



DESIGN QUAR- TERLY

ISSUE 01

THE SUSTAINABLE CITY

How design can set the stage for healthy communities that use fewer resources.



DESIGN QUAR- TERLY

ISSUE 01

**THOUGHTS, TRENDS AND INNOVATION
FROM THE STANTEC BUILDINGS GROUP.**

The Stantec Design Quarterly tells stories that showcase thoughtful, forward-looking approaches to design that build community.

IN THIS ISSUE: THE SUSTAINABLE CITY

In this issue, we look at design ideas that put responsible consumption of resources at the forefront, and consider new dimensions of sustainability such as wellness, living small, autonomous vehicles, and small-scale agriculture. We explore emerging tools for achieving success. From Colorado to Boston to Waterloo, we seek opportunities to design communities that are happy, healthy, and easier on the planet.

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THE CITY IS YOUR LIVING ROOM

Compact urban dwellings promote
community and sustainability
BY AERON HODGES



Humans are flocking to cities. The United Nations projects that by 2050 more than 66% of the world's population will live in urban areas. North America, where sprawl flourished, is urbanizing, too. Most of the 20 largest cities in the U.S. continue to grow in population. In Boston, the population growth is driven by a continuing influx of single professionals, bringing with it an increase in racial and ethnic diversity. The housing markets in North American cities are challenged with luxury housing approaching saturation and few viable models of affordable housing.



WHAT DO WE MEAN WHEN WE SAY **COMPACT URBAN LIVING?** TYPICALLY, WE'RE TALKING ABOUT MICRO-APARTMENTS, WHICH ARE **STUDIOS LESS THAN 450 SF.**



Compact urban living has many advantages.

In cities like Boston, it presents an affordable option for young professionals or students, provides luxury without the upkeep for some urbanites and encourages behavior that supports community life. Compact living promotes social interaction, optimizes the urban housing mix, and counters age segregation. It celebrates the idea of the city as a dynamic place where one can access culture, services and community—without driving or even owning a car. Less talked about, however, but just as important is that compact living is a big step toward sustainable living.

What do we mean when we say compact urban living? Typically, we're talking about micro-apartments, which are studios less than 450 SF. In Stantec's design for the **Hearth House** compact living concept, we created a system of interlocking 250 SF studios for Boston. The compact 1 bedroom is less than 650 SF and 2 bedrooms top out at 850 SF. This type of housing is best suited for individuals who are willing to downsize so that they can live closer to urban cores, trading in some space and in-unit amenities for friendlier rents and mortgages.

Micro-units and compact living enable city dwellers to live a dynamic lifestyle within their means. Compact living enables access to life in the city with all its amenities. It's a good fit for those that see the city as their living room, entertainment space, gym and laundry room—and don't need a private version of all of the above in their dwelling.

But for those that desire it, luxury micro residences can feature more space devoted to upscale amenities, pools, gyms and social space—or laundry rooms.

Ideally, compact living optimizes the mix of singles, students and families in city.

Existing family housing in cities like Boston is often occupied by student roommates or young singles who can pool together higher rent than a single family. As a result, families who prefer urban living are priced out of cities. If we utilize empty lots in an existing urban community to build compact urban living units, and house our students and young professionals there, we will free up traditional housing. Micro apartments are a better fit for early career single professionals, allowing families to occupy the city's single-family homes.

So, how do micro-apartments benefit the environment and our wellness?

Compact living supports sustainability and wellness. The data backs this up.

Based on a study conducted by UC Berkley, the average carbon footprint of households living in the center of

large, population-dense urban cities is about 50 percent below average, while households in distant suburbs are up to twice the average. Compact living means relying more on public transit, cycling or walking to get around—as parking is not included. Living small in the city puts us closer to public transit and amenities vs. commuting from a suburb. The shorter distance the commute, the less driving we do, generally, and the less our daily carbon emissions. Compact living requires less climate control to maintain comfort (30K BTUs for a house vs. 7K BTUs to cool a micro-apartment). Smaller dwellings mean less material required for construction, and less construction waste per person.

Physical activity

The micro-apartment lifestyle means getting out of the home on foot more often for things like groceries, laundry or a work-out. This is important. Lack of physical activity contributes to numerous health problems, higher health costs and an estimated 200,000 annual deaths in the U.S. The U.S. Center for Disease Control recommends that adults

average at least 22 daily minutes of moderate physical activity, such as brisk walking, to stay fit and healthy. Among physically able adults, average annual medical expenditures are 32% lower for those who achieve physical activity targets (\$1,019 per year) than for those who are sedentary (\$1,349 per year). Cities with high walkability, bike-ability, public transit quality and nice parks such as Boston are best suited for those living compact to reap rewards in terms of wellness.

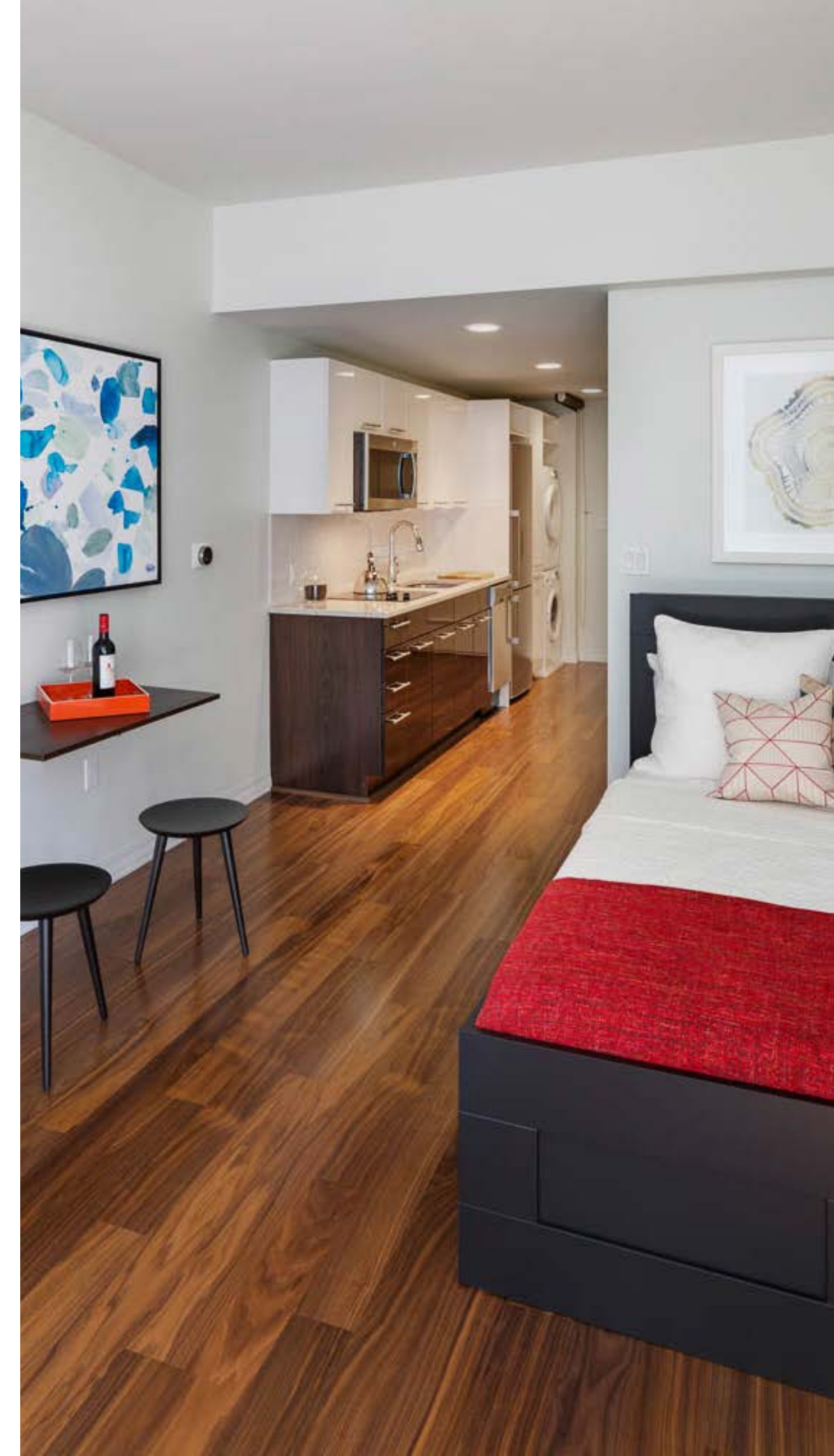
Life in the street

Compact living promotes interaction in the building, walkable communities and social interaction at the street level. Smaller units allow same number of units with additional spaces for social interaction, without adding more building area, which would increase cost. Social interaction through well-programed spaces are key to providing a strong sense of community, forging genuine connection beyond what one can achieve through social media. **D**

Associate Aeron Hodges, AIA believes that today's architects are shaping the future of cities. Read more about Aeron's work.



MORE
MULTI-FAMILY RESIDENTIAL



Working in a green building



The intangible benefits of spending the day in a sustainable office BY MERCEDES BYERS

How does it feel to walk into a green building in the morning and spend the day working there?

The case for building green commercial buildings once rested largely on doing good for the planet, but it's much more than altruism today. The business case for building green is increasingly robust, which is good news. But there's another piece to the sustainably designed building that merits a mention, its benefits to the occupant, employer and worker. If green commercial buildings can make us, their everyday users, live healthier, happier and more comfortable and engaged in our work and place of work, we're more likely to desire them, which gives employers a big incentive to locate in them.

It's true, Net Positive is smart business. Case in point, *evolv1*, a 110,000 SF, Class A office building, seeking LEED Platinum certification is been designed for today's tech-savvy workforce. This iconic building shows from both a fiscal and environmental perspective, that it is not only possible, but wise to invest in a Net Positive Energy (NPE) and Zero Carbon Building (ZCB) building design.



Indoors, the building features a high efficiency ventilation system in accordance with a strict indoor air quality policy, a two-story green wall to connect occupants with the natural environment, and an open-concept floorplate for continual adaptability and flexible work environments.



Imagined in partnership with Sustainable Waterloo Region (SWR) and Cora Group, evol1 is being constructed in accordance with the Canada Green Building Council's LEED for New Construction rating system and Zero Carbon Building Standard. A combination of features make this possible: a high-performance building envelope with triple glazing, a solar wall for preheated ventilation, a geo-exchange / VRF (variable refrigerant flow) HVAC system, LED lighting throughout and a living green wall featured in the atrium. The site hosts a combination of rooftop and carport photovoltaic systems in tandem with a geothermal open loop system to make the building a net positive energy and net zero carbon candidate.



Evolv1 demonstrates that a high-performance building can be market-driven and cost-effective, where design decisions are determined by competitive construction budgets with realistic paybacks on investments. Evolv1 serves as a signpost to a new trend in commercial building design.

While some may have a preference for working in a building designed to have a minimal impact on the environment, those who own and lease green commercial buildings want the numbers in their favor. Research shows that lease-up rates for green buildings tend to be higher than average, often up to 20 percent according to the USGBC. Studies of green buildings in San Diego have showed that vacancy rates are lower and rents are higher. In 2015, owners of green buildings reported that their ROI improved by 19.2% for existing green projects and 9.9% on average for new green buildings.

But working in a green building benefits occupants in a myriad of ways people may not even realize.

It's better for your health, your sleep and your thinking. Studies by Harvard University and SUNY Upstate Medical University find that occupants of high-performing green buildings show higher cognitive function scores, fewer sick-building symptoms and higher sleep quality scores than workers in high-performing buildings without green certification. Green certification, thermal conditions and lighting influenced worker perception of their space as well as their cognitive function. According to shrm.org, compared with those working in non-green-certified buildings, occupants of green-certified buildings averaged 26% higher cognitive function, 44% higher workplace decision-making and 38% higher focused activity levels, not to mention better sleep.

What other elements characterize a green building?

■ Non-toxic (non-Red List) materials

Green buildings are built without materials that are known as pollutants or bio-accumulators such as the materials on the Living Future organization's Red List.

■ High indoor air quality, natural ventilation and operable windows

Fresh air is good for you.

■ Access to outdoor views and natural light

Humans work and think better with views of the outdoors.

■ Flexible workspace

Places should support collaboration and adapt to a variety of technologies and work methods.

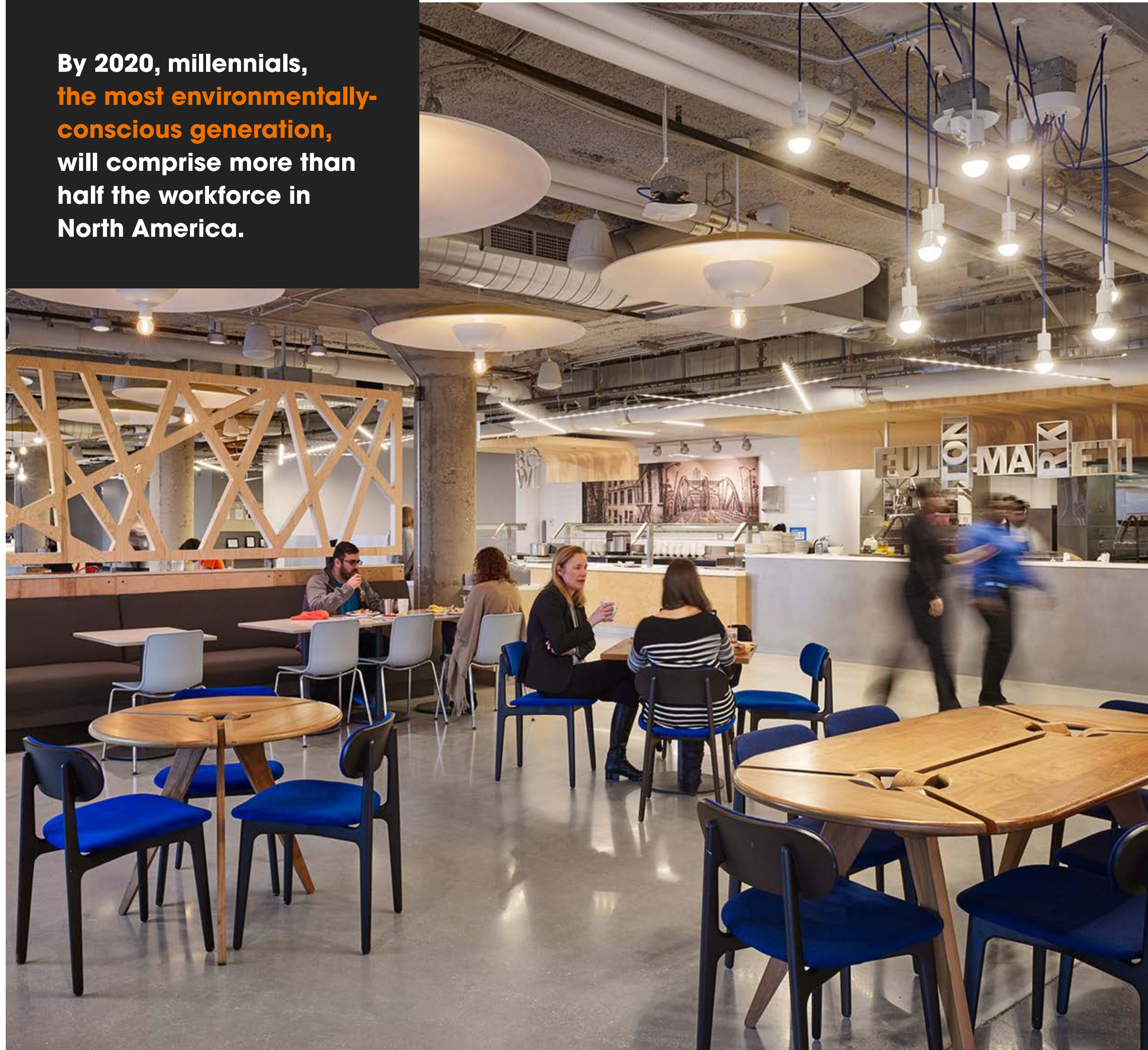
■ Access to transportation options

Give occupants options beyond the car—access to rapid transit, bicycle networks, and walking trails.

■ Nourish the mind and body

Offer easy access to healthy food along with social interaction space where occupants can enjoy a meal.

By 2020, millennials, the most environmentally-conscious generation, will comprise more than half the workforce in North America.



When you go work for a company, you'd do well to care about the building that you'll be working in. If you work in a sustainable building, chances are you won't mind spending time there, be happier while you're working, and stay with your company longer. Good companies know the value of providing a healthy workspace. A healthy building increases staff engagement as well as recruitment and retention.

The U.S. Green Building Council (USGBC) cites sustainability as one of the most effective ways to increase employee engagement. By 2020, millennials, the most environmentally conscious generation, will comprise more than half the workforce in North America. It is critical that employers recognize the needs of the upcoming workforce to attract and retain the best talent.

Research also shows that most people, not just millennials, want to work for a company with a strong green reputation. Companies that invest in green buildings will reap the benefits of using a healthy work environment in recruiting and productivity. Scholars have found that companies that adopt more rigorous environmental standards can expect an average of 16% higher labor productivity than non-green firms.

There are good reasons you will soon see elements of evol1 in the building you work in. From health and wellness, staff retention and productivity perspectives, working in a green building is a positive. In the not so distant future, companies will tout more than just their benefits and bonuses—they will include life-enhancing aspects of the buildings where we spend so much of our lives. **D**



MORE
SUSTAINABLE
BUILDING
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SOURCES

USGBC, The Business Case for Green Building
HARVARD, "The Impact of Green Buildings on Cognitive Function," Harvard University T.H. Chan School of Public Health's Center for Health and the Global Environment, SUNY Upstate Medical University and Syracuse University

Mercedes Byers is a sustainable building consultant in Toronto, Ontario. For more on Mercedes, visit Stantec.com.

A vibrant, futuristic city scene illustrating the integration of autonomous vehicles. In the foreground, a man in a patterned shirt and red pants rides a bicycle on a green-paved path. To his right, a large, white and teal autonomous vehicle labeled 'olli' is driving on a dark, textured road. In the background, a drone flies in the sky above modern buildings, including a prominent skyscraper. To the right, a group of people is gathered on a cobblestone plaza, and a small, white autonomous robot is visible in the lower right corner. The overall atmosphere is bright and optimistic, representing a vision of a driverless urban core.

Autonomous Vehicles Will Reshape Our Cities

A designer visualizes the driverless future of the urban core

BY GREG KRISTO

Each year, Stantec's Greenlight program provides funding for its designers and thinkers to do research and undertake idea-focused projects within the company. Greg Kristo's "Preparing cities for autonomous (self-driving) transportation" was one such Greenlight project. In exploring the possibilities for self-driving and the built environment in Chicago, Greg developed these concepts for a pedestrian-friendly streetscape of the future.

On Randolph St looking West: Extended pedestrian paths become the site for community leisure activities.



Why Study Autonomous Vehicles and The City

I have always had a deep interest in the design of cities and how people navigate them through different methods of transportation. One realized development that caught my attention during my undergraduate studies was Masdar City, which was designed to be a fully sustainable car-free city in Abu Dhabi. One of the main conceptual ideas was that people are the priority, not cars. I think autonomous vehicles open the opportunity to enforce the design of cities around the person rather than the car, and that is truly the way it should be.



—
On Randolph Street looking East:
Extended green space will offer space
for parks and events.

Why Architects and Planners are Curious About Self-Driving Cars

There is nothing that will be as disruptive to our urban fabric as autonomous vehicles. It will impact cities as much as the invention of the car did and lend us the opportunity to reclaim real estate once wasted by parking.

These Vehicles Will Talk To The Built Environment

Once we reach level 5 autonomy (no steering wheel), the features of autonomous vehicles are limitless. Connectivity to other vehicles and infrastructure will be standard features. As designers we ought to think about

the user experience while in transit. Consumers say, if they didn't drive, they would like to do everything from making calls to exercising while commuting.

Autonomous vehicles can potentially help us in our quest to design more pedestrian-friendly cities. They could be synched with our current means of public transit for better transfer opportunities.

Signs of Change

We are already seeing the impact of ride-sharing services in Chicago where some hotels have noted

a significant drop in parking lot usage. Instead of wasting that space, hotels and other large venues can think ahead and design the structure to properly accommodate a future use.

These changes are happening now throughout the world at varying scales and implementations. It is a matter of legislation catching up to the speed of technological advancement. I can envision the possibility of calling for a driverless ride-sharing service from anywhere in the US by the end of this decade. I would anticipate mass adoption where autonomous vehicles are the dominant transit norm by the mid to late 2020s.

Why Use Chicago and This Street as Your Example?

Chicago has a very large suburban commuting population which makes it a very interesting what-if scenario. This portion of Randolph St. is in the West Loop, one of Chicago's booming neighborhoods. Imagine all the surface area that is claimed by the streetscape for parking on Randolph developed into a more pedestrian-friendly area that allows for better usage throughout the day.

Points of Transformation

Large scale buildings like stadiums, entertainment venues, hospitals, universities, hotels, and shopping areas will have the opportunity to redevelop land that is currently allotted for parking. Residential buildings will do away with parking podiums we often see in downtown areas. Parking will become denser and require a smaller footprint as autonomous vehicles will not need to allow for exiting passengers and can therefore park closer to one another. Drop-off / pick-up areas will become crucial points of interest as they will be pivotal to the integration of smart mobility. Ultimately, real estate in the urban core will be completely transformed. ▣

Greg Kristo, Assoc. AIA a team lead in Chicago, participates in the Design Culture group in his office as well as Stantec's Smart Mobility Group—thought leaders researching the future of autonomous vehicles.



MORE STANTEC'S RESEARCH ON AUTONOMOUS VEHICLES AND THE BUILT ENVIRONMENT



Where's my *trashcan?*

Five inexpensive and effective ways to promote **wellness in the workplace** from mild to wild.

BY ANGIE LEE





We are bombarded by passionate opinions on living healthy and working happy these days. What's surprising is that we often fail to see how wellness and the workplace can work hand in hand to make for better, more satisfying, and productive work lives. Today, as we see 'work anywhere' and the option for mobile working expanding, it's important for organizations to look at ways from a wellness perspective, beyond having access to a fitness center or subsidies to your local health club, to make the office as attractive as possible and

further incentivize employees to come into the office. Encouraging face-to-face time and the social aspect of an organizational culture is crucial in support of staff engagement and organizational success.

So, why not start with some basics? I've collected five approaches (some design-related, some related to workplace culture) that can be applied at the office, often without a significant expense, that give your team members a chance to work healthier 9-to-5 right now.

1 — Make 'em move.

A little inconvenience burns calories. **Organize the office so that staff must get up and walk to get through the day.** By centrally located printers and copiers, we can ensure copying and printing tasks necessitate a trip. The same goes for coffee and the pantry, which we transform into the centralized cafes or coffee bars that are so popular now in office environments. Bonus? You've just created social hubs where your people can run into each other.

Likewise, make your trashcans remote. Do trash and recycling together in a central area. In this set-up, staff are mindful of what they throw out or recycle and you have to physically walk to dispose of it.

Make connected floors accessible by stairs. There's a reason your gym's stair climber is always in use.

2 — Let there be light.

We know that at a fundamental level, humans do better in natural light, so it's standard that we maximize access to sunlight wherever possible. During a redesign, we can **create a workplace that gets access to daylight and views** to help us tap into the circadian rhythms that make us happier humans. But in the meantime, what about the furniture — locations, orientations, those high panels, or the shades that are blocking the sun? Open 'em up.

3

— Standing room only.

Outfit the conference rooms with counter-height standing tables, making them standing meeting rooms. This promotes faster turnaround in meetings, people don't linger. It's a bit like a bar, more inclusive and inviting and easier for others to join in, or leave.

Open seating or free address, accompanied by multiple work setting types to support the four modes of work, will, assuming you have strong Wi-Fi, encourage people to get up and move around. Make this a part of the agile workplace culture. Treadmill desks could be another element. Instead of going to a huddle room to do my reading, I can hop on a treadmill desk and read a proposal, mini workout complete. **Go further and make sit/stand desks an option throughout the office.**

4

— Take a walk. Or roll.

Create an incentive for walking around the office with graphic cues for walking/stepping. These could include information on the number of steps required to circuit the building or calories burned by using the stairs for those attuned to their wearables, or uplifting and encouraging mantras and branding in attractive signage around the office.

Promote walking meetings. Make anything less than a half-hour a walking meeting where you and your colleagues can walk and talk simultaneously. **Bonus? Research shows walking can unlock ideas.**

For the wilder, more progressive organizations, building rooms for simple fun activities such as darts, ping-pong, foosball, even spinning right into the office space is a no-brainer. There's no reason a meeting can't be active.

On the large campus environment, assuming that culture supports this, consider the possibility for people to connect between buildings by traveling on wheels. Create pathways for rollerblading and skateboarding, or tracks for scooters so your staff can "roll" from one building to another as needed.

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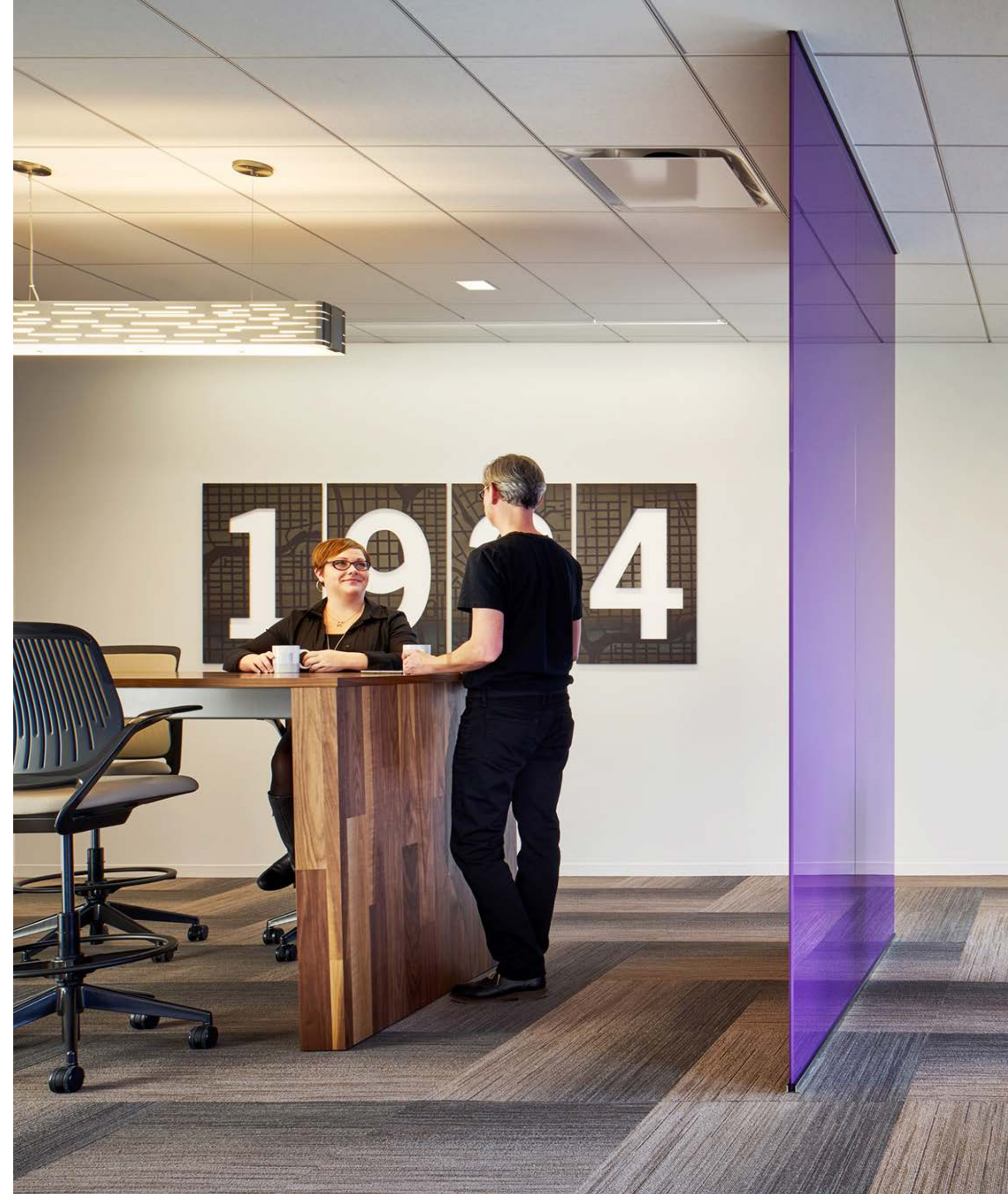
— Get outside.

In general, a sense of wellbeing and/or mindfulness flourishes in outdoor spaces, whether it's a rooftop where people can go sit and work outside, to a corporate campus with outdoor spaces adjacent to buildings. Generally, **locate these areas near cafés, coffee/juice bars or cafeterias**, where grabbing a cup of coffee or juice on the way to a meeting is quite common. To further support wellness, provide access to healthy and nutritious snacks and make sure the Wi-Fi is robust. ■

Based in Stantec's Chicago, IL office, Angie Lee is a Senior Principal and Workplace Sector Leader works with clients to deliver progressive workplace strategies that support human occupants and business objectives. Read more about Angie.



MORE
STANTEC WORKPLACE



ASK AN **EXPERT**:

WHAT IS THE

PASSIVE HOUSE?

BY JOHN DUGAN



ANDREA FRISQUE

SENIOR BUILDING
PERFORMANCE
ENGINEER
VANCOUVER,
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In each edition, we query a Stantec designer on an emerging trend in their field. In this edition, we speak with Andrea Frisque about an approach to sustainable buildings that has emerged from Europe, and we find out that a Passive House sometimes isn't a house at all.

JOHN DUGAN: WHAT DOES THE PASSIVE HOUSE TERM MEAN? HOW DOES IT WORK?

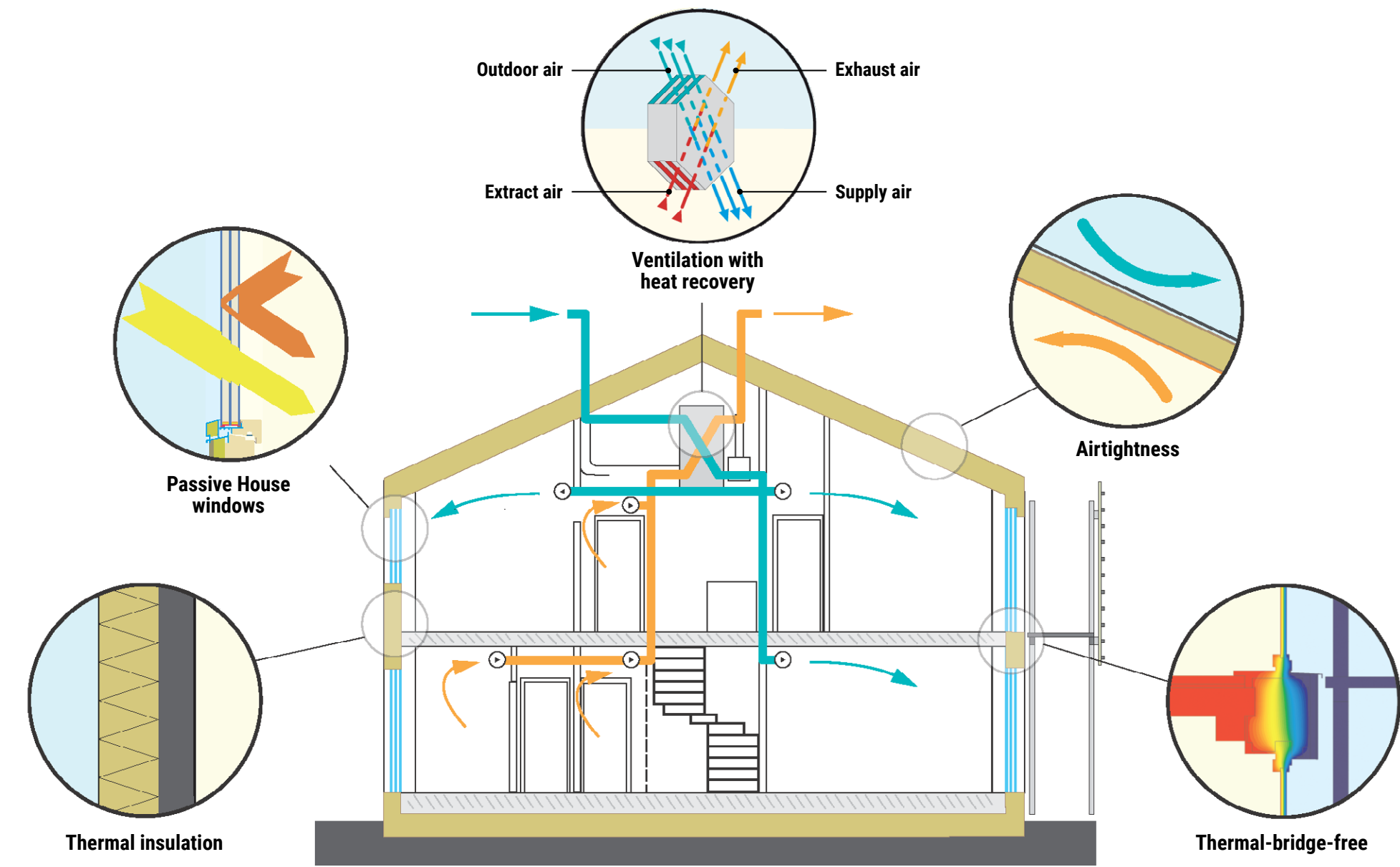
ANDREA FRISQUE: Passive house is an energy standard. It focuses on creating of the most energy efficient buildings possible, while still making economic sense. Thousands of passive house certified buildings all over the world save owners up to 90-95% of energy for heating and cooling compared to a typical building of their type.

Originally, the most common passive house type was a residential building in a colder climate, but that's recently changed. A Passive House can be a school, an office building, a shop, a factory. If you design a highly-insulated building, make that building airtight to reduce infiltration of cold air and add controlled heat recovery ventilation, you've got a passive house—one that uses very little active energy for heating or cooling. That's the main concept for residential and office buildings in cold climates. Passive house design strategies change to be appropriate to location.

JD: WHY PASSIVE?

AF: Here, the expression “passive” means design focuses on strategies that are part of the building, outside of the building systems, to make it as energy efficient as possible. A highly-insulated envelope, triple glazing, and orienting the building so it can harvest solar energy are all passive design measures ripe for implementation.

It also means arranging spaces so they fit with the orientation of the building; bedrooms oriented to north so they can be cooler throughout the day, living spaces to the south with large windows harvesting solar energy. Bathrooms and kitchens are organized with short exhaust lines that can easily combine for heat recovery. Short ducts and compact design are passive measures.



Passive House: The 5 Basic Principles

© Passive House Institute | iPHA

“If you design a highly-insulated building, make that building airtight to reduce infiltration of cold air and add controlled heat recovery ventilation, you’ve got a passive house...” ANDREA FRISQUE



Wood Innovation Research Laboratory

The **Cepheus study showed that total energy consumption (not just heating and cooling) of passive house apartment buildings was less than 50% than that of conventional new buildings.**

JD: WHERE DID IT COME FROM?

AF: Dr. Wolfgang Feist founded the Passive House Institute and built the first passive house in 1996. The Passive House Institute (PHI) is an independent research institute based in Darmstadt, Germany.

JD: WHY IS THE PASSIVE HOUSE BECOMING MORE ATTRACTIVE?

AF: Proven performance is driving passive house design to the top of the sustainable design list. The Passive House Institute and other groups put a lot of effort into confirming the performance of these buildings. A European Union study showed that on average passive house developments use less energy than predicted, especially for heating. The **Cepheus** study showed that total energy consumption (not just heating and cooling) of passive house apartment buildings was less than 50% than that of conventional new buildings and meets design targets.

That makes passive house really interesting to clients like the City of Vancouver. There is a bit of fatigue in the North American market with respect to promises for sustainable

building performance that don't measure up to results. Rightly, our clients are looking for buildings that perform as promised.

Passive house residences have proven that they do. And there's tight quality control. The prediction calculation, the process, the quality control, all together lead to buildings that function and that people are happy in.

JD: WHAT ELSE DO PEOPLE LIKE ABOUT A PASSIVE HOUSE?

AF: Superior thermal comfort. It just feels nicer, you are surrounded by warm surfaces. It's comfortable sitting on the floor. The traditional way of heating buildings just makes the air warm, but you still feel the temperature of the surfaces around you. With passive house, the floor is warm, the walls are warm, the inside of the windows are warm.

JD: WHERE IS THE PASSIVE HOUSE TAKING HOLD?

AF: The largest number of passive house buildings are residential buildings in Europe. But it has recently exploded into the scale and

type of buildings that are relevant to Stantec including very large residential developments, student dorms, even university lab buildings. There's a glass tower bank headquarters that has been certified, a natatorium, and a bunch of supermarkets. There are many passive house daycares and kindergartens in Europe.

But the desire for passive house design is spreading. The City of Vancouver offers an Alternative Compliance Path for rezoning passive house-certified buildings. The City of Toronto is interested in it. BC Housing is exploring it.

JD: IS STANTEC APPLYING THIS NOW?

AF: Our British Columbia-based Sustainability + Building Performance studio is working on two daycare centers for the City of Vancouver that will be passive house-certified as well as an almost all-Stantec project, the Wood Innovation Research Lab at the University of Northern British Columbia. It's contractually required to be certified.

With a dedicated team of sustainability and building performance experts and best practice sharing across

our network what we learn from our ongoing passive house projects is rapidly shared and applied to the other projects we are involved with around the world.

JD: WHAT ARE THE OBSTACLES TO ADOPTION OF THE PASSIVE HOUSE?

AF: The hardest part right now is accessing building components that are passive house-certified. Every component has to demonstrate that it actually performs as the manufacturer claims, unless you buy a certified component. The Passive House Institute certifies

buildings, it certifies people and it certifies components. You can get passive house-certified windows, and passive house-certified heat recovery ventilators, and so on. But we just can't access enough of that in the market, and it's more expensive.

In our building in Prince George, that means the overhead door is being shipped by air freight from Germany. There was nothing comparable.

Passive house certified buildings have been shown to perform. Because the Passive house standard



focuses on optimizing passive building components with the Passive House Planning Package (PHPP), a validated energy model, performance is predictable.

JD: WHAT'S THE PAYBACK LIKE?

AF: The idea is that if your building needs almost no heating, then you can cut out high-end, high-efficiency heating systems and go with a small limited heating system instead.

Roughly, you ought to be able to make a Passive House-certified offices or residential building for an additional 5-7% in capital cost. Construction costs for the high-performance elements are partially offset by shrinking the heating and cooling systems required. As energy costs continue to rise, the payback period for investment is shrinking and, the business case for passive house design will grow.

Unlike sophisticated, high-maintenance systems, passive house strategies like insulation, airtightness and external shading start saving energy right away and into the future, potentially for decades to come. **D**

Dr. Andrea Frisque, P.Eng., Dipl.-Ing., LEED AP, CPHD is a Senior Building Performance Engineer in Vancouver, British Columbia recognized for her expertise in building performance and sustainable design. Read more from Andrea at Stantec.com.



MORE
SUSTAINABILITY
& BUILDING
PERFORMANCE

PAYBACK ON \$OLAR \$CHOOLS

**Energy Modeling Can Help School Districts
Make Better Decisions** BY ENGIELL TOMAJ





Energy modeling has emerged as a powerful and essential tool, allowing clients and owners to make quicker, better decisions about building design.

FIVE YEARS AGO our client asked us, "If we were interested in solar, what does the payback timeline look like?" At the time, we were unaware that they had also asked an engineering consultant who quickly responded with a standard "thirty

years." Instead of tossing back a quick generic answer, we took our time, looked at the big picture and ran the numbers in a model we developed

regarding not just the cost of photovoltaics, the price of various sustainable features and the energy market, but the funding structure for school districts and other inputs. Rather than a guesstimate, we came back with an in-depth analysis. Our client was impressed.

Since then, we've continually refined the model and used it in the design stage with school district clients in Texas. With Lee Elementary School in Coppell ISD district, we can see the results of our energy payback modeling in a built, operational facility.

Why do we do it?

Energy modeling has emerged as a powerful and essential tool, allowing clients and owners to make quicker, better decisions about building design.

This analysis harnesses our expertise in energy efficient design and photovoltaics. It informs our clients as accurately as possible of the options rather than letting them think solar still has a 30-year payback or more. Our model gives our clients confidence that the possibilities have been thoroughly vetted and that we're giving them the best options available. This process gives us a chance to design our projects PV-ready should the installation happen further down the road.

What are some of the factors that impact payback analysis?

The cost of photovoltaics as well as the funding source our client (in our case, school districts in Texas) will use to pay for the building factor in. We also look at a list of a la carte items that can affect the project's EUI (Energy Use Intensity measured in BTU per square foot per year). So we look at the cost of PV, utility incentives, bond rates, bond interest, discounted payback and local laws regarding school funding such as the recapture laws in Texas in our model. In some instances, we are seeing payback on PV at about five years.

Why is this an important step for designing sustainable schools?

Utility companies want us all to reduce their burden on the grid because they have to maintain capacity for peak load in summer season or suffer us with rolling blackouts. Their goal is to spread demand. Buildings are similar. You try to design PV system to offset

the building's baseload one for one, making payback possible. Our model is designed to calculate that payback and accurately predict the timeline in which those energy savings will cover the cost of investment.

How does the declining cost of PV impact this?

The cost of PV has come down so much that buying renewable energy can be less than the cost of implementing certain sustainable design features on a project. When we designed Lee Elementary School, we were paying raw costs of \$3.52 per watt. Now, for an equivalent sized system, PV might be \$2 a watt or less for standard efficiency. The race to the bottom in PV costs means that incorporating major sustainability features (a roof or walls with higher R values) might not be your best bang-for-buck. Changing a construction feature

might cost you \$500K on a school yet save you only one unit of EUI. Investing in PV, on the other hand, might be \$35K-\$37K per EUI unit. More good news? Barring the implementation of tariffs on imports, the cost of PV is only going to go lower as far as we can foresee.

How does this benefit school districts?

With a realistic timetable for payback, school districts can make better decisions on what buildings to build and where to implement PV. Ideally, these bond-financed projects can result in offsets in energy usage and operational costs, freeing up more money in the budget for the classroom, teachers and educational initiatives where it's truly needed. **D**

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Growing Food & Community at Adams Crossing

Planning a Net Zero community
around a farmer's market and
small-scale agriculture

BY MATT SHAWAKER



These days, it's commonplace for us to want to know where our food comes from. We're passionate about food and drink with a good story, especially when it's local. Food is a natural generator of community all over the world. Recently, in Brighton, Colorado, we planned a new community where living, growing food and respectful land use are harmonized.

Food and place have a natural connection.

How to make a new development in a Western boomtown stand out from a series of cookie-cutter developments? Our client looked to sustainable communities in Germany for inspiration. They came to us for our sustainability experience with the goal of developing a Net Zero community northeast of Denver. Net Zero Water emerged as another goal. Providing enough space for agriculture to cover 50% of the community's caloric needs emerged as yet another goal. Those became the principles for planning **Adams Crossing**, a community of single-family homes, townhomes and apartments, and micro-farms, breaking ground in 2018.



Solar structures shade sidewalks, and solar arrays are used on the roofs of structures such as the farmers' market, community tool shed and bike garage that face the central community greenway.

Many of the 1.5-8.5 acre farm-kit farms will grow to create value-added products (e.g. tomatoes become marinara sauce) and unique businesses, such as a daycare that harvests its own vegetables. The farms with value-added concepts give the community reason to come together around a hub, the plaza with a weekly farmer's market, small grocery, shops and cafes, creating a vibrant place without dependence on traditional retail.

We're certain it's a first for Colorado.

We've learned a few things about planning sustainable communities from Adams Crossing.

It's not the technology that's innovative, it's the combination of ideas

The energy technologies employed here aren't new and designing a Net Zero single family home isn't hard. What makes Adams Crossing unique is the combination of technology (photovoltaics and geothermal) and integration of small-scale agriculture in a food-culture-inspired community setting. A passion for local food ties into the perennial need new communities have for a third place.



A farmers' market center acts as a community hub for food-centric Adams Crossing, offering products grown and made locally.

Set big goals

We asked stakeholders; What do you want people to say about Adams Crossing in 20 years? The kick-off resulted in the ambitious goals for sustainability, energy use and water management mentioned above and set the tone for the entire process.

While our goals concern the context of the development itself—not transportation to and from—we envisioned a synergy between agriculture, development and energy conservation that had few precedents. We designed a proposed district geothermal loop to run under the farms, the park and loop into the communities, providing a stable air temperature to reduce energy required for home heating and cooling. Waste energy will go back into the farms and extend the growing season.

Make the numbers add up + turn challenges into opportunities

To compensate for the developer's investment in geothermal, PV systems, and water management in the neighborhood, we needed to save money elsewhere. We dramatically reduced infrastructure needs, even removing streets and the costs associated with road, curb, and gutter installation. We took out as much infrastructure as possible so we can treat water where it falls and educate residents about water consumption on site.

We did this strategically and created a linear park. We decided on a building type that's rear-loaded, so it can be accessed from an alley. And we developed greenways that run north and south through the site, physically and visually connecting residents to nature.

Partner with experts

This project wouldn't have gotten far without Agriburbia, a consultant and professional farming firm. At Adams Crossing, each farm kit includes a farm area and a house with an industrial component for preparing those farmers'-market-ready products. You can farm it yourself or have Agriburbia farm it for you. Either way, Agriburbia will develop a farm plan, teach you how to farm, and connect you to buyers.

Partner with the City

Much of the developer's acreage falls within a 100-year floodplain that can't be developed. So, farming is a solution that acts as an economic driver for the project and adds value from that which would otherwise be a burden on the project economics. We approached the stream corridor running through the neighborhood as

Adams Crossing features a network of solar panels in parking areas and on roofs (pictured in blue) as well as a geothermal field with distribution loops (in red).



something to be protected. Second Creek is slated to become a regional greenway with access to regional bike trails that make it easy to access the farmer's market from other communities or for residents to commute to Denver car-free.

Tap into the local history

Historically, Brighton has been a vegetable farming town, so the idea of residents growing their own broccoli, tomatoes, and squash has roots. Ultimately, we met our local agriculture planning goal and then some.

Based on USDA research of crops historically grown in Brighton, the 62-acres of farmland can produce 77 million calories per year—twice the resident's nutritional requirements from vegetables.

Set it up to become more sustainable over time

As the community grows and the remaining area is developed, we intend to refine these energy-saving features and design. The locally-grown food and dining options here will also make more sense when a new civic government building opens nearby, bringing the bustle of thousands of workers and neighbors to the area every day. Someday, long-range regional public transit will connect to this community, making a true low-carbon lifestyle possible. In the meantime, we can evaluate the first phase of Adams Crossing and see the potential of a food-centered development that embodies a higher standard for sustainable community. **D**

Senior Associate, Matt Shawaker brings experience as both a design consultant and developer to his role as urban designer in Stantec's Denver office. Contact Matt at matt.shawaker@stantec.com.



Final Thought:

Making Happy Cities

How my passion for storytelling and the environment led me to a design ethos that's beyond sustainability



BY **DOMINIC WEILMINSTER**





The process of telling stories in journalism parallels design very closely. The journalist spends time researching, interviewing, and collecting a diverse range of information that must be synthesized into a coherent and meaningful story. Design is no different.”

In my previous life as a full-time journalist, I covered education, city planning and wrote features for a local newspaper. The people I met and insights I gained as a journalist were a valuable education. Over time, however, inspired by the growing momentum in the sustainability movement and being a Colorado native raised in the outdoors, I wanted to play a part in protecting the environment. Architecture and design struck me as a direct conduit to making positive, tangible change through creativity. So, I made the leap to a new field.

The process of telling stories in journalism parallels design very closely. The journalist spends time collecting information that must be synthesized into a coherent story. Design is no different. We gather information and inspiration from our client to create a cohesive whole. Project constraints carve out opportunities. My creative process tends to be introspective and responsive—reflecting my journalistic instinct to listen, synthesize, and compose a response that’s meaningful.



Eastside Human Services, Denver, CO
Photography by Frank Ooms



Eastside Human Services, Denver, CO
Photography by Frank Ooms

Sustainability as standard practice

In our practice, sustainability plays a role in just about every project we touch. We think about it because we serve as stewards of smart design solutions in all cases. On the projects which I have led, I've been fortunate to experience a holistic range of sustainable thinking from building performance-driven design to design that makes a lasting social impact.

Since my first project, I've pushed forward sustainable design as an all-encompassing, triple-bottom-line approach. Our aim on Eastside Human Services for the City of Denver was to use this civic project to create a welcoming, community-focused building that made visitors seeking social services feel empowered. The project design employs a variety of passive strategies

to emit calm daylight in to work space and energetic natural light into social spaces. Native and adapted plantings contribute to passive site security and storm water treatment. A local art program promotes ongoing engagement. Today, the LEED Gold-certified building is a much-loved beacon in the community.

The Happy City

If we think beyond sustainability and resiliency, and look at holistic aspects of practicing design with a social impact, our goals become more ambitious. We need new terms to encapsulate them. "The happy city" refers to a way of life that better connects us with other people and the places we inhabit. If you commute two hours to work every day, you might only interact with a small group of people. Your experience with the outside world becomes

skewed, alienating you from interaction with strangers or new experiences. This life doesn't support our natural instincts as social beings. Happy cities seek to diversify those experiences and reconnect us. This means more mixed-uses in our communities, engagement with public spaces, places for expression and a reduced reliance on our cars. This adds up to a more social environment, and often a more sustainable, walkable environment. If we can execute designs that help us to fully experience the places we inhabit, we increase our levels of social trust.

I've already put the happy city concept into practice. Providing master planning services for Dubai South, site of the 2020 World Expo, required us to research what drives quality of life in urban areas. Key values such as walkability, sociability, inclusiveness, play, and

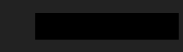
ownership of public spaces shaped the design solution. My hope for the new development is that it creates a truly interwoven community and positions urban happiness as a model for future developments. ■

Dominic Weilminster, Principal, leads civic and higher education design in Stantec's Denver, CO office.

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