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Well Grounded:

Airports of the Future Accommodate Growing Masses of People with Safety, Comfort and Services in Mind

+ More Transportation Projects

TREND ALERT: electric vehicles

THIS ISSUE FEATURES AUGMENTED REALITY!

See Page 10

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Ridley Township Marina, Ridley, PA Installing contractor: E.P. Donnelly Inc. Architect: Catania Engineering Associates,
General contractor: J.S. McManus Inc. Photographer: hortonphotoinc.com
Profiles: Snap-Clad, PAC-750 vented, ColorGard snow retention system Color: Copper Penny

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-Clarice Jones, Project Architect, Catania Engineering Associates

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WELL GROUNDED

Airports of the future accommodate growing masses of people with safety, comfort and services in mind.






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PERUSE TRANSPORTATION PROJECTS FROM AROUND NORTH AMERICA:

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- Los Angeles Union Station
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- Floyd Bennett Field, New York
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- Metra Station, Lombard, Ill.

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COVER PHOTO: : © PAUL DINGMAN, COURTESY OF FENTRESS ARCHITECTS

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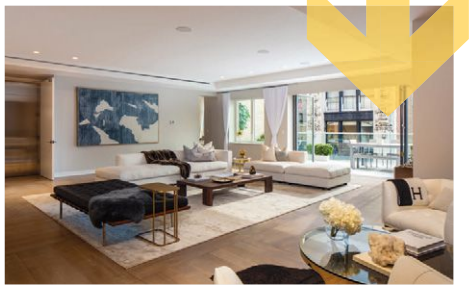

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pointofview

FOLLOW THE CLUES

In 2014, I was in a personal rut. Although I loved my job working on ***retrofit***, I was living in Chicago surrounded by millions of people but feeling increasingly isolated. My local friends had all gotten married or were having kids, and the city and its crime were beginning to affect me, literally and figuratively. I wanted to leave Chicago and move closer to my family in my home state of Iowa, but I felt trapped by my condo. I still was underwater after the 2008 downturn and my 15-unit building only allowed three rentals, all of which were rented.

It was during this time of unhappiness that Michael, an industry friend who always imparts sage advice, made a reappearance into my life via telephone. He reminded me that we can easily make excuses for not doing something that will make us happier; most of these excuses are financial. Michael urged me to be open to clues from the universe that would show me the path I needed to follow to find my happiness again. At the time, I wasn't sure what sort of clues I should be looking for—or even how to look for them—but Michael had never steered me wrong before so I remained open to his wisdom.

A few weeks later, my phone rang on a Friday at 5 p.m. and the number wasn't one I recognized. I assumed it was a business call and, even though I wanted to start my weekend, I took the call. That call made me 30 minutes late for my nightly walk with my dog, Belle. When Belle and I returned home from our walk, I noticed a realtor showing one of the units in my building that was a rental. I ran up to my condo and immediately emailed the condo board, saying, if that unit did indeed sell, I wanted to be the third rental in the building. The next week, the board confirmed I could rent my unit. One month later, I had hired a property manager who found my first tenant while movers hauled my household to Iowa. Three weeks after that, I met my future husband in Iowa. At the time of this writing, we have a 14-month-old daughter. Talk about a turn of events, simply because I had taken a phone call at 5 p.m. on a Friday! By taking that call, the path for my future was laid out before me. I just had to take the first step.

I continuously am reminded about following clues that lead to beautiful outcomes while editing this magazine. At least one gorgeous renovation in every issue features an architect who says his team was true to the original architecture of the building—basically, the path was there; the design team just needed to be true to it. In this issue, that story is "Transformation", page 48. Brian Lee, FAIA, LEED AP, design partner with Skidmore, Owings & Merrill, Chicago, says his team strived to connect their design for Optimo, an old-school hat-making shop in Beverly, Ill., with the craftsmanship displayed in the 1914 firehouse that would house Optimo.

Wanting to stay in the neighborhood in which Optimo got its start, Graham Thompson, Optimo's owner, purchased the old firehouse for $1 through a community development program. He was very interested in maintaining the look of the original firehouse. The result is a stunning space that beautifully melds the hatmaker's aesthetic to the architecture of the space.

Only by following the clues from the firehouse could Skidmore, Owings & Merrill's design team have created the magnificent space that is Optimo, just like following clues the universe presented to me resulted in changes in my life for which I'm eternally grateful.

CHRISTINA KOCH
Editor in Chief

THIS ISSUE FEATURES AUGMENTED REALITY!

Download the free Layar Augmented Reality app. (The QR code will help you find the app.) Then, hover over pages 14, 24, 29, 47, 77, 78, 79 and 84 with a smartphone or tablet and watch videos that bring the content to life.

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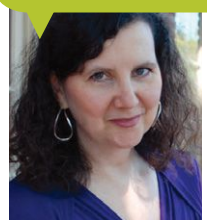
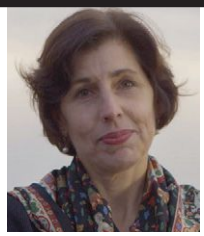


Most airports were built decades ago and are not designed to function for today's volume nor the shifting realities of technology, security and social preferences. **KJ Fields**, a Portland, Ore.-based ***retrofit*** contributor, writes our "Cover Story", page 18, about how global commerce and increasing demands for air travel are requiring airports to improve quality, comfort and the passenger experience.



Maria T. Vargas is the director of the Better Buildings Challenge at the U.S. Department of Energy, Washington, D.C. During a visit to King County, Wash.—a partner of the DOE Better Buildings Challenge—King County International Airport officials showcased how the county achieved 60 percent energy savings and $31,000 per year in cost savings at the airport. Vargas writes about the airport's deep energy retrofit in "Energy", page 36.

Shengliang (Daniel) Rong, MArch, MS, WELL AP, LEED GA, is an indoor lighting expert with Delos Living LLC, New York. He leads the design and execution of research projects that aim to understand the impact of electric and natural lighting on human health and wellness. As such, Rong writes in "Component", page 42, about the Light Concept of the WELL v2 pilot, as well as discusses how to utilize the standard's changes to benefit lighting and lighting controls design.

Allen Barry, who writes about architecture and sustainability from Chicago, reveals the renovation of a 1914 Beverly, Ill., firehouse for the high-end hat-making business of Optimo. In "Transformation", page 48, Barry explains how the architects at Skidmore, Owings & Merrill, Chicago, took time to understand Optimo's production process in an effort to marry form and function in the historic building.

Joe Thompson, vice president and account manager with Skanska USA's Durham, N.C., location, writes about the new Raleigh Union Station, N.C., in "Mixed Use", page 56. The adaptive reuse of an old warehouse in the heart of downtown Raleigh into a multimodal transit center is a key component of long-term plans to catalyze growth and revitalize the downtown Warehouse District.

"Multifamily", page 64, illustrates the recent renovation and adaptive reuse of Cardinal Cushing Centers' former dormitory into Bethany Apartments in Hanover, Mass. **Edward R. De Blieck**, AIA, NCARB, LEED AP, a project manager at Chelsea, Mass.-based The Architectural Team Inc. (TAT), and **Melanie Conant**, IIDA, NCDIQ, director of Interior Design at TAT, explain how they created a 37-unit affordable housing community for area residents within the dormitory.

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BETTER BUILDINGS

Have you ever wondered about manufacturers' perspectives on industry issues? So have we! In 2018, ***retrofit*** launched the "Better Buildings" section of its website. In this section, ***retrofit***'s staff writers examine issues important to and directly impacting you, our readers, with guidance from manufacturers who have unique viewpoints into our industry. So far, ***retrofit***'s team has tackled the topics of building entrance security, flexible work stations and managing smart buildings. Expect more well-researched topics in 2019!

www.retrofitmagazine.com/category/better-buildings

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Since ***retrofit*** was established, industry experts have been sharing their insight about energy efficiency, technology, codes, green-building programs, natural disasters, products and more via ***retrofit***'s blog. Click on "Online Exclusive" in our website's top navigation and select "Blog" in the drop-down menu. New blogs are posted every two weeks and shared via our e-newsletter.

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Chicago Union Station Renovation Time-Lapse

Project Walkthrough

Sunlight is shining on the Great Hall at Chicago Union Station once again! Teams completed a major restoration of the 219-foot-long skylight that is a center of the train station, and EarthCam documented the entire process. View progress from October 2017 to December 2018 from several unique perspectives.

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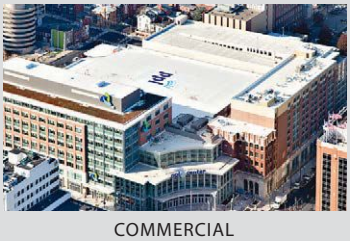
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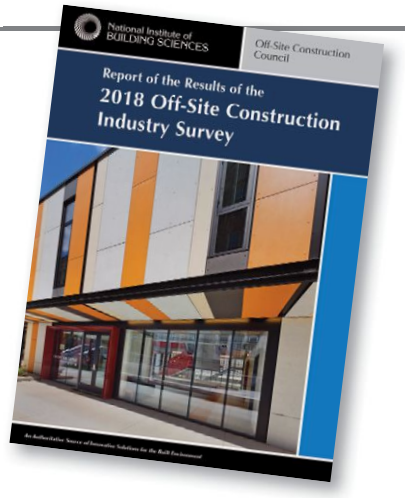
SURVEY ANALYZES EVOLUTION AND PERCEPTION OF OFF-SITE CONSTRUCTION



Four years after the Washington, D.C.-based National Institute of Building Sciences Off-Site Construction Council (OSCC) conducted an initial survey to gain an understanding of how the U.S. construction sector is using off-site construction techniques and technologies, the council issued a follow-up survey to see how the industry's use has changed. At NIBS' recent annual meeting, OSCC released "Report of the Results of the 2018 Off-Site Construction Industry Survey", compiling the 2018 industry survey results. (Read the full report at bit.ly/2MywOyd.)

A total of 205 participants from around the country responded to the 2018 survey. The respondents came from across the building industry, representing the diversity of stakeholders involved in the decision-making and implementation of off-site construction. They included construction management and general contractors, engineers, trade contractors, architects and owners/developers.

The following are some key findings from the report:

- Most respondents (87.62 percent) indicated they had utilized off-site fabricated components to some degree during the past 12 months while 81.63 percent expected to utilize off-site construction more often or the same amount in the next 12 months.
- The participants (who could select multiple categories) are using off-site elements for commercial construction, industrial, health-care, education, multifamily, hospitality, single-family and data-center construction.
- Respondents indicated that although off-site construction requires moderately or significantly higher levels of engagement, the increased integration and collaboration throughout the delivery process can result in higher quality and reduced changes throughout construction.
- The respondents identified the primary benefit of off-site construction to be a reduced overall project schedule and, specifically, the duration of the construction phase. Other realized benefits included quality of the product and cost effectiveness.
- Construction culture and late design changes were the most significant barriers recognized.
- The survey also pinpointed the construction manager or general contractor is the one most often to implement off-site construction.
- The survey indicates additional education is needed for current decision-makers and owners, who have the potential to demand the use of off-site construction.

OSCC plans to distribute more industry-based surveys to obtain additional data about the state of prefabrication in the construction sector.

Learn more about OSCC, including how to get involved, at www.nibs.org/page/oscc.

LEED v4.1 Is Open for Registration

The Washington, D.C.-based U.S. Green Building Council's newest version of the LEED green building program, LEED v4.1, is open for registration for new construction projects and interior spaces with LEED v4.1 BD+C and LEED v4.1 ID+C. ¶ "The hallmark of LEED is continuous improvement and that is exactly where we are going with LEED v4.1," explains Mahesh Ramanujam, president and CEO, USGBC. "LEED v4.1 is set to raise the bar. … From improving energy performance to emphasizing human health and integrative building design, LEED is encouraging project teams to operate beyond the status quo." ¶ The goal of LEED v4.1 is to make the rating system more accessible to more projects based on lessons learned from LEED v4 project teams. This newest beta version updates performance thresholds and referenced standards to ensure LEED remains a global leadership standard for green buildings and continues to expand the marketplace for LEED. The changes also advocate for improved performance throughout the life of buildings; reward leaders based on their performance; and incorporate performance reporting to enable building owners to track progress toward environmental, social and governance goals. Currently, there are more than 96,200 commercial projects participating in LEED in 167 countries and territories. ¶ To participate, users can register using LEED Online, review the LEED v4.1 Beta Guide and download the LEED v4.1 rating system. The latest education videos and live online webinars featuring USGBC subject-matter experts also are offered. USGBC staff will be available to meet in person at the 2019 Greenbuild and regional events. ¶ To learn more, visit usgbc.org.

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TRANSLUCENT DAYLIGHTING
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This installation at DuPage Airport features LIGHTWALL® incorporated into both fixed wall sections, as well as operable hangar doors.

Architect: Burns & McDonnell | Photo: courtesy balloggphoto.com

DuPage Airport, West Chicago, IL

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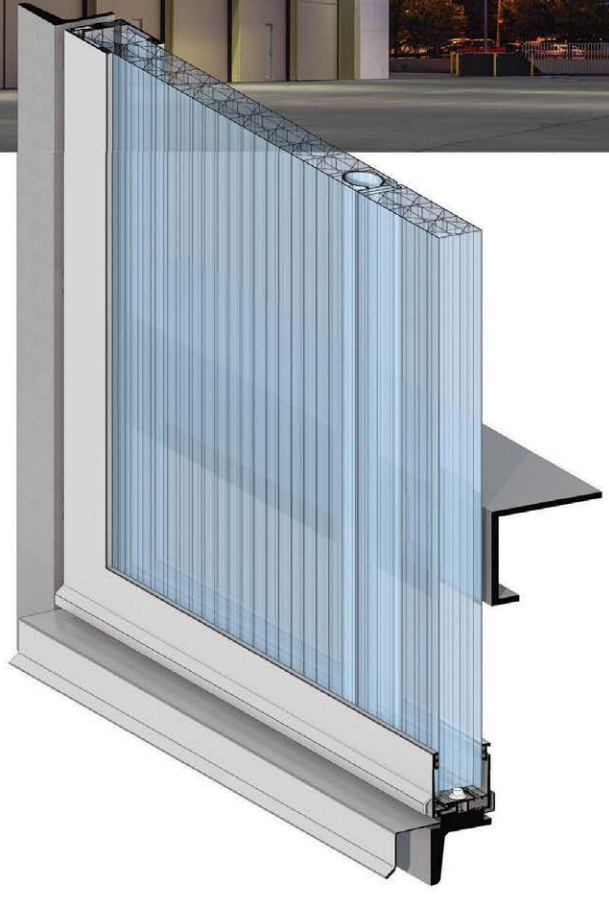

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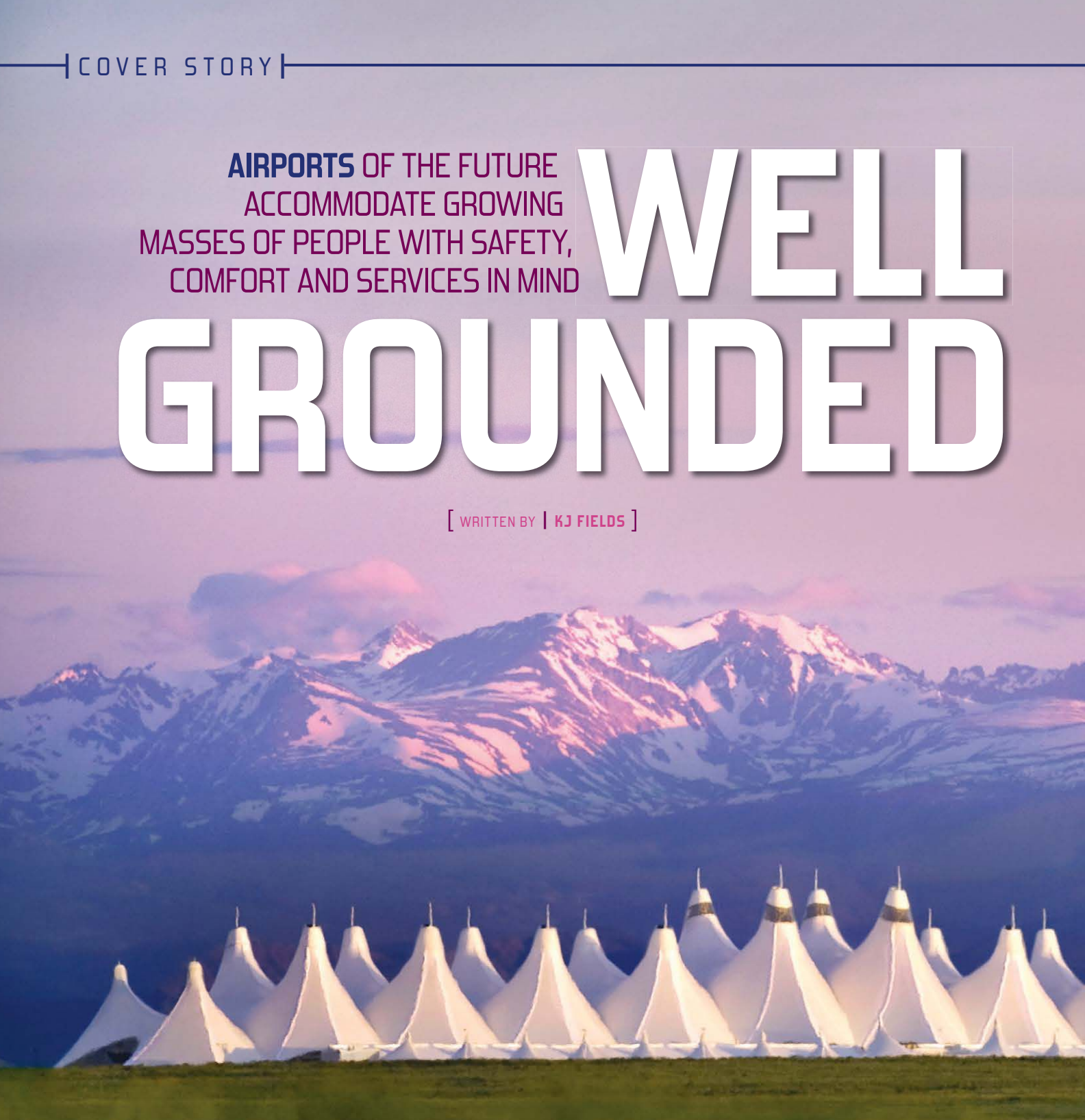


As one of the world's largest daylit structures, Fentress Architects' design for **DENVER INTERNATIONAL AIRPORT**'s roof evokes the Rocky Mountains and incorporates sustainable strategies and natural light.

PHOTO: © ELLEN JASKOL, COURTESY OF FENTRESS ARCHITECTS

Getting to one's destination may be the goal of air travel, but the journey through airports is changing. In the past 40 years, exponential growth in airline passenger travel has become a worldwide phenomenon. According to the Montreal-based International Air Transport Association, annual international flight exceeds 4 billion passengers, and the Federal Aviation Administration, Washington, D.C., reports that 2.6 million people fly in and out of U.S. airports every day.

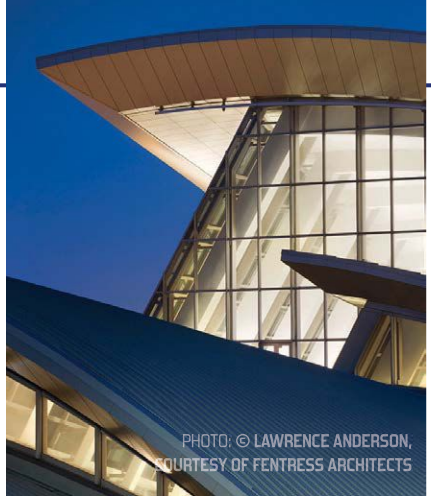
Many airports were built decades ago and are not designed to function for today's volume nor the shifting realities of technology, security and social preferences. "Airports are among the most complex and highly frequented transportation hubs, but they are also increasingly important places for work, commerce, recreation and culture," says Curt Fentress, principal in charge of design of Denver's Fentress Architects. "With global commerce and the demand for air travel increasing, airports of the future must place quality, comfort and the passenger experience at the forefront of the design."

WAITING GAME

The events of 9/11 in 2001 dramatically changed air travel, and long security lines to eliminate threats to the traveling public became the norm at airports. Travelers can't gauge the time it may take to get through security, so they need to arrive early. When the lines aren't as long as anticipated, however, passengers have spare time on their hands. This creates a big business opportunity for post-security retail, services and amenities. "Airports have a captive audience of high-end customers willing to spend money, and that's a good group to market to," Fentress explains. "In addition, the money from retail is non-restricted revenue, which is essential for airports to build new facilities."

Restaurant options are important; meals are no longer served on all flights and today's travelers prefer a wider variety of international, healthy and organic choices. Airport patrons also want non-traditional shopping and higher-end retail stores, such as Chanel and Brooks Brothers. Services are in demand, too. Business travelers taking multiple trips a week or passengers with long layovers may seek a massage or salon for a haircut.

To offer comfort and entertainment options, airports are now providing unconventional amenities, such as yoga rooms, therapy dogs and digital play experiences. In the Incheon International Airport (ICN)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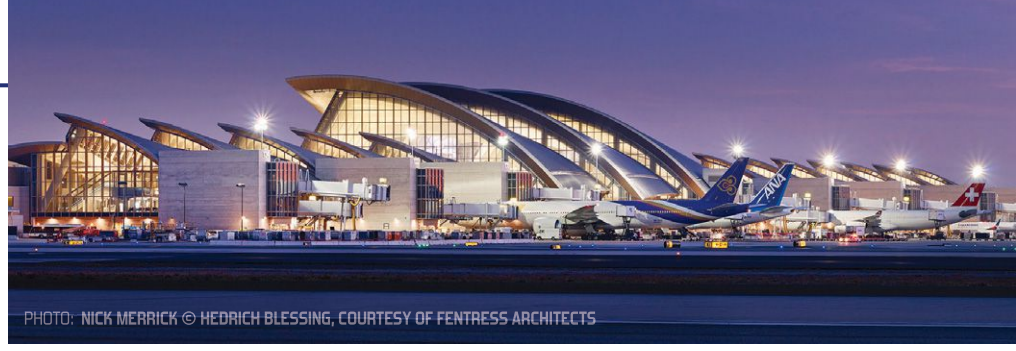
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↑To accommodate **LOS ANGELES INTERNATIONAL AIRPORT**'s (LAX's) Tom Bradley International Terminal's rising passenger rates and capture LA's character, Fentress Architects designed a wave-like roof using site-rolled, standing-seam roofing and formable Alucobond soffits and fascias.

←LAX's Alucobond fascias and soffits, integrated with the standing-seam stainless-steel roof, meet the airport's aesthetic needs and provide long-term performance.

in South Korea, Fentress Architects even added a wedding chapel. These upscale retail and diverse amenity offerings mean that outdated terminals must be renovated or new ones built to draw customers. "We have options when we travel," Fentress asserts. "I choose to fly and connect through cities with airports that I prefer, and I avoid certain airports that are worn out, create a bad experience or are inefficient."

SELF CONTROL

One way airports are improving efficiency and the passenger experience is through digital technology. Self-service technologies are evolving to become more user-friendly. Computerized kiosks for self check-in processes are ubiquitous, and new self baggage-drop kiosks automatically check-in luggage and dispatch it into the bag sortation system. Airports are providing flight, gate, walk times and other important information to passengers through beacons, sensors and digital technology, such as tablets in restaurants. New third-party service providers are leveraging tablet technology to conveniently deliver food and drinks to passengers' individual locations at departure gates.

Technology also gives individuals more control over security line wait times. For example, biometric technology (facial recognition, fingerprints and retinal scans) has become an increasingly important part of airport security and removes the need to present documents at multiple stages of the journey. Biometric technology may someday replace passports and airline tickets, as well. Although technologies reduce wait times and free up space for other activities, Fentress believes there will always be some sort of waiting line at airports. "The line provides a way for security officers to observe people, look for those who are nervous and identify potential threats," he notes.

Several airports also have performed trials using robots that respond to passenger questions or conduct security or cleaning services. Because airport layouts can be confusing places, augmented reality (AR) wayfinding may soon allow passengers to use the camera function on their devices to view AR directions to their destination within the terminal.

CIVIC CONNECTION

Airports are becoming multimodal transportation hubs that stimulate economic development as they integrate with cities, and some are taking on a role as real-estate developers and urban planners. The Denver International Airport (DEN) plans to develop its 16,000 acres of unused


PHOTO: © BRADY LAMBERT, COURTESY OF FENTRESS ARCHITECTS

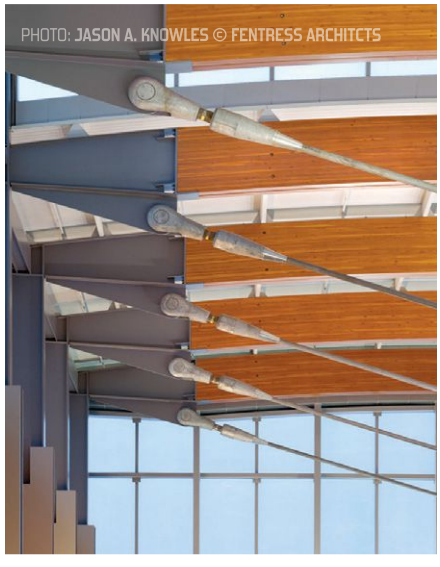
PHOTO: JASON A. KNOWLES © FENTRESS ARCHITECTS

↑**RALEIGH-DURHAM INTERNATIONAL AIRPORT**'s (RDU's) rolling roofs reflect the hills of the Piedmont region, and curbside canopies evoke images of textile machines, honoring an industry integral to the local economy.

↗Wooden trusses create longer spans than conventional framing and provide column-free spaces that offer greater longevity, durability, and flexibility to accommodate future changes in the airport's infrastructure. The use of natural daylighting from glass curtainwalls and clerestories provides context for RDU passengers and helps establish a sense of place.

The bridge from curbside to **INCHEON INTERNATIONAL AIRPORT**'s Passenger Terminal relates the arrival experience to Korean landscape and ceremonies as travelers walk above gardens with native plants.

PHOTO: © PAUL DINGMAN, COURTESY OF FENTRESS ARCHITECTS

↑ **ORLANDO INTERNATIONAL AIRPORT**'s Boulevard will guide passengers throughout the terminal while connecting ground transportation, check-in, retail and security screening.

RENDERING: **COURTESY OF FENTRESS ARCHITECTS**

land with diverse commercial uses and seamless airport access. "Airports are also integrating humanistic spaces reminiscent of civic plazas or town squares into their designs," Fentress says. "[DEN] has a plaza with activities that it promotes in concert with events in the city. For example, if the local hockey team is in the playoffs, [DEN] may transform the plaza into a temporary ice-skating rink."

Other civic examples include Fentress Architects' design of the new South Terminal Complex at the Orlando International Airport, which incorporates daylit, garden-filled civic spaces that serve as central gathering places for passengers, and ICN's performance and cultural exhibition areas.

SUSTAINABLE STRATEGIES

Creating humanistic spaces is also a sustainable measure, and sustainable features are increasingly important in airport design—in part because of social demand and its marketing potential. For the Tom Bradley International Terminal at Los Angeles International Airport (LAX), Fentress Architects added clerestories and broad windows into stainless-steel roof forms that stretch over column-free structures. The design bathes the space in sunlight and its wave-like ceiling forms reduce solar glare and heat.

"Whether it's making spaces brighter through natural light or designing areas for bins that separate recyclables from trash, people notice and appreciate these things, but they also have a cost benefit," Fentress asserts. "If you can shave $100,000 off annual energy operations, that matters. If you can shave off $1 million per year with better insulation, high-performing heat glass and water-saving fixtures in restrooms, that's a major impact."

Greater durability and flexibility also come into play. For example, at the Raleigh-Durham International Airport, Fentress Architects designed a lenticular wood truss roof comprised of 1 million square feet of glue-laminated timbers and custom-fabricated steel supports for durability. At DEN, the terminal's Great Hall is enclosed by a double-layer fiberglass fabric roof, which allowed for greater spans than traditional roofing systems to increase space flexibility.

"One of the best things you can do is design airport spaces to be as flexible as possible for future changes in infrastructure and the way people travel," Fentress says. He points to the fact that people take far fewer items on trips nowadays and that carry-on luggage did not have wheels until 1987, so the curbs and steps in older facilities impede passenger movement.

TYING IT TOGETHER

When new facilities are added to existing terminals, Fentress says they strive to create a cohesive design. "If there is a master plan, we build upon it or we unify the airport with forms reminiscent of the surrounding landscape or existing architecture." At LAX's Tom Bradley International Terminal, for example, the steel roof structures draw their shape from Pacific Ocean waves and pay homage to LAX's 1969 Theme Building's parabolic arches.

If funds don't allow for architectural gestures, Fentress Architects ties together new and existing spaces with similar interior elements, like carpeting, terrazzo, furniture, retail storefronts, and airport signage for visual continuity.

To encourage the next generation of airport designers, each year the firm issues the Fentress Global Challenge (left). The international design competition geared to young and student architects offers a $10,000 cash award (as well as airfare, lodging and the entrance fee to an event where the award will be presented—not to exceed $5,000) to the first-place winner. This year the theme is The Terminal Building in the Year 2075. "Airports are building types rarely discussed in architecture schools," Fentress notes. "We created the challenge because I want students to know that transportation facilities and airports can be an important part of their career."

FENTRESS GLOBAL CHALLENGE

ENTER THE FENTRESS GLOBAL CHALLENGE

The annual competition was created to engage students worldwide in the exploration of future design possibilities in public architecture. This year's challenge asks entrants to re-envision airport mobility in the year 2075. The first-place winner receives a $10,000 cash award (as well as airfare, lodging and the entrance fee to an event where the award will be presented—not to exceed $5,000). Deadline is May 31. Learn more and enter at fentressglobalchallenge.com.

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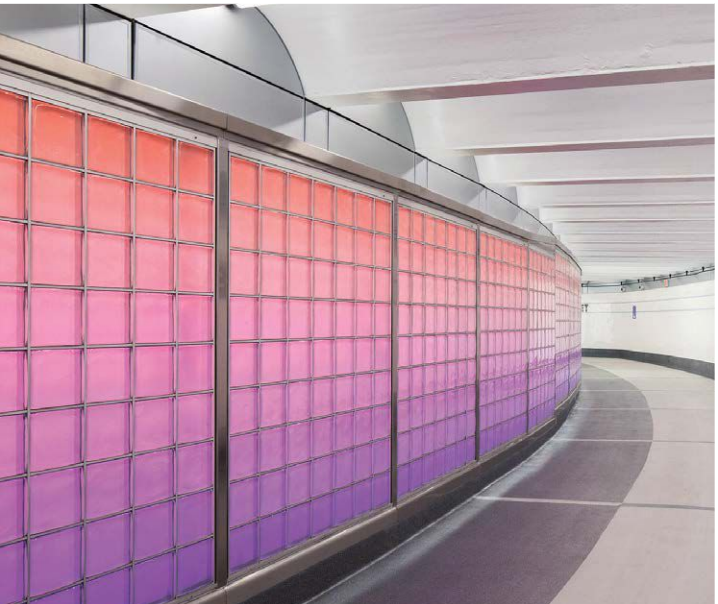
Circle No. 14

DOWNTOWN LINK

Philadelphia

View the color-changing glass-block walls at a SEPTA station.

PHOTOS: CHARLES UNIATOWSKI PHOTOGRAPHY



RETROFIT TEAM

ARCHITECT: Sowinski Sullivan Architects, Philadelphia, www.sowinskisullivan.com
GENERAL CONTRACTOR: AP Construction Inc., Philadelphia, www.apconstruction.com
GLASS BLOCK WALL SYSTEM INSTALLER: DHC Construction Inc., Springfield, Pa., (610) 585-1403

MATERIALS

The design team envisioned active and passive walls that would help connect passengers to the streets above and direct them to their locations. Passive walls are simple white tile and active walls are a series of inter-changeable modules. The active walls include EXTECH's custom-engineered and -fabricated glass block system that, in concert with the static white and color-changing lights, simulate movement and transparency. A minimal amount of exposed metal framing was specified for EXTECH's system to maximize the glass surface area and blend with the concourse's existing, mortared glass block walls.

"The glass block wall is the common thread throughout the concourse," says Kevin Rockey, R.A., project leader with Sowinski Sullivan Architects. "Where possible, in later phases, we plan to retain the existing glass block walls and use them to our advantage by retaining and restoring them as cost effectively as possible. Where this was not possible or practical, the new system is being used."

Behind EXTECH's customized glass block grid system, programmable LEDs generate the desired appearance and control. This also is where the conduit that previously was exposed and mounted to the corridor ceilings was re-routed, housed and secured. Planning for future services, extra room remains in the space concealed by the active walls' glass block.

The Southeastern Pennsylvania Transportation Authority's (SEPTA's) Engineering, Maintenance and Construction department required the glass block system to comply with impact-resistance, graffiti-resistance, vibration-resistance and maintenance requirements. In addition, the glass block wall sections would need to vary in size and placement with some spanning full corridors and others integrating between maps and signage.

Successfully achieving SEPTA's and Sowinski Sullivan Architects' numerous criteria, EXTECH's engineers developed a 1 1/2-inch glass block, joggled-set, modular system arranged in vertical panels with a narrow aluminum frame along the top and bottom. Up to seven vertical panels, each at 7-feet tall by 8-inches wide, are interconnected within a wall section.

GLASS BLOCK WALL SYSTEM MANUFACTURER: Exterior Technologies Inc. (EXTECH), extechinc.com

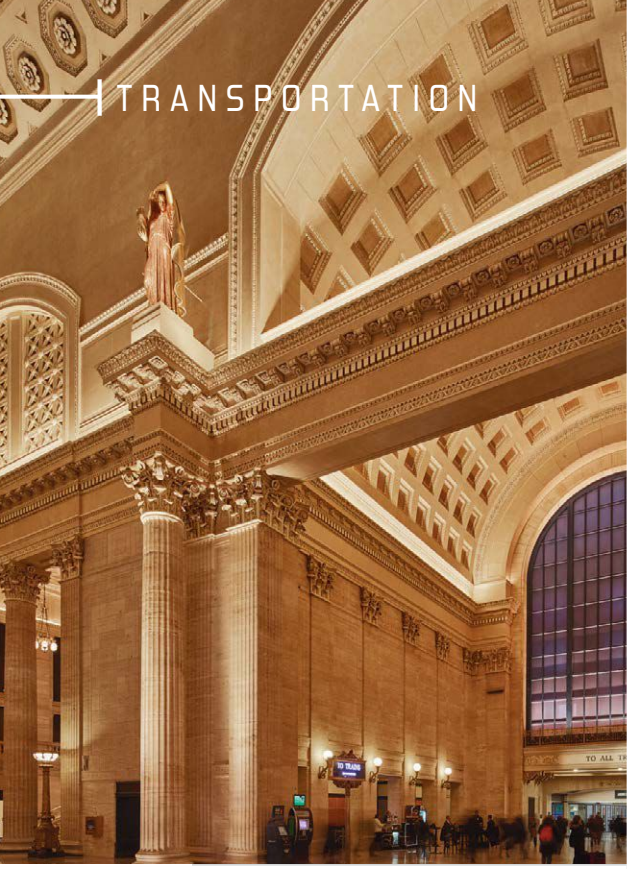
THE RETROFIT

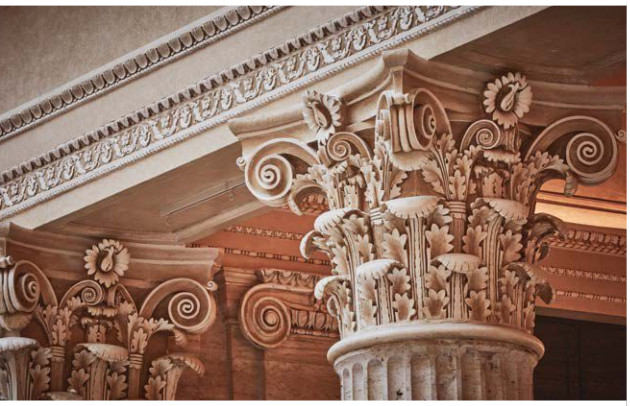
During summer 2018, SEPTA completed the first phase of the Downtown Link, its Center City concourse improvement program to upgrade the underground pedestrian tunnel network.

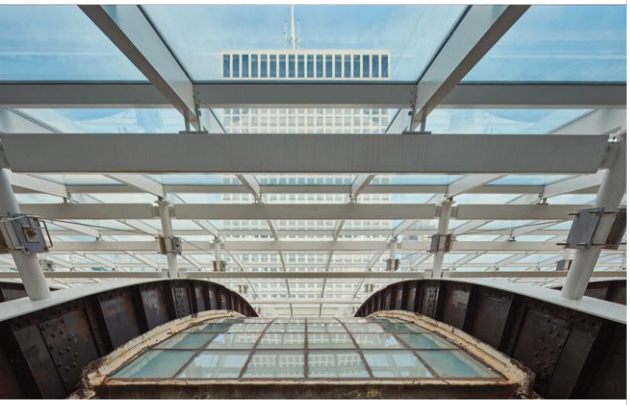
The multi-phased, $59.65 million improvement program seeks to address some of Pennsylvania transit system's most pressing needs in its vital Center City pedestrian concourse. During the program's first phase, contractors made structural repairs, remediated leaks, replaced lighting fixtures and escalators, upgraded elevators, improved security and enhanced architectural components.

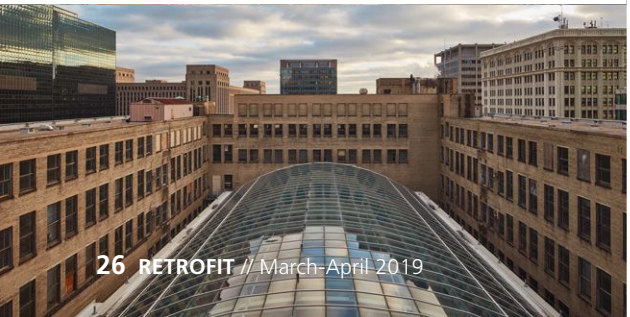
The Downtown Link connects six subway stations; two regional rail systems; and provides access to many businesses, offices, historical points of interest and other destinations. This public space comprises more than 500,000 square feet.

"Originally built in the early 1900s, renovations over the years resulted in a piecemeal mismatch of materials. Nothing is straight; there are no right angles," Rockey says. "In addition to addressing the areas in need of the most repair, SEPTA saw this as an opportunity to re-image the concourse as a destination unto itself. It can be disorienting underground and you can lose track of your geographical place. Within the concourse, we created an episodic experience of events for the passengers and public as they moved through the paths and corridors. Because of its consistent size and appearance, the modular system layout also can be changed. It is an evolving, living installation and a successful project."









CHICAGO UNION STATION GREAT HALL

RETROFIT TEAM

ARCHITECT: Goettsch Partners, Chicago, www.gpchicago.com
GENERAL CONTRACTOR: Berglund Construction, Chicago, www.berglundco.com
SKYLIGHT RESTORATION: Super Sky Products Enterprises LLC, Mequon, Wis., www.supersky.com
MECHANICAL CONTRACTOR: The Hill Group, Franklin Park, Ill., www.hillgrp.com

MATERIALS

The following products were used in the renovation:
HISTORIC SKYLIGHT RESTORATION: Pattern 516 Texture Inner Lite Laminated to 1/4-inch Clear Tempered by Oldcastle BuildingEnvelope, obe.com
NEW ENERGY-EFFICIENT SKYLIGHT: 1 1/4-inch Laminate IGU with Neutral 50 Low-e Coating on #2 Surface by Oldcastle BuildingEnvelope
CUSTOM AND RESTORATION LIGHTING FIXTURES: Archistoric Products, www.archistoric.com
GENERAL LIGHTING: Luminii, www.luminii.com, and elliptipar from The Lighting Quotient, www.thelightingquotient.com
THEATRICAL LIGHTING: ETC, www.etcconnect.com
CUSTOM 7-FOOT 6-INCH BY 6-FOOT 4-INCH STAINLESS-STEEL ELEVATOR CAB: Anderson Elevator, www.andersonelevator.com
LIQUID AND SHEET ROOFING MEMBRANES: G410 80-mil PVC from Sika Sarnafil, usa.sarnafil.sika.com

THE RETROFIT

Originally designed by renowned architecture firm Graham, Anderson, Probst & White, the 1925 Great Hall suffered water leakage and deterioration because of flaws in its original design and was in need of substantial repairs.

To address the necessary work, the design team renovated the station's iconic, 219-foot-long skylight, which experienced extensive moisture damage during the past several decades. To restore the cast-iron skylight assembly while maintaining its historic appearance, the Goettsch Partners team, led by Leonard Koroski, FAIA, LEED AP, designed an energy-efficient, modern skylight above the original structure. Supported 5 feet above the restored cast-iron skylight, the new high-performance skylight of steel and 858 panes of clear, high-efficiency glass protects the landmark building while brightening the Great Hall interiors with 50 percent more natural daylight than before.

Other work designed by Goettsch Partners included structural improvements, new plumbing, plaster repair, restored ornamentation and new lighting. "Essential to our vision for this project was preserving the historic design features of the building while making necessary improvements and repairs to stabilize this landmark for the long term," Koroski explains. His experience with preservation and adaptive reuse of historic structures includes the iconic Wrigley Building and Civic Opera Building in Chicago, as well as Mies van der Rohe's Farnsworth House in Plano, Ill.

Koroski and the Goettsch Partners architectural team directed the methodical removal of paint layers to reveal the original coloration of the ornate plasterwork. "By restoring the Union Station's original color scheme and stabilizing the skylight, visitors now enjoy the authentic experience intended in the 1920s, full of sunlight and color," Koroski adds.

Working with Berglund Construction, the team also installed a new elevator and restored 24 ceiling chandeliers and two figural sculptures by noted artist Henry Hering, also unveiled in 1925. Historic reproduction light fixtures added 27 light sources to improve interior lighting.

An innovative, suspended work deck with swing stages—in lieu of conventional floor-mounted scaffolding—allowed the construction work to proceed without interrupting the 120,000 daily travelers and commuters at this major transit hub. "This work enhances our customer experience with a much brighter and inviting Great Hall," notes David Handera, Amtrak vice president, Stations, Properties and Accessibility.

This $22 million project for Amtrak, which took more than three years to complete, is the latest in a series of major redesign and restoration projects by Goettsch Partners that started in 2010. Complementing its work at the historic Union Station headhouse building, Goettsch Partners currently is designing a new high-rise office tower on an adjacent parcel to the south. Developed by Riverside Investment & Development and Convexity Properties, the building's anchor tenant BMO Financial Group was announced in December 2018 with a planned opening in 2022.

View a time-lapse video of the skylight restoration on page 14.

PHOTOS: © AMTRAK, COURTESY GOETTSCH PARTNERS

LOS ANGELES UNION STATION

RETROFIT TEAM

PLUMBER: Los Angeles Union Station Engineering Staff, www.unionstationla.com
PLUMBING MANUFACTURERS REPRESENTATIVE: Delco Sales, Anaheim, Calif., www.delcosales.com
PLUMBING SUPPLIER: SupplyWorks, www.supplyworks.com

MATERIALS

With 50,000 to 100,000 people going through the station on a daily basis, water efficiency and hygiene are paramount. Not only do Sloan's ECOS Flushometers reduce water volume by up to 30 percent with their dual- or single-flush high-efficiency option, but the hands-free sensor on the station's water closets promote hygiene in the bustling facility.

Sloan's G2 Flushometers provide similar benefits when train station representatives decided to retrofit the station's existing Sloan Royal Flushometers on urinals. With hands-free operation, the electronic flushometers automatically operate by means of an infrared sensor for high- and low-target detection in the station's public restrooms and its Executive Office area.

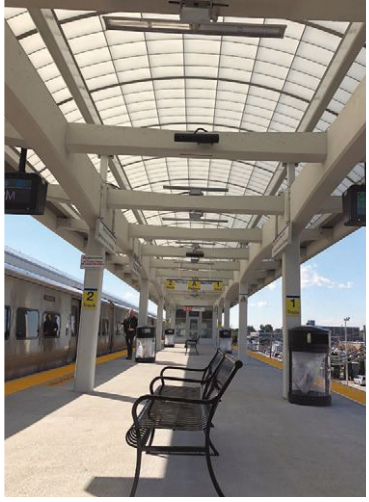
Polished-chrome Optima Faucets also were installed, providing Los Angeles Union Station with another touch-free product. The sensor-activated faucets provide efficient water savings.

WATER-SAVING BATHROOM FIXTURES MANUFACTURER: Sloan, www.sloan.com

THE RETROFIT

Known as the "last of the great train stations," Los Angeles Union Station has stood as one of Los Angeles' architectural icons since 1939. Although it operated purely as a train station for many years, the station has evolved to become a destination. Today, the mixed-use facility—listed on the National Register of Historic Places—boasts art exhibitions, live music and fine dining.

PHOTOS: **JON MILLER ARCHITECTURAL**



PHOTOS: KALWALL

HICKSVILLE STATION | New York

RETROFIT TEAM

ARCHITECT: AECOM, New York, www.aecom.com
CANOPY INSTALLER: All Action Architectural Metal & Glass, South Plainfield, N.J., www.allactionglass.com
ENGINEERING, ESTIMATING, CONTRACTS ADMINISTRATION, PRODUCTION AND MANAGEMENT: Kalwall, www.kalwall.com

MATERIALS

Hicksville Station was selected to undergo a $122 million facelift. One of the most eye-catching features of the station's new look is 1,678 linear feet of 23-foot-wide Kalwall Kalcurve that forms the canopies on the north and south platforms. The canopy manufacturer's quick time from production to installation is a point of pride.

Kalwall panels are suitable for canopies because the diffuse natural daylighting eliminates shadows, hotspots and glare. They also allow for a soft glow at night to help travelers with wayfinding while limiting light pollution.

The translucent panels camouflage leaves and debris and can be maintained without access scaffolding because maintenance staff can safely walk across the lightweight panels' surface.

TRANSLUCENT PANELS PRODUCT AND MANUFACTURER: Kalcurve from Kalwall, www.kalwall.com

THE RETROFIT

Hicksville Station is the third busiest stop along the Long Island Rail Road (LIRR), serving an average of 26,000 riders each day.

The project, which was funded by the Metropolitan Transportation Authority's LIRR Capital Improvement Program and fast-tracked by New York Gov. Andrew Cuomo, included the replacement of platforms, escalators and staircases, along with new signage and elevators.

BROADCOM PARKING GARAGE | San Jose, Calif.

PHOTOS: CENTRIA

RETROFIT TEAM

ARCHITECT: HOK, www.hok.com
GENERAL CONTRACTOR: Devcon Construction Inc., Milpitas, Calif., devcon-const.com
PANEL DEALER: B.T. Mancini Co. Inc., Milpitas, www.btmancini.com

MATERIALS

The Broadcom Parking Garage, a necessary and integral portion of the HOK-designed, 1-million-square-foot Broadcom campus, was transformed into a visually appealing, open structure with perforated metal panels in Champagne Pearl and Clay colors. About 20,050 square feet of perforated metal was installed on the four-level, 812-space garage.

"Part of the challenge was to transform the existing structure to become more open and interact with the surroundings," says Rafael Gavilanes, project architect, HOK. "The strategy was to line the precast concrete structure with a veil of systematic, yet diverse elements—a metallic veil of perforated metal and textures that allowed us to screen the cars and the headlights from the users and neighbors while allowing light and ventilation to flow through."

HOK's team specified EcoScreen Perforated Cascade metal panels to achieve the desired level of screening and ventilation on this garage façade, as well as make the scale of the structure appear less monolithic and more ethereal.

"CENTRIA EcoScreen allowed us color choices and precise degrees of perforations and corrugated texture," Gavilanes says. "This was a critical aspect of the design: The panels allowed us to break down the hefty garage structure to a more human and approachable scale."

METAL PANEL PRODUCT AND MANUFACTURER: EcoScreen Perforated Cascade from CENTRIA, www.centria.com

THE RETROFIT

The Broadcom Parking Garage spans 249,000 square feet and includes two stairwells and a masonry elevator tower. It was completed in October 2017.

FLOYD BENNETT FIELD | New York

RETROFIT TEAM

ARCHITECT: National Park Service, Washington, D.C., www.nps.gov
WINDOW RESTORATION: Femenella & Associates Inc., Branchburg, N.J., www.femenellaassociates.com

MATERIALS

The municipal airport's representatives demanded an exacting match for the antique glass panes on the façade of two historic hangars. The original wire glass had not been produced in decades; modern building codes had made it obsolete. Bendheim's team collaborated with designers and the window restoration team to design a nearly identical substitute, a safety-laminated pattern glass that contains chicken wire.

PATTERN GLASS WITH CHICKEN WIRE PRODUCT AND MANUFACTURER: VintageWire Glass from Bendheim, bendheim.com

THE RETROFIT

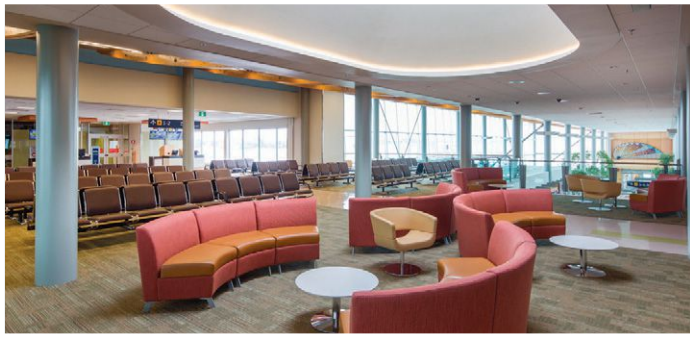
Prior to the restoration, the two historic hangars at New York's first commercial airfield, which is located in Brooklyn, were the most rundown structures on the site. Windows were destroyed, walls collapsed and the roof was missing.

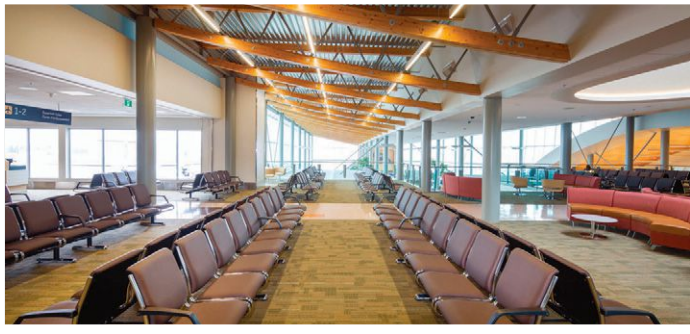
The airfield has a storied history. In the 1930s, 26 around-the-world flights originated from Floyd Bennett Field. Amelia Earhart flew out of the airfield and so did Douglas "Wrong Way" Corrigan, who crossed the Atlantic and landed in Ireland—after registering his flight plan to land in California.

VICTORIA INTERNATIONAL AIRPORT

Victoria, British Columbia, Canada

PHOTOS: COURTESY OF DURWEST CONSTRUCTION MANAGEMENT INC.





RETROFIT TEAM

ARCHITECT: Office of McFarlane Biggar Architects, Vancouver, BC, www.officemb.ca
ENGINEER: WSP, Victoria, www.wsp.com
CONSTRUCTION MANAGER: Durwest Construction Management Inc., Victoria, durwest.com

MATERIALS

Victoria International Airport (YYJ) has won numerous awards for customer service, hospitality and environmental achievements. YYJ is the third busiest airport in the province of British Columbia. Almost 19 years ago, when the Victoria Airport Authority was embarking on the first of many airport expansion projects at YYJ, facilities personnel were receiving regular complaints about jet-engine-exhaust odors entering offices, the main terminal and baggage-claim areas.

As part of the first terminal building expansion in 2001, Dynamic 2-inch Tandem Air Cleaners were installed in four new custom air-handling units and one existing air-handling unit serving a baggage-claim area, customs area, ticketing and arrivals area, pre-board and retail spaces, and new baggage-handling facility.

"We were a little skeptical of the Dynamic air cleaners' ability to remove VOCs and jet wash, but the airport personnel were anxious to solve the problem," recalls Paul Timmins, senior project engineer at WSP. "Once the air cleaners were installed, the odor complaints stopped, and the airport has been happy with the performance ever since."

Although the mechanical portion of each phase went out for bid, owners have specified the same air-cleaning technology on all subsequent phases of airport expansion, including an $11.2 million renovation and expansion of the Terminal Building Departures area in 2004. In 2009, a renovated Eagles Landing Observation Lounge was opened. In 2010, a new Operations Centre was opened for fire-protection and emergency-response operations. In 2012, new terminal building improvements were unveiled, including the expansion of the pre-board security screening area, new concessions and food areas, and a new retail store. In 2016, baggage-handling operations were upgraded, which included replacement of the primary baggage screening machines, demolition of existing conveyors, supply and installation of new conveyors, and a building expansion to suit the new conveyors.

The most recent project includes the expansion of the Lower Hold Room, or groundfloor departure lounge, after passengers clear security screening. It includes the addition of approximately 19,000 square feet of space to the current Hold Room and includes new and expanded food and beverage services, retail services, washrooms, airline counters and basement support areas. Dynamic V8 Air Cleaning Systems will be utilized on the new expansion. The Dynamic V8 systems offer MERV 15 performance, maintenance intervals measured in years, and low static pressure drop that reduces fan energy and brake horsepower.

AIR CLEANERS MANUFACTURER: Dynamic Air Quality Solutions, www.dynamicaqs.com/commercial
AIR-HANDLING UNITS MANUFACTURER: Haakon Industries, www.haakon.com
VARIABLE FREQUENCY DRIVES MANUFACTURER: Trane, www.trane.com
RADIANT HEATING MANUFACTURER: Fraccaro Radiant Solutions, www.fraccaro.it/en
TRENCH HEATING MANUFACTURER: Kampmann GmbH, www.kampmann.ca

METRA STATION | Lombard, Ill.

PHOTOS: SCOTT BELL

RETROFIT TEAM

ARCHITECT: KMI Architects|Engineers, Chicago, www.kmichicago.com
GENERAL CONTRACTOR: John Burns Construction Co., Orland Park, Ill., www.jbconstructionco.com
CANOPY INSTALLER: Progressive Dynamics, Streamwood, Ill., www.progressivedynamicsinc.com

MATERIALS

The renovated Metra Union Pacific/West commuter railroad station marks a major improvement for riders and residents of the Village of Lombard. Prior to construction, riders simply boarded trains from two uncovered platforms. Now, the nearly 1,300 weekday riders enjoy the convenience and shelter of 250 linear feet of curved metal roof canopies on both sides of the tracks.

The platform canopies are clad with approximately 11,000 square feet of PAC-CLAD Tite-Loc Panels from Petersen. The curved 22-gauge panels are finished in Aged Copper. The Tite-Loc Panels were manufactured at Petersen's headquarters plant in Elk Grove Village, Ill.

"The PAC-CLAD panels were selected for their durability," explains John Mehdi, project designer at KMI Architects|Engineers. "The overall canopy is long and we wanted to break it down into modules with the higher roofs marking the entrance to the platform area."

The repetitive modular sections reduce cost and can facilitate a future curtainwall system to further protect stairways and ramps from the elements.

METAL PANEL PRODUCT AND MANUFACTURER: PAC-CLAD Tite-Loc Panels from Petersen, pac-clad.com

THE RETROFIT

The railroad line separates the Village of Lombard from north to south. A major component of the project included construction of a pedestrian tunnel to allow safe passage across the tracks.

Riders and residents have applauded the station updates. Metra Executive Director and CEO Don Orseno says: "We have not only significantly boosted the appeal of the Lombard Station, but we have also significantly boosted safety. We now have fully renovated platforms with beautiful new canopies, as well as a sparkling new pedestrian tunnel—the safest way possible to get across a set of train tracks."

INTRODUCING
retrofit's
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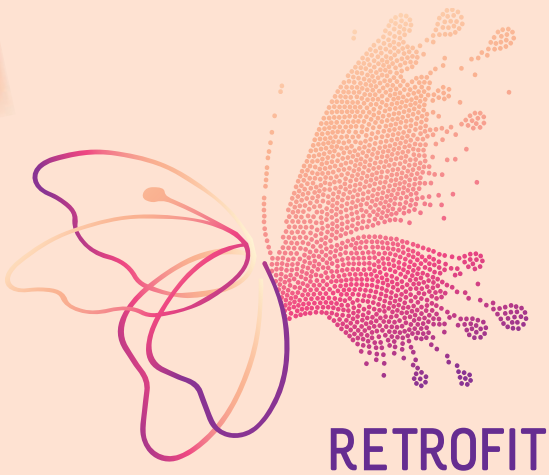

RETROFIT MAGAZINE

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ENERGY PERFORMANCE TAKES OFF

Historic Airport Terminal Realizes Massive Savings from Deep Energy Retrofit

WRITTEN BY | **MARIA T. VARGA**

PHOTOS: **KING COUNTY**

It is not often that travelers slow down and admire their surroundings while racing to catch a flight, but the airport in King County, Wash., warrants a pause.

The historic and efficient King County International Airport is one of the country's busiest non-hub airports, averaging 200,000 takeoffs and landings annually, primarily cargo flights followed by local passenger and private flights. During a visit by Washington, D.C.-based U.S. Department of Energy (DOE) representatives to King County—a partner of the DOE Better Buildings Challenge—airport officials led a walking tour that provided a close look at how the county performed a deep energy retrofit of the airport terminal. (Read the DOE case study of the terminal at bit.ly/2FuGQzk.) By incorporating high-efficiency energy technologies and practices into the airport's heating, cooling, and lighting systems, the county produced an impressive 60 percent energy savings and $31,000 per year in cost savings, as well as provided a model for similar deep retrofit projects. The Better Buildings Challenge exists to support and highlight its partners' leadership in energy efficiency and share their solutions so that other organizations can achieve similar impactful results. Learn more at betterbuildingsinitiative.energy.gov/challenge.

TO ACHIEVE ENERGY savings of 60 percent in its historic airport terminal while improving traveler and

(continues on page 38)

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Circle No. 20

The incremental cost of selecting highly efficient mechanical technologies over less efficient replacements was an estimated $350,000. But with a return of around $31,000 per year from energy cost savings and a utility efficiency rebate of $74,000, the investment in efficiency pays back in less than nine years.

building occupant comfort and reducing staff time spent on building maintenance, King County focused on six key strategies:

1] **A long-term investment perspective:** The county and its project partners understood that the mechanical system was at an age at which it needed to be replaced; the incremental cost of selecting highly efficient technologies over less efficient replacements was an estimated $350,000. But with a return of around $31,000 per year from energy cost savings and a utility efficiency rebate of $74,000, the investment in efficiency pays back in less than nine years and delivers net cost savings thereafter.

2] **Working with the state and local utility:** The county successfully worked with state and utility partners to further improve the project finances. The Washington State Department of Commerce awarded a $300,000 grant to King County to help fund the project. Seattle City Light, Seattle's publicly owned electric utility, provided additional energy-efficiency incentives of $74,000.

3] **Holistic approach:** The county replaced mechanical and lighting systems throughout the 25,000-square-foot facility, in addition to the lighting for the building exterior and parking lot. The project highlighted how this approach coupled with a modern design can dramatically reduce energy use.

4] **State-of-the-art technologies:**

a. Variable Refrigerant Flow (VRF) heat pumps and a Dedicated Outdoor Air System (DOAS) replaced existing multi-zone air-handler rooftop units. The VRF system is fully programmable with controlled zones and set points aligned for occupancy and use. Carbon-dioxide sensors control ventilation in conference rooms.

b. The county installed two new, high-efficiency heat-recovery ventilators, which achieve up to 90 percent heat recovery, providing building ventilation previously delivered by the rooftop multi-zone air handlers noted in bullet a. The innovative heat-recovery ventilators are relatively new to North America and create deeper energy savings than traditional heat recovery, as well as significantly reduce the need for supplemental heating and cooling.

c. The county replaced interior lighting with a mix of innovative and cost-effective technologies. In most spaces, 15-watt LED lamps replaced 32-watt fluorescent tubes. Some areas with high use and sufficient daylighting received fixtures with luminaire-level lighting controls. These spaces take advantage of daylight harvesting and occupancy sensors.

d. Utilizing these fixtures created the unexpected result of a perceived increase in lighting output from the LED lamps and caused airport staff to report some spaces as over-lit. Consequently, in those zones, the airport dimmed those fixtures to 75 percent output, improving visual comfort and enhancing energy savings.

e. The county upgraded outdoor airport ramp and parking-lot lighting to LED technology from traditional metal halide and high-pressure sodium fixtures, as well as employed night setbacks to 50 percent of full lighting levels. A microwave-based occupancy-sensing system controls exterior lighting at night, dimming the parking-lot lights when no vehicles are present and the tarmac lighting when no planes are approaching.

5] **Staff engagement to ensure savings:** Prior to the retrofit, staff often used personal electrical devices, such as fans, task lights and space heaters, in their workspaces. Following the deep energy retrofit, staff discontinued the use of these personal electrical devices to further reduce energy use and improve energy cost savings.

6] **Addressing unique building challenges:** The Main Terminal is a 2-story masonry brick building constructed in 1929, making it one of the oldest airport terminals in the country. There have been several renovations and numerous interior improvements since original construction, including heating system conversions from coal to oil to natural gas and now carbon-free electricity. This project illustrates how historic buildings can achieve deep energy reductions, exceed advanced energy-code requirements and reduce climate-change impacts. The county's project team also successfully obtained special Federal Aviation Administration clearance for use of a crane to set new rooftop VRF and DOAS equipment and remove the old HVAC rooftop units.

KING COUNTY is no stranger to high-performing buildings. As a partner in the Better Buildings Challenge, the county has already achieved an impressive 18 percent improvement in energy-use intensity across its 5.8-million-square-foot portfolio of buildings, knocking on the door of its 2024 target of 20 percent savings. The county established a goal to transition completely to high-efficiency LED lighting across its building and facility portfolio by 2020. Its Department of Natural Resources and Parks (the department with the most energy use) met the all-LED goal at the end of 2018—two years early. The county also tapped big energy savings in facilities, such as the King County Aquatic Center, which achieved 24 percent annual energy savings and $127,000 annual cost savings.

MATERIALS*

VARIABLE REFRIGERANT FLOW HEAT PUMPS // Mitsubishi Electric Cooling & Heating, www.mitsubishicomfort.com

HEAT RECOVERY VENTILATION // VS1000 RT from Ventacity Systems, www.ventacity.com

INTERIOR LEDS // GE Lighting, www.gelighting.com; Green Creative, greencreative.com; Lithonia Lighting, lithonia.acuitybrands.com; Lumark, www.cooperindustries.com; and Lunera

DAYLIGHT / OCCUPANCY FIXTURES // Lithonia Lighting

PARKING-LOT LIGHTING CONTROL SYSTEM // Lumewave EMB901 from Echelon, www.echelon.com

PARKING-LOT FIXTURES // Leotek, leotek.com

**The products chosen by King County International Airport representatives for use in the deep energy retrofit do not reflect endorsements by the U.S. Department of Energy.*

(Read DOE's case study about the aquatic center at bit.ly/2QOVdQz.) In addition, the county's park maintenance and equipment repair complex became the county's first net-zero energy facility.

In an effort to achieve broader energy savings, the county also implemented an innovative revolving fund for energy retrofits, allowing county agencies and now all cities within the county to gain access to low-cost financing, helping unlock an estimated $250,000 in annual savings through efficiency improvements. Learn more at bit.ly/2CoBOAI.

"We are working across our diverse county programs to continuously improve energy performance of our buildings," explains Megan Smith, director of Climate and Energy Initiatives for King County. "As a Better Buildings Challenge partner, it is important to us to share our successes and learnings with other local governments pursuing deep energy-efficiency retrofits."

The mission of the Better Buildings Challenge is to realize deep energy savings amongst committed partners and share efficiency solutions across all sectors and regions. After research and development, or R&D, there is S&D, or share and duplicate, that also drives down the cost of energy technology adoption. Unlike the sharing of certain sensitive technologies in early development, the sharing and duplication of successful practices in adopting new energy-efficient technologies in the field is not only appropriate but critical to catalyzing energy and cost savings that make energy more affordable and businesses more competitive. The King County International Airport retrofit is a great example of impressive energy savings and an effective approach to retrofitting that can inform other projects across the county and country.

"We hope that our work here can be a model for other local governments around the country and show how these retrofit projects can be achievable, cost-effective and meet customer needs," Smith adds.

Whether you are looking to retrofit a government building, local airport,

> We hope that our work here can be a model for other local governments around the country and show how these retrofit projects can be achievable, cost-effective and meet customer needs.
>
> *—Megan Smith, director of Climate and Energy Initiatives, King County*

historic landmark or completely different type of building, King County's approach to its deep energy airport retrofit provides a helpful model. To learn about many more effective and innovative approaches from Better Buildings Challenge partners across the country, visit betterbuildingssolutioncenter.energy.gov.

In most spaces, 15-watt LED lamps replaced 32-watt fluorescent tubes. Utilizing these fixtures created the unexpected result of a perceived increase in lighting output from the LED lamps. Consequently, in those zones, the airport dimmed those fixtures to 75 percent output, improving visual comfort and enhancing energy savings.

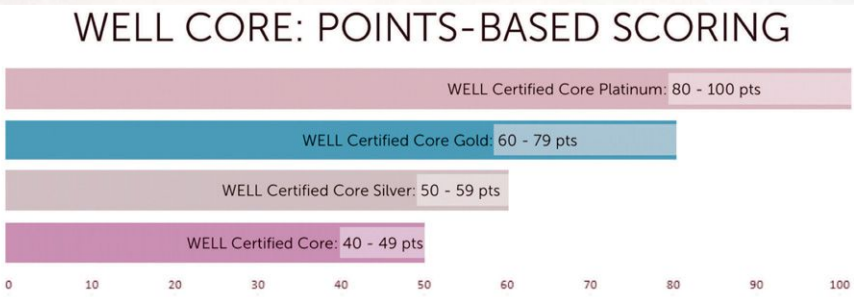
WELL, about Time!

DESIGNING LIGHTING AND CONTROL IN THE AGE OF WELL V2

WRITTEN BY | SHENGLIANG (DANIEL) RONG, MArch, MS, WELL AP, LEED GA

The WELL Building Standard (WELL v1) was introduced to the world more than four years ago in September 2014 with the goal of promoting better buildings that help people thrive. According to the New York-based International WELL Building Institute (IWBI) website, WELL is a performance-based system for measuring and certifying features of the built environment that impact human health and wellbeing through air, water, nourishment, light, movement, thermal comfort, sound, materials, mind and community. It marries best practices in design and construction with evidence-based medical and scientific research, harnessing the built environment as a vehicle to support human health and wellbeing.

During the past few years, more than 1,000 projects across 43 countries have registered for WELL certification or have already been certified by IWBI. Informed by the lessons learned from these projects and the global network of WELL Accredited Professionals (WELL APs), IWBI launched the pilot version of WELL v2 in May 2018. As WELL continues to evolve, some fundamental refinements and enhancements have been incorporated into the WELL v2 pilot. And since the WELL v2 pilot was launched, more than 200 projects have already registered (wellonline.wellcertified.com/community/projects).



With the growing interest in WELL v2, determining how to effectively achieve certification under it is gaining more momentum. This article focuses on exploring the changes in the Light Concept of the WELL v2 pilot and discusses how to utilize those changes to benefit the design of lighting and lighting controls.

WELL v2 Is Better

In addition to its impact on the visual system, it is well known that light has a significant non-visual impact on human health and wellbeing. The intensity, wavelength, duration, and timing of light can affect our alertness, mood, endocrine function and circadian rhythms. Circadian system disruption and prevention of melatonin release caused by light exposure have been linked to obesity, diabetes, depression, mood disorders and reproductive issues, among others. (Read a study titled

(continues on page 44)

Attend this Presentation at LIGHTFAIR

Shengliang (Daniel) Rong will be co-presenting "Designing Lighting, Daylighting and Controls to Meet the WELL Building Standard," at LIGHTFAIR International 2019, an annual architectural and commercial lighting trade show and conference. This session will compare Version 1 and Version 2 WELL standards. Features within the Light Concept will be defined while application-specific examples of lighting, daylighting and control designs will illustrate how they may be achieved. LIGHTFAIR is being held May 21-23 at the Pennsylvania Convention Center, Philadelphia. Learn more and register at www.lightfair.com.

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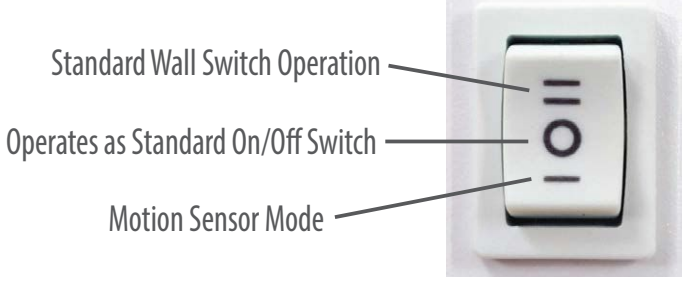

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Educational materials are available from Delos Living LLC, New York, for improving employees' awareness about how indoor environments impact their lives, including the non-visual impacts of office task lighting.

"Measuring and Using Light in the Melanopsin Age," published in the U.S. National Library of Medicine, National Institutes of Health, bit.ly/2U3E6w4.) Because of these known associations, one of the main goals of the Light Concept in the WELL Building Standard is to provide guidelines for minimizing the disruption of our circadian systems, enhancing productivity and enhancing visual acuity.

Compared to WELL v1, the scope of the Light Concept in the WELL v2 pilot is more comprehensive while the feature structure is more concise with more focused preconditions and optimizations. Also, there is more flexibility within each feature: More pathways are available for the project team to be able to achieve the feature intent. While still emphasizing access to circadian-effective light indoors, either from daylight or electric sources like in WELL v1, the Light Concept in the WELL v2 pilot has undergone major consolidation and refinement. (Comparisons between WELL v1 and the v2 pilot are available at bit.ly/2FI2IHR.) The following are some detailed examples:

MORE COMPREHENSIVE SCOPE The most important change related to lighting is that the WELL v2 pilot has added three new lighting-related components to its scope:

- Lighting education
- Electric light flicker
- Lighting control

These are in addition to the six light components originally covered in WELL v1:

- Circadian design
- Glare control
- Activity-based lighting
- Daylighting
- Color quality
- Visual acuity

Now included as the second part of Feature Lo1 - Light Exposure and Education is a precondition to promote lighting education for all projects. Knowledge learned from previous experience shows that educating building occupants about circadian rhythm, sleep hygiene, age-related increase in light requirements, and the importance of daylight exposure on circadian and mental health is critical to the success of building management post-occupation, as well as to any kind of human-centric lighting control strategy.

The array of smart lighting and controls available today enables a multi-level interaction between a user and system. If the user is not fully equipped with the relevant knowledge, the advanced control capability of the system may become overwhelming or challenging to the occupants and facilities personnel. Educational materials, such as informative

Living spaces can be the next big adoption opportunity for advanced lighting control.

signage next to control keypads, brochures for distribution, and short lunch and learns informed by the design team and building management team, can help improve employees' awareness about how indoor environments impact their lives, including the non-visual impacts of office task lights and the overall lighting system.

Another change in the scope in WELL v2 focuses on electric light flicker management, which has been added in Feature L07. Direct and indirect flicker perceived by our eyes can have a negative impact on our visual performance. (Read an article about this from the *Journal of Light & Visual Environment* at bit.ly/2T7gXc9.) Tunable and dimmable solid-state lighting systems can have flicker issues during their operation period if not manufactured or used properly. By adding this requirement, the WELL v2 pilot encourages the use of high-quality electric lighting systems. These technologies are being introduced into WELL certified projects more frequently.

Enhanced ability for occupants to control ambient lighting systems also has been added as a new feature (Feature L08). The WELL v2 pilot encourages projects to create more personalized lighting experiences by utilizing advanced lighting controls, such as white-tunable lighting and other smart lighting strategies. Because this feature is applicable to all space types, it can be included in living spaces, as well, especially in smart home projects where tunable and personalized lighting are frequently used.

Indeed, the industry has actively started to integrate advanced lighting controls as part of the wellness living experience, as illustrated in a recent article published by The Hill, titled "Home intelligence expert says smart home technology will help people maintain wellness", bit.ly/2sDXTH3. Although it is exciting to embrace new lighting technology, the bottleneck to successfully achieving this feature is commissioning, making it essential that each design team fully understands the intent and outcomes of the feature while the commissioning team possesses both skill and lighting system flexibility at final tuning to achieve the feature's objectives.

Understanding the needs of owners and occupants, as well as specifying the proper systems, is critical to the success of this feature. For example, if occupants have great daylight access for most but not all of the time, designated task lamps with tuning and dimming capability may be a more proper—and easier—solution compared to a full ceiling lighting system with data-mining capabilities.

WELL LIGHT OVERVIEW

Learn more about each precondition and optimization, as well as pathways to achieving them, at bit.ly/2Mnwu4X.

Precondition: L01 - Light Exposure and Education
Precondition: L02 - Visual Lighting Design
3 Points: L03 - Circadian Lighting Design
3 Points: L04 - Glare Control
3 Points: L05 - Enhanced Daylight Access
1 Point: L06 - Visual Balance
2 Points: L07 - Electric Light Quality
2 Points: L08 - Occupant Control of Lighting Environments

Circadian lighting can be provided from both daylight and electric lighting perspective with an emphasis on view management.

IT IS NOT SURPRISING that electric lighting technology is gaining momentum in the WELL v2 pilot because solid-state lighting and smart lighting technologies are playing increasingly important roles in improving people's lighting experiences … .

In the WELL v2 pilot, a well-designed electric lighting system can help a project score up to 10 out of 14 optimization points in the Light Concept, whereas good daylighting design can help a project score up to six points. It is not surprising that electric lighting technology is gaining momentum in the WELL v2 pilot because solid-state lighting and smart lighting technologies are playing increasingly important roles in improving people's lighting experiences, as well as the circadian benefits associated with such lighting technologies.

MORE CONCISE FEATURE STRUCTURE

The Light Concept in WELL v1 includes 11 features, four of which are preconditions that are mandatory for WELL certification (Silver) and seven of which are optimizations that can be used to achieve higher certification levels. However, in the WELL v2 pilot, there are only two preconditions and six optimizations (see "WELL Light Overview", page 45). Although the number of preconditions in the WELL v2 pilot has been reduced and circadian lighting design was changed into an optimization in Feature L03, electric lighting in Feature L01 has remained a precondition, given its importance to human health and wellbeing. One of the reasons may be that the WELL v2 pilot is trying to offer more flexibility to project teams that have technical difficulties achieving circadian lighting with daylight and electric light collectively.

Features in WELL v1 that have been modified in the WELL v2 pilot include the following:

- Low-Glare Workstation Design
- Surface Design
- Daylight Modeling
- Daylight Fenestration
- Light at Night
- Circadian Emulation

Most of these features are regrouped under more concise scopes and consolidated to strengthen other features. For example, in the WELL v2 pilot, two parts of Daylight Modeling are used to strengthen the Glare Control and Enhanced Daylight Access features. The concept of Daylight Fenestration in WELL v1 has been used to diversify both Light Exposure and Education and Enhanced Daylight Access. To explore these changes further and delve into all the WELL concepts and features, visit v2.wellcertified.com/v2.2/en/concepts.

MORE FLEXIBLE PATHWAYS

The Light Concept in the WELL v2 pilot offers different tracks for project teams to achieve each feature. And, instead of being standalone features, some features are interconnected, which makes it possible to have synergy between features. This gives project teams more flexibility and incentive to explore a variety of possibilities.

For example, there are more than five different pathways to achieve the two preconditions (Feature L01 - Light Exposure and Education and Feature L02 - Visual Lighting Design) in the WELL v2 pilot. Another good example is Circadian Lighting Design (Feature L03): There are four tracks in this feature, covering daylighting and electric lighting design. Among them, two tracks are interconnected with Enhanced Daylight Access (Feature L05). There are more than 10 pathways for project teams to achieve the Circadian Lighting Design Feature in the WELL v2 pilot by combining the five different native tracks in Feature L05. This allows the WELL v2 pilot to be more accessible and achievable to different project types, no matter how the project may be optimized for view management, workstation layout, computational modeling or glare control.

Thrive in the Age of WELL v2

The WELL Building Standard has been reshaping the lighting industry since it was first released. With the launch of the WELL v2 pilot, this initiative will continue gaining momentum by continuing to raise awareness around the importance of lighting design and technologies through a more comprehensive and flexible set of guidelines.

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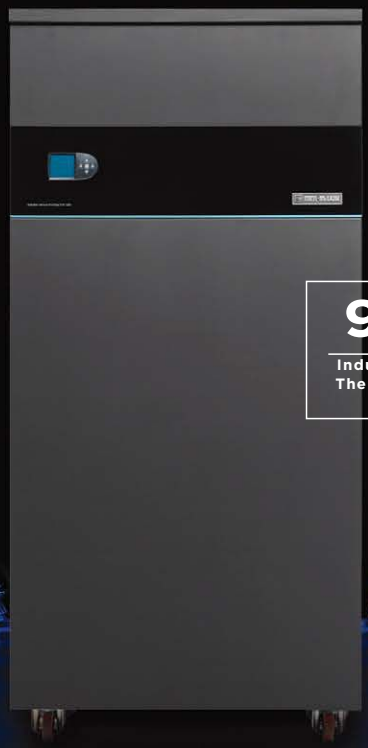

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WRITTEN BY | **ALLEN BARRY**

PHOTOS: **TOM ROSSITER**

A CENTURY-OLD FIREHOUSE IS TRANSFORMED INTO A FASHION-FORWARD HAT FACTORY

In the first half of the 20th century, hats were a staple of men's fashion. Young or old, rich or poor, few self-respecting men would walk out in public without their trusty fedora, bowler or newsboy cap.

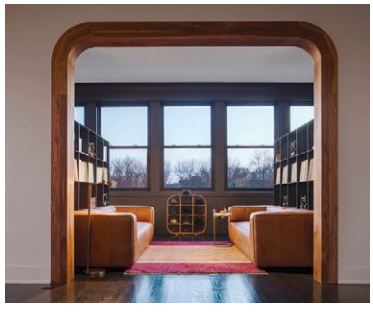
Today, hats are making a big comeback, and there is nostalgia for the look and quality that came from the craftsmen of days gone by. A well-made hat is more than just an accessory; it's a statement and reflection of the individuality of its wearer.

There may be no greater advocate for the artistry of high-quality hats than Graham Thompson. He is the owner and founder of Chicago-based Optimo, a maker of fine hats for the past two decades. Thompson studied under a great old-time hat maker on the South Side of Chicago before carrying on the tradition with his own company.

Optimo has long displayed and sold its hats in a storefront in the classic Monadnock Building in downtown Chicago and manufactured them in a workshop in the South Side neighborhood of Beverly. As the reputation of Optimo hats grew, it became apparent the company would need to expand its operations.

Close to Home

Thompson and most of his small group of employees all had ties to the South Side, so he wanted to keep making his products in the neighborhood where it all began. He was able to work with the community of Beverly and participate in a community development program through



the city of Chicago. The program enabled him to purchase an old firehouse building for $1, under the condition that he would renovate it and do business in the community.

Originally built in 1914, the building is one of the oldest remaining firehouses in Chicago. It would prove to be a perfect fit for a hat maker that draws so much inspiration from the past. To tackle the renovation, Optimo turned to the architects at Skidmore, Owings & Merrill in Chicago.

"The scale of this was much smaller than anything we normally do," says Brian Lee, FAIA, LEED AP, design partner with Skidmore, Owings & Merrill. "But having visited the shop and having met Graham, I was struck by how passionate he was about architecture and design and how it related to his product. He wanted to connect the environment with his operations, in terms of a total design. That intrigued us."

Originally built in 1914, the firehouse would prove to be a perfect fit for a hat maker that draws so much inspiration from the past.

Above and Below

Any retrofit project has challenges related to the original building's layout and purpose. Sometimes those can be ripe opportunities to do something unique and special. In the case of the Optimo facility in Beverly, Ill., being located in an old firehouse meant there were two large holes in the ceiling where firemen used to slide down poles and into action.

"I remember walking into the place and seeing the fireman's pole and opening on the second floor down to the first floor," recalls Brian Lee, FAIA, LEED AP, design partner with Skidmore, Owings & Merrill, Chicago. "We thought, instead of filling those openings, they could be perfect windows from one space to another."

Thick glass was installed in the openings, and there is now a connection between the studio space above and the manufacturing space below. Workers can look up and see people in the studio space, and when customers are touring the studio, they can look down and see the product actually being made.

Dapper Display

What is the best way to display hats? Most would think the best solution is to build a shelf. In reality, shelves aren't the best way to display hats because they collect a great deal of dust. The designers at Skidmore, Owings and Merrill, Chicago, and the Optimo team experimented with different ways to approach this problem and found that two rods, spaced about 6 inches apart, is the perfect way to perch a hat. It allows just enough air to flow around it and doesn't collect a lot of dust and dirt.

Stylish Production

The design team took time to understand Optimo's production process in an effort to marry form and function in the new building. The company has hundreds of wood and metal forms and a mix of old and new equipment, some of which is more than a half-century old. The goal was to create a small manufacturing facility combined with show and retail space and to do it in way that mirrors the men's fashion aesthetic that Optimo represents.

"We tried to think about the workflow and production line to find ways to make the process more efficient and integrate all the equipment in a way that effectively uses power, steam and air," Lee says. "Fortunately, we were doing this in a space that had really good bones. The old fire station had a high-bay vehicle space and some support spaces along the side. It also has an upper floor that Thompson wanted to use to create a studio salon for customers."

The floors and walls were redone, and new windows and plumbing were installed. An upgraded HVAC system was added, using strategically placed indoor cooling units connected to roof-mounted multi-zone split system units. Radiant floor heating also was utilized. The stairs were rebuilt in wrought iron with an oak railing. With all the big changes, there was still a strong sense of staying true to the original firehouse.

"We looked at old photographs, and the building plan is pretty much intact," Lee explains. "We were interested in creating a sort of holistic design that matched the hat aesthetic to the architecture of the place. There was a sense of craftsmanship in the existing building. We tied the look of the wood trim to the work surfaces and old cast iron machines. All around, old is sprinkled in with new. We tried to give dignity to everything."

The large garage doors were replaced with new 13-foot-tall doors clad in a bronze alloy. They will turn a patina green over time and are already beginning to turn. Even in places where things had to change, there was an effort to respect and reuse as much as possible from the original building.

"Being an old fire station, it had a big bathroom and showering area that was lined with marble," Lee says. "We repurposed all of the marble and the original tile

flooring in a new staff kitchen and another new bathroom.

"Thompson was always really interested in doing things in terms of how the building might have looked before," Lee adds. "He wanted things to be in character with the original architecture but also be contemporary. We tried to take that tack with all the work we did. It has a link to history and the craftsmanship of his product but is very contemporary in terms of a look that is minimal functionalism."

Well-balanced Workspace

Having once housed large fire engines, the high-bay, two-vehicle garage space proved to be perfect for the machines and manufacturing activity required to create Optimo hats. The other rooms on the side are ideal for parts of the process—buffing, cutting, sewing and trimming—that require a cleaner, dust-free environment.

"It's a very efficient setup," Lee says. "We were also able to utilize the beautiful natural light that is coming in from the sidewall into the space. There isn't really a need for ambient light in the space. They just needed task lighting, which is accomplished by small lights or a simple hoop that lights over a particular machine. It is a well-balanced space and a perfect workshop environment that is really pleasant to work in."

As with any manufacturing space, particularly one that also has public-facing retail and show element, sound needs to be taken into consideration. In this case, the design team found that some problems have a funny way of solving themselves.

"We were worried about acoustics because we had left the original plaster ceilings and the building has polished concrete floors," Lee recalls. "A lot of hat molds and hat displays are mounted on custom-made wood racks with cork backs and we found that the hats and cork had a level of acoustical absorption. Together they provide soft materials that sort of line the space. Employees say that when they are in full production, noise is not a problem at all."

The design phase of the project was completed in fall 2015. Construction on the workshop portion wrapped up in the winter of 2016, and the second-floor studio space was completed in fall 2017. The Optimo team has embraced their new space and Lee is proud to have a happy client.

> We were interested in creating a sort of holistic design that matched the hat aesthetic to the architecture of the place. … All around, old is sprinkled in with new. We tried to give dignity to everything.
>
> *— Brian Lee, FAIA, LEED AP, design partner, Skidmore, Owings & Merrill*

Retrofit Team

ARCHITECTURE, INTERIOR DESIGN AND MEP ENGINEER // Skidmore, Owings & Merrill, Chicago, www.som.com

- Brian Lee, FAIA, LEED AP, design partner
- Jaime Velez, FIIDA, ASID, director of Interior Design
- Jeremy Bouck, senior interior designer
- Daniel Bell, senior technical designer, associate director
- Dennis Milam, technical designer
- Rebecca Delaney, P.E., LEED AP, MEP team leader
- Michelle Mirrielees, LEED AP BD+C, materials specialist
- Dickson Whitney III, AIA, project manager

GENERAL CONTRACTOR // Helios Construction Services, Chicago, heliosconstruction.com

METALWORK // Bader Art Metal & Fabrication, Chicago, www.baderartmetal.com

WOODWORK // Carpenter Corey, (630) 809-7229

HARDWOOD FLOORING // Ace Flooring and Restoration, Chicago, (773) 517-6884

RADIANT HEATING // GRYF Radiant Floor Heating Systems, Arlington Heights, Ill., (847) 867-4714

Materials

BRASS FRONT DOORS // Tim Thompson Designs, www.timthompsondesigns.com

PAINT // Benjamin Moore & Co., www.benjaminmoore.com

GOAL-POST LIGHTING // LEDALITE Linear TruGroove (direct/indirect) from Signify, formerly Philips Lighting, www.lightingproducts.signify.com

HVAC // Carrier, www.carrier.com

WINDOW TREATMENTS // Fasara Glass Window Film from 3M, www.3m.com

FLOORING // Ace Flooring & Restoration, (773) 517-6884

CUSTOM DOORS // Tim Thompson Designs

SEATING // CB2, www.cb2.com

The design team took time to understand Optimo's production process in an effort to marry form and function in the new space.

"We were able to create a design that I thought matched the same pulse that flows through Thompson and his passion for making hats of the highest-quality craftsmanship," Lee says. "Every component was thoughtful in terms of how it would work, what it would cost, and how it would be right for the workers and could make their jobs easier."

Hats themselves are an item of expression and function. They keep wind and weather off the wearer's head and also project an image, personality and feeling. That same principle was applied to this project.

"With everything, there was always an overlay of asking, 'what does it look like?' We took Thompson's ethos of craftsmanship and functionality and doing things with a sense of style," Lee says. "People are drawn to Thompson because he is so passionate about what he does. This isn't work for him. It is something he believes in, and that is why he is one of the best hat makers in the world."

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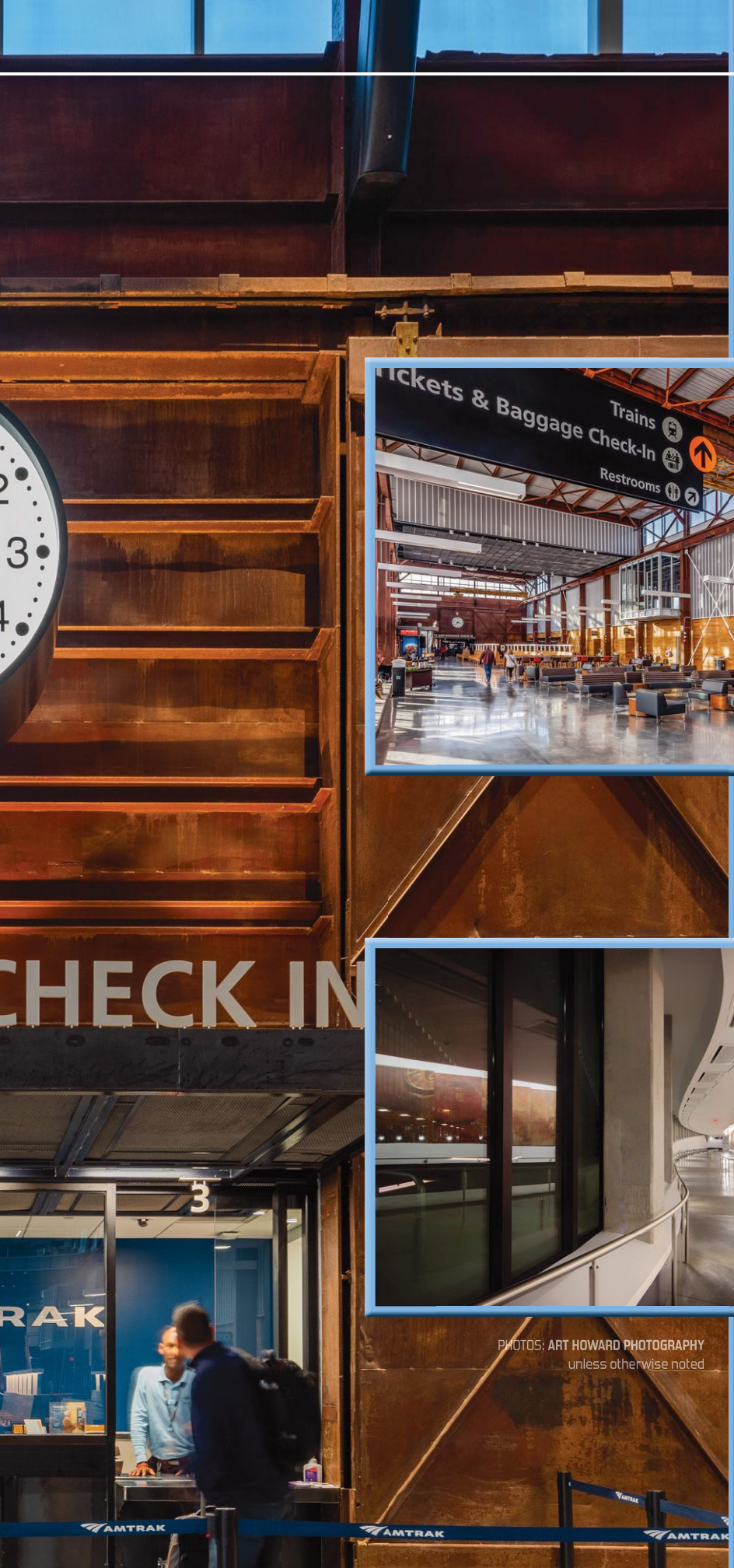
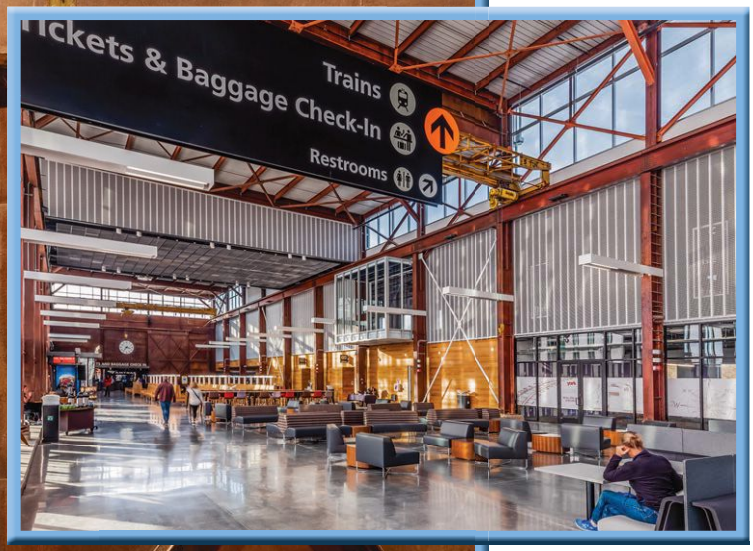
ALL ABOARD

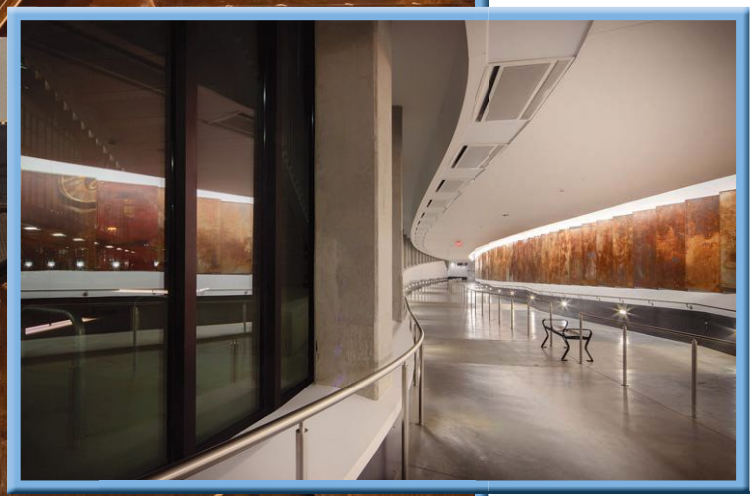
A Former Industrial Warehouse Becomes an Urban Transportation Center, Designed to Become Raleigh, N.C.'s 'Front Door'

WRITTEN BY | **JOE THOMPSON**

PHOTOS: CHAD MELLON







PHOTOS: ART HOWARD PHOTOGRAPHY unless otherwise noted

Raleigh, N.C., is a city in the midst of a powerful transformation. Regional growth and aging facilities recently spurred the development of a new multimodal transit center to accommodate increased train ridership, connect passengers to other modes of transportation, and replace an older Amtrak station that was one of the busiest in the Southeast region despite its lack of accessibility features and its location on the city's outskirts. The resulting Raleigh Union Station, which opened in July 2018, showcases the adaptive reuse of an old warehouse in the heart of downtown Raleigh and is a key component of long-term plans to catalyze growth and revitalize this downtown Warehouse District.

Skanska USA's Durham, N.C., location, in a joint venture with Raleigh-based Clancy & Theys Construction Co. and in association with Holt Brothers Construction, Raleigh, converted the abandoned industrial building—the Dillon Supply Co. warehouse—into a state-of-the-art, 43,000-square-foot urban transportation center that now houses passenger rail services, future commercial space, and indoor and outdoor civic space for special events.

The project's architectural team from Raleigh-based Clearscapes envisioned the building as an industrial cathedral. Passengers enter the former warehouse's towering main hall by passing under the railroad bridges designed by STV Engineers, Charlotte, N.C., to access the Terminal building. Awaiting their trains, passengers will be able to peruse shops or grab a bite at a potential eatery on the upper floor while enjoying a unique view of Raleigh's skyline.

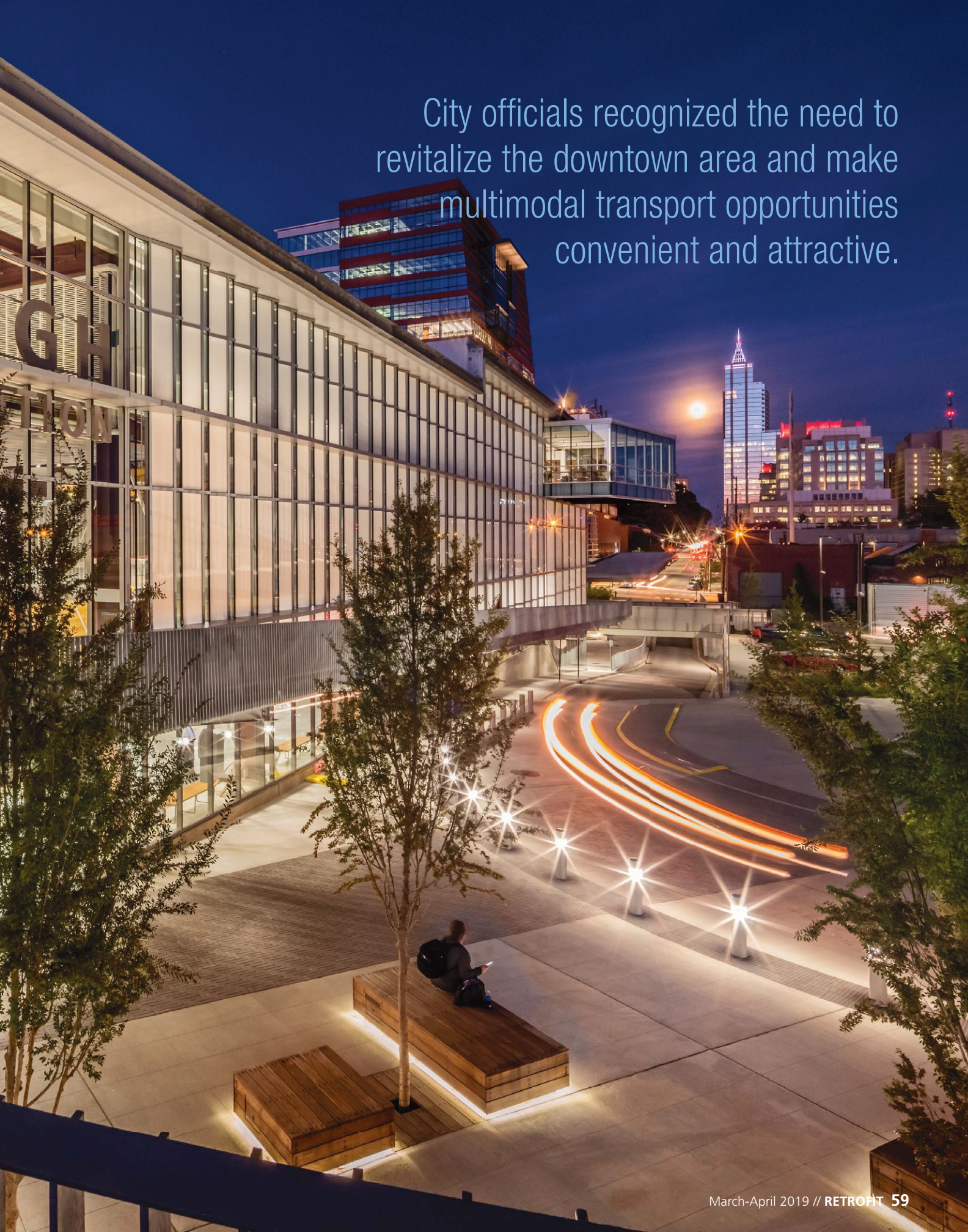
Construction Overview

Adapting an existing building for an entirely new use presents challenges and opportunities. In the process of demolishing the old warehouse, the project team left the exposed steel frame structure in place, making a visual connection to the building's history and providing an aesthetic framework for the station's design. They reinforced the foundations to support the new building expansion and used the distinctive rust-colored steel as a design inspiration for the final look of the station. Matching the steel, a red oxide color was used throughout the building with black, gray and orange accents used on other elements.

The original concrete footings of the warehouse are visible coming out of the floor and the existing 40-foot sliding metal barn doors were kept in the final building design as visual elements. Salvaged metal from the exterior of the old warehouse was reused to create 36 4- by 6-foot metal panels that are artistic elements on the concourse wall. The canopy above the new exterior civic plaza is a cantilevered structure supported by four 37,000-pound columns, each constructed from four I-beams.

Two of the gantry cranes used in the Dillon Supply warehouse to lift pieces of steel off the factory floor and move them throughout the facility were retained in the new building and locked in place as unique design elements. A large clock has been hung from the gantry crane at the station's west end.

While retaining the existing steel structure, the construction team had to extend a portion of the structure down one level to new lowered foundations to facilitate the building's new function and match up to the new lower exterior elevation. This represented one of the unique and challenging



City officials recognized the need to revitalize the downtown area and make multimodal transport opportunities convenient and attractive.

AN ABANDONED WAREHOUSE has been converted into a transportation hub using innovative design and construction practices that created a modern facility while retaining the original structure.

aspects of the project. Creating a new lower entrance required the installation of temporary foundations and support structure to buttress the existing building structure while the interior excavation and structure work were performed.

Located at the juncture of three rail lines, the new station is essentially an island, surrounded by train tracks. One line temporarily was taken out of service to construct two rail bridges that allowed vehicles to pass beneath the rails for access to the station.

The project team also had to deal with another "historical" factor in their work: the presence of contaminated soil and water, a relic of the structure's previous function as an industrial warehouse and an adjacent coal gasification facility. When pumping out groundwater during the excavation to install roads or utilities, contaminated water had to be collected in a holding tank and treated, and coal slag was gathered and taken to a disposal site.

Blending Old with New

Not only does the station retain elements of its history in its new look, it also features a number of modern components. The main hall includes thousands of feet of hot-water piping running through the building floor to provide radiant heat. This allows the concrete to absorb the heat from the pipes and provide greater energy efficiency while offering comfort for passengers and visitors. The glass curtainwall has a zig-zag pattern with honeycomb inserts between two panes of glass. This proprietary system allows sunlight and warmth to enter while minimizing glare and excessive heat. It is a key component of the building's temperature control and energy efficiency. The zig-zag shape also provides acoustical benefits.

The new Raleigh Union Station, which provides 9,200 square feet of passenger areas, is more than five times the space of the former station. The project features two rail bridges, a passenger concourse and tunnel, and a 950-foot-long center-loading train platform. Some of the facility's highlights include:

- A spacious main hall that is considered the "living room" of the station and serves as the central point for passengers and those employed in the leased spaces on the upper two floors of the station.
- A civic plaza that comprises four different seating areas and a bandstand, suitable for public events. The plaza has a concrete slab

foundation strong enough to support food trucks to enter and serve customers.

- Three tenant areas: a 3,847-square-foot space for a potential "grab and go" convenience store on the first floor; 6,262 square feet of office space; and a 2,702-square-foot room designed for a restaurant on the upper mezzanine, which boasts an outdoor terrace and spectacular views of downtown Raleigh.
- An Amtrak waiting area, which serves as the transition from the civic plaza to the concourse. It has seating areas for passengers, as well as workstations with electrical outlets and fiber-optic connections to enable them to work while at the station. It also includes a ticketing counter and customer service desk.
- A ramp leading to the platform enables baggage carts to deliver luggage directly to the trains, as well as assists passengers with limited mobility to be transported to the loading platform.
- A canopy walkway, which covers the entire face of the building, provides access to an observation area.

Retrofit Team

ARCHITECT // Clearscapes, Raleigh, N.C., www.clearscapes.com

GENERAL CONTRACTORS // Skanska USA, Durham, N.C., www.skanska.com; Clancy & Theys Construction Co., Raleigh, www.clancytheys.com; and Holt Brothers Construction, Raleigh, holtbrothersconstruction.com

ENGINEER // STV Engineers, Charlotte, N.C., www.stvinc.com

Materials

RADIANT HEATING SYSTEM // Uponor Inc., www.uponor-usa.com

WINDOWS // Oldcastle BuildingEnvelope, oldcastlebe.com

CURTAINWALL // Oldcastle BuildingEnvelope

HONEYCOMB GLASS IN CURTAINWALL // Panelite, www.panelite.us

ROOFING // Johns Mansville, jm.com

GREEN ROOF // American Hydrotech Inc., hydrotechusa.com

ROOF PAVERS // Hanover Architectural Products, hanoverpavers.com

HVAC // Trane, trane.com

The ticketing area and Amtrak offices are housed in the new construction expansion area, which was attached to the existing building.

Raleigh Union Station also boasts some impressive green elements, including a terraced roof, featuring plantings and concrete pavers, that overlooks a pollinator garden. The plantings in the pollinator mound were chosen to foster and facilitate the urban bee population. Burt's Bees, a personal care company headquartered in Durham, donated a portion of the funds used to create this area. Other sustainable features include onsite bioretention, permeable pavement systems, a green roof over the concourse and stormwater management features.

Thinking about the Future

Designed to serve as a regional transportation hub, the station serves Amtrak's long-distance Silver Star passenger train, providing service to the Northeast and Florida, as well as offering four daily round trips to Charlotte provided by Amtrak and the North Carolina Department of Transportation. It also already incorporates some infrastructure for future commuter rail and adjacent bus service for local residents.

Although several bus routes already run adjacent to the Raleigh Union Station civic plaza, within five to seven years an adjacent construction project could add six to 10 bus bays, complementing the city's existing 22-bay station and increasing Raleigh Union Station's connectivity to the city. Additional mixed-use space with retail is also planned for the area.

In addition, Raleigh Union Station is serving as a catalyst for continued revitalization of the city's Warehouse District. A nearby mixed-used development, featuring an 18-story office tower with retail space and two 6-story apartment buildings with an adjoining parking deck, as well as the 20,000-square-foot Morgan Street Food Hall, are other innovative, adaptive-reuse projects helping to reshape the area.

City officials envision the new Raleigh Union Station as "a front door to the city." With their long-term master plan in mind, they recognized the need to revitalize the downtown area and make multimodal transport opportunities convenient and attractive. To serve both of these goals, they supported a vision to convert an abandoned warehouse to a transportation hub using innovative design and construction practices. This vision has created a modern facility that retains the structure and look of its original purpose while providing the modern infrastructure to support contemporary demands and take advantage of future opportunities.

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Circle No. 33

THE ROAD TO BETHANY APARTMENTS

WRITTEN BY | EDWARD R. DE BLIECK, AIA, NCARB, LEED AP, AND MELANIE CONANT, IIDA, NCDIQ

A Pioneering Massachusetts School Is Reimagined as Affordable Housing

RENDERING: TERRY CRACKNELL

Located about 30 minutes from Boston in wooded Hanover, Mass., the 175-acre Cardinal Cushing Centers' simple Georgian and Colonial Revival structures belie their innovative past. Founded in 1947 by Cardinal Richard Cushing, Archbishop of Boston, this complex housed the Northeast's first large-scale school for children with intellectual and developmental disabilities. Today, while much of the campus still operates as a specialized school, the Archdiocese of Boston has allocated certain portions for redevelopment, offering a broad range of non-denominational support services for the disabled and the Hanover community at large.

A recent $8.5 million renovation and adaptive reuse led by Chelsea, Mass.-based The Architectural Team (TAT) Inc. with the creative stewardship of the Planning Office of Urban Affairs (POUA), a non-profit housing developer affiliated with the Archdiocese of Boston, reimagines this National Historic District's former dormitory building as Bethany Apartments, a 37-unit affordable housing community for area residents.

The historic dormitory building was constructed in 1957 with a grant from U.S. Ambassador Joseph Kennedy, an enthusiastic patron of this pioneering school. Originally named for its eminent donor, the 3-story, red-brick structure once housed 200 students. As the Cardinal Cushing Centers campus evolved to include affordable senior housing and other supportive services, the 58,375-square-foot former Kennedy Building transitioned into administrative use and eventually fell into disrepair. Working through the Archdiocese and leasing the structure to POUA, which is a mission-driven leader in social justice and affordable housing for families, offered Cardinal Cushing Centers an opportunity to give the building new life as much-needed affordable housing for the Hanover community. Just as important, locating Bethany Apartments on the campus grounds gives students a chance to interact with the development's residents, helping the Cardinal

Cushing Centers organization further its mission of integrating children with disabilities into the surrounding community.

Site Work

POUA engaged TAT, a longstanding collaborator, to lead the building's renovation and retrofit into an affordable apartment community. At the project's outset, extensive site work proved to be one of the project team's most significant challenges. Located next to protected wetlands, the large H-shaped structure sits on a significant slope and much of the first floor is below grade. Keeping the existing foundations secure was a major concern, especially as the high water table created difficulties for below-slab trenching needed to install new sanitary and stormwater drainage piping. In fact, at its lowest point where plumbing exits the building, the sanitary trench encroached on the water table.

Working with geotechnical and structural engineers, TAT devised an underpinning for existing footings and foundations, as well as shored up the earth and foundations in particularly vulnerable areas. To solve the piping issue, the project team decided to trench below one of the building footings, run pipes through the space and then pour additional concrete below the trench to maintain structural integrity.

Stormwater drainage presented another challenge. The site's clay-heavy soil does not allow for much surface water percolation, and an existing bioretention area behind the building could not absorb the full amount of stormwater runoff. With help from the civil engineers, TAT designed and installed a new secondary drainage system in the bioretention treatment area that helps accommodate runoff and other surface water.

Accessible and Approachable

Additional site work focused on improving accessibility and wayfinding throughout the property. Concrete walkways form new paths from the street and around the building, as well as to a new parking lot

RETROFIT TEAM

ARCHITECT AND INTERIOR DESIGNER // The Architectural Team Inc., Chelsea, Mass., www.architecturalteam.com

CLIENT // Planning Office for Urban Affairs (POUA), Boston, www.poua.org

GENERAL CONTRACTOR // NEI General Contracting, Randolph, Mass., www.neigc.com

CIVIL ENGINEER // Horsley Witten Group, Boston, horsleywitten.com

STRUCTURAL ENGINEER // Odeh Engineers, Boston, www.odehengineers.com

MEP ENGINEER // Wozny/Barbar & Associates Inc., Hanover, Mass., www.wbaengineers.com

ROOFING CONTRACTOR // Mahan Slate Roofing Co., Springfield, Mass., www.mahanslate.com

LANDSCAPE // CC Consult Group, North Andover, Mass., (617) 997-3646

MATERIALS

ROOFING SLATE // New England Slate, newenglandslate.com

WINDOWS // Green Mountain Window, www.greenmountainwindow.com

DOORS // Lang Door & Hardware, langdoor.com

EXTERIOR CUSTOM DOORS // Upstate Door, upstatedoor.com

CARPET // Milliken, floors.milliken.com, and Shaw, shawfloors.com

VINYL PLANK FLOORING // Shaw

INTERIOR LIGHTING FIXTURES // AFX Inc., www.afxinc.com; Columbia Lighting, www.hubbell.com/columbialighting; and Kuzco Lighting, kuzcolighting.com

EXTERIOR LIGHTING FIXTURES // Environmental Lighting for Architecture Inc., www.ela-lighting.com, and Hubbell Lighting, www.hubbelllighting.com

ELEVATOR // EcoSpace from KONE, www.kone.us

ERV/HEAT PUMP // Greenheck, greenheck.com

SPRAY FOAM INSULATION // Icynene, www.icynene.com

BATHROOM FIXTURES // Cleveland Faucet Group, www.cfgonline.com; Moen, www.moen.com; and Niagara Conservation Corp., niagaracorp.com

in the rear, while pavers highlight building entrances. Other less prominent but equally important additions, such as new lamp poles and exterior building-mounted lighting, also aid safety and wayfinding to improve the resident experience and campus safety. Ornate, lantern-like fixtures at the expanded front entrance are designed to match those seen in historic photographs of the building, contributing to the sense of historic character.

When it came to repairing and retrofitting the building itself, a few significant projects were necessary. To create an additional handicap-accessible entrance, for example, the project team carefully demolished a new opening in the rear façade to make space for establishing an entirely new entry sequence. Combined with the new parking lot, the improved accessible access means the primary entrance is now at the building's rear. This led to an unexpected design benefit: Cardinal Cushing Centers had retained the right to use a portion of the building's first floor as a health center for its students, and the project work afforded a good opportunity to design a separate, adjacent entry for this facility that can be used once the allocated space—currently just shelled out—is retrofitted in the future.

Similarly, during their life safety review of building plans, the local fire department requested that the existing elevator be replaced with an elevator system to accommodate 84-inch-long ambulance stretchers. With this in mind, the entire structure needed to be demolished and replaced with a new masonry-lined shaft for the larger-capacity car. The new elevator system that could serve the larger car is a cost-effective low-rise system without a machine room, saving floor space and using an energy-efficient gearless traction motor requiring no hydraulics or oil.

Another crucial building systems upgrade came with the installation of a new mechanical plant. Updated elements include a cooling tower and an energy recovery ventilator (ERV) with each apartment unit using the hybrid heat pumps. The oversized dimensions of the original mechanical room eased the installation process, offering plenty of space for the large ERV unit.

Architectural Rejuvenation

Exterior building elements needed replacement, too. Work on the roof was more substantial than first anticipated with the original slate in poor condition because of decades of exposure to moisture infiltration and related water damage. Although a restoration initially seemed possible, a complete replacement was ultimately necessary, leading to critical decisions about material choice and color for the historic structure.

The building's classic, Colonial Revival style presents a distinctive profile where the roof has significant visual impact and a major role in the renovation's ultimate curb appeal. With this in mind, the TAT design team chose a blue-green slate that offers an attractive and historically sensitive contrast with the red brick construction. The new roof was installed in combination with copper gutters and downspouts, offering a new highlight for the complex. Behind the historic envelope, spray foam insulation was applied to the roof structure and dormers through the attic space. Spray foam was chosen because it creates a better seal for the building envelope and reduces moisture and air infiltration for structural longevity.

In addition to the roof, all the existing wood window frames had to be replaced. For cost and performance considerations, retrofit aluminum replicas of the original window profiles were considered as a possible, value-oriented solution. Yet, in this case, working with a custom fabricator, provided a highly cost-effective opportunity to use wood replacement windows. As a result, new double-hung wood window frames closely replicate the originals in look and feel. In concert with the building's repointed brickwork, the radiant white color of the new window frames offers a fresh, crisp aesthetic for the Bethany Apartments façades.

Inside, the project team found significant mold and moisture encroachment on first-floor spaces because of the site's high water table, and leaks from the roof had damaged much of the fourth floor. As a result, the most extensive repair work took place on these two floors; many spaces were stripped down to the exterior masonry walls and then entirely rebuilt. The

TAT EMBRACED THE VIBRANT COLORS OF THE COMMUNITY ROOM'S LARGE STAINED-GLASS WINDOWS AND REFLECTED THEM IN THE SPACE'S FINISHES AND FURNISHINGS. TODAY, THE WINDOWS ACT AS INDIVIDUAL ARTWORKS AND ELEMENTS OF THE DÉCOR, RATHER THAN AS RELIGIOUS OBJECTS WITHIN THE FORMER SCHOOL DORMITORY.

BEFORE PHOTOS: **COURTESY THE CUSHING CENTERS ARCHIVES**

second and third floors, infrequently used after the building's shift to administrative duty, were in need of significantly less repair.

Landmark Opportunities

Because POUA funded much of the renovation and conversion with historic tax credits, in addition to federal and private bank loans, state housing subsidies and local municipal funding, certain elements of the interiors work were bound to exacting National Park Service guidelines. Restoring the large interior chapel space, for example, required preserving the integrity of its large stained-glass windows, which were carefully de-leaded, along with the dentil cornice and paneled wainscoting. Similar historic trim work was restored at the main lobby entrance and along each floor's primary corridor, where original wooden classroom doors were sanded and refinished in place to meet National Park Service requirements.

The largest programmatic challenge was in the adaptation of the original, 2,000-square-foot, double-height chapel space as a community room and lounge. Effectively programming such a large interior area for multiple uses demanded a thoughtful approach. The interiors team chose to employ furnishings as the main element for delineating space and breaking up the large community room into varied and enticing zones. A variety of different seating options, from inviting sectional sofas and individual lounge chairs to shuffleboard-game surfaces and clusters of tables near the included community kitchen, create configurable niches for different forms of interaction and activity while maintaining the grandeur of the historic space.

Using furnishings as an organizing element also helped the design team solve a secondary challenge created by the community room's former life as a chapel: how best to make a space with built-in religious aspects work for a nondenominational community of diverse residents. By embracing the large stained-glass windows' vibrant colors and reflecting them in the finishes and furnishings, TAT transformed the windows into individual artworks and elements of the décor, rather than as religious objects. Bright pops of yellow, red, and orange form a cohesive and fun palette, offering the kind of lively atmosphere befitting a space meant for resident engagement.

Clustered on the first floor along with the community room, other amenity spaces, including a laundry room and fitness center, reflect an equally deft programmatic solution. Because of

the topography of the site, the second floor is effectively the main floor. The design team was challenged to think of ways to integrate the five units located on the first floor so they would not seem remote or less connected to the rest of the building. Locating much of the amenity space at this level and providing access to views across the site, the design team preserved a sense of interaction for residents of first-floor units, allowing these apartments to feel fully connected to the broader Bethany Apartment community.

The rest of the former dormitory building's floor plan lent itself well to an apartment conversion, and the design team emphasized bringing natural light and design energy into the interior spaces. Bringing a more residential flavor to the long corridors, for example, a blend of crisp white and blue hues energizes the formerly drab walls, and carefully restored original 2-inch square tiles are painted into the color scheme so they blend into the space. Below residents' feet, carpet tiles with cross-banded colors also visually break up corridor lengths. Throughout the building, artwork by former students graces the walls, providing a connection to the past that respects the Cardinal Cushing Centers' innovative heritage and offering further visual interest.

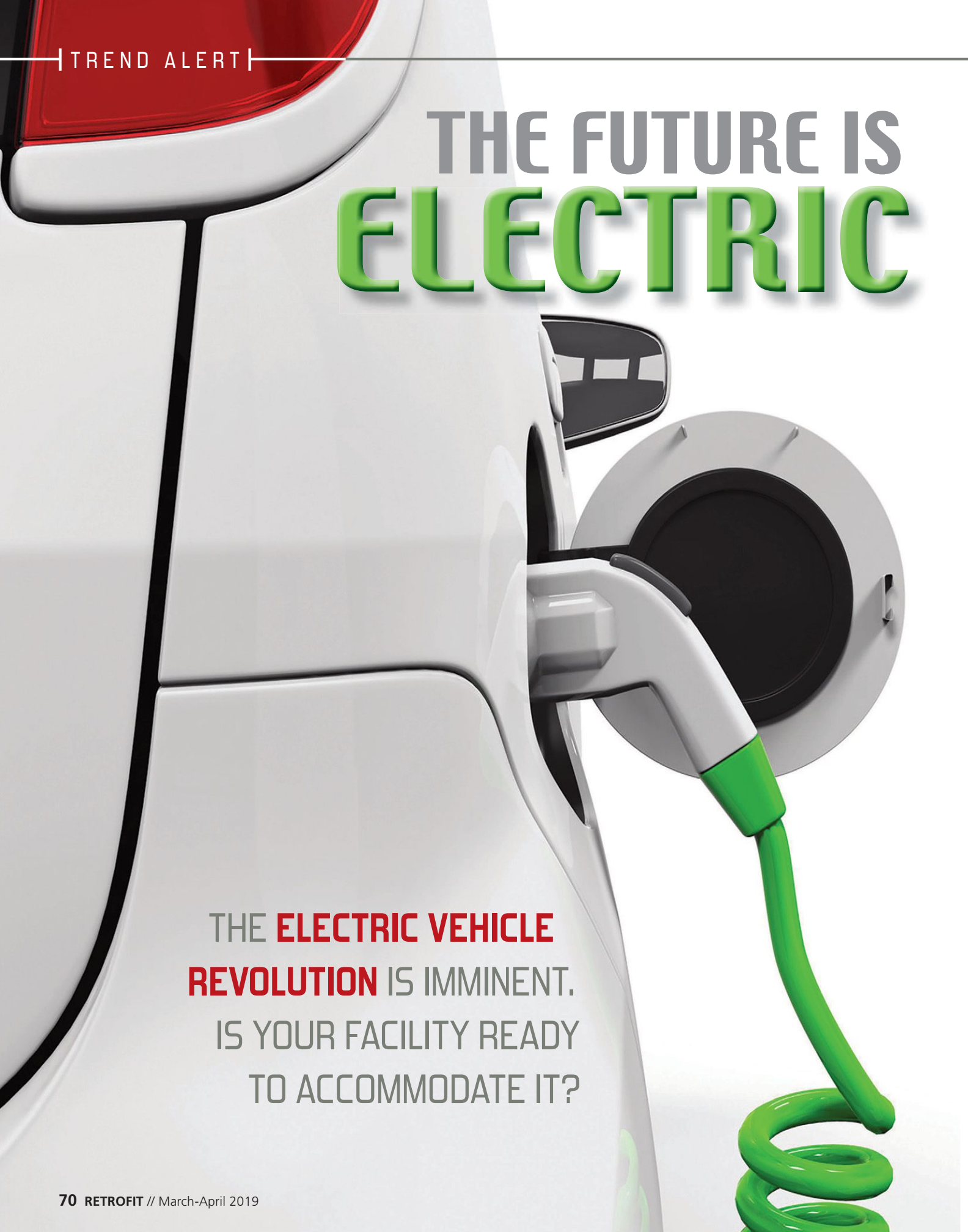
The unit mix comprises eight one-bedroom apartments, 25 two-bedroom apartments and four three-bedroom apartments with a majority of units leased at affordable rates to serve households with incomes ranging from 50 to 60 percent of area median income. The four lowest-income units are rented with a preference for state Department of Mental Health clients. Individual units range in size from an average of around 710 square feet for a one-bedroom home to 885 square feet for a two-bedroom space and up to nearly 1,100 square feet for a three-bedroom unit.

All 37 apartments feature a durable and attractive mix of materials, including vinyl plank flooring that resembles wood, Shaker-style cabinetry with wood blocking and planking, high-quality appliances, LED lighting throughout, and a full array of innovative bathroom accessories and fixtures. The building's numerous large windows ensure each home receives abundant natural illumination.

As the project team worked through final punch-list items in July 2018, the property was already two-thirds leased with 85 percent of those units occupied. Cardinal Cushing Centers' officials noted that Bethany Apartments received several hundred applications for its 37 homes, reinforcing the reality that more developments of its kind are needed in the Hanover area.

At the groundbreaking nearly nine months prior, Cardinal Seán P. O'Malley reflected on POUA's goals for Bethany Apartments. O'Malley remarked that Bethany Apartments, which is named for the biblical village signifying refuge, highlights a "commitment to develop true communities where people with a wide range of incomes and abilities can live together with dignity and respect." For TAT and the rest of the project team, meeting that objective represents adaptive reuse at its best.

THE FUTURE IS ELECTRIC



THE **ELECTRIC VEHICLE REVOLUTION** IS IMMINENT. IS YOUR FACILITY READY TO ACCOMMODATE IT?

WRITTEN BY | **ROBERT NIEMINEN**

Two years ago, *The Washington Post* reported that among the most popular cars in America, Tesla's Model S was "far and away the most loved vehicle overall." Described as a zero-emission car that's "outrageously sexy and desirable," Tesla has helped catapult the electric vehicle (EV) into the upper echelons of the automotive industry—a feat not many would have anticipated just 10 years ago.

Since the introduction of the Nissan Leaf and Chevy Volt in the U.S. in 2010, EV sales have approximately doubled year over year with more than 96,000 vehicles sold in 2013 alone, according to Building Owners and Managers Association Greater Los Angeles' (BOMA/GLA's) Sustainability Committee.

But how big is the EV market, really, and why does it matter to the existing buildings market?

"From everything I've read and I've heard, electric vehicles will be as ubiquitous as our cell phones are now; they'll basically displace the internal combustion engine at some point in the future," says Paul Wessel, director, market development, for the U.S. Green Building Council, Washington, D.C. "And I think everybody's all over the place about how quickly that's going to happen."

A new report from the Rocky Mountain Institute (RMI), Boulder, Colo., projects EVs will comprise 55 percent of annual vehicle sales by 2040, representing 50 million electric vehicles sold and 33 percent of total cars on the road worldwide. What's important to note is how quickly the industry is growing. According to Bloomberg New Energy Finance's (BNEF's) 2018 EV outlook, it took 60 months for the first million EVs to find buyers; that figure doubled in 17 months, and 10 months later EV sales jumped from 2 million to 3 million. (BNEF predicts sales will reach 5 million in less than six months).

"I think we're at the end of the early-adopter-phase market," explains Amy Egerter, senior associate with RMI's building practice. "But at the same time, it's getting a lot of national attention, especially as people set these really ambitious climate goals, and electrifying the transportation sector is a big part of that."

Clearly, the EV revolution is well underway. The question is: How can our current infrastructure accommodate a future dominated by electric vehicles?

EVs' Impact on Existing Buildings

Buildings consume nearly half of all electricity and, as the global population continues to grow, so will the demand for electricity. In fact, RMI projects electrical use will increase by more than two-thirds through 2040 across all sectors worldwide. Simultaneously, the growth of EVs will only contribute to load growth—as much as 11 to 16 percent, according to the report.

To help meet energy demands, states like New York and California have developed building standards to prepare for the growing need for EV charging infrastructure. The 2016 CALGreen Code, for example, requires EV infrastructure and EV spaces for new multifamily residential facilities and nonresidential buildings in California. Mandatory measures for nonresidential facilities require approximately one EV charging space for every 10 regular parking spaces under the CALGreen Code. (To learn more about EV-ready building codes, read a recent article published in *Charged* magazine at bit.ly/2MaRmwu.)

While state and local governments grapple with regulatory changes governing EVs, organizations like USGBC are working toward market transformation from within. Wessel, who currently leads the charge for USGBC's Parksmart program (see "USGBC's Parksmart Program", page 72), says it's good public policy to enact EV-ready rules at the local level. However, like LEED, USGBC promotes voluntary standards adopted by building owners who understand the market value of being forward-thinking.

"We're trying to encourage people to be thoughtful as they're both building new parking infrastructure and retrofitting their existing structures to think about all the options about how that single parking garage fits in the ecosystem of our mobility system," Wessel says.

As building owners consider the big picture in terms

PHOTOS: **U.S. GREEN BUILDING COUNCIL**

USGBC'S PARKSMART PROGRAM

PARKING is one of the largest land uses in cities, according to the U.S. Green Building Council, Washington, D.C. As the number of motor vehicles on the road continues to grow, with projections topping 2 billion by 2030, parking structures are taking on greater significance in terms of ensuring a sustainable future for the transportation sector.

Enter Parksmart. Formerly known as Green Garage Certification, Parksmart is currently the only rating system designed with sustainable mobility in mind through responsible siting, design and operations. Administered by Green Business Certification Inc., the program is a complement to LEED and other green rating systems.

"What our program Parksmart does is lay out a whole menu of options to think about in your parking structure and say, 'This is an asset that provides a service that I've decided is necessary to meet the needs of people wanting to access my building, whether it be a sports arena or an office building or university or a hospital,'" says Paul Wessel, director, market development, for USGBC. "'How do I best take advantage of this asset and look at the ways in which it can help create cleaner air, cleaner water and build a stronger community? And what are the opportunities for me as an owner and what makes sense for me to invest in today as part of building that tomorrow?'"

To that end, the Parksmart program guides new and existing structures toward efficient solutions that benefit building owners, property managers, tenants and society overall. Based on rigorous best practices, the certification program defines, measures and recognizes high-performing, sustainable garages that reduce their environmental impact, increase energy efficiency and performance, integrate sustainable mobility services and technologies, and more.

Much like LEED, Parksmart awards points (248 maximum) for sustainable practices across four categories, including management, programs, technology and structure design, and innovation. Projects that receive 160 points or more are awarded the program's highest designation: Parksmart Gold.

For more information, visit parksmart.gbci.org.

of EV and energy loads, the authors of the RMI report pose a logical question: Where will all the additional energy come from? Likewise, is it possible for existing buildings to offset the predicted demand for EV electricity through increased deployment of energy-efficiency retrofits?

In short, the answer is yes.

Addressing Demand through Energy Efficiency

According to RMI, the most cost-effective way to address the increased energy demands presented by the EV revolution is by improving the energy efficiency of buildings. Compared to constructing new-generation infrastructure—even from renewable resources—retrofitting existing buildings represents the lowest-cost option for meeting future energy needs.

"We believe that the current global building retrofit rate, estimated at 1.0% per year, can be increased dramatically based on existing, cost-effective, and widely available energy efficiency technologies in combination with supportive policy and emerging business and financial models," the authors of the RMI report suggest. "Additionally, these retrofits can be used as a means to install smart charging EV infrastructure to ensure future grid stability and renewable energy penetration."

Analysis by RMI shows during the next few decades, buildings in the U.S. can cut energy use by as much as 38 percent using existing and emerging technologies. The good news for facility executives is many of these solutions do not require invasive construction. For example, LED lighting, variable

THE MOST COST-EFFECTIVE WAY TO ADDRESS THE INCREASED ENERGY DEMANDS PRESENTED BY THE EV REVOLUTION IS BY IMPROVING THE **ENERGY EFFICIENCY** OF BUILDINGS.

frequency drives, low-E glass coatings, smart building controls and retrocomissioning are all viable, cost-effective options to help meet future energy demands.

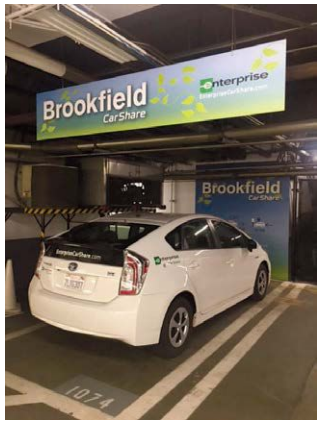
Although the current regulatory environment doesn't require existing structures be retrofitted with actual EV chargers, equipping buildings now with the infrastructure to accommodate them is a wise decision—and in some cases is what's required by new codes.

"As you're doing a retrofit, building in the capacity to be able to meet the need is a smart thing to do, and it's the most cost-effective time to do it," Wessel says. "It's why New York imposed this originally and other states are adopting it. They're typically not mandating that you install chargers but mandating that you install the internal infrastructure in your parking structure to allow that to happen. At the same time, you should be looking at your lighting and your ventilation systems because that's where the real energy savings are in a parking structure."

Counting the Costs

"The biggest challenge [with EVs] is obviously that the infrastructure isn't built out yet," Egerter notes. "Building owners are going to have to think about how to put those in and how to upgrade their electrical infrastructure and how to pay for it." Adding EV charging units can be a fairly simple process, depending on the complexity of the conduit installation to run the power cabling from the electrical room to the charging stations. Not all charging units are created equal, however.

There are three different types of EV charging stations—levels 1, 2 and 3 (or DC Fast Charging)—each with different performance



Adding EV charging units can be a fairly simple process, depending on the complexity of the conduit installation to run the power cabling from the electrical room to the charging stations.

Example for Recovering Level 1 Charging Costs when Providing Wall-mounted Level 1 Electric Vehicle Supply Equipment

	Annual Cost	Monthly Cost
Electricity Consumption Cost for 1,039 kWh/per year*	$110 per year	$9.17 per month
Wall-mounted Level 1 charging equipment with cord and connector $300-$600 over 10 years	$30-$60	$2.50-$5.00 per month
Installation for wall-mounted Level 1 charging equipment $300-$1,000** over 10 years	$30-$100 per year	$2.50-$8.33 per month
Plug-in Electric Vehicle (PEV) Driver Fee to Cover All Costs	**$170-$270 per year**	**$14.17-$22.50 per month**

Source: *U.S. Department of Energy, "Level 1 Electric Vehicle Charging Stations at the Workplace," July 2016.*
**Average one-way commute (12 miles, 2009 National Highway Transportation Survey, nhts.ornl.gov); Average PEV efficiency (3 miles per kWh, U.S. Department of Energy, 2014 PEV Models, www.fueleconomy.gov); Average commercial customer electricity price (10.59 cents per kWh, Energy Information Administration).*
*** U.S. Department of Energy, November 2015, "Costs Associated with Non-Residential Electric Vehicle Supply Equipment," bit.ly/2SyYx3V.*

characteristics and pricing, according to the non-profit advocacy group Plug In America, Los Angeles:

LEVEL 1: "Level 1 charging is the technical jargon for plugging your car into an ordinary household outlet," writes Tom Saxton, chief science officer for Plug In America, in a recent blog. As the least-expensive option that only requires the installation of a standard household outlet (assuming no additional wiring is needed), Level 1 provides EVs with roughly 4.5 miles of range per hour of charging, or about 22 hours for a full charge.

LEVEL 2: Level 2 charging units are a bit more expensive but provide faster charging speeds. Averaging about $2,000 per unit, Level 2 chargers supply 240 volts (similar to an electric dryer or oven) and allow for a wide range of charging speeds, all the way up to 19.2 kilowatts (kW), or about 70 miles of range per hour of charging, according to Saxton.

LEVEL 3/DC FAST CHARGING: "At the other end of the spectrum is DC Fast Charging, the fastest type of charging currently available," Saxton says. "It provides up to 40 miles of range for every 10 minutes of charging. These stations are expensive—up to $100,000—and require more power than your house."

In addition to the price of the chargers and installation, the costs of electrical use must also be taken into consideration. According to BOMA/GLA's Sustainability Committee, the maximum power delivered for a standard Level 2 charging unit is 7kW per hour (240V at 30Amps). With the average cost of electricity in the U.S. at $0.12/kWh, the maximum cost to a building will be $0.84 per hour of use.

To offset these costs, commercial properties typically assess fees for charging services that vary depending on the objectives of the property, according to BOMA/GLA. Currently, price categories for EV charging range from free/no cost to $1 and $2 per hour. Additionally, some landlords charge a flat monthly fee for tenants whose employees use the charging services.

How does a building owner decide which type of charger to install? Wessel recommends taking an incremental approach to demand if uncertain where to start. "You can scale up over time. You can lay out 20 Level 1 chargers [initially] and then as demand grows or people's interests change, you can scale them up to Level 2 if that's what you want and that's what your tenants want," he says.

Doing the Right Thing

Preparing your existing real estate now to accommodate the future of EVs is prudent. Not only will it help attract future tenants who are looking for amenities, such as EV charging stations, but also it offers an opportunity to realize greater efficiencies in your building's performance to help offset the inevitable increase in energy demand.

More importantly, however, planning for a more sustainable future isn't just smart—it's the right thing to do in the long run.

"As an owner who's committed to running a responsible building, increasingly thinking about that owner's role in developing a more sustainable society and being resilient and figuring out how you fit into the picture … it's valuable to be doing 'the right thing,'" Wessel says. "It's frankly not that expensive, and it's a good thing to do."

> "WE'RE TRYING TO ENCOURAGE PEOPLE TO BE THOUGHTFUL AS THEY'RE BOTH BUILDING NEW PARKING INFRASTRUCTURE AND RETROFITTING THEIR EXISTING STRUCTURES TO THINK ABOUT ALL THE OPTIONS ABOUT HOW THAT SINGLE PARKING GARAGE FITS IN THE ECOSYSTEM OF OUR MOBILITY SYSTEM."
> *—Paul Wessel, director, market development, USGBC*

Image: Sam Morris/Las Vegas News Bureau

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WINDOW SHADES ARE NATURALLY RESISTANT TO FLAMES

Draper Inc. now offers window shades made with Mermet USA's GreenScreen Nature sustainable shade fabric. GreenScreen Nature, which is recyclable, is constructed of 100 percent natural fiberglass material. As such, GreenScreen Nature does not require additional FR additives to make it resilient to burn and flame. GreenScreen Nature is GREENGUARD and GREENGUARD Gold Indoor Air Quality Certified, RoHS Compliant (free of heavy metals), fire retardant (NFPA 701-10 TM#1, California U.S. Title 19, and CAN/ULC-S109 Small & Large Scale), fungal-resistant (ASTM G21) and bacterial-resistant (ASTM E2180). The fabric also is Red List-compliant and has a health product declaration.

www.draperinc.com // Circle No. 37

VINYL COMPOSITE WALLCOVERING LOOKS LIKE WOOD, STONE

Verçade Wall Fashion offers 3-D, textured wall products in the style of natural stone and hardwood for interior walls. Vercade, which is easy to clean and maintain, can be installed quickly. Available in 6- by 48-inch planks and 12- by 24-inch tiles, the vinyl composite material can be used in virtually any sprinklered interior (as referenced by the International Building Code). Myriad patterns can be achieved with Verçade in horizontal and vertical formats. A pillowed-edge lends a realistic look and feel to each product and helps minimize the effects of wall imperfections.

vercade.com // Circle No. 38

COOL COMMERCIAL SPACES WITHOUT REFRIGERANTS

Cambridge Engineering has expanded its commercial cooling offerings with E-Series and ESC-Series evaporative cooling units. The Cambridge E- and ESC-Series lines help facilities efficiently meet IAQ and comfort standards without the use of refrigerants. E-Series provides direct evaporative cooling using up to 70 percent less energy than conventional mechanical cooling systems while the semi-custom-fabricated ESC-Series air handler uses 30 to 40 percent of the energy of mechanical systems through direct, indirect or a combination of both evaporative cooling techniques. In addition, Cambridge Engineering will make direct and indirect evaporative coils a regular option for its M-Series makeup air units.

www.cambridge-eng.com // Circle No. 39

STEEL CONNECTION ELIMINATES FIELD WELDING

Simpson Strong-Tie's Yield-Link connection simplifies and streamlines structural-steel connections made in the field without compromising structural strength. The Yield-Link connection requires no field welding, resulting in reduced onsite labor costs, licensing fees and construction time. By eliminating field welding, the Yield-Link connection also removes the need for field weld inspections. And because beams can be designed without supplemental lateral bracing, fewer fabricated steel elements and field connections are required. With a smaller restricted zone, MEP coordination is eased. Yield-Link is designed to absorb forces in a seismic event and, as a bolted connection, it is easier to replace than welded beams and posts, which simplifies repairs following a natural disaster.

strongtie.com/yieldlink // Circle No. 40

CONNECT PEX TO COPPER WITHOUT A FLAME

With plumbing professionals looking for flameless solutions that make hybrid PEX-to-copper connections quick and easy, Uponor North America has launched its ProPEX copper press adapters in sizes from 1/2 to 3 inches. Manufactured from lead-free brass to meet local and national potable-plumbing codes, the press adapters don't require new tools or processes and are backed by Uponor's 25-year transferable limited warranty. The adapters also incorporate a patented design for securely fastening the pipe and fitting together, eliminating the need for a stainless-steel ring.

View a short video demonstrating the ProPEX copper press adapters.

uponorpro.com // Circle No. 41

SURFACE MATERIAL IS AVAILABLE IN EARTHEN HUE

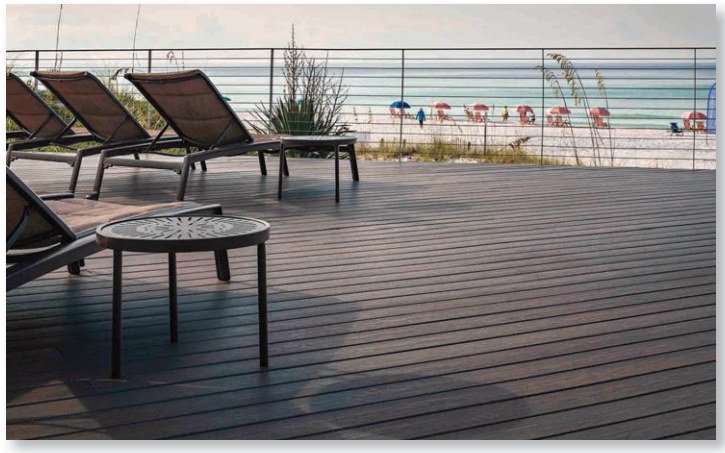
HanStone Quartz has released Shangri-La, a garnet gem tone and onyx-inspired pattern. Shangri-La can be underlit and is suitable for commercial projects. HanStone is easy to maintain, eco-friendly, stain-resistant, durable, nonporous and heat-resistant.

www.hanstonequartz.com // Circle No. 43

COMPOSITE DECKING LOOKS LIKE INTERIOR HARDWOOD FLOORING

MoistureShield Vision composite decking resembles interior hardwoods to provide a seamless transition to the outdoor deck. The product comes in five natural colors: Cathedral Stone, Mochaccino, Sandstone, Smokey Gray and Spanish Leather. The deck boards are available in 12-, 16- and 20-foot lengths with fascia boards in 12-foot lengths. Non-grooved square shouldered boards and grooved profiles for hidden fasteners are available. Vision decking is available with a lifetime structural warranty, as well as a limited lifetime fade and stain warranty.

moistureshield.com // Circle No. 42



FOLDING GLASS WALL ACHIEVES EXTERNAL NOISE REDUCTION

NanaWall Systems has introduced its NanaWall AcoustiFOLD, a first-floor-supported folding glass wall that is able to achieve up to STC 45 for educational settings and interior spaces. This system combines acoustically separated aluminum framing and gasketing with sound-enhanced glass to achieve external noise reduction while allowing natural daylight to flood interior spaces. The hinged panels are intuitive and convenient to operate, allowing staff to open or close the system when needed. The two-point contact Gothic-arch wheel-bearing design also provides an equal distribution of weight and permits the floor-supported system to glide with less friction.

www.nanawall.com/products/acoustifold // Circle No. 44

View a short video demonstration of how the HES 9800 works on the Adams Rite EX88.

ELECTRIFY EXISTING OPENINGS

ASSA ABLOY Electronic Security Hardware and ASSA ABLOY Group brand Adams Rite have released HES 9800 and Adams Rite 7800 Electric Strike. The HES 9800/Adams Rite 7800 Series is a low-profile, surface-mounted electric strike designed specifically to work with the Adams Rite 8800 and 8700 Series Narrow Stile Rim Exit Devices and the EX88 Interlocking Rim Exit Device. As the only electric strike compatible with the Adams Rite Starwheel and Interlocking latching mechanism, the HES 9800/Adams Rite 7800 electrifies openings on aluminum storefronts, commercial perimeter doors and high-occupancy commercial facilities, as well as provides an electrification option for the Adams Rite EX88.

assaabloyesh.com or adamsrite.com // Circle No. 45

CONTINUOUS INSULATION RAINSCREEN SYSTEM FEATURES STONE WOOL

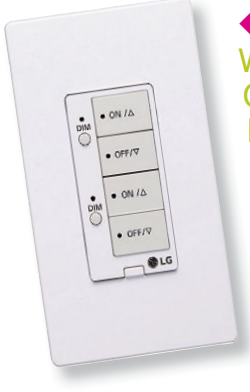
Knight Wall Systems has collaborated with ROCKWOOL to market COMFORTBOARD 110, a continuous insulation (CI) rainscreen attachment system utilizing stone wool insulation. The product will now be marketed as a complete rainscreen solution alongside Knight Wall Systems' CI System and HCI System. Developed for use as an exterior continuous insulation in commercial applications, COMFORTBOARD 110 is thermally efficient, moisture-resistant, vapor permeable and creates high-performance wall assemblies. These assemblies are effective against fire, moisture and thermal bridging, as well as allow for drying potential. The CI System and HCI System are designed to properly disperse the façade loads over exterior stone wool board insulation with thermally isolated fasteners penetrating the thermal barrier, thus minimizing thermal bridging.

knightwallsystems.com // Circle No. 47

MASONRY VENEER RESEMBLES WOOD

Creative Mines has launched a line of masonry veneer products called Craft Weathered Planks. The hand-crafted line, developed by master moldmakers, is evocative of weathered barn wood and fences that have acquired a patina over time. The collection celebrates the American countryside, demonstrating Creative Mines' pride in its USA-made products. The line currently includes five products from which to select or mix: Barrelstave, Blueskye, Greenfield, Milkpaint and Redbarn. The colors in the line vary from vibrant and intense to burnished and weathered tones.

www.creativemines.us // Circle No. 46



USE EXISTING WIRING TO CONNECT LED FIXTURES

LG Electronics' 480V step down transformer provides a solution for power conversion down to 277V, enabling building owners with three-phase power to use existing wiring to connect with any LG LED lighting fixture. Once commissioned, LG lighting solutions offer a selection of control options, such as light levels, time-out features, fade rates and scheduling. The lightweight design allows for easy installation and is suitable for large indoor spaces, such as warehouses, factories and gymnasiums. In addition, the next-generation LG Battery Scheduling Switch can be placed virtually anywhere and offers wireless control using ZigBee to configure and control fixtures, along with an energy-saving set scheduling feature.

www.lglightingus.com // Circle No. 48

NEW BASIN OPTIONS FOR ALL-IN-ONE HANDWASHING SYSTEM

Zurn has added three basin designs within the Sundara Handwashing System portfolio: Tide, Surf, and Inlet include single, double and triple configurations. The new options join Sundara's established Reef and Drift basin designs. The Sundara system is available in seven basin colors across the five designs.

Zurn offers five sets of curated sensor faucet and soap dispensers, available in multiple finishes. Multiple manual faucets and soap dispensers also are available. Zurn's Sundara Handwashing System is an all-in-one-box solution: basin, faucet and soap dispenser. The system also can be specified with the manufacturer's in-wall carrier system.

zurn.com // Circle No. 49

GLASS PROVIDES GRADUAL TINT TRANSITION

Saint-Gobain has made available SageGlass Harmony, dynamic glass that offers daylight, heat and glare management while maintaining a connection to the outdoors. The product delivers a gradual in-pane tint transition from fully clear to fully tinted. Harmony can be integrated as an IoT device and managed to deliver an optimized indoor environment.

www.sageglass.com/harmony // Circle No. 50

VRF SYSTEMS FEATURE UP TO 30 PERCENT SMALLER FOOTPRINT

Mitsubishi Electric Trane HVAC US LLC has introduced CITY MULTI N-Generation outdoor units that deliver better energy efficiency and personalized comfort control to commercial building applications. The N-Generation features a footprint up to 30 percent smaller than previous models and offers more design flexibility because of improvements in vertical piping limits, which have been increased from 164 feet to 295 feet. The units, which are available in 6- to 32-ton capacities, include a four-sided heat exchanger delivering increased heating capacity within the reduced footprint. They also feature an improved compressor and fan design with five airflow settings that vary the units' noise output.

nextgenvrf.com // Circle No. 51

View a video introduction of N-Generation CITY MULTI.

UNDERLAYMENTS PROVIDE OPTIONS FOR VARIOUS ROOF SYSTEMS

HydraShell MAX, a standard synthetic underlayment, and HydraShell Supreme SA, a peel-and-stick underlayment, are McElroy Metal's new underlayment offerings. HydraShell MAX's four-layer construction can be used under all types of finished roofing materials, including steel roofing. It can be used on roof slopes as low as 1/2:12 and requires fewer fasteners. HydraShell Supreme SA is a suitable option for high-temperature, self-adhering applications. The SBS modified asphalt offers pliability, and the cool gray surface reduces heat buildup.

www.mcelroymetal.com // Circle No. 52

AD INDEX

MARCH-APRIL 2019

SAFE HOUSE

Historic Church Is Adapted to House Women Affected by Domestic Violence

IMAGE: COURTESY DIGROUPARCHITECTURE

RETROFIT TEAM

ARCHITECT // DIGroupArchitecture, New Brunswick, N.J., www.digrouparchitecture.com
- Jeffrey Venezia, AIA, principal in charge
- Jaime Masler, project manager
- Swarupa Samant, project architect

STRUCTURAL ENGINEER // Harrison-Hamnett P.C., Pennington, N.J., www.hhpccse.com

MEP ENGINEER // Kelter & Gilligo, Princeton Junction, N.J., kandg-pc.com

HISTORIC PRESERVATION CONSULTANT // Westfield Architects & Preservation Consultants, Haddon Heights, N.J., www.wa-pc.com

MATERIALS

CLADDING // Oko Skin from Rieder, www.rieder.cc

CEILING TILE // Certainteed, www.certainteed.com

TILE // Daltile, www.daltile.com

FLOORING // Pastiche Oak Golden Hardwood Flooring and TecWood from Mohawk, www.mohawkflooring.com

COLUMNS // PermaLite from HB&G Building Products Inc., www.hbgcolumns.com

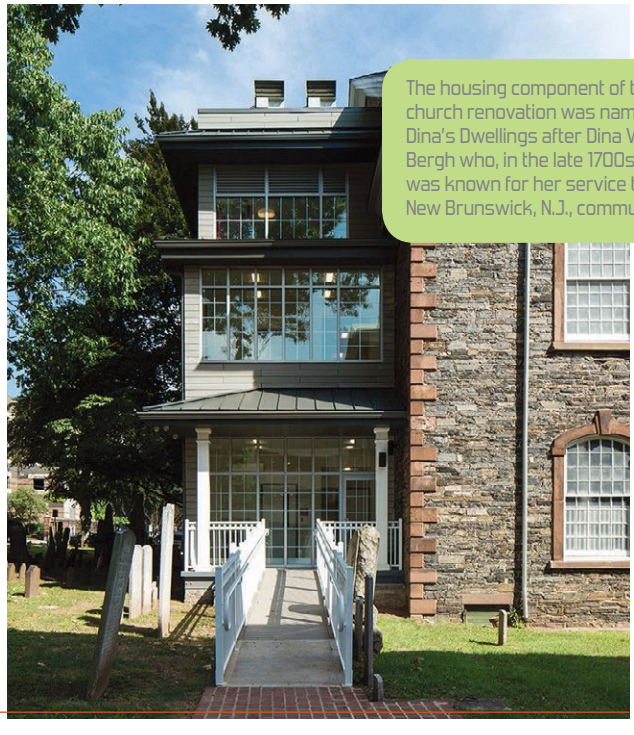
ELEVATOR // Thyssenkrupp, www.thyssenkruppelevator.com

The First Reformed Church of New Brunswick, N.J., originally constructed in 1812, lost the majority of its interior in a 1971 fire set by the abuser of a woman who was seeking sanctuary in the church. This tragedy was the inspiration for a renovation completed in 2016 that included updating interior spaces for the still-functioning church, as well as adding housing for women affected by domestic violence.

Because the church was designated a State of New Jersey Historic Building, the design team at DIGroupArchitecture, New Brunswick, was challenged to maintain the church exterior and interior balcony. Consequently, the team designed two stories of residential units—four studio units and two two-bedroom units on the first floor and three studio units and one one-bedroom unit on the second floor—as well as two stories of church space. A shared third floor, which features a two-sided elevator for handicap access, is key-controlled for security.

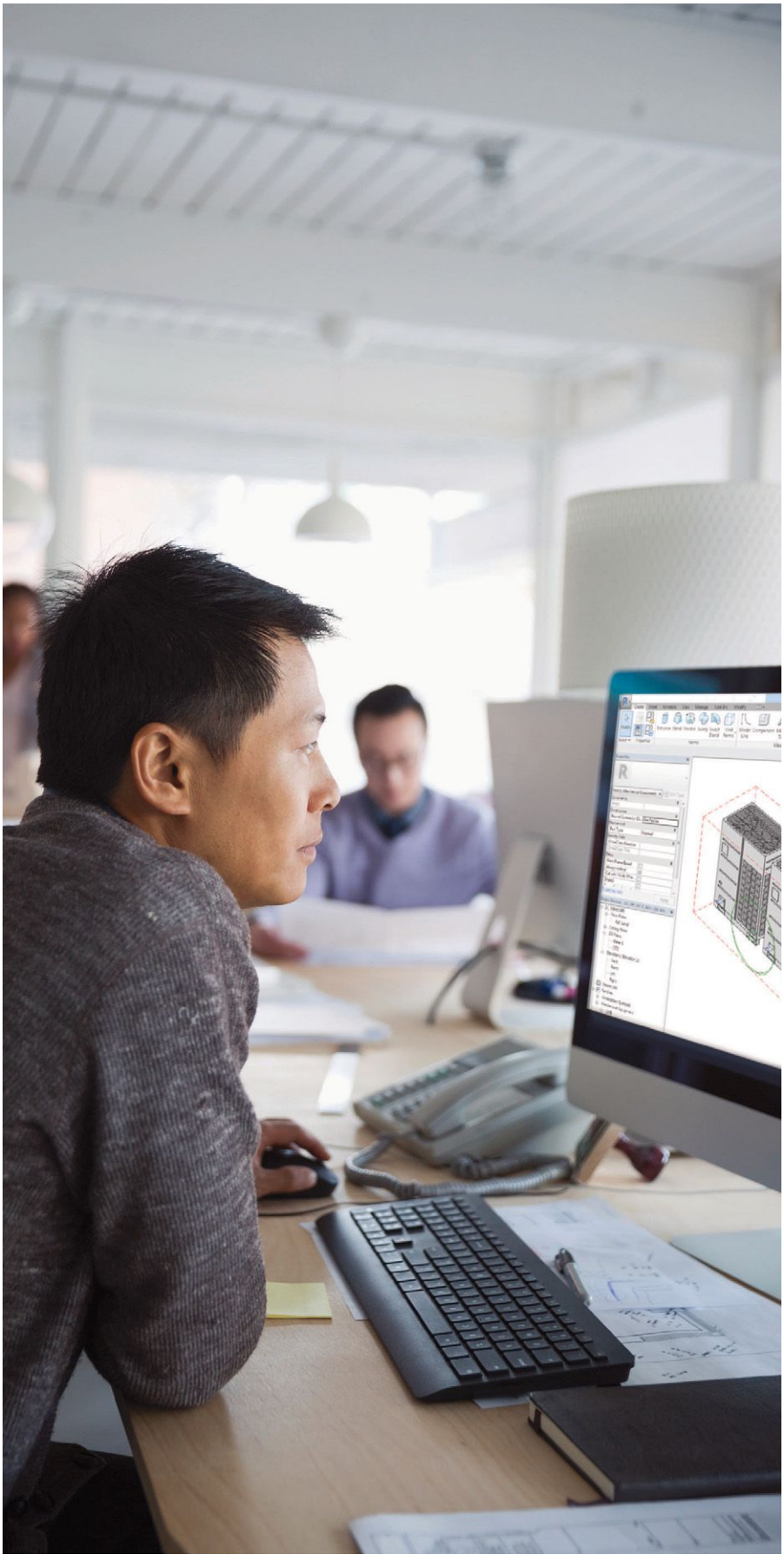
To meet the program goals of the church, the first floor hosts the community gathering space and features four original wood columns supporting the balcony and second floor. The second floor now is home to the sanctuary/cultural center and receives abundant light from four large circle-head windows on the north-to-south sides. Central to the design concept was the idea that natural light invites First Reformed Church congregants and the public to the sanctuary/cultural space and signals to the community the haven created within.

Because no graves could be moved or disturbed, entry into the housing portion was raised 30 inches off the ground with supporting piers placed selectively to avoid grave shafts.



The housing component of the church renovation was named Dina's Dwellings after Dina Van Bergh who, in the late 1700s, was known for her service to the New Brunswick, N.J., community.

PHOTOS: NICK VENEZIA



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