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BUILDING GREEN

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DEVELOPERS WHO TRY TO GO GREEN FIND MONEY STANDS IN THEIR WAY

Going net-zero can add 7 percent to the cost of construction. Financial incentives could help more ultra-green projects get built.

The building industry is again under scrutiny following the adoption of the legally binding Paris climate conference agreement, which limits average global temperature increases to less than 2 degrees Celsius.

BY AARON SWAIN
WEBER THOMPSON

The good news is we are entering a period of great opportunity for smart design and investment.

Although there is still work to do, we have taken the first steps to getting there. The ecological challenges have been understood, and we've acknowledged that we have the ability to solve the problems.

Environmental revolution

Energy is a major focus, presenting an opportunity for improvement in every building project. The economics are simple and scalable: by reducing buildings' energy demand, we save money in the operating costs.

But wait, there's more! By reducing demand for energy (through more energy-efficient buildings), the cost and demand for primary energy resources also declines — in today's energy grid, these are largely oil and coal reserves.

In addition, through investments in renewable energy (solar and wind), we have an opportunity to break our addiction to fossil fuels, eliminating the need for further resource extraction and exploration in environmentally sensitive areas. We saw this locally with Shell's recent decision to abandon exploration of oil reserves in Alaska as a result of the drop in barrel price of crude oil.

Without increased demand, proposed new power plants become unnecessary. Economically, this frees up capital for reinvestment in sustainability initiatives and incentives.

The potential is compelling. It is potentially the foundation towards a global environmental revolution, advancing us beyond the industrial age and leaving something nice for our kids. It may sound a bit like a pipe dream, but we've seen pockets of small-scale success all around the country and the world.

One example is the intense goal of the net-zero building, introduced by the Living Building Institute and the Living Building Challenge. In Seattle, we've seen the Bullitt Foundation actually achieve this net-zero energy goal — a lofty achievement and a great case study to understand one path of success.

But with lofty goals come lofty costs, limiting the impact on the industry as a whole. If the success achieved is not repeatable or scalable, the overall contribution is diminished. This is the cycle we have found ourselves in today: a few gems and glimpses of the potential, but with the vast majority achieving more mediocre targets, largely due to the economics.

To get to net-zero as an industry, we clearly need a stepping stone. That could very well be the passive house model.

Focus on efficiency

In the residential sector, a growing number of single-family builders have been proving the viability of targeting energy efficiency for more than 25 years.

"Passive house" refers to a building strategy that focuses on superinsulated, airtight building envelopes, and incorporation of energy-efficient heat-recovery technology in the mechanical equipment.

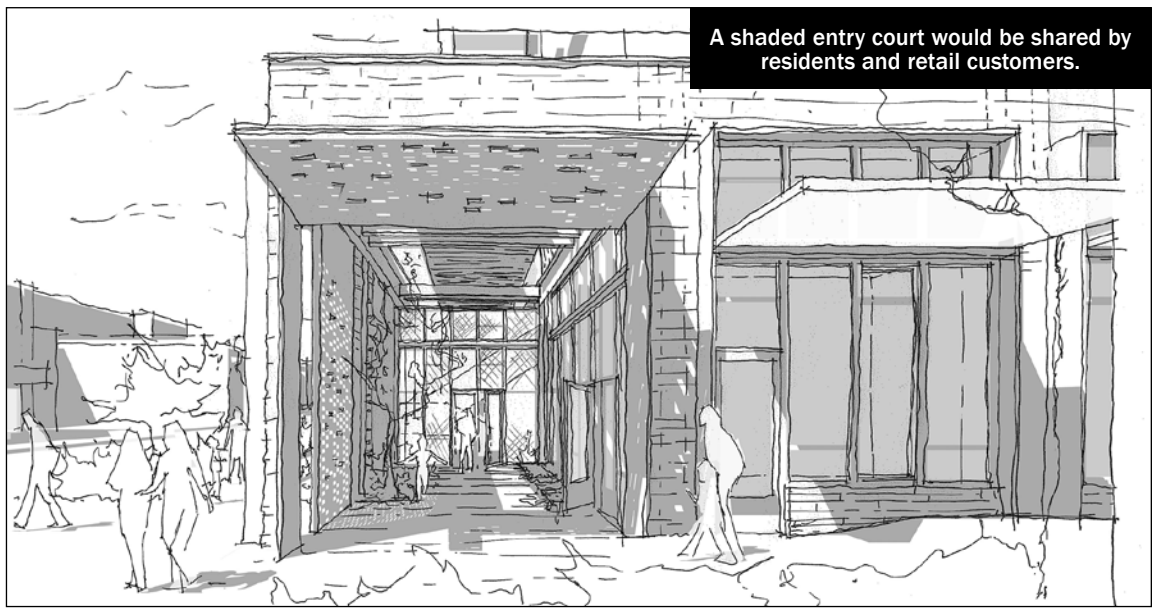
The resulting buildings are both energy-efficient and comfortable — equally important to any sustainability strategy. Also important, the strategies are not limited to location, use or building type — they can be applied to any building across any sector.

To expand the knowledge of these building principles, the Passive House Institute and a U.S. branch of the organization (PHI-US) were created. They provide a certification process to recognize success, and are a resource of proven design strategies.

This largely grassroots organization has historically focused on single-family projects, but the multifamily and commercial development world is taking a hard look at these strategies to achieve the same level of success. (It should be noted that unlike other certification programs — Living Building, LEED and Built Green, for example — passive house focuses primarily on energy.)

At the Passive House Northwest Conference in Portland earlier this month, the first major-scale projects were presented, demonstrating both the successful integration of these energy-efficient strategies, but also the economic shortfall still challenging massive adoption across the industry.

Weber Thompson is designing a passive-house apartment building for a site on Capitol Hill.



A shaded entry court would be shared by residents and retail customers.

IMAGE COURTESY OF WEBER THOMPSON

The Cornell Tech residential tower in New York is a 26-story, 350-unit high-rise under construction that will be a long-term hold for an institutional owner with deep pockets. The Second and Delaware project in Kansas City is also a long-term hold, but for a market-rate developer. To pencil, they have incorporated a few creative funding mechanisms, including a loan from the U.S. Department of Housing and Urban Development and an integrated project delivery/profit-sharing-contracted construction team.

A technology premium

In Seattle, architects Weber Thompson, builder Cascade Built and developer Barrientos LLC are proposing a mid-rise multifamily project targeting passive house-level performance goals at 1300 E. Pike St. on Capitol Hill.

This small infill project of less than 50 units largely relies on its walkable, urban location in the Pike-Pine Urban Village to provide the amenity package for residents. The project incorporates interactive approaches to energy savings by relying on tenants to interact with the building differently, with features like operable exterior window shades, and variable refrigerant flow or possibly ground source energy-efficient cooling systems, rather than simple yet energy-intensive air-conditioning units.

Currently the necessary technologies are showing a 6 to 7 percent premium over costs of standard construction. To make it pencil, the projects are pursu-

DEVELOPERS — PAGE 15

BUILDING OPERATORS ADD ENERGY MANAGEMENT TO THEIR REPERTOIRE

Savings can come from simple steps like turning off equipment at night.

The building operator job description used to be limited to keeping occupants comfortable, and maintaining equipment and operating systems. Managing energy use was not one of the responsibilities.

BY ERIK WESTERHOLM
NORTHWEST WATER & ENERGY EDUCATION INSTITUTE

That's changing, and Building Operator Certification instructor Duane Lewellen is seeing the change firsthand.

"What we're finding is that facility operators are becoming more and more involved or responsible for managing the energy consumption of the building — a role that they typically haven't played in the past," he said.

That expanding role means the ability to conduct a Level 1 energy audit, or a basic energy usage scoping, a skill that building operators can use to bolster their resumes.

Unsure where to begin? Building operators can download a Level 1 audit checklist from the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) or take a Building Operator Certification course to learn about energy scoping. Lewellen said there are three critical components to a basic energy audit: document existing conditions, benchmark the building, and make improvements.

Document existing conditions

Lewellen recommends building operators conduct an energy audit about once every five years.

The first step is to gather data on the existing conditions and energy usage of the building. This may include the square footage, occupancy, equipment schedules and lighting systems. Lewellen recommends operators work with their local utility companies to gather utility data. If available, interval data showing daily energy usage is helpful. Some utilities can also loan out tools such as infrared cameras, which can identify sources of heat loss.

By working with interval data from a local utility, Lewellen discovered a building he was auditing was not shutting down on the holidays, even though employees were not in the building. This led to a simple scheduling adjustment that generated instant savings.

In addition to a daytime energy audit, Lewellen is an advocate of the "midnight audit." This involves an operator walking through a building when it is unoccupied to observe opportunities to save energy when no one is in the building.

"You'd be amazed at the energy-using equipment that is operating when no one is there," Lewellen said.

Benchmark the building

After determining the existing conditions of a building's energy usage, it is important to compare the building's efficiency to the efficiency of similar buildings.

Energy Star offers online resources that can guide building operators in determining energy scores to benchmark their buildings. The scores range from 1 to 100. A score of 50 would mean that a building is average, with about half of its operations more efficient than those of similar buildings and half of its operations less efficient than those of similar buildings.

"A low Energy Star score demonstrates plenty of opportunities to invest in improvements to a building's efficiency," Lewellen said, "while a high score demonstrates opportunities to invest in maintenance and fine-tuning."

In preparation for the third step, operators can research what operators of similar buildings have done to improve their buildings' efficiency.

Make improvements

Once a building is analyzed and benchmarked, it is time to create a five-year improvement plan and to begin implementing it. Lewellen shares three types of opportunities to include in Level 1 energy improvements:

- **Operations and maintenance:** These improvements entail repairing broken equipment and optimizing equipment operations.
- **Low-cost and no-cost investments:** These are the typical types of improvements an operator will make after a Level 1 audit. They include cost-efficient solutions such as installing lighting motion sensors.
- **Capital improvements:** These are more expensive investments such as replacing all the windows in a building. They are most common for buildings that receive a low Energy Star score, and they may not be necessary for every energy improvement plan.

According to the U.S. Environmental Protection Agency, 30 percent of the energy in buildings is used inefficiently or unnecessarily. With this in mind, it is essential that today's building operators learn how to conduct basic energy audits using the steps above.

To learn more about conducting basic energy assessments, building operators can participate in training programs, join associations and access online checklists and guides. Lewellen recommends operators conduct their own Level 1 audits and consider outside help for more complex Level 2 and Level 3 audits.

"As the role of the building operator continues to evolve," Lewellen said, "the need for operators to be trained to conduct basic energy audits will continue to grow."

Erik Westerholm is a project specialist with the Northwest Water & Energy Education Institute at Lane Community College in Eugene, Oregon.

A simple energy audit can improve efficiency.

PHOTO COURTESY OF NWEEI

INSIDE

ON THE COVER

The new Weyerhaeuser headquarters in Pioneer Square will pursue a LEED platinum rating and Green Globes certification. The Urban Visions project was designed by Mithun. IMAGE BY MIR

DJC TEAM

SECTION EDITOR: JON SILVER • SECTION DESIGN: JEFFREY MILLER
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BIG-BOX STORE GETS A SECOND LIFE AFTER A GREEN MAKEOVER

Adaptive reuse offers an eco-friendly way to transform urban sites.

BY GREG BELDING & ELIN HEADRICK
RICE FERGUS MILLER

This big-box store in Tukwila is now an energy-efficient office building for King County Housing Authority.

PHOTO BY WILLIAM WRIGHT PHOTOGRAPHY

We often see empty, underutilized buildings throughout our communities. The dilapidated warehouse, an abandoned strip mall, empty stores — each of these tell stories of recession, the flight to the suburbs, changes in the way we shop, and finding our way with new technologies.

What if these existing buildings could be repurposed to help strengthen our communities instead of leaving a void? Rice Fergus Miller's adaptive reuse work has focused on big-box, retail and warehouse renovations — to transform abandoned buildings into places where we work, gather as a community and, through strategic green building practices, become models of sustainability.

Adaptive reuse projects are innately sustainable — the greenest building is the one already standing.

Reused sites offer attractive benefits. They are centrally located, with ample parking and typically a strong existing shell and core that can be used and built upon. The infill of existing building stock can reduce urban sprawl and offer new ways to think about unstoppable growth and development, and acknowledge the heritage of the site.

From big-box to offices

Rice Fergus Miller worked with the King County Housing Authority to bring together previously separated KCHA departments into a central annex office facility in Tukwila.

This complete renovation of an existing 36,000-square-foot former big-box store promotes KCHA's desire to create a cohesive environment and be a more integrated agency. The converted space provides work areas that are flexible, comfortable, efficient, high-ceilinged and filled with daylight.

With a budget of under $95 per square foot, Rice Fergus Miller and our mechanical engineer, Ecotope, created a design with an Energy Use Intensity of 26 — one-third the energy use of KCHA's previous office buildings. The office space uses 50 percent less energy and 25 percent less water than their nearby executive office space.

Energy-efficiency features include new double low-e insulated glazing systems, energy recovery ventilation, variable refrigerant flow, zoned heat pump system, large skylights with internal light shelves, dimming lighting controls for corridors, and occupancy controls on all lights in rooms with doors.

This high-performing building received from ASHRAE a national second-place technology award for existing commercial buildings. The central annex office also received Energy Star certification from the federal government.

With a score of 98 of 100 for energy efficiency, KCHA has one of the most efficient office buildings in the nation.

Alaska warehouse conversion

Rice Fergus Miller has designed a combined administrative office for the Tongass National Forest and the Sitka Ranger District, currently under construction, in Sitka, Alaska.

The project involves renovation of an existing warehouse into office space, and adapting an existing shop building for storage.

The new office space will have radiant floor heating, heat-recovery ventilation and a projected EUI of 30.

Biomass, a Forest Service resource, is the primary heat source for this administrative building. With Southeast Alaska's reliance on heating oil and their extremely limited supply of hydroelectricity, projects like this become a model for how towns like Sitka can grow without burdening the residents with additional infrastructure costs.

The two-story, 10,900-square-foot, wood-framed warehouse will become comfortable and efficient office space. The exteriors of the two structures are being designed to fit the context and character of historic Sitka, as well as the Forest Service's Built Environment Image Guide.

The renovation of the exterior walls includes new siding, insulation, flashing, building wrap, doors and windows. The intent is to make the entire building weather tight.

New use for Navy bunker

Forest City Military Communities (now Hunt Cos.) is working to redevelop the Landings (formerly Jackson Park Navy housing), a former Navy ammunition depot during World War I and World War II, and renovate other military housing at the Bangor Naval Submarine Base in Kitsap County.

The project includes complete

KCHA's space uses a third of the energy of the agency's previous offices.

PHOTO BY WILLIAM WRIGHT PHOTOGRAPHY

interior and exterior renovation of over 350 mid-1970s housing units and the repurposing of an ammunition bunker to become the new community center.

Rather than let the bunker continue to be an eyesore, Forest City and Rice Fergus Miller adapted an existing ammunition bunker into a community center. These bunkers (only three remain on the site) are the last vestige of the site's war heritage. Instead of tearing them down, one was repurposed to recall history, reduce the carbon footprint of new construction, and take advantage of the construction to address Navy requirements for force protection.

The 5,000-square-foot bunker includes a multipurpose community room with a kitchen, fitness room with children's play area, leasing office and presentation space. This renovated bunker helps retain the military heritage of the area.

Strategically placed windows help bring in daylight while meeting the requirements for blast-resistant construction. The mechanical system, coupled with new insulation strategies, help drive the building's energy use down, resulting in greater efficiency.

This bunker-turned-community center anchors a redeveloped low-income naval housing community and brings a sense of place and identity it previously lacked.

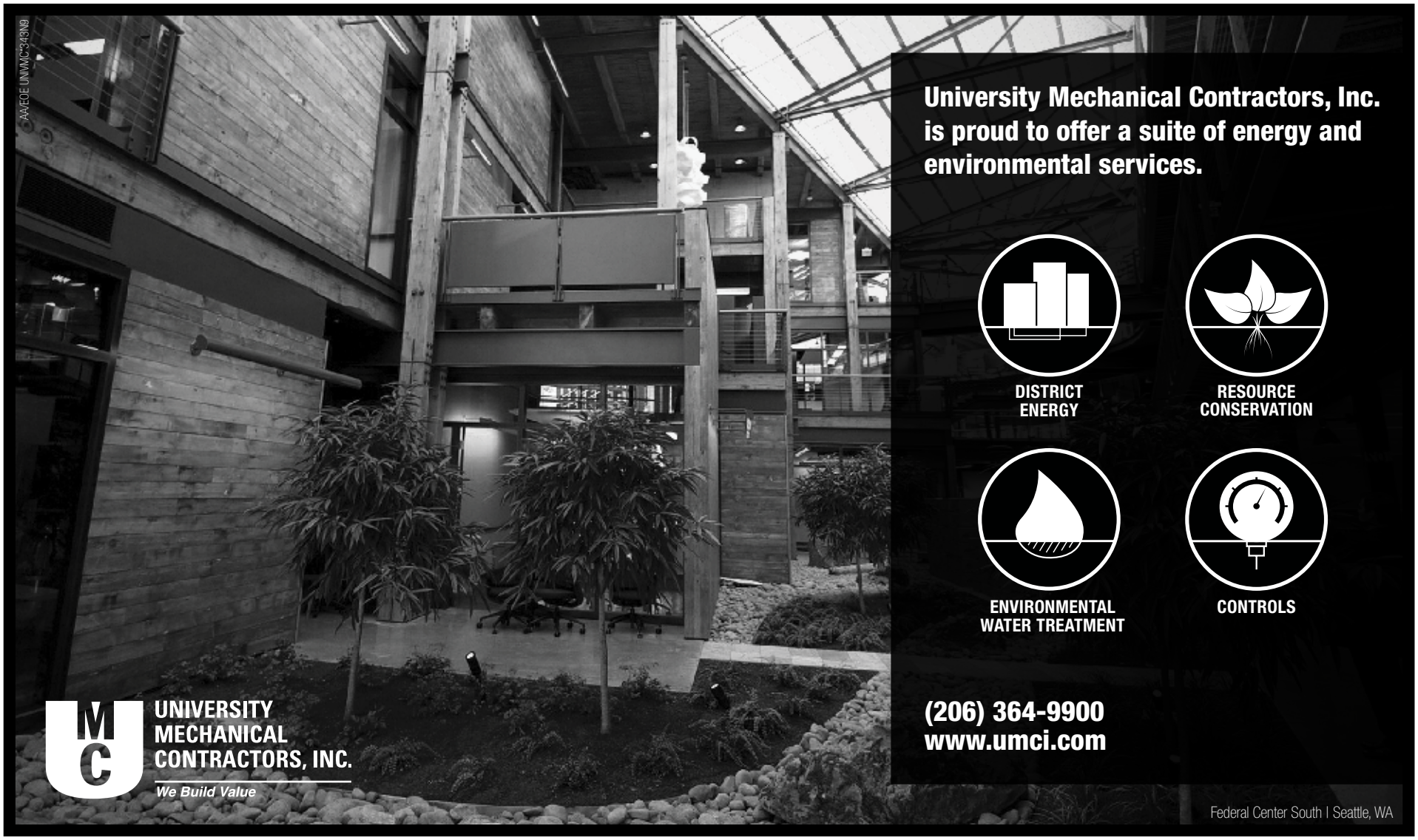
These adaptive reuse buildings are comfortable, designed to last, and use materials and energy as efficiently as possible. Reuse is one way we can do the right thing for our community, our clients and our employees.

Greg Belding is an architect and principal at Rice Fergus Miller, where he focuses on high performing, energy-efficient projects. Elin Headrick is an associate and marketing director at Rice Fergus Miller.

This Kitsap County naval bunker will become a community center.

IMAGES COURTESY OF RICE FERGUS MILLER

This U.S. Forest Service warehouse will receive new siding, insulation and flashing.



‘PASSIVE HOUSE’ DESIGN CAN MAKE HOUSING MORE AFFORDABLE

Pennsylvania and other states are seizing on super-efficient housing as a way to cut operating costs and build healthier homes for families in need.

As Seattle gets ready to deliver 20,000 units of new affordable housing, we should ask if it can deliver the kind of high-quality, energy-efficient and low-maintenance housing that everyone deserves.

Most of the new affordable housing in Seattle will be underwritten with both state Low Income Housing Tax Credits (LIHTC) and the soon-to-be-implemented city of Seattle linkage fees.

BY TIM WEYAND
NICHOLSON KOVALCHICK ARCHITECTS

These funding agencies, being strong proponents of social justice, should take note of recent successful affordable housing projects in Pennsylvania, which have been able to provide high-quality, healthy housing within state affordable-housing budgets.

Three years ago, Pennsylvania wanted to find a way to improve energy efficiency and construction quality in state-funded affordable housing projects, and landed on the “passive house” standard as the mechanism for achieving their desired gains.

Passive house refers to a voluntary standard of building design that reduces energy used for heating and cooling by up to 90 percent over code-minimum buildings. The passive house design methods of air-and-weather barriers, superinsulation and heat-recovery ventilation also create very healthy indoor air environments and reduce risk of rot and mold in buildings.

A year later the Pennsylvania Housing Finance Agency implemented an incentive program that included passive house energy benchmarks in its LIHTC application scoring. Their belief was that competition for state funds from nonprofit affordable housing developers would drive lower-energy, higher-quality projects.

In the first year, 20 percent of all awarded affordable housing projects in Pennsylvania were built to the passive house standard, which will result in 422 new high-performance affordable housing units. In the 2015 funding cycle, almost half of all proposed projects chose to pursue the standard.

Other states with affordable housing funding agencies have taken note, and currently nine other states, including New York, New Jersey, Ohio, Rhode Island, Massachusetts, Illinois, Connecticut, New Hampshire and Idaho, have included the passive house standard as an incentive in their own affordable housing funding selection criteria.

A 40-unit affordable passive house complex planned for Erie, Pennsylvania.

IMAGES COURTESY OF NICHOLSON KOVALCHICK ARCHITECTS

This affordable passive house project in Philadelphia received funding from a nonprofit agency.

“Future-proofed” housing

Affordable housing developments are well suited to being high-performance passive house buildings for many reasons.

The first reason is that passive house buildings are much more efficient to heat and cool than conventional buildings, which lowers operating costs. Lower operating costs are very important for affordable-housing operators because rents are lower than market rate average, and they must keep operating costs in check to remain viable.

In fact, because electricity costs are rising faster than rents in many areas throughout the U.S., passive house buildings confer additional long-term financial viability to multifamily housing assets, often referred to as “future-proofing.”

The second reason that affordable housing developments are well suited to being passive house is that maintenance costs are lower. This derives from the air- and weather-tight exterior walls and roof, which prevent water intrusion as well as in-wall vapor condensation, eliminating the chances for rot and mold. Longer exterior system replacement schedules translates into lower reserve funds, and therefore lower operational costs.

Third, passive house interior spaces are much healthier than conventional buildings, which is just as important for affordable housing residents as it is to any other individual or family.

We believe that everyone should have access to safe, healthy, affordable homes. Spaces are more comfortable because the passive house enclosure and HVAC system keeps thermal and humidity swings within the human comfort range, and because the heat-recovery ventilation system used in passive house buildings provides constant, HEPA-filtered fresh air.

Lastly, apartments are more peaceful because continuous exterior insulation and high-quality windows and doors keep outside noise and odors away.

Need for state incentives

In Seattle, multifamily affordable housing buildings use significantly more energy than their market-rate counterparts across building sizes, according to the Seattle Office of Sustainability & Environment.

This has often been attributed to lower unit sizes and denser populations in affordable housing facilities. However, in the case of mid-rise buildings, the affordable housing facilities are on average 28 percent more dense, yet use 42 percent more energy, which cannot be attributed to population habits alone.

If the passive house standard is incentivized at our state and local levels, it would be reasonable to expect — following Pennsylvania’s experience — that after four years, half of our new affordable housing stock would be performing at 18 EUI, or a full two-thirds less energy than was benchmarked in 2013.

We’ll need to build 8,000 units in four years’ time to stay on pace with the mayor’s housing challenge of 20,000 affordable units within 10 years. With a Pennsylvania-type passive house incentive system, at least half of the 8,000 units would be low-energy, low-operating cost, comfortable and healthy places to live for our community’s needy individuals and families.

The time is now to incentivize high-performance affordable housing in new construction, not later when we will have to go back and retrofit walls, roofs and foundations.

Seattle has long been seen as a progressive city when it comes to social and environmental justice. If we don’t adopt now what other states rightly see as a clearly progressive initiative to build quality affordable housing, then we will not even be able to call ourselves sensible followers, much less leaders, in the social and environmental justice movement.

Tim Weyand is CEO of Nicholson Kovalchick Architects.

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BALLARD FIRE STATION GOES FROM ENERGY HOG TO ENERGY HEAVEN

The 1970s building is 38 percent more efficient after a big renovation.

The project retained 95 percent of the original structure. New additions included glazing and insulation.

PHOTO BY BENJAMIN BENSCHNEIDER, COURTESY OF SHKS ARCHITECTS

The city of Seattle in 2011 began requiring new construction and major renovations over 5,000 square feet to meet LEED gold.

That same year, the city selected a design team to renovate the aging Fire Station 18 at 1521 N.W Market St. in Ballard. The station, originally built in 1974, is now the lead station for Battalion 4 serving northwest Seattle.

BY NELSON MARTELLE
SHKS ARCHITECTS

The project was initially limited to structural upgrades but expanded into a major renovation after a preliminary review found inefficient building systems approaching the ends of their serviceable lives, envelope components in need of replacement, and crew facilities that no longer met the operational demands of the fire department. With the increased scope, the renovation of Fire Station 18 sought to answer the question, "How lean could this 1970s-era energy hog become?"

Understanding the embodied energy value of existing buildings, the team embraced the existing site constraints, systems and assemblies. An integrated approach including the entire design team, owner and firefighters developed strategies to meet the functional, performance and operational challenges of the project. Two sustainable strategies emerged:

- **Reuse:** Make the most of the embodied energy already on site by retaining as much of the existing building as possible.
- **Reduce:** Use less new energy by installing high-efficiency building systems and minimizing energy loss through envelope.

These two strategies resulted in a renovated Fire Station 18 designed to operate at an Energy Use Intensity (energy used per

"There's no more sustainable a building than a durable one."
Michael Aoki-Kramer, LEED™ AP
Managing Principal
RDH Building Science Inc.

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Creating sustainable communities for the future, one project at a time.

Photography credits to Benjamin Benschneider and Mike Walmsley

COUGHLINPORTERLUNDEEN
STRUCTURAL CIVIL SEISMIC ENGINEERING

Fire Station 18

Owner:
City of Seattle

Architect:
SHKS Architects

General contractor:
Faber Construction

Mechanical/electrical engineer:
WSP Parsons Brinckerhoff

Structural engineer:
Swenson Say Faget

Civil engineer:
LPD Engineering

Specification writer:
Cite Specific

Landscape architect:
Site Workshop

square foot of building) of 51 kilo-British thermal units per square foot annually — 40 percent below the average of Seattle neighborhood fire stations.

Reuse

To optimize the existing building, the design team analyzed its limitations and advantages.

The existing building's primary structure consists of parallel masonry bearing walls running north-south, supporting floor and roof assemblies of glu-lam beams, wood decking, and concrete topping slabs or precast hollow-core concrete planks with concrete topping slabs.

While structural analysis showed the building required substantial intervention to achieve the required seismic performance level of "immediate occupancy," the basic structure of the building had several desirable qualities.

First, the primary structure was clearly distinguished from space-defining partitions, allowing for easy identification and reconfiguration of the nonstructural partitions to accommodate the fire department's changing programmatic needs. Further, the primary structure is composed of durable materials capable of standing up to the wear of an all-hours facility. So in spite of 40 years of service, it remained in relatively good repair.

Lastly, existing glu-lam beams and decking met the dimensional requirements of heavy timber construction, meaning the assemblies had some fire resistance rating.

Given these qualities, the decision to retain as much primary structure as possible was made early in the design process. In total, over 95 percent of the primary structure of the existing building was reused.

Reduce

The first step in designing the building to consume less energy was to establish a baseline performance.

Working with an existing building provided two points of comparison. The station had a pre-project EUI of 82.3 in 2014.

For the second step, our team created an energy model showing the performance of a hypothetical version of the fire station constructed to the current requirements of the Seattle Commercial Energy Code. This model performed significantly better than the existing station — an EUI of 54.6.

Using the energy model to test the impact of specific design options, the team worked to improve performance beyond code requirements. Taking into account the unique operational requirements of the station, this analysis allowed the team to make strategic interventions to selected envelope components to yield the best building performance within the project budget.

In the end, a combination of increased roof insulation, replacement of leaky and poorly performing glazing, and selective insulation of existing exterior masonry walls provided the best results.

Another critical part in reducing energy consumption was to upgrade building systems. A large part of the improved building efficiency is due to the replacement of the existing gas-fired boiler used for heating and the window AC units used for cooling.

They were replaced with a high-efficiency, variable-refrigerant flow air-source heat pump. Individual fan coils in each of 17 building zones allow for simultaneous heating and cooling and greater control of thermal comfort. The ventilation system features heat recovery allowing up to 72 percent of waste heat in the exhaust air stream to be recaptured to preheat outside air.

Plumbing system upgrades included high-efficiency, gas-fired water heaters and low-flow fixtures throughout the station. Electrical and lighting systems improvements included the nearly exclusive use of LED fixtures, vacancy sensors and automatic daylight zonings.

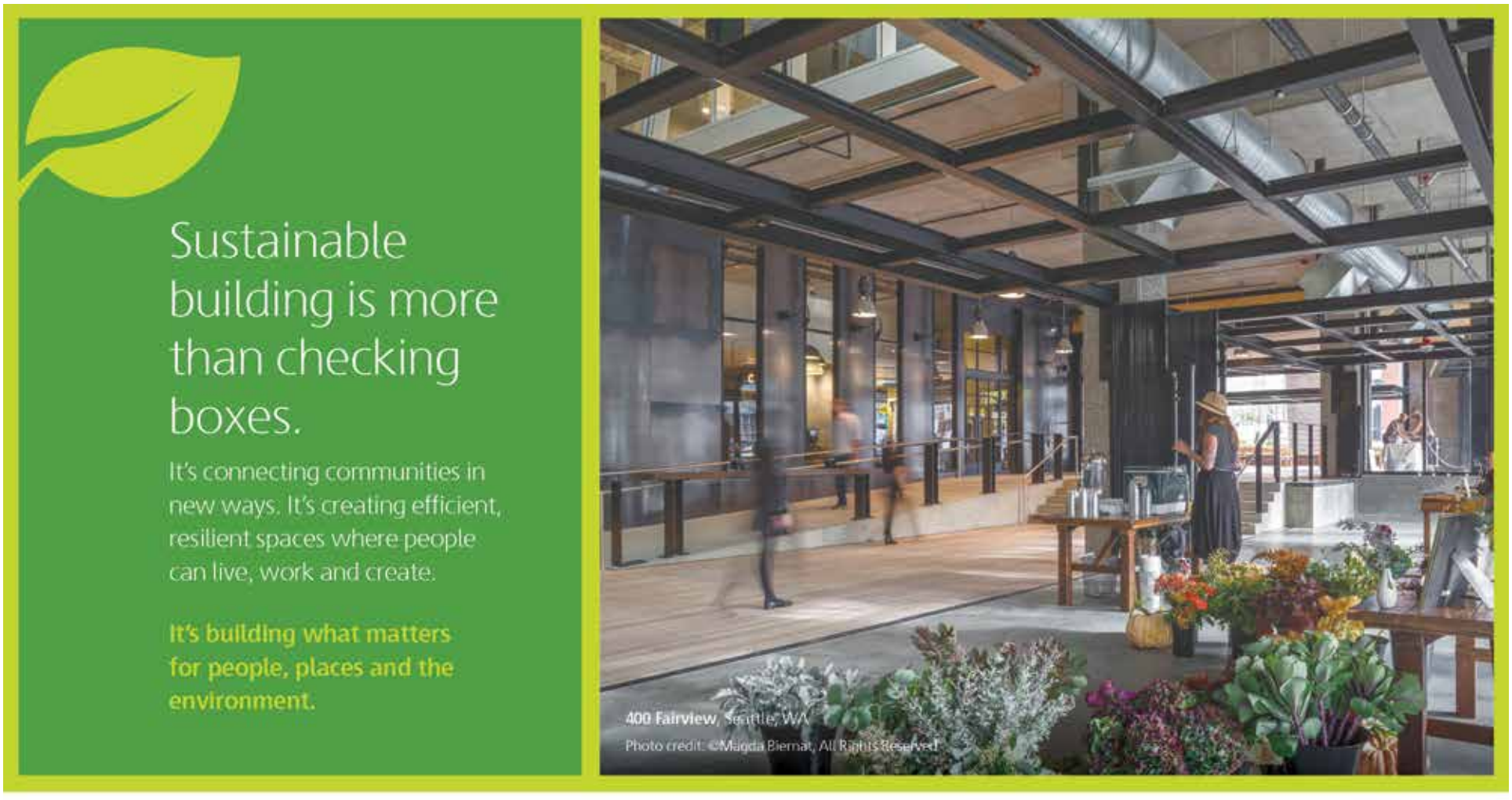
The net result for the renovated station is an EUI of 51.0. This represents a 6.6 percent improvement over prescriptive code performance, a 37.8 percent improvement over the existing station, and a 40.7 percent improvement over the 2014 city average for neighborhood fire stations.

The improved efficiency combined with the retention of the embodied energy of the existing station demonstrated the effect that conventional sustainable strategies can have when rigorously applied to existing buildings.

Nelson Martelle is an associate at SHKS Architects, where he concentrates on complex renovations of existing buildings.

Fire Station 18 before the renovation.

PHOTO COURTESY OF SHKS ARCHITECTS



SOUTH LAKE UNION'S 'SWALE ON YALE' IS GETTING SET TO GROW

The stormwater system will treat over 190 million gallons of runoff a year when it's completed in 2018.

BY DAVID SCHWARTZ
KPFF CONSULTING ENGINEERS

JASON SHARPLEY
SEATTLE PUBLIC UTILITIES

BRANDON MORGAN
VULCAN REAL ESTATE

The "swale on Yale" gathers and cleans stormwater runoff from Capitol Hill before it enters Lake Union.

This voluntary retrofit of a storm system in a dense urban setting is the first of its kind in the United States.

The swales — there are two, actually — were a collaboration between Vulcan and Seattle Public Utilities. KPFF Consulting Engineers completed the civil design, and KPG was responsible for the landscape, urban design and interpretive signage.

The swales were built adjacent to the Stack House and Supply Laundry mixed-use complex in South Lake Union. They run along Yale and Pontius avenues between Harrison and Republican streets.

The first two swales went online in 2015. A second set of two will be built concurrently with a new Vulcan development a block to the south. The project is anticipated to finish in 2018.

The swales provide water-quality enhancement for a previously untreated, 435-acre sub-catchment of urban runoff from the 630-acre Capitol Hill area. Stormwater runoff from the streets of upper Capitol Hill transport silts, oils, heavy metals and other pollutants from the streets to the stormwater collection system and into Lake Union.

The swales are significantly improving the water quality by removing a large portion of sediments and other pollutants, improving the long-term environmental health of the lake.

This project will treat over 190 million gallons of stormwater runoff annually once it's completed.

How the system works

The swales were designed to divert low flows out of the current storm drainage system into the treatment system, which includes a "swirl separator" and the swales. The swirl separator removes large sediments and "floatables."

The project starts with a flow-diversion structure that backs stormwater up using a weir to divert water towards the treatment system. Higher flows during storm events will overflow the weir and continue down the existing 72-inch piped conveyance system. The diverted lower flows pass through the swirl separator prior to continuing to the swales.

Flow-splitting devices are used to divide the flows from the swirl separator into the four individual swales (including two that are yet to be built). Each of the flow-splitting structures has an emergency overflow to prevent excessive amounts of water from flowing into the swale and to allow for system maintenance.

The peak flow that the swales are initially intended to treat is roughly 3,240 gallons per minute. The swales vary in width and length. The flow splitters are designed to divide the water so that each swale slows the water, retaining it for a minimum of nine minutes.

The swales are designed so that the water entering the swale wells up out of a trench drain to ensure that the flows are spread across the width of the swales. There are also interim weirs to make sure the flows stay spread across the entire width and do not create short circuits.

The weirs also allow the swales to maintain a slope that will keep flow velocities low. Sedges and rushes are densely planted in the swales in order to have a thick area of vegetation to slow and filter the water.

Water quantity and quality monitoring was installed at the upstream and downstream ends of the swale, on Yale between Harrison and Republican, to monitor the water quantity treated and water quality improvements.

The swales were designed as a flow-through system and incorporated rain garden soils and an under drain to allow infiltration to occur and enhance the water treatment capacity of the system.

Public-private partnership

The project was developed and funded as a public-private partnership between Seattle Public Utilities and Vulcan Real Estate. This partnership was critical to the success of the overall project.

Vulcan has provided technical and professional services and will fund approximately $1.3 million of the design and construction costs and provide an easement to the city along the front of their development.

The easement provided sufficient space to construct the swales and still have adequate pedestrian walkways. Without Vulcan's contribution and its support of the project's mission, the swales would not have been possible.

The planted swales are designed to remove sediments and other pollutants. A second phase is in design.

PHOTO BY MICHAEL WALMSLEY, COURTESY OF VULCAN REAL ESTATE

An educational sign explains how rainwater flows into Puget Sound.

PHOTO COURTESY OF KPFF CONSULTING ENGINEERS

What's next

The first phase of the project is complete, and the second phase is under design, with an estimated design completion date of fall 2016.

Seattle Public Utilities completed the diversion structure, swirl separator, conveyance piping and flow splitters under a city contract.

The revised design for the second phase includes planting the plants "bare-root." One of the lessons learned from previous planting is that obtaining the plants as bare-root stock is the best way to ensure adequate plant availability. The plantings will be done at similar spacing.

Another design adjustment will be to raise the inflow grate to allow for free flow into the swales, without the grate impeding the flow. Because the swales are performing so well, Seattle Public Utilities is considering increasing the flow to each swale by 30 percent, providing for treatment of roughly 4,200 gallons per minute at peak flow.

David Schwartz is a principal at KPFF Consulting Engineers. Brandon Morgan is a senior development manager at Vulcan Real Estate, and Jason Sharpley is a project manager at Seattle Public Utilities.

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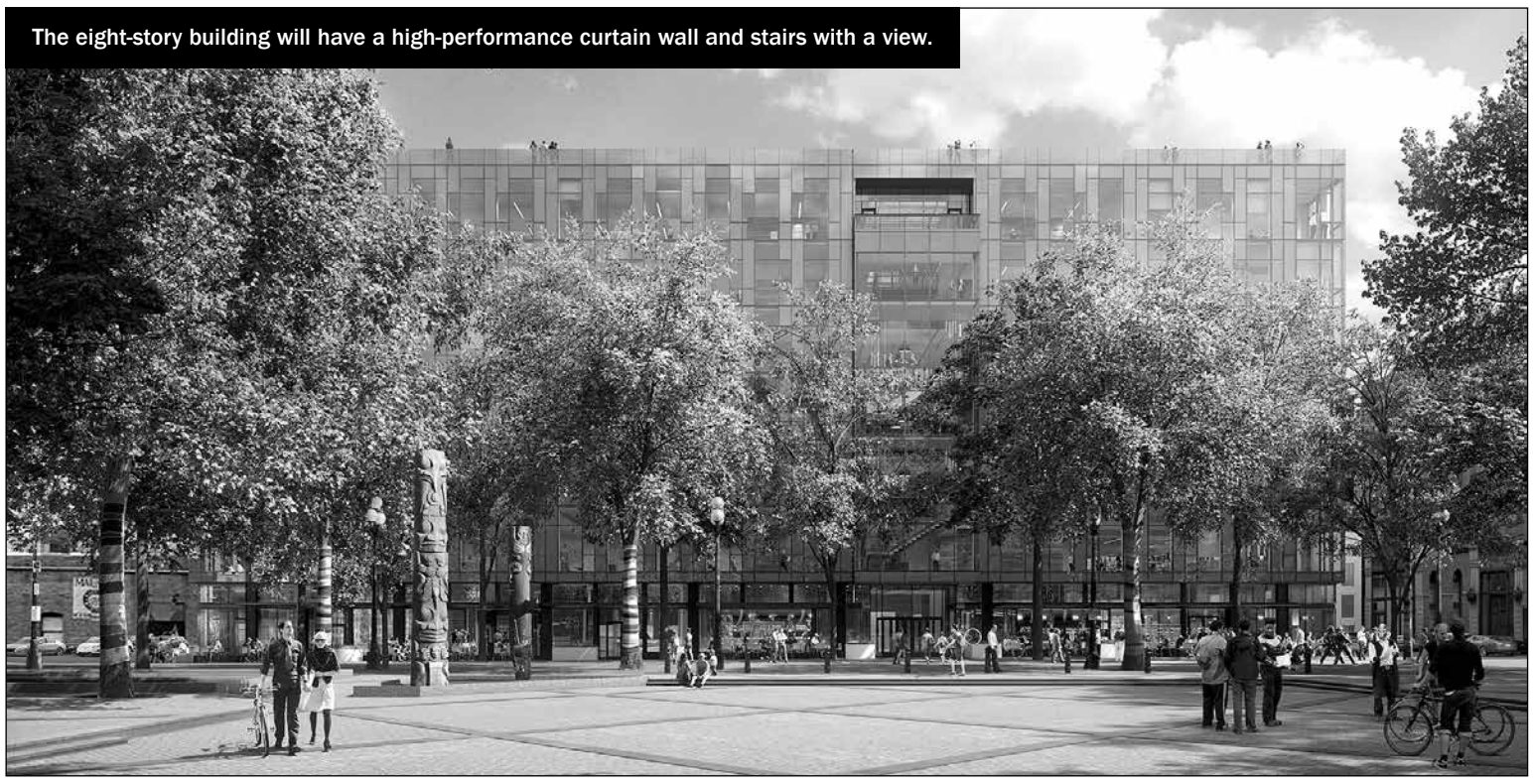
WEYERHAEUSER'S NEW HEADQUARTERS WILL SHOW OFF ITS WOOD PRODUCTS

The interiors will be furnished with renewable, local lumber.

BY BILL LAPATRA & LANA LISITSA
MITHUN



The eight-story building will have a high-performance curtain wall and stairs with a view.

IMAGE BY MIR

There is nothing ordinary about the origins of 200 Occidental.

Urban Visions, a developer with deep roots in Pioneer Square, conceived the project with an equal focus on sustainability and the bottom line. With a fantastic location flanking Seattle's historic Occidental Park, the structure would be the missing piece completing the park's ring of graceful buildings.

It was envisioned to last a hundred years, to fit within its historic context yet to be true to its times, and to lead by example in the renewal of the Pioneer Square neighborhood.

With these aspirations, 200 Occidental came to fruition when Weyerhaeuser chose to lease this building for its new world headquarters.

The 213,000-square-foot structure is quickly taking shape now that its frame is completed. It's being clad in glass and brick, and large parts of the frame will remain visible through an expansive curtain wall facing the park.

Instead of the nine floors that could fit within the allowed building height, Urban Visions chose to build eight floors with higher ceilings. As a result, the building will be filled with daylight that will shine deep into the space, energizing the people inside and reducing the need for artificial lighting.

A healthy environment

Mithun's design for 200 Occidental includes operable windows. Its team of architects and interior designers were especially enthusiastic about this strategy, as the firm is located in a building that relies on natural ventilation for cooling.

Independent studies show people are perfectly willing to accept a wider indoor temperature range — to wear short sleeves or to put on a sweater — if they feel in control of their environment.

Weyerhaeuser embraced the proposal for operable windows, and the design team worked collaboratively to find a holistic solution. Realizing that operable windows needed to function hand-in-hand with the mechanical system, the design team proposed an email notification system that will alert the building occupants about the need to open or close the windows before the perimeter zone of the HVAC system shuts down or turns on.

"Communicating stairs," located in the bay window area projecting over the main building entry, are a prominent feature in Weyerhaeuser's new headquarters. This active design strategy entices people to take the stairs and enjoy the best view in the house. Additionally, movement of people through the stairs creates visual connection between the building and the park.

Other important features that contribute to a healthy work environment include no- or low-VOC interior finish materials, as well as ample bike parking and showers.

Certifiably green

It is not unusual for project teams to set ambitious goals in the beginning only to see them fade as the reality of budgets and other constraints sets in.

Thanks to the entire team's commitment to sustainability, 200 Occidental became a case

WEYERHAEUSER — PAGE 15

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WHAT IS EMBODIED CARBON AND WHY SHOULD WE CARE?

Building materials and construction activity are major sources of carbon emissions. We need to reduce their impact.

During last month's BuildWell conference in San Francisco, I dined with the leading thinkers, researchers, engineers and designers tackling the issue of carbon in the built environment. We had a lively and serious conversation.

BY STACY SMEDLEY
SKANSKA USA

We talked first about what getting to zero carbon in the built environment truly entails. It became clear that there has been a keen focus on reducing carbon emissions in our buildings through increased energy efficiency, leading to less operational carbon over the course of a building's life.

There are benchmarks in place, like those defined by the 2030 Challenge, to help us understand where to start and what to track, and certification systems that allow us to feel the accolades of achieving these operational efficiencies.

Technologies are being developed to help us get to closer to net-zero energy. We can now say "net-zero energy" and get nods and affirmations instead of raised eyebrows, which I personally experienced only a handful of years ago.

Embodied energy and embodied carbon emissions are a different story. It's one that is still in its Wild West phase, with people shooting from the hip in terms of what to assess and how to assess it, and creating their own company- and market-sector-specific benchmarks, sometimes based on arbitrary choices of data source and tracking methodology.

Defining embodied carbon

Perhaps I should step back and make sure we all understand what embodied carbon truly is: Embodied carbon includes the carbon dioxide emitted from the extraction of raw materials through the final manufacture of a product.

A building's embodied carbon encompasses the embodied carbon of all its materials, as well as carbon emissions from transportation of those materials to the building site.

In Skanska's efforts to track and understand our buildings' embodied carbon, we also aim to include emissions from construction activity such as equipment use, transportation of workers to and from the jobsite, and land disturbance in construction.

Where things stand

While we are currently capable of benchmarking operational energy consumption, employing sustainable strategies in design and tracking savings during operation, we do not have a benchmark for embodied carbon.

We don't have standard practices and resources for incorporating embodied carbon reduction strategies into our design process, and we aren't aligned on what should and shouldn't be included in embodied carbon calculations when it comes to building construction.

Because we are in the business of constructing buildings, Skanska understands the role materials procurement and construction practices play in a building's holistic carbon story.

In Seattle, Boston, Houston and Washington, D.C. — markets where Skanska is the owner/developer/builder — we have developed our own construction tool and format for tracking the embodied carbon of our commercial development projects. This has helped us understand what our averages are, set our own benchmarks, and work to reduce embodied carbon emissions in our buildings based on what we are learning.

A few others in the design, construction and research sectors are also committed to this — each of us using our own methods and resources to try to determine what are the materials and construction heavy hitters.

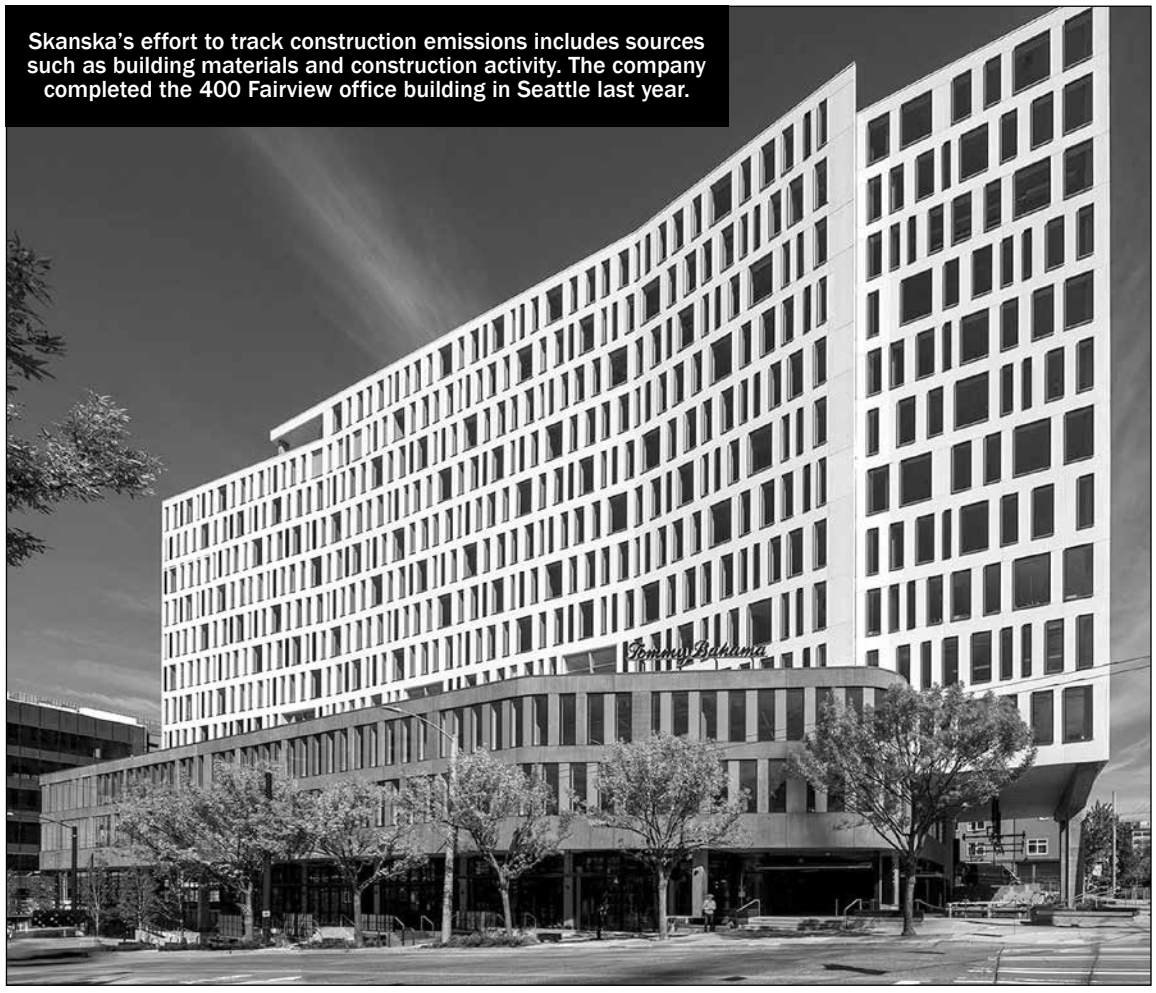
The good news is that when we compare our embodied carbon calculations to the work done by others, the results are similar. Independent organizations are coming to the same conclusions about the highest-impact materials and processes, helping determine where we should initially focus our efforts when targeting significant embodied carbon reductions in our buildings.

Next steps

There comes a point when actions speak louder than words or data.

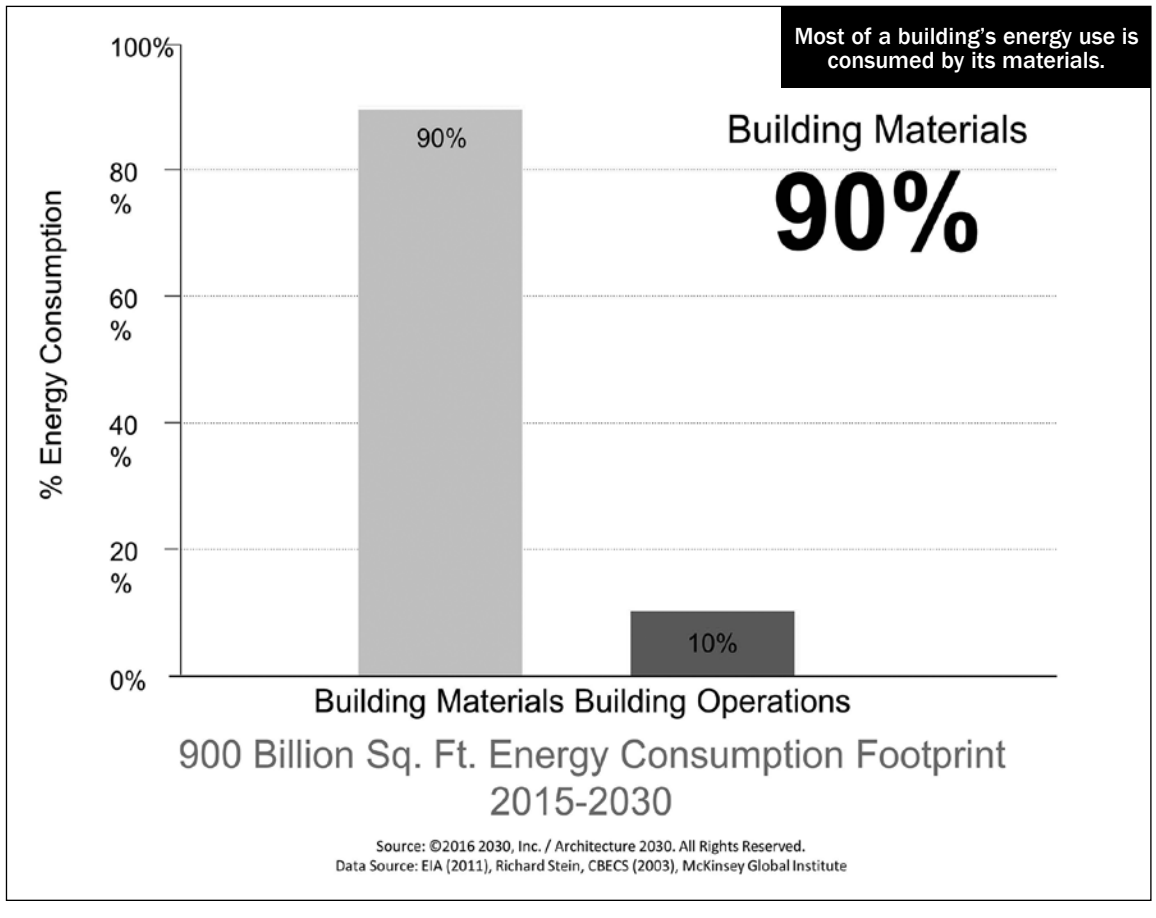
We are at that point with embodied carbon — there is enough data to arrive at reasonable conclusions, and enough of a critical mass acknowledging the timely need for embodied

EMBODIED CARBON — PAGE 15



Skanska's effort to track construction emissions includes sources such as building materials and construction activity. The company completed the 400 Fairview office building in Seattle last year.

PHOTO BY MAGDA BIERNAT



Most of a building's energy use is consumed by its materials.

SOURCE: 2030, INC./ARCHITECTURE 2030

HOW SHARING SIT-STAND DESKS WILL HELP ANTIOCH BE SMALLER AND GREENER

It's one of the ways the school will save space and use less furniture in its new home.

BY MEAGHAN BEEVER & KATHRYN MOORE
GENSLER

Building green. This term brings to mind many traditional strategies of sustainable design — LED lighting, low-VOC, FSC, to name a few.

As designers, we look beyond these traditional strategies and include related and equally important, but different, areas of performance. Our client's goals provide the strong foundation for this design strategy. We ask ourselves: How can we make these spaces perform, provide a positive impact and add value?

To help answer these questions we have identified three lenses that define our approach: environmental, social and economic. Environmental refers to a traditional approach to sustainability; social refers to employee health, wellness and equality; and economic refers to real estate, risk management and cost reduction.

With this intention set at the project's conception, we are able to achieve high levels of performance each and every step of the way.

One project that exemplifies how this approach works is Antioch University. Antioch has a national footprint with campuses located across the country. In 2014, we were enlisted to help re-envision their Seattle campus.

Antioch's community-centric mission focused on social responsibility and a pedagogical approach that emphasizes applying what is learned in the classroom to the common good, made them an ideal partner in pushing for a holistic approach to design performance.

Antioch is relocating from a 65,000-square-foot, mid-century building in Seattle's Denny Triangle to a four-story building under construction at Third Avenue and Battery Street in Belltown. Antioch will take around 30,000 square feet in the multi-tenant building.

In rethinking their campus design, Antioch's priorities were to manage real estate cost, maintain a strong internal and external community connection, and better align their space with the Antioch brand and mission. Ultimately, Antioch was focused on attracting new students and inspiring their creative, service-driven students, faculty and staff.

To address these goals, our team employed strategies designed to improve and support the new campus's economic, social and environmental performance.

Using fewer resources

While traditional strategies of environmental design remain integral elements of the project's success, the client's environmental focus was to decrease resources.

Antioch's location in the center of Seattle's urban core was crucial. With an entirely commuter-based student population, the connection to multiple means of public transit and community amenities like pharmacies and day cares are critical to attracting new students and retaining existing students, faculty and staff.

During the site selection process, Antioch also prioritized access to the outdoors. With an exterior deck accessible to all on the third floor and a community roof deck for the building occupants to enjoy, Antioch's selected site provides a connection to nature.

The build out of their space also included many of the energy-efficiency savings that are resource driven. By providing the right quantity and type of spaces based on utilization, the reduced footprint allowed for reduction of water, electrical demands and HVAC needs compared with their current space. The new space will yield savings of approximately 20,000 kilo-British thermal units per person, according to data provided by the Seattle Office of Sustainability & Environment.

Additional lighting power density and MEP load reductions are anticipated through more efficient systems, cutting energy needs and lowering operating costs for Antioch.

Right-sized spaces

Managing real estate costs defined Antioch's economic strategy. Recognizing they were situated in an older, outdated building that was larger than their current need, Antioch engaged in a campus-wide study to identify inefficiencies in the way their current square footage was allocated.

Antioch plans to move into its Belltown space in early 2017. The building is under construction.

IMAGE COURTESY OF PERKINS + WILL AND GENSLER

During five days of careful observation of how spaces were being utilized across the campus, the study revealed an opportunity to reduce the current footprint significantly. In total, the new campus has roughly 50 percent space reduction, which required creative approaches to utilization planning, class scheduling and multipurpose spaces. In the new space, highly mobile faculty will be implementing a seat-sharing ratio of three people to every two desks — a strategy that not only reduces square

ANTIOCH — PAGE 15

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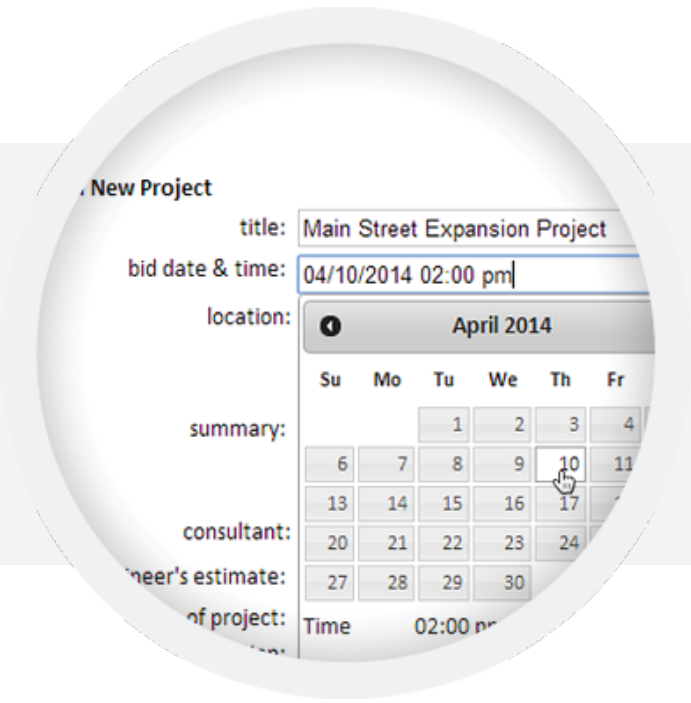

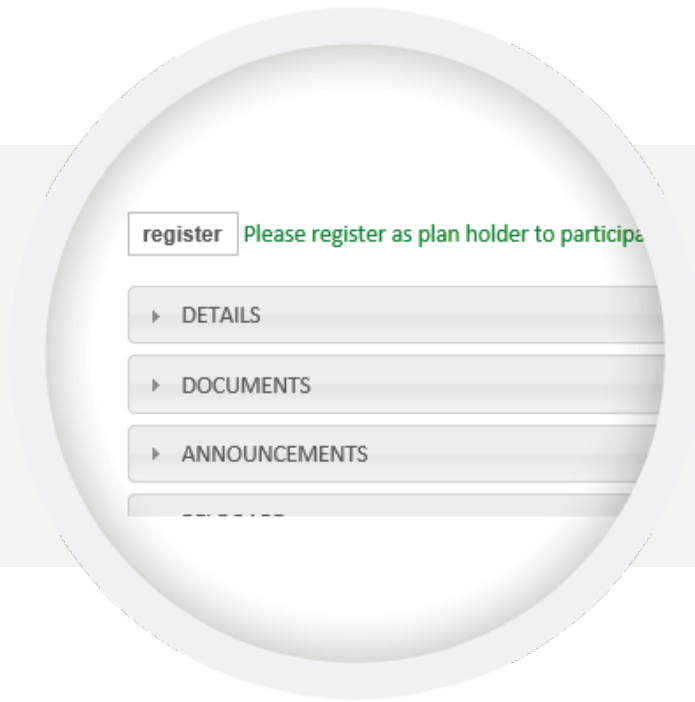

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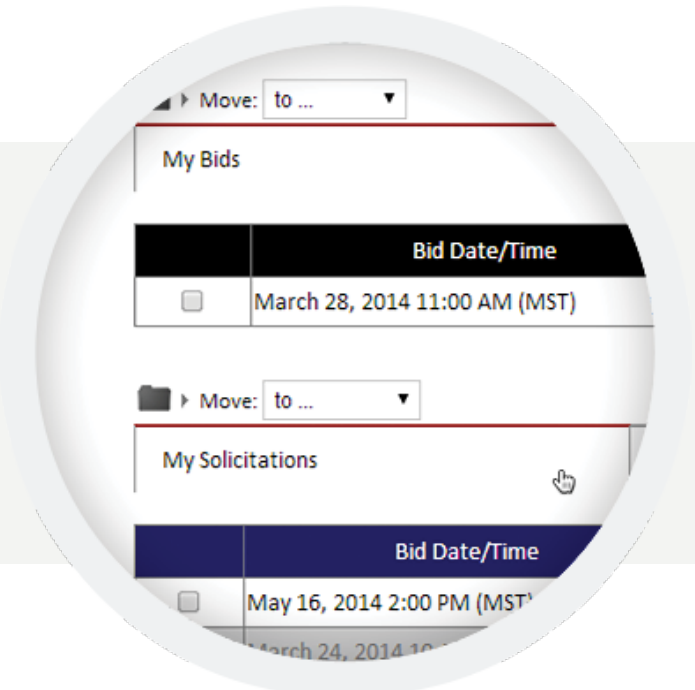

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ANTIOCH

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footage, but also minimizes the need for furniture and other raw materials.

In taking the time to understand how campus spaces were used, Antioch also uncovered an opportunity to right-size spaces like meeting rooms and classrooms to be more appropriate for the number of people that are actually using them.

A focus on community

The overarching social strategy was to strengthen the human connection. Antioch's focus on their community — faculty, staff, students and alumni — is at the heart of their organization. Its importance underlies every decision, making the social strategies integral to the success of this project.

Engagement with the campus community during pre-design focus groups indicated that appropriate acoustics for classroom and offices spaces would be a critical measure of success in the new space. Allowing for the right balance of background noise and the appropriate types of spaces for each level of privacy required provides the optimal environment for focusing and learning.

It is now a well-known fact that sitting poses health risks. To mitigate injury, and keep staff and faculty healthy and engaged, workstation ergonomics are being considered during the furniture selection process. The majority of desks will be equipped with a sit-stand feature encouraging occupants to stay active and change postures throughout their work day.

Inclusivity has always been a feature of Antioch's Seattle campus. This will continue on their new campus. All-gender facilities are available, universal design in conference rooms and classrooms allows those with hearing difficulties to participate without barriers, and veteran and women's outreach programs are also maintained. The focus on social strategies aligns with Antioch's principles and shows their commitment to a healthier and more effective environment.

Through strategic thinking and a balanced approach to design performance, we were able to align the client goals with performance goals to achieve a successful project that exceeded the client's expectations.

While much of what is described above doesn't fall into the industry's preconceived notion of building green, Antioch's story is a compelling one. Project case studies like these are showing clients what is possible above and beyond the traditional thinking, and hopefully we will start to see a shift in the market.

Educating clients about the social and economic benefits of building green in addition to the environmental benefits will up the ante for design thinking and continue to push the industry, all the while keeping Seattle on the forefront of the green movement.

Kathryn Moore is a technical designer and associate at Gensler, a global design and planning firm. Meaghan Beever is a consulting analyst and workplace strategist at Gensler.

WEYERHAEUSER

CONTINUED FROM PAGE 11

study in deep green design thinking, as it traded the initial goal of LEED gold certification for pursuing LEED platinum, the highest available level of LEED certification that the U.S. Green Building Council offers. In addition, Weyerhaeuser's new headquarters is targeting Green Globes certification.

Rooftop terraces

Many of the sustainable design features are the same qualities that will make this project attractive to its occupants.

The enclosed rooftop recreational space will offer meeting and informal gathering rooms with panoramic views of the city and Elliott Bay. Open areas of the main roof will include terraces and gardens for people to recharge or walk a few loops around the roof perimeter. The rooftop gardens, with a mix of meadow plants and sedums, will slow down the flow of stormwater, and the penthouse roof will support a sizable solar array.

The design team took a holistic approach and emphasized collaboration to optimize building performance within budget.

To a large degree, many of the rooftop features became possible thanks to reliance on a highly efficient, dedicated outside-air, variable refrigerant flow HVAC system that required little rooftop space in comparison with other alternatives.

High-performance glazing, effective insulation, and all-LED lighting contributed to the reduction of the HVAC system size by lowering peak cooling loads.

Showcase for wood

The sustainable benefits of wood will be evident throughout the tenant space. Wood will not only contribute natural beauty and warmth of the interiors, but also will tell the story of Weyerhaeuser's business and commitment to sustainable forestry.

Mithun embraced the client's desire to showcase its products and incorporated the company's lumber materials, oriented strand board and Parallam beams as flooring, wall and ceiling finish in key areas. Regionally sourced and renewable lumber will be featured in the core interior spaces and used in a number of furniture pieces throughout the design.

Relying on transit

Weyerhaeuser's new headquarters is centrally located in Seattle's oldest neighborhood and a short walk away from a multi-modal public transportation hub. With its reliance on transit, the project will include only one parking level and is anticipated to have minimal impact on road congestion, despite bringing more than 600 employees into the area. Weyerhaeuser is actively encouraging employees to find ways to commute that don't require driving alone.

There is a unique relationship between 200 Occidental and its surroundings. It is a study in contrasts between the old and the new, between the complex history of the neighborhood and the strong sense of optimism prompted by recent improvements, and reinforced by Weyerhaeuser's decision to relocate here.

The success of the project is grounded in shared vision and collaboration to produce a sustainable building that will be enjoyed by its inhabitants and passersby alike for many years to come.

Bill LaPatra is a partner and Lana Lisitsa is an associate principal at Seattle- and San Francisco-based Mithun, whose multidisciplinary approach seeks to unite human and natural systems within the built environment through planning, urban design, architecture, landscape architecture and interior design services.

DEVELOPERS

CONTINUED FROM PAGE 2

ing any available incentive, but those opportunities are limited.

Developers will do their best, but may fall short of the meeting the certification standards — an all-too-common occurrence in our industry, and another marker of the gap between the successes achieved and the data recorded and referenced.

We have recognized the core issue. We've developed the technologies and knowledge base to succeed. The final piece to make it reality are more incentive programs that help reduce first costs.

Jurisdictions need to recognize that buildings designed to meet these certifications provide long-term benefits to the community. Within these incentives, the economic sustainability of these buildings could be within reach.

Aaron Swain is an associate at Weber Thompson working in the mid-rise, multifamily design studio.

EMBODIED CARBON

CONTINUED FROM PAGE 12

carbon reductions in buildings. The next step is to set reasonable benchmarks and get to work.

Setting benchmarks for average embodied carbon, as found in a series of standard building types, would create a line in the sand for owners, designers and contractors to reference when looking at where and how to make impactful reductions.

Benchmarks would allow the development of design tools that enable project teams to assess the embodied carbon reduction impact of various site, material and construction operation decisions. This assessment would create a pathway to proactively measure and document progress toward zero carbon, and a platform for builders to tell a meaningful carbon reduction story.

Studies show that over the next 20 years, 900 billion square feet of new and rebuilt buildings will be constructed in cities worldwide. That equates to building an entire New York City every 47 days.

The counterbalance to this is the outcome of last year's Paris climate conference, where over 200 countries acknowledged that we must keep global temperature increase under 1.5 degrees Celsius or face dire climate-change consequences. To ensure our best chance of staying below this mark, we must create embodied carbon benchmarks and commit to reductions that lead to zero carbon emissions by 2050, and we must do it quickly.

The time to align around a comprehensive path to zero embodied carbon is now, and Skanska is committed to being a part of the necessary action.

Stacy Smedley is the director of sustainability at Skanska USA, where she provides strategic guidance across Skanska projects in the Seattle area and nationwide.

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