaks.

cltalon.com

Construction Specialties

Image courtesy of Construction Specialties

RSH-5700 Storm Resistant Louver

The RSH-5700 Louver from Construction Specialties is AMCA certified, tested, and proven to provide reliable resistance in winds as high as 50 mph that drive 8 inches of water per hour. It is designed to span widths of up to 12 feet without interruption and integrates well with high-performance curtain wall and metal panel facades. For more information visit www.c-sgroup.com/architectural-louvers.

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Guardian Glass

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The Renaissance of the Restroom

A closer look at five projects redefining the common experience in this private space

Sponsored by ASI Group and Scranton Products® | *By Jeanette Fitzgerald Pitts*

Photo courtesy of Scranton Products®

Walk into any restroom in the United States, and chances are that there is probably room for improvement. Whether it's the gaping sightlines that offer glimpses inside an occupied stall; empty dispensers of soap, paper towels, or toilet paper; a hand dryer that does not seem to effectively dry hands; a haphazard layout that sends users zig-zagging from the stall to the sink to the dryer to the door; mistakes in ADA compliance; or any number of assaults on the senses that often occur in this sensitive space, restrooms today can be designed to support the basic needs of their occupants in a much better way.

The surprising truth about the restroom space, from a design perspective, is that while these areas are critical for the day-to-day occupancy and overall functionality of any building, their design is often lower priority than the more readily visible but less crucial areas. In the past, it was common practice to use a master specification for a restroom space, essentially delivering banal, cookie-cutter restrooms to project after project. Unfortunately, the layout, partitions, materials, and accessories contained within the master specification also delivered a lackluster experience that left occupants often complaining publicly about this private space.

Today, there are new product solutions available to address many of the common complaints that users make about restrooms. New types of partitioned compartments and restroom accessories can improve the level of privacy occupants feel in the stall; ensure a sufficient supply of paper towels, soap, and toilet paper is available; streamline the stall-to-sink-to-dryer route; make restrooms easier to maintain and more difficult to vandalize; and feature a distinguishing style that complements the aesthetic themes found in the other interior spaces of the building.

While the specific goals for any restroom project are informed by the building type, the anticipated occupants who will use the facilities, and the statement that designers and owners wish to make in the space, the partitions and restroom accessories selected for the space can be instrumental in achieving them. This course will explore five very different projects—an elementary school, a commercial office space, a hospital, a stadium, and the exquisite Zaha Hadid-designed Port House in Antwerp, Belgium—each showcasing the way these new solutions can be used to create a better modern restroom.

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Learning Objectives

After reading this article, you should be able to:

1. Specify restroom compartments for the K–12 space designed to keep children safe and comfortable with child-sized partitions, no-lock door knobs, and no-pinch finger guards.
2. Describe the various partition features that can be used to eliminate sightlines and create high-privacy restroom compartments.
3. Identify the qualities of the high-density polyethylene (HDPE) material that contribute toward earning LEED v4 credits.
4. Create stadium restrooms that support health and hygiene by ensuring they are equipped to dispense enough soap and paper towels to manage the peak-time rush and offer more hygienic hand dryers.

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Photos courtesy of ASI Group

At Eastwood Village Primary School, designers decided to create smaller cubicles in the restrooms that would be used by the younger children and provide larger compartments in the restrooms accessed by the older children.

EASTWOOD VILLAGE PRIMARY SCHOOL

The Eastwood Village Primary School, located in Rotherham, South Yorkshire, United Kingdom, was the first primary school to be built in the town in the past 30 years. The academy instructs students from Foundation Stage 2 through Year 4, a timespan that is comparable to preschool through third grade in American schools, and it offers a nursery. Designed by Rotherham Borough Architects, the £6.4-million primary school was intended to be a modern structure that would support learning in every space. As executive headteacher Mark Young explains, "We will make this school what we want it to be, which is successful, exciting, and vibrant. Everything is brand new. It's purpose-built, and it's a perfect space for learning." The vibrant, purpose-fit intention is even visible in the restrooms, which were thoughtfully designed to best accommodate the little people using them.

The Perfect Partitions for Children

The restroom can be a challenging space for children, especially at school. The goal is to design the space so that it feels safe and secure, without the child feeling trapped. Privacy is important, but locking mechanisms can cause confusion and anxiety. From the unique child-sized cubicles to the fixed knobs, finger guards, and durable phenolic partitions, the restrooms at Eastwood Village Primary School provide an excellent example of the difference that a few special details can make.

Child-Sized Compartments

The ages of the students attending Eastwood Village Primary School range from four to nine years old. Designing spaces to accommodate children within this age range can be tricky because of the vast size and developmental differences that exist between children at either end of the span. On this project, designers decided to create smaller cubicles in the restrooms that would be used by the younger children and provide larger compartments in the restrooms accessed by the older children.

Working with a manufacturer that could deliver different-sized panels in the same type of partition system enabled designers to create restrooms throughout the school that featured consistent colors and materials while tailoring the scale of the space to better fit the students using it. Adjustable pedestal feet enabled installers to make field adjustments if the floors were not level, making installation easy and issue free.

Fixed, No-Lock Door Knobs

Locking stall doors in a restroom used by young children can create several issues. A child may forget how to operate the lock, essentially locking himself or herself inside and causing a distressful situation. A locked door may create a barrier that prevents or delays a caretaker or teacher from being able to access a child inside the compartment who needs help. Luckily, an alternative exists that allows a restroom to be designed for young people without a potentially problematic locking stall door.

Fixed door knobs do not include a locking mechanism. Resembling a simple stem, these devices can be used to open and close the door of a restroom stall, providing privacy for an occupant without creating a barrier to entry or exit. At the Eastwood Village Primary School, these fixed, no-lock door knobs were selected for all the student compartments in the building.

"No-Pinch" Finger Guards

Another feature that helps to protect kids in the restroom space is a finger guard. Designed to shield little fingers from getting pinched between the doors and pilasters, finger guards are supple rubber profiles placed between the two panels that cushion the impact and prevent injury. They also add privacy to a stall without having overlapping, routed edges.

Durable and Vibrant Phenolic Partitions

Restroom partitions are available in a number of different materials, each with their own unique characteristics and benefits. While powder-coated steel, stainless steel, and plastic laminate may be more familiar, phenolic is a material that is gaining momentum in the restroom partition market because it is attractive, durable, easy to clean, and available in a wide range of sizes and colors. Phenolic partitions were selected for use in the Eastwood Village Primary School restrooms.

Phenolic partitions matched the aesthetic and performance needs of the Eastwood space perfectly. There is a distinct orange and grey palette that is featured prominently on the exterior of the building as well as throughout many of the interior spaces. The phenolic partitions are available in so many colors that the designers were even able to pull the vibrant orange and grey color theme into the restrooms.

In terms of performance, phenolic materials are antimicrobial, nonporous, water resistant, and impact and scratch resistant, making them extremely easy to clean and difficult to vandalize. The combination of strength and cleanability was an optimal solution for the primary school environment.

NEW HEADQUARTERS OF THE SACRAMENTO REGIONAL BUILDERS' EXCHANGE

The Sacramento Regional Builders' Exchange (SRBX), a non-profit organization that serves Northern California's commercial construction industry, recently completed a construction project itself, opening a new and ultra-modern 11,000-square-foot headquarters in Sacramento.

Originally founded in 1901 and currently serving more than 1,100 member companies, the SRBX is the construction industry's oldest and largest association in the region. Dedicated to supporting the development and advancement of its members by offering educational programs, safety programs, bidding information, political advocacy, and creating networking opportunities to connect people within the industry, the new space is the hub of the organization's important activities. "The new SRBX facility is a central site for member meetings, industry events, and on-site training," explains SRBX CEO Tim Murphy. "Creating the right look and feel for this space was essential for conveying the professional nature of our organization."

A New Level of Privacy and Beauty in the Restroom

It can be difficult to impress members of the building industry with the built environment. Designers selected rich blues, burgundies, and wood tones to complement the polished concrete floors and glass walls found throughout the interior. Murals depicting Sacramento's history and the skyline that its members helped to build are featured prominently throughout the space. The modern and professional theme was also captured effectively in the restroom with the use of a new partition system that elevated the aesthetic and experience of privacy beyond what was typically found. "These new partitions are stylish and beautiful, extremely durable, easy to clean, and you can't beat the added privacy," says Murphy. "They exceed the standard of comfort offered in private facilities."

A New Level of Privacy

The new restroom compartments installed in the SRBX headquarters offer a private experience, free from the gaping sightlines so often encountered in the restroom stall. The enhanced privacy is the result of two unique features that were designed to eliminate sightlines on either side of the door: the shiplap edge and the continuous, edge-mounted hinge.

The side of the door panel that swings open and shut is outfitted with a shiplap edge so that the material of the door physically overlaps with the adjacent pilaster. The overlap creates a reliable visible barrier along the full vertical edge of the door panel, eliminating the opportunity for a sightline to exist.

On the hinged side of the door, a continuous, edge-mounted hinge eliminates the sightlines that often exist above and below the hinges in a typical compartment. The continuous nature of the edge-mounted hinge means that the hinge runs from the top of the door panel all the way to the bottom, creating a continuous privacy seal as well. When the stall door is opened, the hinge is exposed, but the view into the stall remains completely obstructed. When the panel door is shut, the hinge is hidden, providing a cleaner aesthetic.

Made of HDPE Material

The partition system selected for the SRBX restroom is made from a beautiful mahogany-toned high-density polyethylene (HDPE), which is one of the most commonly used plastics in the United States. Technically speaking, HDPE is a solid plastic material that is manufactured by compounding polymer resins under high pressure to form a solid, single thickness panel, which is why it is often referred to as solid HDPE.

Photo courtesy of Scranton Products®

In the headquarters of the Sacramento Regional Builders' Exchange (SRBX), the restroom partitions are made from solid HDPE and feature shoeless pilasters, which deliver a cleaner aesthetic that is also easier to clean.

There are many characteristics of this material that make it a good fit for the restroom space. Solid HDPE panels are nonporous and impermeable. They won't absorb moisture and resist the growth of mold, mildew, and rust. Many other partition solutions are not manufactured from a solid material and instead feature panels with a core that is vulnerable to mold growth. Plastic laminate panels often have a particleboard core, and stainless-steel and baked enamel panels often contain a honeycomb core made of cardboard. Both particleboard and cardboard will host mold, which, over time, can spread throughout the interior of the stall or partition. Beyond mold resistance, HDPE is a highly durable material that resists dents, scratches, corrosion, graffiti, and rust.

Shoeless Pilasters Deliver Cleaner Solution

Because the HDPE material is moisture and mold resistant, HDPE pilasters can be specified without the shoes typically seen on a traditional bathroom partition system. When the panel material is moisture sensitive, as most of them are, the shoes are designed to keep the panels off the ground. Unfortunately, the traditional shoes provide hiding places for germs, bacteria, and mold to grow, and they are difficult to clean. Eliminating the shoe from the partition system results in a much cleaner-looking solution that is, in fact, cleaner and more sanitary too.

THE PORT HOUSE

The Port House in Antwerp, Belgium, designed by Zaha Hadid Architects (ZHA), is a spectacular project that transformed a historic, albeit run-down, fire station into the new headquarters for the world's fifth-largest port, the Port of Antwerp. In 2007, the offices of the Port of Antwerp had become too small and spread out. Staff was scattered across different buildings throughout the city. There was a need to find more office space and a wish to relocate to a place where technical and administrative services could be housed together. The old fire station on Mexico Island—a listed replica of a Hanseatic residence, ideally situated at the threshold between the city and its vast port—needed a change of use to ensure its preservation so it was selected as the site for the new headquarters.

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***Jeanette Fitzgerald Pitts** has written dozens of continuing education articles for* Architectural Record *covering a wide range of products and practices.*

PRODUCT REVIEW

The Renaissance of the Restroom

ASI Group

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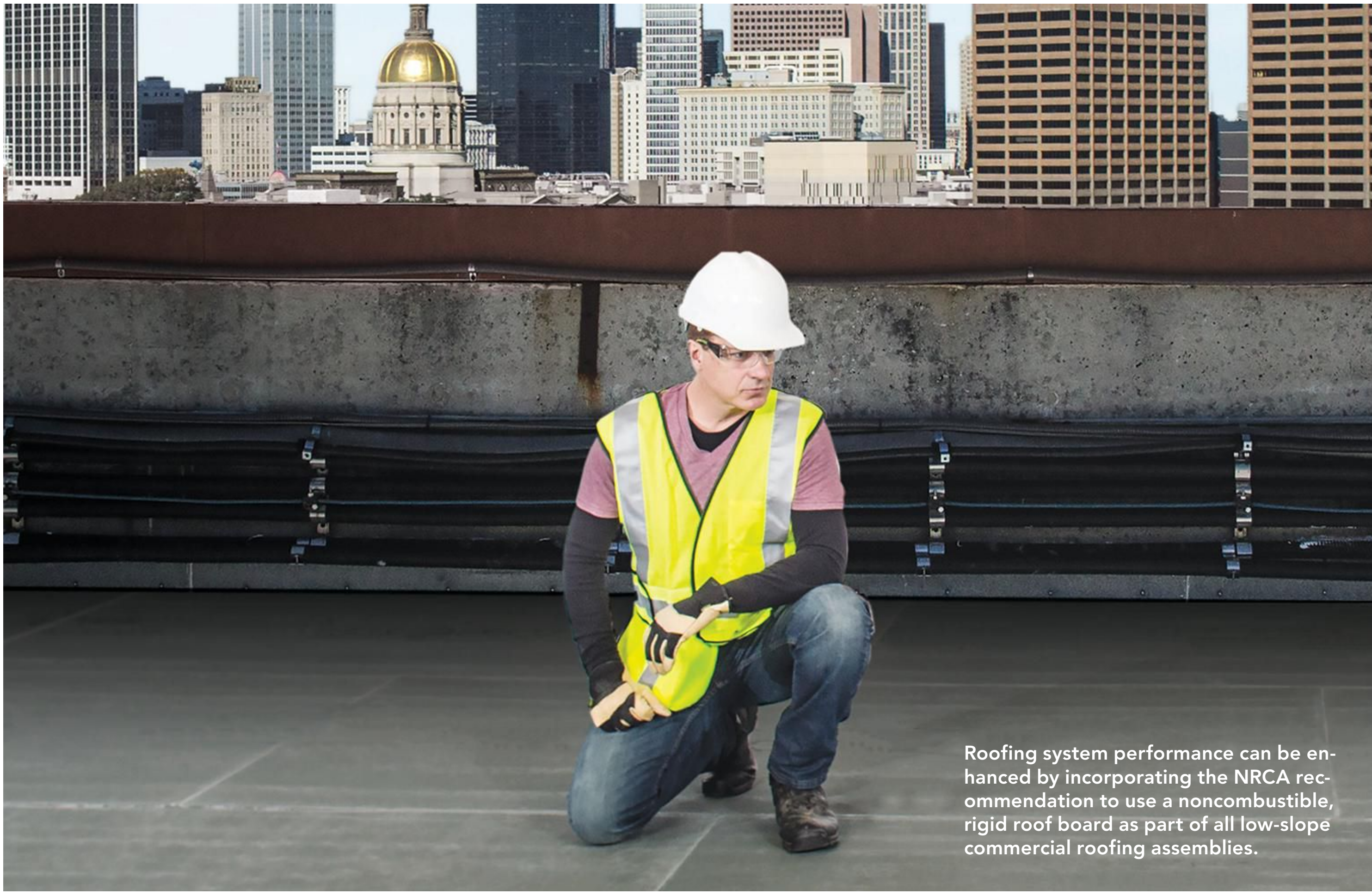

Roofing system performance can be enhanced by incorporating the NRCA recommendation to use a noncombustible, rigid roof board as part of all low-slope commercial roofing assemblies.

All images courtesy of Georgia-Pacific Gypsum

Selecting Rigid Cover Boards in Commercial Roofing Systems

Using a roof cover board on every project is the emerging norm—and the type matters

Sponsored by Georgia-Pacific Gypsum | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

On most commercial, institutional, and industrial buildings, roofing is a big investment whether at the time of first construction or when it needs to be replaced. That's the primary reason durability of the roof is so important: it translates directly into a lower total cost of ownership. It can also make a difference in terms of how the roof performs during routine and severe weather conditions to protect the building from the elements. Recognizing this need for durability, the National Roofing Contractors Association has recommended, for many years, the inclusion of a rigid cover board in all single-ply commercial roofs. However, the design and construction community has been slow in adopting this best practice for all situations and instead only tends to specify or use a roof board in specific situations, such as when a high-performance roof is necessary. Of late, new technologies, new studies, and experiences both with and without cover boards have pointed to the fact that such roof boards are a logical and economical choice. Based on all of these factors, this course looks

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

1. Discuss the evolution of roofing cover boards from the 1970s to present day, particularly in light of the use of single-ply membranes.
2. Explain how the forces of nature (i.e., fire, wind uplift, moisture, hail/puncture, foot traffic, and sound) affect roof function and durability of different types of roof cover boards.
3. Summarize the advantages related to construction process and cost benefits when including a cover board in all types of commercial roof assembly design.
4. State the roof system types, specialty systems (i.e., photovoltaic and vegetative roofs), and attachment options that can be utilized specifically with glass mat gypsum cover boards.

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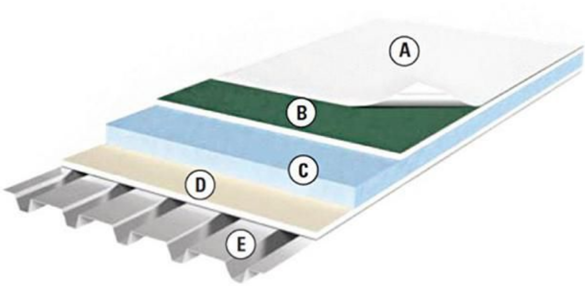
at the value that rigid cover boards deliver to a commercial roof assembly, how they perform in adverse conditions, and how different types of cover boards compare to each other.

EVOLUTION OF ROOFING AND RIGID COVER BOARDS

We begin with a brief historic perspective of how cover boards have evolved over time to support new types of roof assemblies and meet the growing needs of building owners. Note that the terms "roof board" and "cover board" are sometimes used interchangeably. Roof board is a generic term describing a rigid board used in a commercial roof assembly for a number of reasons. When it is used directly over the deck, it is being used as a thermal barrier for fire protection (mitigates risk of internal building fire spreading via the roof). When used between the insulation and membrane, it is called a cover board. Cover boards are used to protect different parts of the assembly from a number of concerns, including external fire, wind uplift, puncture, and impact.

From the 1920s through the 1970s, there was relatively little innovation in commercial roofing systems. It's true that there were changes during this timeframe in the materials used (e.g., coal tar pitch to modified bitumen), but the essential process of mopping tar or asphalt between multiple layers of felt material remained essentially unchanged. When insulation was used in commercial roofing through this time period, it was a soft fiberglass material that was rolled over the structural deck of the roof. Cover boards (which were called overlayment at the time) were primarily used to keep the asphalt from being absorbed into the fiberglass insulation. Popular overlayment types included perlite and wood fiber boards.



An example of a fairly common commercial (low-slope) roof assembly includes: A) single-ply membrane, B) gypsum-based roof board used as a cover board, C) rigid foam insulation (typically more than one layer), D) gypsum-based roof board used as a thermal barrier, and E) metal roof deck.

The 1980s marked the start of over three decades of innovation in commercial roofing systems when the first glass mat gypsum roof boards were introduced into the market place. These boards provided superior fire resistance, wind uplift performance, moisture resistance, and sound isolation compared to traditional overlayment materials. Also introduced in the 1980s were the first rigid insulation boards, including polyisocyanurate (ISO) boards. These boards were easier to stage and install, provided better R-value, and did not absorb asphalt. Throughout the 80s, there was a lot of innovation in these rigid insulation boards, with several companies launching new, enhanced boards. Some of the first single-ply membranes were introduced during the 1980s, but hot-mop assemblies remained very much the norm.

During the 1990s, single-ply systems slowly became more popular, gaining acceptance in the marketplace due in large part to the ease of installation and overall cost. Single-ply options provided other benefits too, including enhanced energy efficiency, easier/quicker installation on larger roofs, and ease of repair. Because of these advantages of single-ply roofing, the use of hot mopping dropped from roughly 80 percent of commercial roof projects in 1990 to about half of that by the end of the decade. As the demand for single-ply systems increased, so did the demand for glass mat gypsum cover boards. The cover boards provided a structurally strong, smooth surface to adhere the membrane and provided an additional sound barrier while, most importantly, protecting the rigid insulation boards from foot traffic, hail impact, wind uplift, and fire.

Throughout the 2000s, single-ply membranes have continued to grow in popularity, currently comprising approximately 80 percent of the overall market. In response, the demand for cover boards also increased. To feed this demand, high-density ISO (HD ISO) and gypsum fiber cover boards were introduced to the market and glass mat gypsum boards were enhanced to improve adhesive coverage. At the same time, the trend for companies to lower their carbon footprints by reducing their reliance on fossil fuels led to an increase in alternative roofing systems, such as vegetative and photovoltaic roofs.

As the use of roof board products has grown over time, the choices available have also grown. Here are the most common products on the market today:

- Glass-mat gypsum cover boards are composed of a fiberglass mat with a gypsum core.

Glass mat gypsum cover boards are composed of a fiberglass mat with a gypsum core, combining the benefits of gypsum products with rigid, water-resistant fiberglass.

  They can be used with all low-slope roofing systems as a cover board as well as a thermal fire barrier. There are several manufactures of glass mat gypsum boards, all with unique qualities. Comparing the published manufacturing specifications is the best way to match the board's performance with your design intent.
- Gypsum fiber cover board, a blend of gypsum and cellulose fibers (recycled waste paper), is compatible with most low-slope roofing systems.
- High-density polyisocyanurate (HD ISO) is made with closed-cell polyisocyanurate insulation with a high-density core. With the exception of hot asphalt and torch-applied systems, it can be used with all roofing assemblies as a cover board (not as a fire-resistant thermal barrier).
- Mineral fiber board is made of semi-rigid rock wool or fiberglass board and is used with hot-mop, torch, and single-ply roofing systems.
- Perlite boards comprise mineral aggregate board with particles of expanded perlite or vermiculite, selected cellulose binders, and sizing agents. They offer good fire performance and are used with modified bitumen (mod-bit), built-up-roofing (BUR), and some single-ply roofing systems.

Continues at ce.architecturalrecord.com

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Photo: © James Steinkamp Photography

The expansive glass facade of the Zurich Headquarters in Schaumburg, Illinois, is outfitted with automated shades to protect the interior from glare, while maximizing the amount of usable daylight allowed into the building.

Daylight Autonomy 101

Specifying useful daylight deeper into the interior

Sponsored by Lutron Electronics Co., Inc. | *By Jeanette Fitzgerald Pitts*

Throughout history, daylight has been considered in the design of the built environment. Before electric light was invented, in the late 19th century, daylight was the primary light source available to illuminate the interior of buildings, schools, and residences. The houses of Ancient Rome were commonly found to have been planned around a courtyard, with surrounding rooms positioned so that the available daylight could penetrate deeper into the space. A guiding principle of Michelangelo's iconic Laurentian Library, built around 1550, was to maximize the presence of daylight from both the northern and southern exposures in the reading room. In the mid-1800s, the one-room schoolhouses found throughout the United States relied on large windows to provide the teacher and students with enough light for their lessons.

Today, while buildings could meet their illumination needs entirely with electric light, the inclusion of daylight in the interior is credited with several important benefits. Daylight exposure has been linked to improvements in employee productivity and student performance, and even the regulation of a person's circadian rhythm, the internal clock of the body which drives the sleep/wake cycle and has a powerful impact on general well-being. Beyond the touted health benefits, using daylight instead of electric light to illuminate interiors could save an enormous amount of energy, making it a good-for-the-body and good-for-the-planet lighting solution.

The key challenge lies in the fact that daylight is a dynamic light source. It comes in many forms, and its presence changes almost hourly. Daylight is affected by the time of the year and the weather conditions of the day. Fortunately, the advancements in daylighting technology and design know-how made in the past decade now make it possible to use the presence of daylight as an illumination source. Some designers are even seeking to use daylight as the exclusive light source for much of the day. This design objective, referred to as daylight autonomy, requires the careful reconsideration of many of the early design decisions made on a project and the selection of the right daylight management system to create a comfortable interior space, largely lit by the sun.

INTRODUCING DAYLIGHT AUTONOMY

Today, designing a space to meet specific daylight-related objectives is a common practice. The usual daylighting goals include achieving

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Learning Objectives

After reading this article, you should be able to:

1. Define the concept of daylight autonomy and several metrics that can be used to identify where glare conditions may exist and where useful, soft daylight fills the space.
2. Identify the many design decisions that affect the amount and type of daylight that is available to a project and how deeply that daylight travels into a building.
3. Compare the performance of manual shades and automated shades in terms of their ability to maximize the amount of usable daylight allowed into the space, provide glare control, preserve views, and achieve daylight autonomy objectives.
4. Explain the results of daylight simulations conducted by LMN Architects proving that automated shades would create a large useful daylight zone while controlling glare, which created the comfortable, daylight-filled office space it wanted to design.

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some predefined daylight illuminance level on the workplane or at the floor, incorporating some measure of glare control, or delivering a daylight zone of a certain size. Achieving daylight autonomy essentially requires a project to achieve all of the above and more.

The 10th edition of *The Lighting Handbook*, published by the Illuminating Engineering Society of North America (IES, formerly IESNA), defines daylight autonomy as "the percentage of the operating period (or number of hours) that a particular daylight level is exceeded throughout the year." It is a dramatically different way to think about and measure the presence of daylight in a building. "One advantage of using daylight autonomy to quantify daylight availability in a building is that the daylight autonomy calculations take climate into account, an aspect that previous metrics for quantifying daylight had not included," explains Jack Bailey, partner at One Lux Studio in New York City. "This metric could benefit architects and owners significantly. Architects can use daylight autonomy analysis to evaluate different design alternatives to determine which concept provides more usable daylight in the interior, and owners will know, definitively, that their buildings are making good use of daylight. It also provides a consistent metric for comparing the performance of different buildings for building codes and green building initiatives."

It should be noted that at this moment achieving daylight autonomy in a building is not required by any international, federal, state, or local building code. "It was included in the first public draft of the International Green Construction Code (IgCC) but removed in favor of a simpler metric," explains Bailey, who served on the committee that wrote the IgCC. "Nor is daylight autonomy analysis required for a project wishing to achieve LEED or any other type of green building certification," he continues. "However, daylight autonomy is recognized as an option for achieving the daylighting credit in LEED v4."

METRICS FOR MEASURING DAYLIGHT AUTONOMY

Where daylight autonomy is the goal, it is critical to understand that a high daylight autonomy value does not necessarily create a productive, comfortable, energy-efficient daylit space. The DA value of a given point in a space represents the percentage of annual daytime hours that daylight levels exceed a predefined illumination level. When the defined threshold is the recommended illumination level for the space, the DA value indicates the amount of time that the interior space could be exclusively illuminated with daylight. For example, consider a location in an office space where the target daylight level is 30 footcandles (fc) (DA 30) and the DA value is 87 percent. This means that area of the office receives at least 30 fc of daylight for 87 percent of the workday, enabling the overhead electric lights to be turned off a substantial amount of time every day.

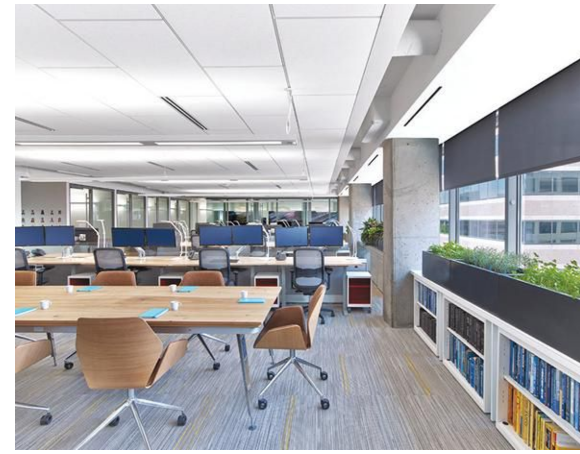
While the DA metric indicates the amount of time every day that predefined minimum daylight levels have been achieved, it does not consider whether the available daylight is, in fact, too bright to use in the space, without a daylight management mechanism. In order to achieve a more complete picture of the presence of daylight in a space and ensure that the design adequately protects the interior from glare, there are a few additional metrics that should be considered.

Spatial daylight autonomy (sDA) refers to the percentage of floor area where 30 fc is achieved for at least 50 percent of the workday. Higher sDA values indicates that a larger interior space receives at least 30 fc of daylight for at least 50 percent of the workday. Generally, sDA is calculated using a daylight simulation tool that computes the daylight levels in the space for every hour of the year. Although there are many DA metrics, sDA has become the most common due to its inclusion in LEED v4 and the WELL Building Standard.

There is a metric that identifies the presence of extremely bright or direct daylight in the interior space. The annual sunlight exposure (aSE) metric identifies the percentage of the floor area that receives intense daylight, exceeding 100 fc, for more than 250 work hours every year. This metric is included as a design consideration in both the LEED v4 rating system and the WELL Building Standard. For example, to achieve the LEED v4 Daylight credit, a project must have a maximum aSE value of 10 percent.

Beyond identifying the exposure to intense daylight that a space receives, there is also a metric that measures the amount of useful daylight that a space receives. The idea of useful daylight revolves around the level of daylight that can be introduced into a space without causing glare or disrupting the visual environment. That range of useful, glare-free daylight is generally considered to be between 10 and 200 fc at the workplane. Useful daylight illuminance (UDI) refers to the percentage of work hours where the illuminance from daylight in a space is between 10 and 200 fc.

Photo: © Eric Laignel



The ASID Headquarters in Washington, D.C., used an automated shading system to satisfy criteria in both the LEED v4 green rating system and the WELL Building Standard.

There is also a metric that measures the perception of glare. Daylight glare probability (DGP) quantifies occupants' perceived glare from daylight. It is calculated by evaluating the entire visual field of a potential occupant, taking into account the light intensity, size of the glare source, contrast, and its position in the field of view. DGP is generally considered the best metric to evaluate glare potential today.

The Benefits of Daylight Autonomy

In many instances, energy savings is achieved by sacrificing something else that is deemed valuable, such as occupant comfort. One of the reasons that daylight autonomy is such an attractive design objective is that it manages to deliver significant energy savings, without negatively impacting occupant comfort or the functionality of the space. In fact, it may improve occupant comfort by improving access to outdoor views and ensuring that occupants are exposed to optimal amounts of usable daylight throughout the day, which improves productivity and satisfaction while protecting the space from direct or overly bright light that can cause glare and discomfort. Daylight autonomy creates energy savings by being smarter about the inclusion and management of daylight and eliminating excess lighting energy that is essentially unnecessary.

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Photo courtesy of CertainTeed and Paul Crandall & Associates

Low-Slope Roofing: Specifying a Quality, Cost-Effective Roof System While Considering the Skilled Labor Shortage

The skilled labor shortage may impact your choices when specifying low-slope roof systems

Sponsored by CertainTeed

According to the Bureau of Labor Statistics, the year 2018 began with more than 252,000 construction industry job vacancies across the United States.[1] As aging baby boomers retire and the market struggles to find young people skilled in the trades, labor challenges are becoming a significant concern for many companies, including roofing contractors. As we will learn in this course, the shortage of skilled labor can lead to increased installed costs for certain types of roof systems and an increased potential for an

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1 AIA LU/HSW

Learning Objectives

After reading this article, you should be able to:

1. List the ways in which the roofing skilled labor shortage can impact the accurate, durable application of a specified roof system.
2. Describe how roof design, project parameters, product selection, contractor crew, and project management will impact the labor efficiencies associated with roof system installation.
3. Discuss the basic advantages of a self-adhered modified bitumen roof system as compared to other popular low-slope roof systems, including durability and decreased person-hours to install.
4. Integrate data regarding product application, skill level requirements, and time to install when specifying a roof system.

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inadequate installation. This can ultimately affect the choices architects make when specifying low-slope roof systems.

In order to meet the challenge of providing clients with cost-effective opportunities while supporting a durable roof specification, this course will present data regarding the labor advantages provided by self-adhered modified bituminous roof coverings.

HOW THE SKILLED LABOR SHORTAGE IMPACTS LOW-SLOPE SPECIFICATION CHOICES

While a skilled labor shortage is affecting the construction industry as a whole, the roofing sector has been hit particularly hard. In August 2018, the National Roofing Contractors Association (NRCA) issued an Action Alert encouraging members to urge Congress to address the issues facing the industry. The alert highlighted the difficulty roofing industry employers have finding workers to fill job openings.

To meet demand, an unskilled or underskilled labor force is frequently employed. Given the labor situation, what are the potential impacts on the installation of the roof system specified on your project?

First, use of unskilled labor can lead to an increase in time to complete the installation of the specified roof system. The application complexity of a roofing product and the required skill level of workers to properly and effectively install the product can magnify this issue. This increased installation time translates directly to increased costs.

The lack of skilled labor also increases the potential for compromised installation quality. Proper installation, according to manufacturer specifications, is key to creating a high-quality and durable roof. A properly installed roof, adequately maintained, should last for decades, thereby decreasing the total cost of ownership. However, a lack of the required skills for proper application and poor management of unskilled crews can lead to costly failures and repairs, compounding this issue.

As an architect, specifying a quality yet cost-effective roof system must take into account the current labor environment. The time and skill required to install a roof system must be understood and considered during the specification process. And these decision factors can be used as talking points when addressing costs with clients.

SPECIFICATION CONSIDERATIONS: MATERIALS AND DURABILITY

Roof system specification is generally undertaken with a strong eye toward performance and durability because the roof is one of the most vulnerable parts of a building, especially during hazard events. A failure in the roof system can have devastating effects on all areas of the building, critical equipment, and on occupants, and it can contribute to significant downtime after an event if the building is not occupiable due to roof damage.

During storms, the roof system must be able to withstand all types of threats, including high wind, windborne debris impacts, and hail. In extreme climates, a roof system may need to be durable enough to handle long periods of harsh UV exposure or heavy, consistent snow loads. This type of exposure and the key role played by the roof system in protecting the building, its contents, and its occupants requires that architects have confidence in the materials included in their chosen roof system.

Therefore, it is imperative to have a fundamental understanding of the material options, their performance histories, and relative prices. This knowledge can help architects align specifications to reflect a client's cost-to-value (durable, watertight protection) balance.

Safety

As with other building products, roof systems must meet or exceed building codes and insurance requirements. Low-slope roof systems are primarily rated for fire and wind. Proper attachment is the primary consideration for roof systems, and this course will focus on single- and multi-ply roof membrane systems.

Fire Ratings

ASTM E108 defines testing methods and fire ratings for both resistance to fire from above or from under the roof deck. Products are classified as Class A, B, or C, and local codes determine the class of materials required based on location and occupancy type. Roofing product manufacturers will provide the fire rating details for the system, which typically include the classification of the deck construction type supporting the roof system (combustible or noncombustible), roof incline restrictions, and any other requirements, such as barrier boards, ply sheets, and surfacing.

Wind Ratings

ASCE 7 defines requirements for wind uplift resistance, with ASTM D6630 specifically addressing low-slope roof membrane assembly performance. Proper wind-resistant product specification depends on proper design with accurately determined wind loads and wind-resistance capacities based on building location, height, and configuration. Therefore, product-specific ratings should be used as a guide only after determining the project-specific wind loads and required wind-resistance capacity.

Continues at ce.architecturalrecord.com

A BRIEF HISTORY OF ROOFING MATERIALS

With the move out of cave dwellings and into hand-built shelters, the roofing industry was born. Since then, man's quest for the best roofing material to create a safe and comfortable environment has ranged from animal skins and grasses to complex chemical composites.

In between, sod and other natural materials were the roofing materials of choice. Then, about 5,000 years ago, the Chinese began using elaborate clay tiles on roofs, some examples of which still survive in museums in the Forbidden City. The Greeks also began using clay tiles but used a more modest, flattened tile that eventually made its way to Western Europe around 100 BC. Clay tiles, however, were extravagant and expensive and only used by the wealthiest in society. Those of lesser means turned to thatched roofs, using tightly bundled reeds and fronds. Both of these methods for providing roof cover persist into modern times.

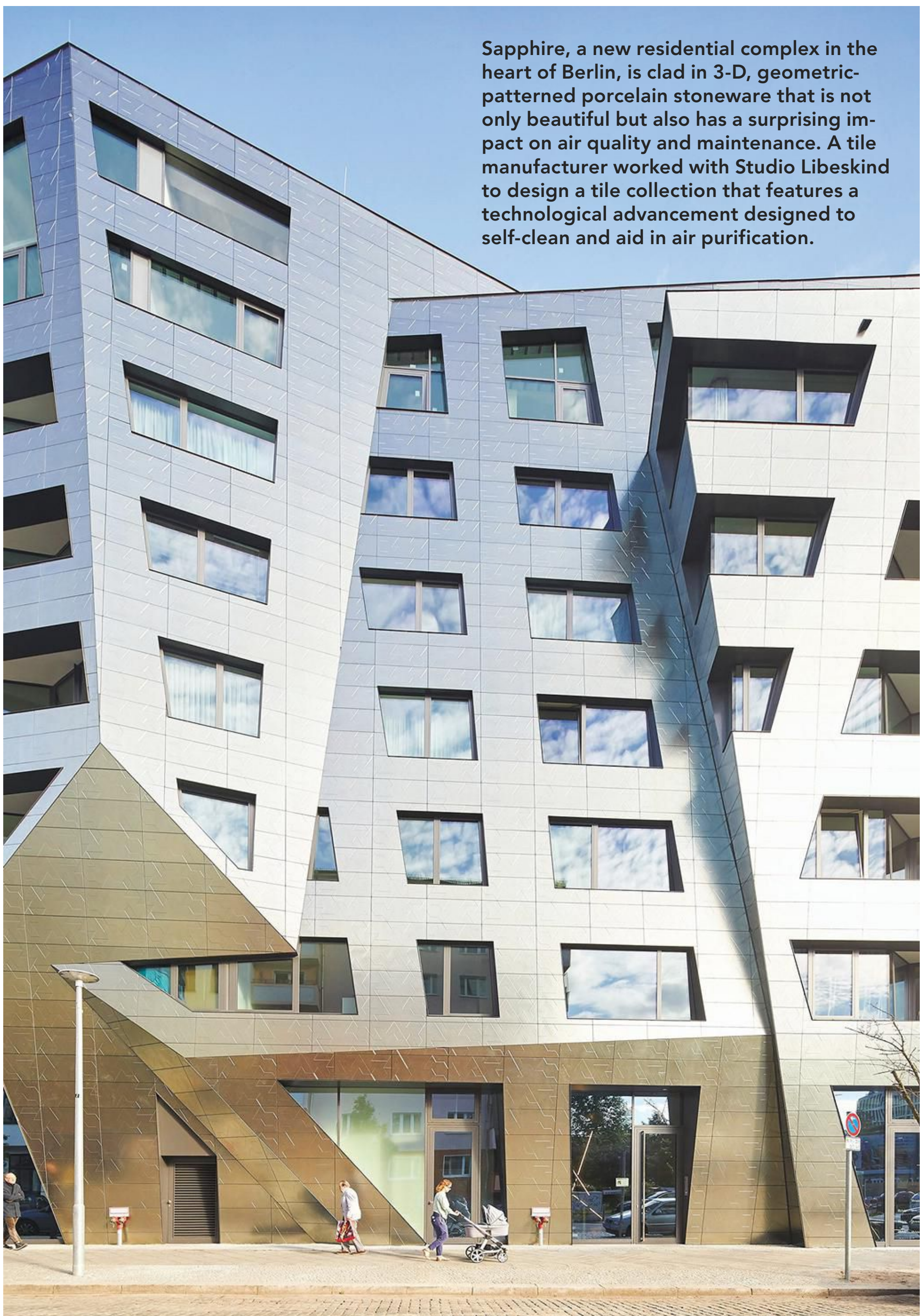
In the past 200 years, roofing innovation has moved forward at a blistering pace compared to its previous 40,000-year history. Bitumen, or asphalt, made its appearance more than 100 years ago, and man-made materials have gained popularity in the last few decades.

The roofing industry is now motivated by the need for increased durability due to the effects of climate change and increasingly stronger and more frequent storms, demonstrating the one constant throughout the ages: man's continuous search for safe and comfortable shelter.

Innovations That Drive Sustainable Ceramic Material Selection

Twenty-five years of advances in digital manufacturing, material science, and life-cycle certifications provide new sustainable ceramics

Sponsored by Ceramics of Italy | *By Celeste Allen Novak, FAIA, LEED AP, BD+C*



Sapphire, a new residential complex in the heart of Berlin, is clad in 3-D, geometric-patterned porcelain stoneware that is not only beautiful but also has a surprising impact on air quality and maintenance. A tile manufacturer worked with Studio Libeskind to design a tile collection that features a technological advancement designed to self-clean and aid in air purification.

Photo: © Hufton + Crow/Studio Libeskind/Casalgrande Padana

Centuries of ceramics and porcelain—tiles, mosaics, pottery, wall and floor surfaces—have proven that this natural, versatile material is part of the human DNA. From simple drinking gourds to expressive tile mosaics that effectively transmit stories and myths of a variety of cultures, ceramics have evolved with technological changes. Within the past 25 years, the ceramic industry is one of many that has responded to the digital age with new, innovative products. Twenty-first century material science, nanotechnology, computer-driven machinery, new sustainability metrics, and communications are technological advances creating the opportunities for interactive design solutions among manufacturers and design professionals.

CONTINUING EDUCATION

1.25 AIA LU/HSW

1.25 GBCI CE HOURS

1.25 PDH, LA CES/HSW

Learning Objectives

After reading this article, you should be able to:

1. Describe the installation advances and criteria required to safely specify large, lightweight, porcelain panels for exterior cladding and interior surfaces.
2. Explain how new ceramic products are naturally nontoxic and slip and fire resistant, with additional antibacterial and self-cleaning properties to provide maintenance and health benefits.
3. Increase design intelligence in buildings by using advanced digital manufacturing to customize wayfinding and material diversity.
4. Specify durable tile surfaces that resist cracking in any climate zone.

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GBCI COURSE #0920017556
LA CES COURSE #K1811G

Photo courtesy of ABK Group

The invention of digital printing has led to the availability of large-format, thin porcelain panels with unlimited surface designs and textures.

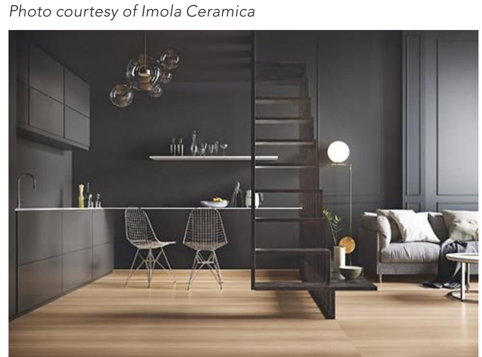
Unique clusters of manufacturers are driving innovations. As an example, according to Vittorio Borelli, chairman, Confindustria Ceramica, "For several years now, the Italian ceramic tile industry has been pursuing a policy of sustainable development, from selection of raw materials through to the production of products certified in accordance with the strictest international standards. It uses increasingly high-performance and efficient manufacturing systems capable of completely reusing waste, significantly reducing water consumption and emissions, using energy more efficiently, and maintaining a commitment of social responsibility toward people and the planet." These new ceramic products include digitally printed walls and floors, durable large-scale and thin-line porcelain indoor and outdoor panels, healthy self-cleaning and antibacterial surfaces, embedded solar roofs, and sustainable production.

Principal solutions adopted by ceramic companies for efficiency and energy savings can include high-efficiency single-layer kilns, use of single-firing production cycles, cogeneration, heat recovery, use of materials with lower melting points, and energy diagnostics as well as sector energy consumption databases. Characteristics of sustainable ceramic products over their lifetime can include the amount of maintenance a product requires, its durability, nontoxicity, and recyclability.

Single-fired ceramics have a greater resistance to atmospheric agents and weather better than double-fired tiles. They have a higher breaking load and an exceptional resistance to wear, even with thinner tile profiles. Clay, shale, gypsum, and sand are the basis for all ceramics. The higher the oven temperature and increased compression of the clay material, the stronger the tile. Pioneered in Italy in the early 1990s, porcelain is a ceramic tile that is compressed and fired once at a temperature of 1,200–1,250 degrees Celsius. At those temperatures, the tile is vitrified or transformed to an inert, impermeable, high-strength material with an absorption rate less than 0.5 percent.

Within the past 25 years, the industry has expanded its portfolio to include a range of thicknesses from 3 millimeters (1⁄8 inch) to surfaces up to 30 millimeters thick (13⁄16 inches). This development has led to the use of porcelain as both interior and exterior building and landscape surfaces. Nanotechnology has lead to new production techniques that create self-cleaning and antibacterial surfaces that do not require sealants. New computer numeric control (CNC) routers, water jet cutting, computer-driven surface manipulation, and the sharing of computer files between designers and manufacturers are the beginning of the story. The rest includes advances in grout, installation, and the development of sustainable production techniques.

Photo courtesy of Imola Ceramica



New shapes and digital printing techniques provide a wide range of options for the selection of ceramic surfaces with various material finishes and looks.

Innovations in ceramics have supported market changes in health care, hospitality, commercial, and residential properties. From bathrooms to boardrooms and hospitals to schools, the ceramic industry is an advancement of one of the oldest materials on the planet. According to Bart Bettiga, executive director of the National Tile Contractors Association (NTCA), "The past twenty-five years have changed everything. The production and installation of large, thin porcelain tiles has revolutionized the industry." He reports that "the technology to produce these changes came out of Italy, and in the past five to ten years." This includes new digital ink printing that replicates wood, marble, as well as photographic images on surfaces in many sizes and shapes.

New ceramics have sustainable attributes and life-cycle advantages over other materials. In the past three years, the NTCA has developed new standard to guide design professionals in their selection and installation of these new products. From craft to science, ceramic innovations are changing the aesthetics of our built environment.

DESIGN INTELLIGENCE

Design professionals can influence perceptions and behaviors in buildings through both the form of a building as well as material selections. Social scientists and health-care professionals are providing data as to how humans respond to color, daylight, and natural textures. Intelligent design seeks to define environments that support human well-being. Innovative products that expand the designer's palette include a wide array of images with very high resolutions replicating stone, wood, and marble through introduction of new digital ink printing.

Continues at ce.architecturalrecord.com

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All images courtesy of Dryvit Systems, Inc.

Prefabricated EIFS panels are a means to achieve a high-performance, quality-controlled, code-compliant exterior wall system on virtually any type of building.

Prefabricated EIFS-Clad Wall Panel Assemblies

Designers, contractors, and owners all benefit from this advanced building approach

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

Architects and general contractors are constantly in pursuit of time-efficient, cost-effective, and quality-assured solutions related to building design and construction. Currently, this objective is even more influenced with the developing skilled labor shortage present in many construction disciplines and markets. An increasingly common solution to address all of these objectives is the use of off-site fabrication of key building assemblies. In particular, prefabricating exterior walls with metal studs and exterior sheathing has been routine practice for many commercial buildings. A growing number of design and construction professionals have recognized that it is also quite possible and advantageous to go several steps further and create more complete wall panels. In fact, many prefabricated wall sections can be air and water sealed to meet code, insulated with continuous insulation to meet or exceed energy requirements, and finished in a variety of appearances. One of the best means to accomplish all of this in an exterior wall assembly is found in using prefabricated wall panel assemblies clad with exterior insulation and finish systems (EIFS). This course addresses, in detail, the characteristics, advantages, and design considerations in using this proven construction approach.

CONTINUING EDUCATION

1 AIA LU/HSW

Learning Objectives

After reading this article, you should be able to:

1. Describe the performance, constructability, and durability characteristics of prefabricated exterior wall panels using EIFS cladding.
2. Investigate the design and construction considerations when incorporating prefabricated EIFS panels into a new or renovation project.
3. Assess the ability of prefabricated EIFS panels to meet code requirements for energy conservation, integration of air- and water-resistant barriers, and fire-testing compliance.
4. Recognize the three common types of prefabricated EIFS panels and be able to incorporate panel configurations effectively into building envelope designs.

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PREFABRICATED EIFS PANEL OVERVIEW

Prefabricated panel construction has been around for many years, but the process is still largely misunderstood. Owners, developers, and designers not familiar with prefabrication may wrongly perceive it as a complex, costly, and/or time-consuming process. Without overcoming these misconceptions, they run the risk of not considering all available options and missing out on the potential real benefits of prefabricated construction.

Prefabricated EIFS panels are essentially no different than traditional field-applied EIFS. From an engineering, performance, and code-compliance standpoint, they do everything that field-applied systems do. The only difference is that they are simply fabricated in an off-site shop or in a designated area at or near the construction site in a well-managed and protected manner. Once the panels are complete, they are then delivered or lifted into place onto the building. The fabrication and installation can be done by the same company or different contractors depending on the circumstances of a project.

Prefabricated EIFS panels are designed, detailed, engineered, and completely sealed around their entire perimeter as a full-face sealed wall assembly. Fabricated essentially as a series of performance layers, they provide complete air, water, vapor, and thermal barriers. They can also incorporate drainage capacity in the wall assembly through the integration of fluid-applied air- and water-resistive barrier coatings, integral fluid-applied flashings, and horizontal weep and drainage detailing.

If the finished prefabricated panels are constructed off-site, then their maximum size may be dictated by over-the-road trucking limitations for width, length, and height (i.e., 45–55 long, 8–8.5 feet wide, and 8–8.5 feet tall). This can usually be worked around in most designs, but if large sizes are needed with critical dimensions, then consultation with a fabricator may be in order to determine their practical limits. Panel size for either on-site or off-site fabrication could also be limited by crane-lifting and erection access and capabilities for size, weight, and space availability. Nonetheless, prefabrication is suitable for a wide range of sizes, shapes, and configurations.

USING PREFABRICATION TO OVERCOME WEATHER AND TEMPERATURE ISSUES

Quality assurance and project time schedules are important aspects of all building construction projects. The most common challenges associated with both are weather, temperature, and the related protection of materials and processes. Field-applied materials, including EIF systems, can be limited by

Fabricating EIFS panels indoors avoids the problems of weather and scheduling delays often associated with field construction.

unintentional negative influence from such weather conditions, leading to possible schedule delays. If the temperature and/or weather falls outside the product curing guidelines, then the contractor may need to delay the work or install temporary protection until the materials cure—both of which create unknown and uncontrolled conditions that can add significant cost to a project if not budgeted initially. These conditions may also lead to material defects and void any warranty.

By contrast, when construction is protected from weather and temperature conditions outside of one's control, the building envelope can be more consistent in quality, more easily meet time schedules, and be more readily coordinated. When prefabricated wall envelope panels are built off-site, or even on-site but indoors in a controlled environment, there is a more predictable production schedule and multiple quality assurance verification points in the process. Within a prefabricated EIFS panel production facility, the temperature is controlled, enabling proper and managed material curing time. Additionally, with no concern for weather conditions, prefabricated EIFS panel production can be completed on schedule despite outside temperature fluctuations or precipitation events. Furthermore, for a great portion of the country, winter significantly impacts all temperature- and weather-sensitive construction. Prefabricated EIFS panel production and erection can occur during the winter months, significantly enhancing building envelope enclosure time objectives and dramatically shortening a project's overall construction schedule. Overall, prefabricated EIFS panels can be worked on and completed while the building structure itself is underway, allowing for a quicker enclosure and completion of the exterior facade, thus enabling the building to open sooner.

EIFS PANEL DESIGN AND CONSTRUCTION CONSIDERATIONS

Based on the schedule and quality advantages just described, it is increasingly common to see components of a project prefabricated, including exterior wall portions of the building envelope. Since these enclosure components can be manufactured cost-effectively off-site and easily transported, the on-site work is focused on lifting and attaching the panels to the building structural frame to provide the enclosure for the building. Due to the fairly universal ease and application of this process, prefabricated EIFS panel construction can be used on practically any building but is more commonly used in education, hospitality, healthcare, office, entertainment, and multifamily buildings. These buildings tend to be larger in size, have more repeating and rhythmic features that result in duplicating panel designs, and are built under tight timelines. For commercial buildings, they have become favored because a faster construction cycle leads to quicker occupancy.

EIFS finishes are no longer limited to stucco-like appearance but now include brick masonry and metal shown here plus a range of others.

Architectural Character, Style, and Finish

EIFS claddings have a long-standing history for easily accommodating any architectural character or style. This remains true whether the building uses a field application or prefabricated panels. That means EIFS-clad panels can incorporate quoins, cornices, trim bands, medallions, or grooves, all of which are integrated as components of the panel during the production fabrication process.

While much has changed to enhance EIFS' performance over the years, the biggest advancement is the availability of a wide variety of finishes. Traditionally, EIFS have been thought to look similar to conventional stucco. Standard finishes are available in almost any color in a rough or smooth finish. Further, sophisticated specialty finish options now allow the EIFS facade to represent the aesthetic appearance of other materials, such as brick, granite, stone, travertine, limestone, metal panels, and even weathered steel. In addition to the appearance, there have been significant advancements in the chemistry and long-term performance of finishes. EIFS' textured finish can now incorporate a hydrophobic water-repellant enhancement that utilizes both state-of-the-art chemistry and fractal geometry technology to enable a textured finish surface treated to repel water. This allows it to dry faster and reduce the accumulation of airborne dirt and other contaminants, keeping it cleaner longer and reducing maintenance costs. Additionally, there have been significant advancements in enhanced UV-stable colorants, raising the bar for color science to a whole new level of stability, resistance to UV degradation, and long-term color brightness, and paving the way for the use of many colors not previously considered.

Design and Engineering Process

The design process using prefabricated EIFS panels is very straightforward and consistent with most typical design sequences. The architect determines the aesthetic and performance requirements in accordance with the overall design intent of the building envelope. Panel layout and engineering design for the framing can be done in concert with a structural engineer or with a specialty engineer for prefabricated EIFS panels. Either way, the panel engineers coordinate with the fabricator and/or erector, perform the final detailed engineering for structural performance, and develop the panel connections. They also provide the fabrication engineering calculations required to meet the building's wind, dead, and live design loads. Since EIFS panels are among the lightest prefabricated panel options available, they allow for reduced structural capacities for materials to be used in the panels, which will reduce building dead loads and overall building structural cost. The panel engineers also create the detailed shop drawings specific to the overall panel size and configuration in accordance with the architect's building design and desired exterior aesthetics. Once the architect reviews and/or approves the shop drawings, then fabrication begins.

Quality Control

By employing a specified prefabricated panel process, architects as well as building owners can be assured that the exterior wall will be completed correctly and with no substitute products. Additionally, the architect can readily inspect, monitor, and observe the prefabricated EIFS panel wall system's quality off-site during fabrication and before it is placed on the building. This is a very important quality-assurance measure that is not usually available with traditional construction methods where the exterior wall is constructed directly on-site, occasionally in difficult-to-access areas, with numerous steps, layers, materials, and trades.

Storage and Staging Space

Storage and staging space can be extremely limited on job sites. Prefabricated EIFS panels made off-site do not require any on-site production area, staging area, or on-site storage space. Of course, they can be assembled on-site if a suitable area and protection are available. Either way, they are typically crane-lifted into place directly off of a truck or a designated place on-site. Sometimes, that means the sharing of an already available on-site crane is possible. This lends itself to panels being installed at night or other off-crane hours, thus making full use of the crane's availability and sharing cost.

Using this process, prefabricated EIFS panels can be shipped on a "just-in-time" basis, erected, and installed the same day. No scaffolding is needed, which assists sites with limited space and helps control costs. Prefabricated EIFS panel construction also limits the number of subcontractors and bodies on the job site, along with reducing or eliminating job site waste from the assemblies. The entire panel consisting of framing, sheathing, air- and water-resistant barriers, continuous insulation, and aesthetic finish is fabricated and then installed by one subcontractor with a small crew, compared to the multiple trades that are required with more traditional field construction methods and far more on-site labor.

BUILDING AND ENERGY CODE COMPLIANCE

Since their introduction to the U.S. market in 1969, EIFS have evolved into one of the most tested and well-researched wall claddings in the

Prefabricated EIFS panels can be delivered to the site, placed directly onto the building structure, and attached in a variety of ways.

construction industry. Today's EIFS are in full compliance with building codes which emphasize weather protection, energy conservation, and fire-resistive construction and performance. These codes include the International Building Code (IBC), the International Energy Conservation Code (IECC), ASHRAE Standard 90.1, and other related standards.

Recent updates to the IBC require water-resistive barriers and full-assembly fire testing for exterior walls, which prefabricated EIFS panels can provide. Further, the IECC latest requirements for continuous air barriers and continuous insulation have made exterior wall assemblies far more sophisticated not to mention thicker in their composition. Coupled with enhanced requirements for flashing integrations, these code changes are fueling an increased concentration toward dramatically improved energy efficiency compared to the past. Of course, many of these changes are impacting overall building structural cost that could be offset by the significantly lighter weight of a prefabricated EIFS panel wall assembly.

Most notably, the IECC has dramatically increased the requirement for exterior continuous insulation (CI) on commercial-framed wall assemblies as a means of mitigating heat energy gain/loss through thermal bridging at the stud lines. These new criteria alone add two or more inches of depth to a traditional veneer wall assembly. Adding CI also pushes the cladding or veneer off its normal structural plane, which can significantly increase bearing structure, anchoring, and attachment needs, additionally increasing cost and possibly effecting long-term cladding performance.

Traditional EIFS as well as prefabricated EIFS panels have always been an energy-efficient cladding. This energy efficiency is attributed to the continuous insulation and air barrier used as components of the system. EIFS continuous insulation wraps the exterior of buildings eliminating the thermal bridging that occurs when traditional cavity insulation is installed between the framing studs. While traditional cavity insulation has a stated R-value, the effective R-value of the total assembly is actually much lower. For example, a building with steel studs at 16 inches on center that uses cavity insulation rated at R-13 has an effective value of R-6 due to thermal bridging. This dramatic reduction comes about because heat is transferred through the studs of the wall, completely compromising the cavity insulation. Continuous insulation installed outside of the studs overcomes that thermal bridging issue and is much more effective in terms of energy performance.

Full steel-stud composite panels are the most common and most complete type of panels with framing, sheathing, insulation, AWRB, and finishing system all fabricated in advance.

Fire Safety

While many cladding products can be code compliant with modification, EIFS are completely code compliant unto themselves. Traditional EIFS as well as prefabricated EIFS panels have been tested in a variety of typical wall assembly configurations and have successfully passed the stringent NFPA 285 flame-propagation test as well as the ASTM E-119 2-hour load-bearing wood-frame assembly test.

Air- and Water-Resistant Barriers

Prefabricated EIFS wall panels are highly unique in that they are composed of all the building, and energy-code-required barrier layers, including an integrated air- and water-resistive barrier (AWRB) in addition to the continuous insulation (CI). The majority of EIFS manufacturers offer fluid-applied AWRBs that also contribute to the development of a drainage plane in wall assemblies. The AWRB can be applied via trowel, roller, or airless sprayer depending on the contractor's preference or underlying substrate requirements. Further, they are available in either a permeable or nonpermeable vapor barrier version depending on the hygrothermal performance needs of the overall wall assembly. Part of the beauty of a prefabricated EIFS panel assembly is that since there are no through wall mechanical attachments, no punctures are created in the AWRB. That means there are fewer opportunities for air and water to infiltrate or cause damage.

PREFABRICATED PANEL TYPES

With an understanding of the basic principles and makeup of prefabricated EIFS panels, let's take a closer look at how they are physically constructed. Essentially, there are three common types of fabrication techniques, each of which are explored further in the following paragraphs.

Full Steel-Stud Composite Panels

The most common type of prefabricated EIFS panel assembly has traditionally been a full steel-stud composite panel system. These very complete panels are composed first of steel-stud framing covered with exterior sheathing. Next, AWRBs and flashing for rough openings or wall penetrations are installed to create the needed air and water resistance. Then, adhesive, and continuous insulation boards are installed on top. Finally, a reinforced base coat is applied followed by a selected textured finish coating. This panel type represents one entire exterior wall envelope assembly with the full combination of multiple trades, materials, and their necessary coordination.

Full steel-stud composite panels are very flexible in regards to orientation and size, with the only size restrictions being those of trucking capabilities, roadway or delivery route restrictions, site logistics or access and erection requirements. They are commonly fabricated in sizes ranging from 8, 10, or 12 feet wide and up to 50 feet long depending on the trucking arrangement used. Full steel-stud composite EIFS panels are typically designed and fabricated with barrier or non-drainage type EIFS claddings; however, drainage capacity can be incorporated on an individual-panel basis. This would require the development of weep detailing at horizontal termination conditions, such as the head joints of wall-penetration components like windows, doors or louvers as well as at the bottom horizontal panel joint. Because this panel type includes the metal studs and sheathing, it has complete and inherent structural integrity. Typically, it is the EIFS panel fabricator who coordinates the detailed design and engineering of the panels and structural connections in accordance with the architectural drawings and specifications.

Continues at ce.architecturalrecord.com

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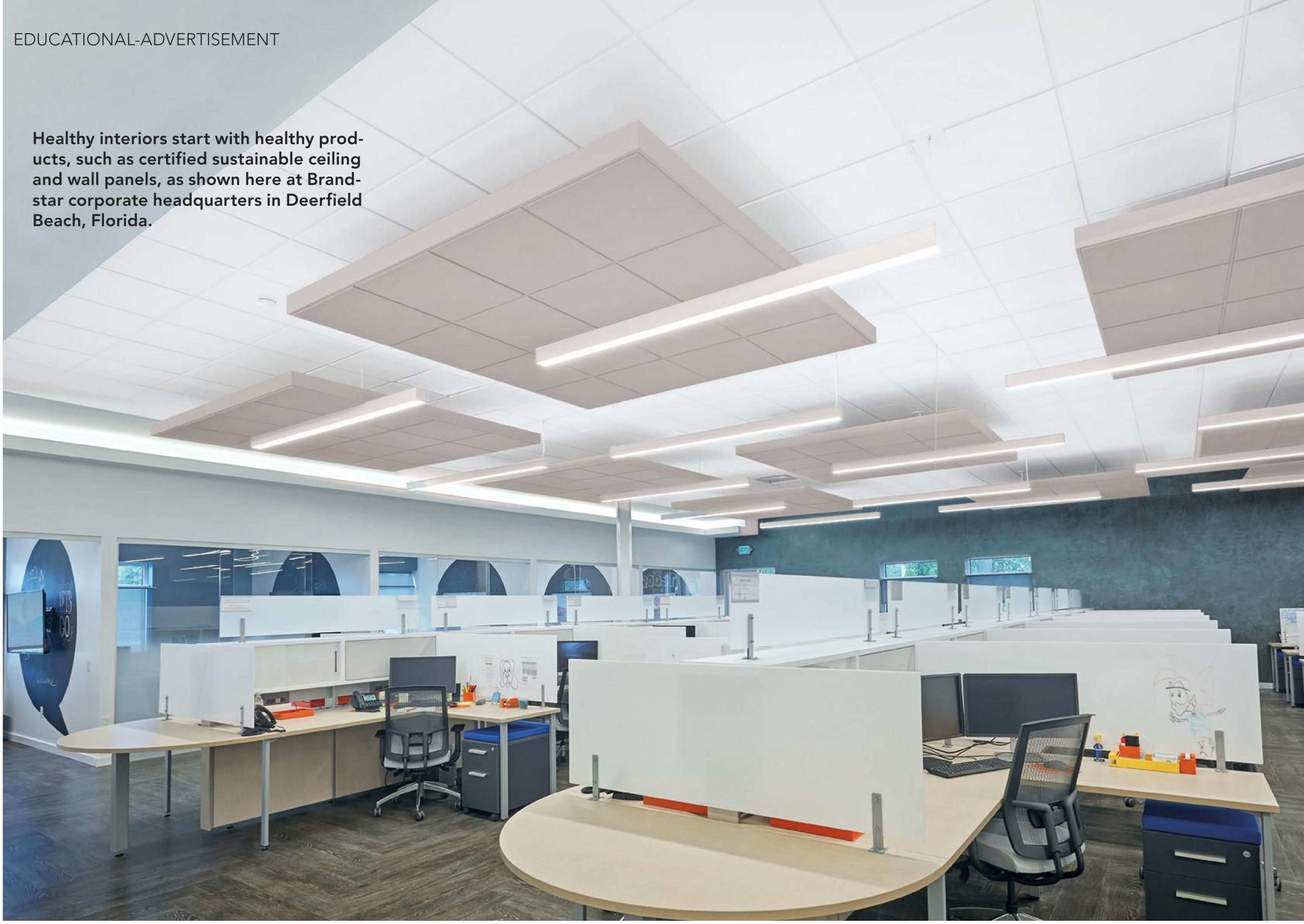

Healthy interiors start with healthy products, such as certified sustainable ceiling and wall panels, as shown here at Brandstar corporate headquarters in Deerfield Beach, Florida.

Photo courtesy of Armstrong Ceiling and Wall Solutions

Sustainable Material Selection Delivers Better Spaces

Sustainble materials, ingredient transparency, and flexible sustainable designs improve interior spaces

Sponsored by Armstrong Ceiling and Wall Solutions | *By Rebecca A. Pinkus*

Recent trends in green building design and product selection focus on sustainable and energy-efficient materials and how they can impact and improve architectural performance and occupant experience. Both performance and occupant experience are extremely important when designing for interior spaces, where most people spend an estimated 90 percent of their time. Architects, designers, and builders as well as green building programs understand the importance of choosing the right products for the space. But there's more to it than that.

This growing shift toward an emphasis on the health and well-being of occupants is now closely tied to sustainable building practices that use environmentally friendly materials and products, and in particular increased product ingredient transparency. Architects and designers have many options when it comes to specifying materials, and product transparency can help them make choices best suited to their project requirements.

CONTINUING EDUCATION

1 AIA LU/HSW

Learning Objectives

After reading this article, you should be able to:

1. Discuss how current design trends paired with sustainable material selection can help specifiers create healthier buildings.
2. Explain how specifying sustainable materials for interiors contributes to occupant well-being.
3. List the ways that sustainable ceiling and wall materials can contribute to healthier building interiors.
4. Describe how new industry standards and transparency are driving quieter, sustainable, and more comfortable interior spaces.

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The driving forces behind the trend include new ideas about how spaces are used, deliberate attention to how spaces impact the productivity and health of occupants, and increased transparency about product ingredients and related certifications. Together, these trends provide that architects, designers, specifiers, and building developers all have opportunities to rethink not only the products they use but also how to use them.

A CHANGING WORKFORCE: THE ROLE OF THE MILLENNIAL GENERATION

The millennial generation has had a huge impact on reshaping interior spaces in the workplace. Where previous generations relied on closed office spaces and cubicles, new workers emphasize the benefits of nontraditional, flexible workspaces that include anything from open-plan areas for collaboration to kitchens, lounges, and recreation areas. Workplaces specifically designed for open-plan, focus, or collaborative spaces can lead to unwanted noise, which is a leading factor in workplace dissatisfaction, and can reduce effectiveness and increase stress of building occupants.

SUSTAINABLE, HEALTHY MATERIALS FOR BETTER INTERIOR SPACES

In addition to a shift to more open interior design options, sustainability has become a true driving force with building design. Manufacturers, developers, architects, designers, and building owners all have a goal to create buildings that are energy efficient and sustainable, and that do more to improve the occupant health and well-being compared to more traditional designs. Balancing these sometimes competing priorities can be challenging at times with so much information available. Product transparency and third-party certifications help streamline relevant information in a way that makes the design process more manageable and helps architects be confident they're choosing sustainable materials for their projects.

NEW RESEARCH ON THE IMPACT OF THE INDOOR ENVIRONMENT

Where we previously relied on anecdotal evidence about the impact of interior lighting, air quality, and noise on occupant experience, we now have a growing body of scientific evidence that supports what people have known for a long time: indoor environments affect human health. From a designer's perspective, this means that healthy interiors can positively impact occupant experience.

While the metrics and outcomes that show the level of impact that a well-designed space can have are still fairly new, researchers are beginning to quantify some of the things people often complain about in spaces, such as low light, poor air quality, and noise. For example, researchers at the Healthy Buildings program at Harvard's Center for Climate, Health and Global Environment (C-CHANGE) focus on the concept of "building for health." They have found that employees working in spaces with enhanced air quality and better ventilation can raise their cognitive function scores. Changes in lighting can help too; a blue-enriched light that mimics sunlight in an office space can improve an employee's sleep quality overnight. The result is that employees can perform better at work and are better rested than those who work in poor indoor conditions. Both of these factors lead to increasing employee satisfaction and employee retention, which can translate into financial benefits for employers, and thus property owners.[2]

The challenge is that the upfront investments can be costly, and the return on investment (ROI) isn't immediately apparent to potential building owners and property managers. But that view is starting to change. Many businesses and organizations are becoming increasingly aware that it takes more than just a "good job" and a positive work culture to hire and retain good employees. One of the most common shifts is a general understanding that well-designed workplaces and healthy environments have a tremendous impact on employee satisfaction, productivity, and ultimately retention. Evidence shows that employees who work in spaces that are light, bright, quiet, and thermally comfortable are more likely to perform better than those in spaces that are lacking those positive qualities. And performance is a metric that organizations can use as evidence of their investment. Businesses that recognize how important healthy workspaces are will be more likely to invest in new building designs and certified healthy and sustainable products to create better work environments. Buildings designed with the occupant experience and well-being in mind can make a huge difference in improving tenant and occupant satisfaction.

Source: Harvard University/United Technologies

PRODUCT TRANSPARENCY AND CERTIFICATION

Product transparency and certifications help specifiers choose sustainable products that can improve occupant well-being and create better spaces.

Continues at ce.architecturalrecord.com

Rebecca A. Pinkus *is an independent communication consultant, writer, and editor focusing on the intersection of technology, environment, and human health. She has contributed to more than 35 continuing education courses and publications through Confluence Communications.* ***www.confluencec.com***

CONTINUING EDUCATION

Improving High-Performance Facades Through Post-Occupancy Evaluation

POEs are essential to ensuring building facades are functioning as intended and advancing future design

Sponsored by Ornamental Metal Institute of New York

Post-occupancy evaluations are important to ensuring that high-performance facades are actually performing as designed. Such a study was completed for the Energy Center Three building in Houston.

Photo courtesy of Kirksey Architects

While a great deal of time, effort, and expense typically goes into designing, fabricating, fine-tuning, erecting, and commissioning a high-performance facade, once a building is up and running, the building team is typically on to the next project and the owner assumes the facility is performing as intended.

However, due to the complexity and number of systems that must come together in a high-performance facade, more often than not, the system is not performing at its optimal level. A high-performance facade is defined as a building enclosure that employs complex concepts for daylighting, solar heat gain control, ventilation, and space conditioning based on the use of advanced materials, automated dynamic components, and integrated climate controls.

"High-performance facade systems are inherently complex and growing more so," explains Mic Patterson, Ph.D., LEED AP BD+C, immediate past president, ambassador of innovation and collaboration, Facade Tectonics Institute (FTI), Los Angeles. "They are consequently sensitive to

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1 AIA LU/HSW

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

1. Understand the important role that post-occupancy evaluations are playing in improving high-performance facades.
2. Explore the details of how the facade impacts a building's daylighting, solar heat gain control, ventilation, and space-conditioning performance.
3. Review the key characteristics of an effective POE.
4. Examine how well-performed POEs improve a building's performance and occupant satisfaction levels, and lend key insights to future projects.

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quality issues in design and execution, particularly in their fabrication and installation."

Furthermore, the facade is the most expensive part of a building, and the building's energy consumption, daylighting, HVAC, comfort, and sometimes acoustics are highly dependent on it.

"In general, post-occupancy evaluations (POE) are sorely needed as a best management practice for all design projects. With any large capital investment promising multiple attribute returns, it would be unwise not to perform some level of POE and commissioning effort," says Colin Rohlfing, AIA, LEED AP, vice president, director of sustainable development, HDR, Chicago.

"If performance is truly important to a project, it is critical to verify that the facade system is performing as specified," agrees Patterson. However, "many are never subject to post-occupancy evaluation. In those that are, shortcomings are frequently discovered."

Preaching the importance of POEs, Patrick Thibaudeau, vice president, sustainable design, HGA Architects and Engineers, Minneapolis, explains that they show areas where occupant comfort and satisfaction require engaging building occupants in a process of understanding and improving the overall performance of the building. "The post-occupancy phase of a project is becoming increasingly important since it involves the completed project and the actual workings of the people in the building," he says.

Photo courtesy of Perkins Eastman

Useful POE information gathered from another K–12 design led Perkins Eastman to reduce window sizing and add an internal lightshelf at Dr. Martin Luther King Jr. School in Cambridge, Massachusetts. The result is that students and teachers rarely turn the electrical lights on.

THE FACADE'S INTERWORKINGS

Drilling into the details of how facades work, Heather Jauregui, LEED AP BD+C, O+M, CPHC, sustainability specialist, Perkins Eastman, Washington, D.C., explains that from a thermal comfort and energy perspective, the more well-insulated and airtight an assembly, the greater the risk that construction and/or detailing mistakes can be made. If this occurs, moisture can accumulate within the insulation and eventually lead to mold/mildew issues or degradation over time.

Furthermore, from a daylight perspective, the facade has a tremendous impact on how much daylight enters a building and how well that daylight is controlled. "The orientation, window-to-wall ratio, window proportions and location, glazing parameters, and shading elements all impact where and how daylight may be transmitted to the interior and how these elements combine to deliver significantly different results," she says.

"Studying the assembly after construction can help catch potential errors before they may become an issue down the road," she continues. "This can also lead to a learning opportunity for both the design team to improve detailing on high-performance facades on subsequent projects and for the construction team to improve on how the envelope comes together to minimize potential issues."

In fact, Jauregui reports that after conducting POEs on multiple past projects, Perkins Eastman discovered that designing to textbook lighting levels may actually over-light interior spaces in relation to occupants' real-life preferences. This valuable information is currently informing the firm's designs, as it has revised its daylight targets accordingly.

While key data like this can only be uncovered with POEs, Aulikki Sonntag, Drees & Sommer, Basel, Switzerland, points out that the majority of new-construction high-performance facades, especially those that are custom designed, do undergo significant laboratory testing during early construction phases. This frequently includes a performance mockup and, as required, isolated material testing. "These are typically the responsibility of the curtain wall contractor conducted at and/or witnessed by an independent test lab," she explains.

Sonntag reports that performance mockup testing often includes water infiltration testing, static with pressure differential; dynamic water infiltration via simulated wind-driven rain; structural testing of wind loads; thermal testing to confirm material and joinery can withstand extreme temperature changes; racking, which is a simulation of building movement; proof load structural, which is 1.5 times the design wind load; and proof load racking that tests cyclic movements and the associated safety factor for the overall design.

"On selected curtain walls, we use infrared cameras to test for bridging and to review if operable windows are working properly with HVAC interoperability," adds Arathi Gowda, AIA, AICP, LEED AP BD+C, associate, SOM, Chicago.

Additional assessments may include testing the loads induced by window-washing equipment, endurance cycling of moveable components such as shading systems, and cycling of operable elements, which is relevant to maintenance.It's also important to understand that because high-performing new facades incorporate a large degree of prefabrication, if and when field testing were to reveal performance issues post-occupancy, the ability to address these issues may be somewhat limited, depending on the issue.

Continues at ce.architecturalrecord.com

Photos courtesy of Draper, Inc.

Exterior Venetian blinds can provide excellent solar control, allowing in natural light when open and providing maximum heat and light reduction when closed.

Understanding the Benefits of Interior and Exterior Shading Systems

Innovations and options in contemporary shading systems help create productive and healthy interior environments

Sponsored by Draper, Inc. and Phifer Incorporated | *By Jessica Jarrard*

Building professionals increasingly recognize the benefits of natural daylighting to building occupants. Natural light is essential to the healthy functioning of our bodies, including the regulation of melatonin and hormones; people who don't get enough natural light often have trouble sleeping. But windows provide more than natural light; they also connect building occupants to views of nature.

The European Solar Shading Organization (ES-SO) guidebook on solar shading claims that workers who are close to an exterior window report 20 to 25 percent fewer major health complaints, while absenteeism falls by 15 percent when access to windows and daylight is provided. A study conducted by the California Energy Commission found that office workers also perform 10 to 25 percent better on mental function and memory tests when provided with the best possible view.

In 2004, Carnegie Mellon University's Guidelines for High-Performance Buildings reported that maximizing daylight while reducing glare—along with adding responsive lighting controls—improves productivity by a median of 3.75 percent. Given that a productiv-

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1 AIA LU/HSW

1 GBCI CE HOUR

1 IDCEC CEU/HSW

Learning Objectives

After reading this article, you should be able to:

1. Identify the main health, energy, sustainability, and productivity advantages and disadvantages of controlled daylighting.
2. Describe shading system options, including interior and exterior solutions, understand of how these solutions work in the field.
3. Explain how custom shading systems can provide optimal solutions when off-the-shelf products aren't sufficient, while maximizing the benefits of daylighting and still minimizing the hazards that come from too much light exposure.
4. Discuss how shading systems provide energy-efficient solutions for occupants in addition to benefits for the environment.

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ity increase of 1 percent equals 0.8 percent of operating expenses, this study clearly shows that daylighting and daylighting control impact the bottom line.

Natural light is also pleasing to the eye, and it creates dynamic patterns that enhance the aesthetics of building interiors.

Aside from their benefits, windows in buildings can create glare. Direct sun in the eye can cause disability glare, interfering with the occupant's ability to see and work. Discomfort glare occurs any time the background brightness exceeds the brightness of the task. Glare can cause eyestrain, headaches, fatigue, and tension, ultimately affecting productivity.

A good rule of thumb for office environments is that the "bright-to-dark" ratio between the screen or work surface and the direct field of vision should not exceed 3:1; in other words, the work area should be no more than three times as bright as the area immediately surrounding it. The ratio between the screen or work surface and the indirect field of vision, or background, can be greater, but should not exceed 10:1.

The use of interior or exterior shading systems can effectively control light through glazing and, together with the artificial lighting scheme, contribute toward achieving good visual comfort and productive working conditions.

In addition to managing glare, it's also necessary to consider solar heat gain—that is to say, the increase in temperature inside a building space from solar radiation. Solar heat gain is desirable during the heating season because it helps reduce energy demand from the heating system. But in summer, unwanted solar heat gain can increase the cooling energy load and create uncomfortable conditions for occupants.

Photo courtesy of Draper, Inc.

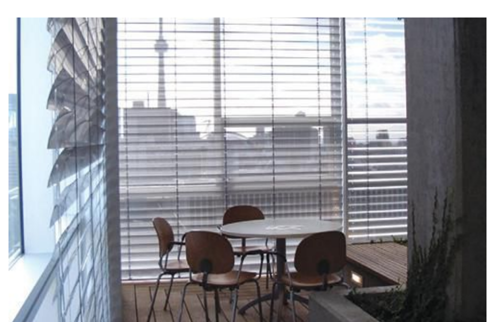
Glare from the sun can cause discomfort or disability glare for occupants.

While good design can help prevent direct sunlight from penetrating the building during the summer months, window size and placement alone cannot stop unwanted heat gain.

The goal of any building design should be to maximize the use and benefits of natural daylighting while addressing the problems of solar heat gain and glare. Although building orientation, window-to-wall ratios, window placement, and glazing performance are important considerations, shading systems are usually required to control heat gain and glare through the seasons. To optimize energy use, shading systems should ideally be automatically deployed and adjusted to respond to the exterior conditions, with supplementary artificial lighting only provided when required.

Daylighting can create many benefits as well as challenges. While there isn't a one-size-fits-all solution, modifications to existing shading systems, specialized solutions, and custom solutions can be implemented successfully to provide health and safety for occupants and well as energy efficiency.

Photos courtesy of Richard Wilson



Interior shading systems include shades that can be raised or lowered fully or left at intermediate positions depending on the time of day.

LIGHTING SOLUTIONS AND SHADING SYSTEMS

Shading systems can effectively control daylighting in commercial buildings and also serve as integral design elements. They can be installed on the exterior or interior of buildings, and even between glazing units or within a double facade. There are many types and styles of modern shading systems used to control daylighting in modern commercial architecture.

Exterior vs. Interior Shading Systems

Exterior shading systems have a big advantage over interior systems: they significantly reduce unwanted solar heat gain by eliminating one of the sources of that gain. Solar radiation is absorbed by shading material, whether installed inside or outside a building. The short-wave solar energy that is absorbed by the shading system is converted into long wave energy (i.e., heat). With an exterior system, this heat is radiated outside the building and never reaches the glazing. However, solar energy that is absorbed by an interior shading system and is then radiated as heat is trapped inside the building. An effective exterior shading system can block 90 percent or more of solar gain. This can contribute to lower HVAC demand, which in turn can contribute to a downsized HVAC system, lower capital costs, and lower operational costs over time.

Interior shading systems consist of shades or blinds that can be operated up or down. Interior blinds incorporate slats, the angle of which can be adjusted to control light, glare, and solar heat gain. Interior shades can be raised or lowered fully or to intermediate positions, depending on the time of day and amount of direct sunlight. Although they are not as effective as exterior systems at keeping solar heat gain out of the building, interior shading systems have other advantages. For instance, there are more material (fabric) options since the shades are not in direct contact with the elements (though they are still susceptible to UV damage). Because they are part of the indoor environment, however, it is important to consider how the material choice impacts indoor air quality. Interior shading systems can be motorized or operated manually.

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Jessica Jarrard *is an independent writer and editor focusing on health, science, and technology. She contributes to continuing education courses and publications through Confluence Communications.* ***www.confluencec.com***

Key Approaches to Commercial Bathroom and Shower Design

Sponsored by Inpro

Google the phrase “commercial bathroom design trends,” and results include functional design, ADA compliance, low-maintenance materials, privacy, transgender accommodation, and warm, high-end feel. This course focuses on commercial washroom and bathroom design, including disability accommodation, bather/user privacy, the problems of mold, mildew, and hygiene, and material and product alternatives to help keep bathrooms and showers cleaner.

Continues at ce.architecturalrecord.com

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Learning Objectives

After reading this article, you should be able to:

1. Discuss the three key design trends driving bathroom design and renovation.
2. Integrate accommodation and universal design principles to commercial washroom and shower design.
3. Explain the key challenges faced in bathroom design regarding accommodation, privacy, the fight against mold, and the cleanliness and hygiene in the space.
4. Master the characteristics of solid surface as a material choice for both new construction or renovation of washrooms.

To receive AIA 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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Continuous Insulation in Framed Exterior Walls

How to determine the amount of exterior continuous insulation required by codes while still retarding water vapor according to climate zone locations

Sponsored by ZIP System® R-Sheathing, by Huber Engineered Woods | *By Peter J. Arsenault, FAIA, NCARB, LEED AP*

Building codes and green building standards are continuing to raise the bar on energy efficiency and high performance in buildings. This is achieved in wood-framed buildings by addressing both insulation levels and airtightness. While this is a positive trend, there are some notable wall design issues to address. Specifically, determining the best amount and type of insulation to use may be unclear, particularly in light of controlling water vapor or moisture that can become trapped in constructed wall assemblies. This is especially true in the case of providing exterior continuous insulation as part of a framed exterior wall. Codes and best practices suggest different amounts of continuous insulation for different climate zones. There is also concern that the continuous insulation can impact the ability of the wall to "breathe" and release any trapped moisture from within the assembly so, in some cases, it can impact the choice of an interior vapor retarder on the warm, inner side of the building.

Continues at ce.architecturalrecord.com

The energy performance of exterior walls is enhanced by including exterior continuous insulation. With new integrated sheathing, this layer is built in to the back of the nailable sheathing that goes directly against the framing.

Photo courtesy of Huber Engineered Woods LLC

Peter J. Arsenault, FAIA, NCARB, LEED AP, *is a practicing architect, green building consultant, continuing education presenter, and prolific author engaged nationwide in advancing building performance through design.* ***www.linkedin.com/in/pjaarch***

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1 AIA LU/HSW

1 GBCI CE HOUR

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

1. Explain the concept of thermal bridging and how it impacts building energy usage in green and sustainable building design.
2. Define the commercial and residential wood-framed wall insulation requirements found in the 2015 International Energy Conservation Code (IECC).
3. Discuss how condensation forms in wall cavities, and investigate strategies to mitigate risk of damage to construction while maintaining sustainable and healthy indoor environments.
4. Identify the practical and green building characteristics of continuous insulation as part of the exterior wall sheathing with other alternatives.

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New and Upcoming Exhibitions

Elemental: Alejandro Aravena So Far
Humlebæk, Denmark
November 10, 2018–February 28, 2019
The second in a series of monographic architecture exhibitions, this show will offer a closer look at the working process of Pritzker Prize–winner Alejandro Aravena's firm Elemental Studio. At the Louisiana Museum of Modern Art. Information at louisiana.dk.

ESKYIU PLAYKITS
Hong Kong
November 17–28, 2018
This exhibition and event series will celebrate the Design Vanguard firm's projects over the last decade and its future visions through interactive showpieces. At Taikoo Place. See taikooplace.com/en/artistree.

Dior: From Paris to the World
Denver
November 19, 2018–March 3, 2019
This exhibit surveys 70 years of the House of Dior's legacy and its global influence. A selection of more than 200 couture dresses (along with accessories, costume jewelry, photographs, and drawings) will trace the history of the haute couture fashion house, its founder, and the subsequent artistic directors who carried Dior's vision into the 21st century. At the Denver Art Museum. For more information, visit denverartmuseum.org.

Paul Rudolph: The Hong Kong Journey
New York
November 29, 2018–March 2, 2019
Through a series of drawings, sketches, and renderings not before shown to the public, this exhibition at the Center for Architecture will focus on the American architect's three significant projects in Hong Kong. For more, visit paulrudolphheritagefoundation.org.

The Sea Ranch: Architecture, Environment, and Idealism
San Francisco
December 22, 2018–April 28, 2019
The exhibition will bring together original sketches and drawings from the designers of this Modernist development on the Northern California coast. Archival images, current photographs, and a full-scale architectural replica will also be on display. At the San Francisco Museum of Modern Art. For more information, visit sfmoma.org.

Ongoing Exhibitions

Moving Away: The Internationalist Architect
Moscow
Through November 30, 2018
Part of an international project that tracks the ideas of the Bauhaus school, this exhibition traces the relationship between the art movement and the Soviet Union through the life and work of former Bauhaus teachers and students in Moscow. At the Garage Museum of Contemporary Art. For more information, visit garagemca.org.

Mario Bellini for Murano
Venice
Through December 2, 2018
Architect and industrial designer Mario Bellini's glasswork is on display at the Fondazione Musei Civici di Venezia as part of Venice Glass Week. The exhibition features recent productions including his architecture for the Deutsche Bank headquarters in Frankfurt (2011) and the Louvre's Department of Islamic Art (2012). For more information, see museovetro.visitmuve.it.

B. Wurtz: Kitchen Trees
New York
Through December 7, 2018
For his first public commission, artist B. Wurtz created an installation of five sculptures for New York's City Hall Park. The whimsical, large, arboreal-looking structures are composed of found kitchen items that form "trunks" and cascading "branches" with hanging plastic fruits and vegetables. More at publicartfund.org.

Ando and Le Corbusier: Masters of Architecture
Chicago
Through December 15, 2018
The inaugural exhibition at Wrightwood 659, a new space designed by Pritzker Prize–winner Tadao Ando, explores Le Corbusier's influence on the Japanese architect. It includes more than 100 Le Corbusier drawings, photographs, and models, as well as 106 small models of Corbu works made by Ando's students. More at wrightwood659.org.

Investigating Where We Live
Washington, D.C.
Through December 31, 2018
The annual exhibit is the product of a five-week program in which teenagers explore and document their interpretation of the city's residents and built environment through photographs, artwork, and writing. The young participants

also design and install the exhibit. At the National Building Museum. More at nbm.org.

Treasures from the White City: Chicago World's Fair of 1893
Chicago
Through January 6, 2019
Held within a gallery that once hosted a reception for the World's Fair of 1893, this exhibit showcases original objects and memorabilia that were designed for and displayed at that international event. Highlighted objects include items from the respective pavilions of Tiffany & Company and Gorham Manufacturing Company, which were seen as groundbreaking in their use of silver production at the time of the fair. At the Richard H. Driehaus Museum. For more information, visit driehausmuseum.org.

Contemporary Muslim Fashions
San Francisco
Through January 6, 2019
Designed by Hariri & Hariri Architecture, the exhibition galleries explore the diversity of Muslim dress codes worldwide and examine how Muslim women have become arbiters of style within and beyond their communities. At the de Young Museum. Visit deyoung.famsf.org.

Close to the Edge: The Birth of Hip-Hop Architecture
New York
Through January 12, 2019
The exhibit showcases the work of students, academics, and practitioners at the center of an architectural movement whose works embody the creative energy evident in other expressions of hip-hop. At the Center for Architecture. For more information, visit centerforarchitecture.org.

Renzo Piano: The Art of Making Buildings
London
Through January 20, 2019
This exhibit examines the design process of the Pritzker Prize–winner and his firm, Renzo Piano Building Workshop, through 16 projects. Each building case study consists of drawings, models, photography, and full-scale maquettes, as well as a new film by Thomas Riedelsheimer. At the Royal Academy of Arts. Visit royalacademy.org.uk.

Maya Lin: A River Is a Drawing
New York
Through January 20, 2019
Inspired by the acclaimed artist's passion for

the environment, the exhibition presents site-specific installations that are mostly focused on bodies of water, particularly the Hudson River. Using materials such as pins, glass marbles, wire, bamboo, and silver, Lin explores how the river flows and shapes—and is shaped by—the land. At the Hudson River Museum. Visit hrm.org.

Edward Burne-Jones
London
Through February 24, 2019
The exhibition charts the rise of the Pre-Raphaelite artist from outsider in the British art world to leading figure of the fin de siècle in Europe. More than 150 works in different media, including painting, stained glass, and tapestry, are on display. Two rooms dedicated to Burne-Jones's most famous narrative cycles are also shown together for the first time. At Tate Britain. Visit tate.org.uk.

Ai Weiwei: Life Cycle
Los Angeles
Through March 3, 2019
Chinese artist Ai Weiwei's first major institutional solo show in L.A. features new and previously unseen sculptural work in response to the global refugee crisis. The title installation, *Life Cycle*, using the traditional Chinese medium of kite-making, depicts the inflatable boats refugees use to cross the Mediterranean Sea. At the Marciano Art Foundation. Visit marcianoartfoundation.org.

dates&events

Lectures, Conferences, and Symposia

LA-Más
New York
November 8, 2018
The founders of this Los Angeles–based nonprofit urban design organization will discuss their work and inspiration at Columbia University's Graduate School of Architecture, Planning and Preservation. Visit arch.columbia.edu.

Neri&Hu: Obsessions
New York
November 9, 2018
As part of a lecture series featuring leading figures in architecture, urbanism, design, and art, Shanghai-based designers Lyndon Neri and Rossana Hu will discuss four projects in China. A conversation with Calvin Tsao, founding partner of Tsao & McKown, will follow the lecture. At the Architectural League of New York. Visit archleague.org.

Shaping Future Cities
Ann Arbor, Michigan
November 9, 2018
The symposium will convene urban practitioners, designers, and developers to assess the implications of technological and developmental change, and describe strategies for shaping future cities. At the University of Michigan's Taubman College of Architecture and Urban Planning. More information at taubmancollege.umich.edu.

Atkinson Forum in American Studies: Place, Memory, and the Public Monument
Ithaca, New York
November 9–10, 2018
This two-day symposium will explore cultural, historical, design, and planning issues that arise around public memorials. The recent debates over Civil War monuments will serve as a starting point for the conversation. The program will consist of formal presentations, panel and audience discussions, and an exhibition of new work by artist Mel Ziegler. At the College of Architecture, Art, and Planning, Cornell. More information at aap.cornell.edu.

Greenbuild International Conference and Expo
Chicago
November 14–16, 2018
This year's convention will concentrate on protecting the natural environment and leveraging the built one to mitigate climate change, enhance community and social equity, and promote sustainable design, among other things. More at greenbuildexpo.com.

Architecture on Stage: Tony Fretton in Conversation with Andrew Clancy
London
November 26, 2018
First known for the Lisson Gallery (1992), British architect Tony Fretton will talk about his practice in conversation with Andrew Clancy, director of the Dublin-based Clancy Moore Architects. At Milton Court. More information at architecturefoundation.org.uk.

Reflections on Alejandro de la Sota: A Pioneer of Spanish Modernism
London
November 27, 2018
Historian William J.R. Curtis, architect William Mann, and a member of the de la Sota family will speak about the Spanish architect's influence on modernism. At the Royal British Institute of Architects. More information at architecture.com.

Competitions

Resilient Homes Challenge
Deadline: November 18, 2018
The World Bank, Build Academy, Airbnb, and the Global Facility for Disaster Reduction and Recovery are looking for designs for small, cost-effective, sustainable homes, for people living in underdeveloped areas, which reduce the risk of damage and enable rapid reconstruction following a natural disaster. Winning designs will be published, and win-

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Publication Detail

1	Publication Name	ARCHITECTURAL RECORD/BNP MEDIA II, LLC
1	Publication Number	132650
2	ISSN	0003858X
3	Filing Date	10/01/2018
4	Issue Frequency	MONTHLY
5	Number of Issues Published Annually	12
6	Annual Subscription Price	72.00
7	Complete Mailing Address of Known Office of Publication	2401 W. BIG BEAVER 700
7		TROY, OAKLAND, MI 48084
7	Contact Person	WAFAA KASHAT
7	Telephone	(248) 786-1631
8	Complete Mailing Address of Headquarter or General Business Office of Publisher	"2401 W. BIG BEAVER RD., STE. 700"
8		TROY, MI 48084-3333
9	Publisher (Name and complete mailing address)	ALEX BACHRACH
9		305 5TH AVENUE
9		NEW YORK, NY 10118-0110
9	Editor (Name and complete mailing address)	CATHLEEN McGUIGAN
9		305 5TH AVENUE
9		NEW YORK, NY 10118-0110
9	Managing Editor (Name and complete mailing address)	BETH BROOME
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13	Publication Title	ARCHITECTURAL RECORD/BNP MEDIA II, LLC
14	Issue Date for Circulation Data Below	09/01/2018

15	*Extend and Nature of Circulation*	*Average No. Copies Each Issue During Preceding 12 Months*	*No. Copies of Single Issue Published Nearest to Filing Date*
15a	Total Number of Copies (net press run)	98083	97046
15b1	Outside County Paid/Requested Mail Subscriptions stated on PS Form 3541. (Include direct written request from recipient, telemarketing and Internet requests from recipient, paid subscriptions including nominal rate subscriptions, employer requests, advertiser's proof copies, and exchange copies.)	65772	63934
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15b4	Requested Copies Distributed by Other Mail Classes Through the USPS (e.g. First-Class Mail)	5	5
15c	Total Paid and/or Requested Circulation	69552	67495
15d1	Outside County Nonrequested Copies stated on PS Form 3541 (include Sample copies, Requests Over 3 years old, Requests induced by a Premium, Bulk Sales and Requests including Association Requests, Names obtained from Business Directories, Lists, and other sources)	23644	25805
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15e	Total Nonrequested Distribution	25128	26474
15f	Total Distribution	94680	93969
15g	Copies not Distributed	3403	3077
15h	Total	98083	97046
15i	Percent Paid and/or Requested Circulation	73.46	71.83
16	***If total circulation includes electronic copies, report that circulation on lines below***		
16a	Requested and Paid Electronic Copies	1917	2126
16b	Total Requested and Paid Print Copies (Line 15c) + Requested/Paid Electronic Copies	71469	69621
16c	Total Requested Copy Distribution (Line 15F) + Requested/Paid Electronic Copies	96597	96095
16d	Percent Paid and/or Requested Circulation (Both print & Electronic Copies)	73.99	72.45
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17	Publication of Statement of Ownership	Publication of this statement will be printed in the 11/01/2018 issue of this publication
18	Signature and Title of Editor, Publisher, Business Manager, or Owner	WAFAA S. KASHAT
18	Title	Audience Audit/Postal Specialist
18	Date	10/01/2018 11:44:35 AM
Version	PS Form 3526, September 2007	

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Ⓡ Regional AD

snapshot

PROJECT *PULSE*
LOCATION PHILADELPHIA
ARCHITECT JANET ECHELMAN WITH OLIN

IN 2009, as part of an effort to improve the civic spaces and infrastructure in downtown Philadelphia, firms KieranTimberlake and OLIN were asked to transform Dilworth Park. While working on the redesign, they and the client Center City District selected sculptor Janet Echelman for a public installation project that would help bring attention to the new square. Though well known for her aerial, netlike sculptures, Echelman hoped to do something that wouldn't disrupt views of the historic City Hall, which sits next to the park. "I didn't want to compete with the lyrical architecture begun in 1871," she says. "There will never be another building like it." This impulse led the artist to create a tribute to the downtown district's long history as a transportation and water-supply hub by embedding the public artwork in the park's 11,600-square-foot fountain. Over the next nine years, Echelman worked with OLIN, Arup Lighting, and consulting firm Urban Engineers to create *Pulse,* a 60-foot by 230-foot mechanical system that playfully emits 4-foot-tall walls of atomized water whenever subways pass underneath. The team also added LEDs to colorfully illuminate the spray. Says Echelman, "My goal for the colored lighting of my mist curtains was to create a 3-D experience of walking into a Mark Rothko painting." *Justin Chan*

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