DESIGN QUAR-TERLY

ISSUE 05

SMART & LIVABLE CITIES

Articulating a livable vision for city life

Stantec

DESIGN QUAR-TERLY

ISSUE 05

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.

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SMART & LIVABLE CITIES

Cities are the future. Our world is urbanizing rapidly and the rising demand for cities is bringing to light issues around livability, affordability, transport and equity. Meanwhile, the possibilities of a connected, data-rich, “smart” community are beginning to reveal themselves. In this issue, we explore concepts of the smart city, while keeping in mind that a livable city is the ultimate goal.

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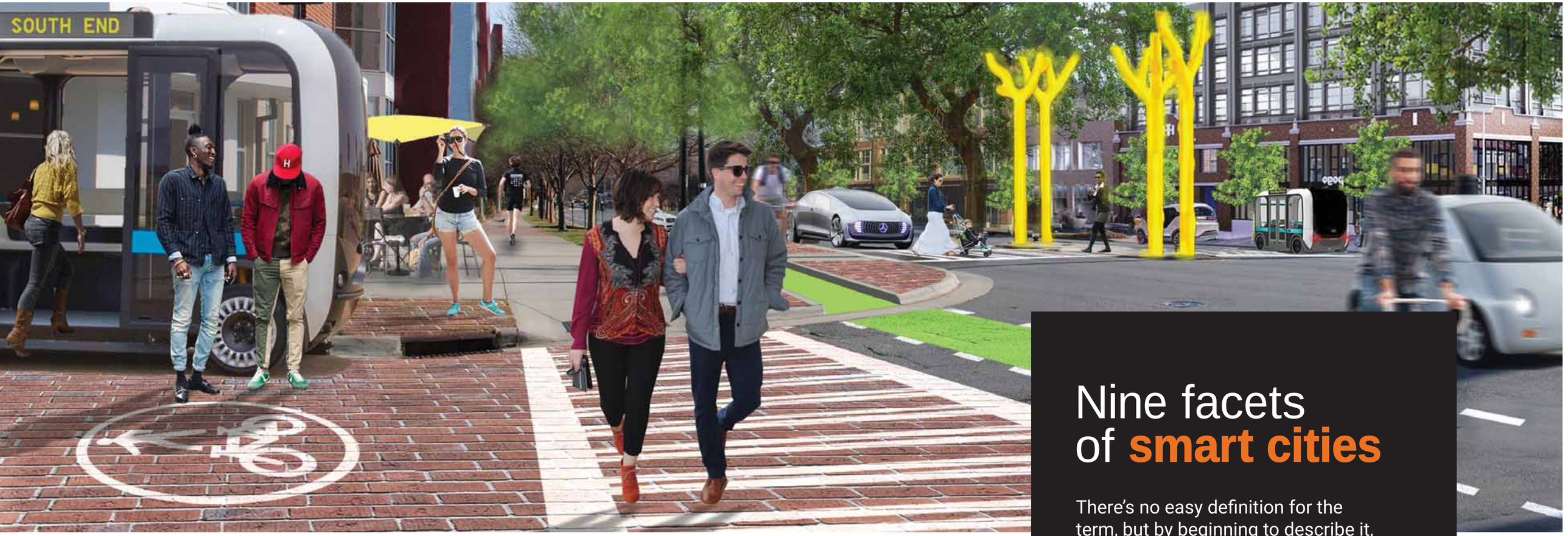

Nine facets of **smart cities**

There's no easy definition for the term, but by beginning to describe it, we can anticipate what's next.

BY RICHARD BAKER AND ARYA ROHANI

→

THE ERA OF SMART CITIES IS APPROACHING FAST, ELEMENTS OF IT MAY ALREADY BE WITH US, BUT DEFINITIONS OF THE TERM ARE PRACTICALLY LIMITLESS AND HARD TO GRASP. ASK PEOPLE TO DEFINE A SMART CITY, AND YOU'LL GET A DIFFERENT ANSWER FROM AN URBAN PLANNER, A DEVELOPER AND A TECHNOLOGIST. WE SPOKE WITH A VARIETY OF EXPERTS TO SOME KEY FACETS OF SMART CITIES THAT HELP US ANTICIPATE WHAT'S TO COME.

What are smart cities, anyway?

A true smart city is where advanced technologies work in the background, unseen, to connect people and things. This network of an internet of things links elements of the city like street lights, trash collection bins, water quality system, traffic lights and so on. Interconnectivity between systems and these functional things means they can communicate relevant information with each other. Sitting atop all this is an intelligent software platform that makes sense of all of these connected things and the data they gather so that it can tell an agency what they need to do to prevent a problem or how to be proactive in providing services where needed.

It's about people, not technology...

The smart city is an approach to problem solving. It's the application of technology in a way that creates a more livable, sustainable city environment for people. Technology is not the dominant force, it's behind the scenes. Lots of companies want to talk about and sell products, but a city manager doesn't care about specific tech or piece of software, they want to provide relevant reliable services to their citizens.

Brooklyn Village
Charlotte, NC

Smart cities benefit from open data, but privacy issues must be addressed.

The key for technology is obviously big data. One definition of smart cities is that they are sensored and actuated. That means they have technology that senses and report data and does something — it takes action. The overall goal of a smart city is to be intelligent, to break down silos and access data and KPIs previously held by various entities. The more open the data, the more smart cities are able to leverage it for problem solving, anticipating crises and taking action. But there are big questions around who owns the data, how much of it should be open, and what are the privacy rights of citizens and visitors.

Elements of smart cities are already here, addressing today's problems.

Cities are already using technology to analyze traffic in real-time. Adaptive traffic lights lengthen the time for green lights to smooth traffic on a congested artery, and even redirect traffic to alternate routes to ease jams on main routes. Smart grid technologies have been in use for a decade in some parts to measure and distribute electricity. Elements such as smart meters, low voltage systems and LED lights are already widely available.>

LA Metro El Monte Station
Los Angeles, CA

So these elements of smart cities already exist. The questions are; can they be taken further? Can then be spread further out and put in places where needed to make our cities even smarter?

Smart cities will be predictive and proactive.
Predictive and prescriptive analytics will make cities smarter. With sensors and software working together, systems will monitor data and predict a problem before it happens, enabling, for example, a city to dispatch a maintenance crew and avert a crisis before infrastructure fails.

We will drive safer in smart cities.
We have nearly 40,000 plus fatalities a year from car accidents in USA. Cars are a major killer. Thus the main catalyst for automated and driverless vehicles is safety. We want to bring that rate to zero. While automation and testing is advancing, despite some setbacks, the technology will eventually achieve a high level of safety, at which point, the major hurdle will be public policy and laws to permit these vehicles. Beyond the safety component, these automated vehicles (AVs) also promise independent, safe transport for the blind and elderly. It's going to take many years for the tech to reach a mature level, but it is coming.

Smart buildings, inside and out.
Building occupant experience will also change with the arrival of smart buildings. Picture a day at work. You will swipe your card early in the morning when you enter your building. The elevator will automatically open up and take you right up to your floor. Your corridor path is illuminated. Your thermostat is already set to the temperature it knows you like. Your task lights are on, too.

The hospitality market has already begun to design rooms such as the **YOTEL Boston Dream Cabin** (a project developed in association with Stantec's GreenLight research program) where the room, knowing the guest's wake-up time and need for sleep, will tune the room's lighting and temperature to encourage a good night's sleep, soothe restlessness and an timely wake-up by tapping into the body's circadian rhythms and natural responses to the light spectrum. >

SMART CITY TECHNOLOGY COULD SAVE ENTERPRISES, GOVERNMENTS AND CITIZENS GLOBALLY OVER $5 TRILLION ANNUALLY BY 2022.

ABI RESEARCH

THREE MILLION PEOPLE MOVE TO CITIES EACH WEEK.

UN HABITAT

Brooklyn Station
Charlotte, NC

Buildings will respond to individual users automatically.
User experience of buildings will increasingly be influenced by a symphony of electrical engineering systems, communication systems, security systems and information systems. They will communicate back to us, as well. Smart buildings that are designed to harvest their own energy like Evolv1 in Waterloo, Ontario can share data with users about their company's energy use on their office floor in real-time. Further down the road, these building systems will be more integrated into the smart city itself, so that data on energy and peak usage of buildings can be tracked and used by relevant stakeholders.

Smart cities require smart policy.
While some aspects of smart cities are here, many aspects won't happen organically, they'll require deliberate choices by policymakers—how to harvest and share data, investment in smart grid tech, for instance. While we are accustomed to hearing about smart city initiatives from big cities, medium and small cities will have a greater challenge, in that they are unlikely to have the funding and staff for a robust internal program, but will also want to reap the benefits of modernization. They will need to partner with organizations, companies or foundations that help them fund their programs, refine their goals and implement them. We expect that smart city funding innovation will emerge from smaller cities and communities as they are forced to think outside the box to get smart initiatives rolling.

Smart cities will have to contend with concerns about digital equity and culture.
To truly bring the benefits of smart cities to all residents, cities will need to bridge the digital divide in areas like smart phone and high-speed internet access. Looming on the horizon are more questions, who will have access to AVs, for instance? Will they augment and supplant affordable public transportation? And globally, the adoption of smart city tech is bound to bump up against local and regional culture. How can rich cultural traditions be preserved as download and upload speeds advance and megacities embrace big data as a policy tool? D

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MORE CITIES ADAPTING TO CHANGE

Based in Lynnwood, WA, **Richard Baker** is an information and communications technology designer. He focuses on the design, coordination, and implementation of the infrastructure for technology systems in buildings. **Arya Rohani, PE** applies his expertise and vision in transportation infrastructure and technology, and strategic planning to improved transportation systems. He leads autonomous vehicles activities at the GoMentum Station in the city of Concord, California.

Teaching energy through play

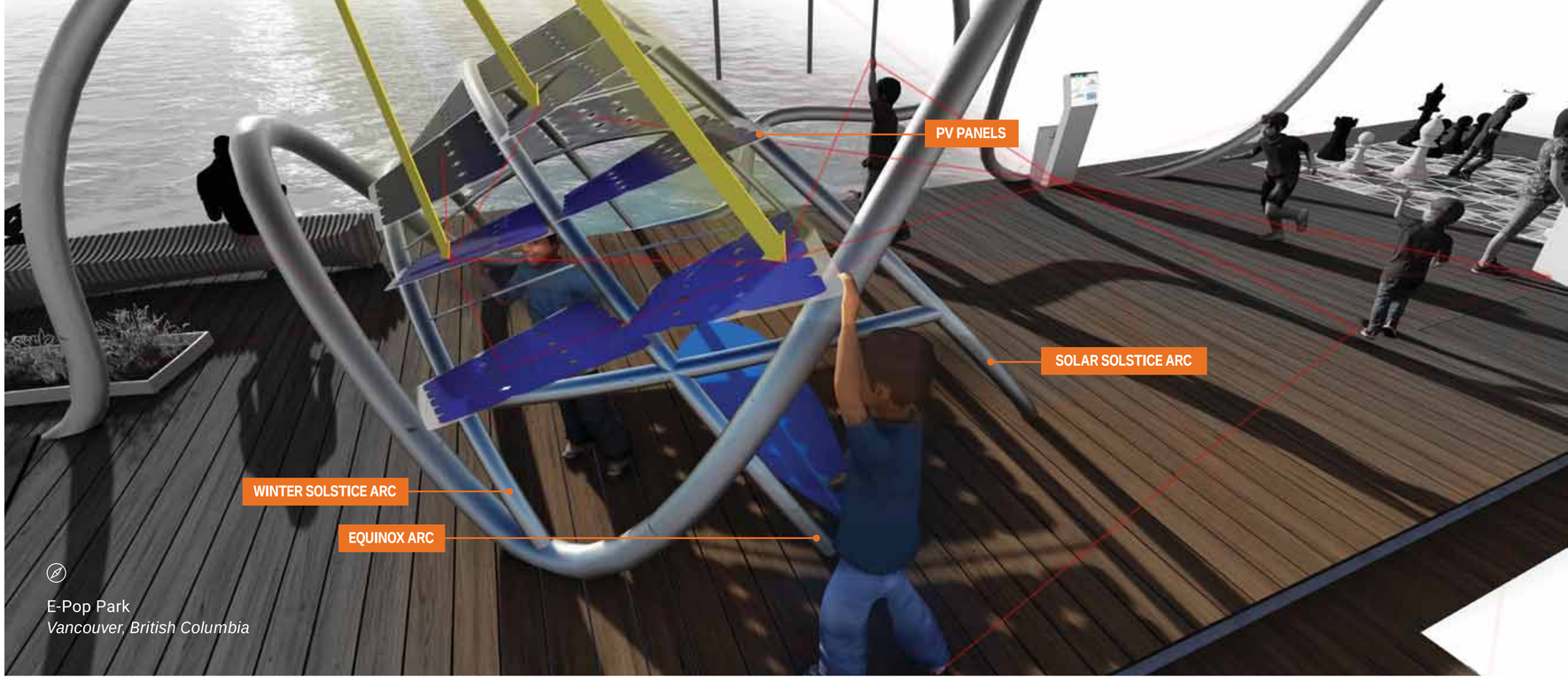
E-pop turns city parks into places that boost energy literacy.

BY MACIEJ GOLASZEWSKI

In a city center, a family enters a seaside park looking for something to do on a sunny afternoon, a group of teenagers rolls into the park to practice their dance moves, while others exercise on kinetic bench or manipulate renewable energy technologies (RET)—all of them are producing energy. And, they can compare their energy production on digital displays within the park or via a mobile app which extrapolates sensor and energy data in real-time. Suddenly, the park's users aren't just enjoying some recreational time, they're learning about energy transfer and use from a real-world example.

Changing behaviors

Why should a pop-up park teach us about energy? While sustainable designers and engineers continue to advance energy efficiency in buildings and urban infrastructure, energy consumption by individuals continues to rise. There is a clear disconnect regarding energy and energy consumption amongst the general public. Humans consume an average 8.6 kilowatt hours (kWh) (The World Bank, 2014) of electricity usage every day, and global demand is growing. In Canada, a single person uses 42.6 kWh a day—enough to drive an electric car for approximately 200 km! Roughly 75% of global power is consumed in cities (AAAS, 2016). With population and energy demand rising, and with migration to urban areas increasing, cities will continue to be responsible for increased greenhouse gas emissions as a result of energy use.



E-Pop Park
Vancouver, British Columbia

Energy literacy

Worldwide, energy literacy (an understanding of the nature and role of energy in the world and in our daily lives) is quite low. Less than 30% of adults and 1% of Canadian youth are considered energy literate (Andre Turcotte, 2012). This lack of energy literacy in the general public can lead to poor choices concerning energy consumption. When we're better educated about energy, we tend to use it more wisely.

One way cities can fulfill their sustainable agenda is to boost their residents' and visitors' energy literacy, creating opportunities for people to engage with and learn about energy experientially so they can make more informed energy choices. Cities need to be asking themselves, what can we do to boost conservation in the public mindset at the individual level?

Introducing E-Pop, an interactive park

Inspired by research on energy tourism, smart cities and innovative technologies for outdoor settings, I prototyped a public realm installation that can educate citizens about energy through play. Energy Pop-up Park, or E-Pop, is an interactive park that provides people with a safe space to gain an understanding of basic energy concepts through games and activities. The activities in E-Pop use human movement to help individuals understand how much effort it takes to harvest or distribute energy. >

At the park, visitors, through their movement and senses transfer, manipulate and observe energy.

Play is incentivized through real-time feedback which invites competition with other players. By gamifying the experience (players are given an “energy budget” to track throughout the park), players see conservation as an ongoing challenging where they can practice and even compete with friends or family.

They also experience the transfer of energy firsthand, their own. E-Pop players convert their chemical energy (from food) to kinetic energy (the energy of an object in motion) by exercising their muscles through movement via a treadmill, bicycle or smart floor. E-Pop converts their physical efforts to electricity using small electrical generators and displays it.

Renewable Energy Technologies (RETs) embedded in the park give players a chance to compare energy-harvesting of sunlight through a photovoltaic panel (PV) versus that captured by a wind turbine. Digital data on each player’s performance will give players an understanding of what the generated electricity could be used for; how long it could power a familiar household objects—like a lightbulb or laptop computer.

Where to play?

For the prototype concept, I located E-Pop along the seawall in the False Creek neighborhood of Vancouver, British Columbia (BC) where I live. The site offers access to natural features, local businesses, and the city center. It’s easy to reach from public transport including the Sky Train, and it has a high volume of pedestrian and cycling traffic all day long. But I designed E-Pop to be small, modular, compact, scalable, easily deployed in a popular and accessible park in any urban downtown. If energy literacy is part of the solution for smart and sustainable cities, we will need creative ideas like E-Pop to get the message out. D

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MORE COOL TECHNOLOGY & RESEARCH

Vancouver-based integrated urban designer and smart city planner **Maciej Golaszewski, M.LAND.ARCH., ENG.LAND.ARCH. LEED® GA** believes educating the public about basic energy literacy is a key to better-informed decisions in daily energy consumption.

SEVEN ENERGY CONCEPTS

E-Pop players will use their muscles and build intuition around these seven energy concepts.

ONE | FORMS

What are the different forms of energy? You may know thermal, electrical, and chemical. What are the others?

TWO | UNITS

Joules, watts, calories. If it’s all energy, why can’t we measure it the same way? Why is energy measured differently in different contexts?

THREE | WORK

A motor powered by electricity can lift a liter of water, and so can human muscles, powered by food. How do we transform available energy to utilize it for various purposes, from transportation, to manufacturing, to heating our homes?

FOUR | POWER

Why is lifting water quickly so much more difficult than lifting it slowly? Why do some actions require more power?

FIVE | CONVERSION

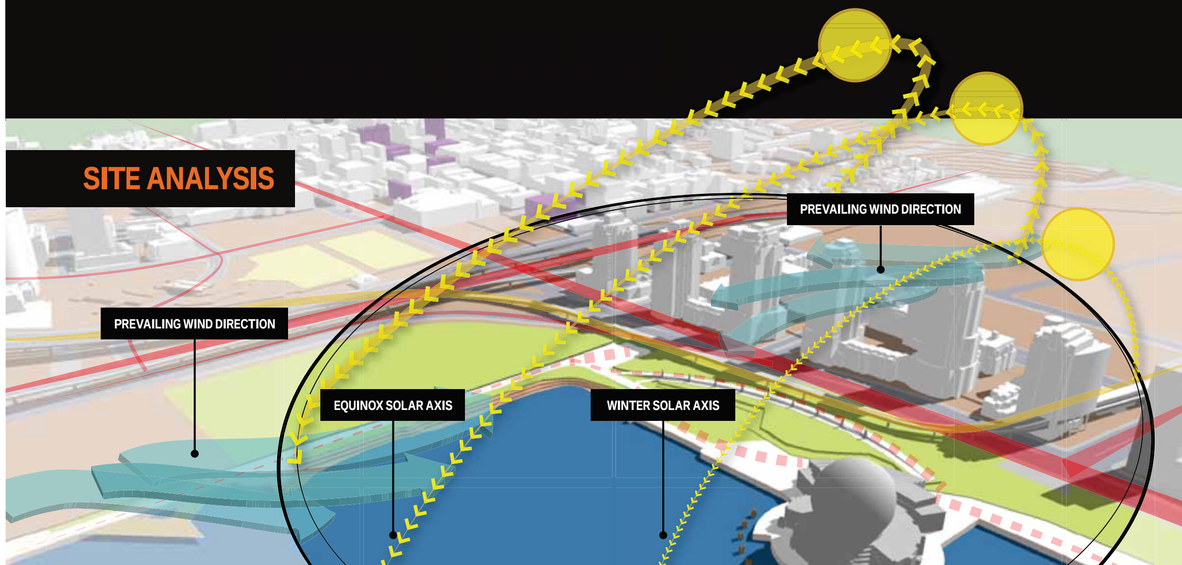
How I can convert energy from one form to another form? Does all energy come from the sun?

SIX | EFFICIENCY

Why are some methods of converting energy more efficient than others? Where does the energy go?

SEVEN | MAGNITUDE

How much energy is required to do work?



FOUR HUBS

The park is defined by four hubs; Human Kinetics, Microclimate Dome, Creative Floor, and the Information Display. These hubs are connected through an Energy Line. E-Pop's design mimics elements and natural processes found in nature.

ONE | The Human Kinetics hub educates players about the amount of energy transfered by humans jogging or cycling. Players convert their body's energy to movement to generate mechanical energy which is converted to electricity.

TWO | The Microclimate Dome hub helps people understand how energy can be harvested from wind and the sun. Players can manipulate PV panels towards the sun and redirect wind turbines towards prevailing gusts to learn how microclimates can influence renewable energy production.

THREE | The Creative Floor hub sets the stage for human movement on a smart floor which converts motion to electricity, so players can see how their activity (from hopscotch to chess to dance) transfers energy.

FOUR | The Information Display hub compiles and compares the energy data generated within the park in real time and displays it to players in an interactive manner. How much electricity does it take to power a light bulb? Players can save their performance data to a smartphone app.

The Energy Line, a winding metal tube that's embedded with LED lights, follows natural features of the park as it connects the hubs. It uses dynamic gradient lighting to visually display the amount of electricity being generated at the park in real-time.

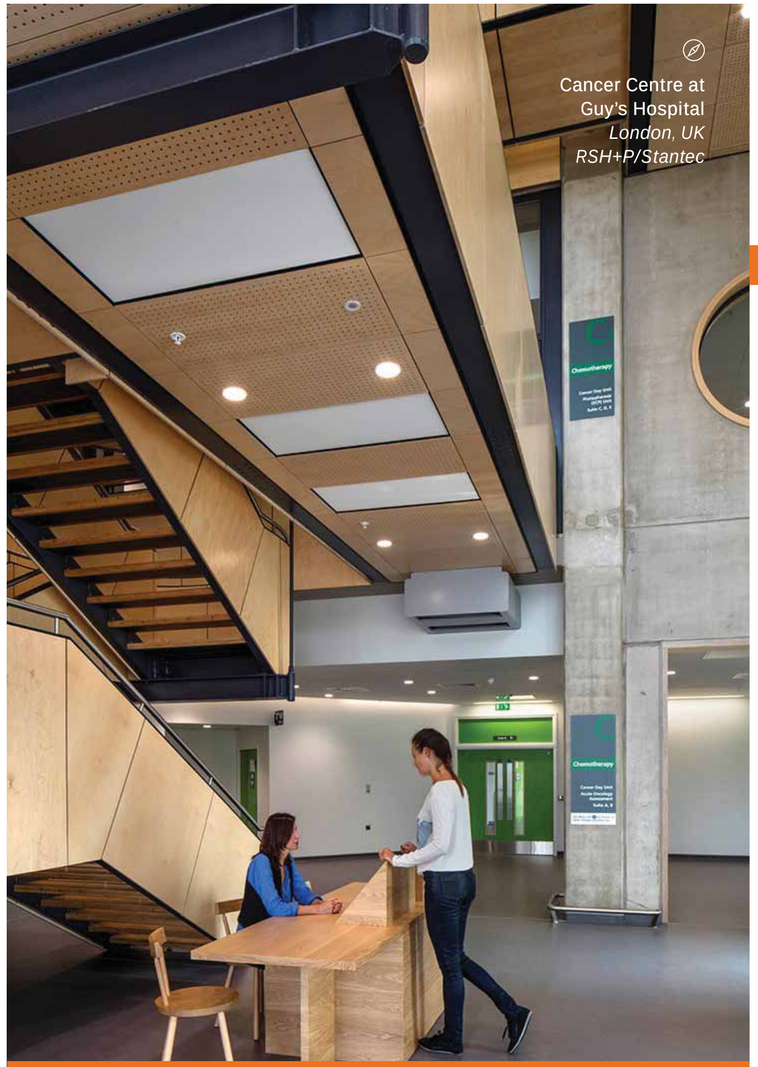
FUTURE READY DESIGN

Embracing modular and prefabrication for complex projects when time and space are tight

BY SHAWN MALEY, ANU SABHERWAL AND RONALD MAR

How much of a building can we build offsite? How granular can modularity be? In today's fast-paced construction market, modular construction offers versatility and advantages that have designers thinking bigger, and smaller, about the possibilities for incorporating pre-fab components. We're confident that modular and prefabrication methods will continue to bloom in coming years. Modularity has a lot of advantages, but with a few caveats.

Modular building is expected to rise 6% globally by 2022, with countries like Sweden (where 84% of detached homes use pre-fab timber) and Japan leading the way. A January 2017 report from the Modular Building Institute (MDI) predicts that modular construction which currently accounts for 3% of all new commercial construction in North America will grow to over 5% over the next five years. In North America, the commercial sector leads adoption of modular methods with industrial, healthcare, and education sectors following behind.



Cancer Centre at Guy's Hospital
London, UK
RSH+P/Stantec

Guy's features a frame made up of 3,756 off-site manufactured concrete elements, including lattice floors, columns, twin wall, shear wall and stairs, smart walls, modular mechanical and electrical elements, and pre-assembled basement walls, as well as a prefabricated 12-story plant tower.

1 Three approaches to modularity

CANCER CENTRE AT GUY'S HOSPITAL

Building on an active urban healthcare campus can be tricky. On the Guy's Cancer Center project, pre-fabrication was a must. The compact project site, and hard-to-reach setting in Central London dictated that 60% of the project was prefabricated off-site. Stantec led clinical planning and interior design at the Cancer Center for Guy's Hospital in London with design partner Rogers Stirk Harbour + Partners. Our contractor partner, Laing O'Rourke saw the opportunity to use the Cancer Center as a demonstration project to show its ability to manufacture custom pre-fab components in its in-house "Explore" facility. The key aspect of the Guy's modular approach was a prefabricated internal partition called a "smart wall." The smart wall is assembled off-site with fire and acoustic performance features, electrics, plumbing and openings pre-installed.

Stantec worked closely Laing O'Rourke during design to develop digital models that facilitated Design for Manufacture and Assembly (DfMA) of the smart walls, reinforced concrete lattice slabs, columns and interior fit-out packages with integrated service conduits. The external façade was comprised of unitized curtain walling, built offsite and craned into place. RSH+P designed extended balconies for the "villages" in the Cancer Center and these were prefabricated. The mechanicals were prefabricated. The servicing modules were manufactured offsite and brought in and interconnected. With a prefabricated lattice slab, the lower section of slab and rebar was pre-cast before being lowered on the site, with the rest poured on site. This avoided any temporary structure. As every floor slab went up, they craned in the smart walls, constructed offsite and precision-cut with robotic arms enabling tight design quality control and significant savings in construction time. >

YALE SCIENCE BUILDING

Science research changes at a rapid clip and today's science buildings must be built for flexibility and expansion. As designers we strive for methods that deliver spaces and corresponding infrastructure that meets our clients' current and future needs, are easy to maintain, and easily modified as research needs change. Because they're so complex, laboratories provide a perfect opportunity to explore modular and prefabricated construction technologies.

Yale University's new Science Building (which Stantec designed in association with Pelli Clarke Pelli) is a good example of modular approaches employed for future-ready design thinking. The majority of the building's labs are open flexible biology labs, which are ideal candidates for repetitive modular design.

For Yale, we embraced multi-trade prefabrication rack modules for the mechanical and plumbing corridor mains on the lab floors. This approach provides a modular structural frame in which the mechanical, plumbing, telecommunications and other laboratory components are installed offsite. The completed assembly is then delivered to the site, and installed as a unit. This approach allowed the delivery of a high-level of organization and consistency in the main laboratory services, including valve locations and future piped system expansion. This consistent, repetitive approach helps the building services to remain relevant as research needs evolve.

The main vertical steam and chilled water building risers also used pre-fabrication. 90-foot assemblies were constructed off-site and craned into the building as single structural elements. Modular thinking at Yale resulted in a more direct path to project completion, increased project quality control and a significant boost to construction safety—a win-win-win for client, contractor and designers. >

Yale Science Building
New Haven, CT
Stantec/Pelli Clarke Pelli

MORE PREFAB

Prefab lab systems: Concepts to optimize construction, maintenance, and flexibility

CENTRE FOR ADDICTION AND MENTAL HEALTH (CAMH)

At the Centre for Addiction and Mental Health Phase 1C project, a pair of hospital buildings located in Toronto's urban core, prefabricated elements are a significant aspect of construction. The exterior building envelope whole-wall panel construction for all the non-curtainwall cladding, roughly 60% of the total building envelope, is prefabricated.

On this alternative finance procurement (P3) project it was sensible to prefabricate certain elements such as the building's rainscreen wall, offsite. This includes the walls for approximately 225 mental health patient bedrooms, each outfitted with a super-size window, operable vent, a complicated window with an interior sash for security, and integrated roller blinds.

The panels are generally hoisted onto the open concrete floor slabs at the exterior edge, and then tilted up in place from the inside. They build the modules, bring them in, tilt them up into place, secure them and move on. Essentially, the on-site crew can put the entire back-up wall up in one go. >

Centre for Addiction and Mental Health
Toronto, Ontario

2 When is modular a good call?

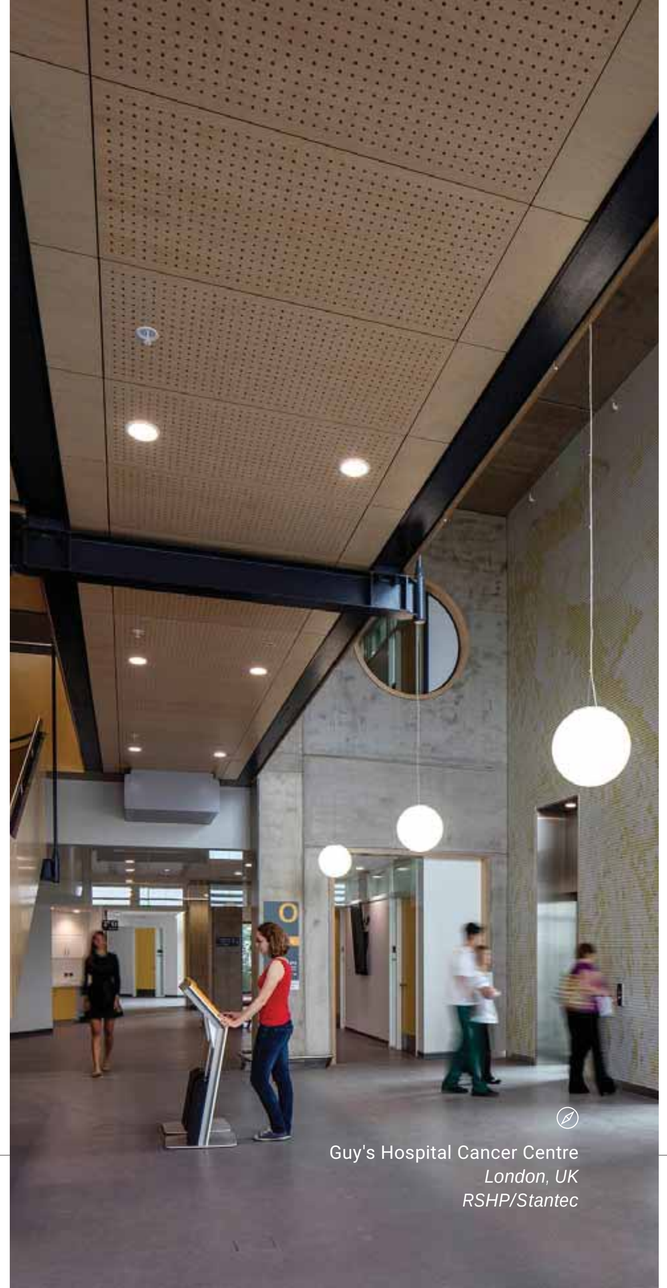
When repetition is necessary
Modularity is a great match for repetition, where it can achieve efficiencies in manufacturing. Therefore, in the education, residential and healthcare sectors where room types repeat, modularity has benefits. Today, it's not unusual for prefabricated hospital bathrooms to be built by trade workers at an off-site facility and trucked to the construction location for installation. SAnd at CAMH, Phase 1C hundreds of patient room walls are being replicated.

When controlling finishing details
A modular/prefabrication process makes it more likely that critical details (say the placement of service connections for a laboratory) can be executed to exacting standards in the workshop.

At **Yale**, the design control allowed us to deliver precision repetition. We were able to control features within inches in the lab modules and system, but also above the ceilings. That uniformity provides Yale maintenance personnel with consistent valving and shut off locations, providing ease of maintenance while enhancing goals for flexibility and future-proofing.

Guy's in London features a great deal of exposed concrete, which is unusual in hospitals. Through modularity, we were able to achieve a much higher quality finish on the concrete surfaces to meet Guy's infection control standards.

On tight urban sites
At CAMH Phase 1C there are very tight constraints with the rest of the urban hospital campus, which remains active during construction, and only a modest staging area available for construction. Prefabricating the wall panels means fewer hands on-site and less staging space needed. Similarily at **Guy's Hospital Cancer Center** in London, the tower was an expansion of an existing medical center in a dense and sensitive area on a cramped triangular site. The building was heavily scrutinized. Modular construction was 30% faster in terms of hours onsite, less noisy and therefore less disruptive to the neighbors and the functioning hospital itself.



Guy's Hospital Cancer Centre
London, UK
RSHP/Stantec

3 What approaches can help us get the most out of modular?

See it as a process
At Yale, an interdisciplinary team analyzed the project for opportunities to apply prefab, and then tweaked the design. This design thinking led us to establish a layout of eight repeating lab modules per floor, each with a repeating single trade prefabrication that brought together Mechanical/Electrical/Plumbing systems with future capacity and routing built into the design, an excellent fit for shop-based fabrication.

Understand that it requires intense coordination
Achieving the benefits of modularity requires early and intense collaboration. And that collaboration extends beyond the design team to the contractor and sub-trades. This collaborative and interdisciplinary approach to problem solving uncovers possibilities for prefabrication that aren't initially obvious. Early consultation with our mechanical contractor allowed us to prefabricate the main building chilled water and steam risers, as well as the main duct risers—a surprise to the design team given the size of these elements.

Digital model to fabrication
With Guy's, it was to our advantage to develop the >

clinical and architecture database and develop finished details on rooms and equipment in a 3D model environment. The engineers modeled everything in BIM. The 3D modeling tool is a crucial communication tool—presenting our project design to the Guy's client group including patients so that they could understand fully the design intent. It was crucial that we delivered in a digital model because that model, once translated, became the blueprint for fabrication.

Where is modular going?

Currently, there are limitations to the application of modular building. Two of the floors at Yale Science Building, for example, were too specialized to reap the benefits of multi-trade pre-fabrication, although single-trade prefab was leveraged. At Guy's, erecting smart walls as the building was going up created an unusual, albeit temporary, situation: exposed interior walls during construction. But, keeping the above in mind and challenging ourselves and clients to use their imagination, means that prefabrication and modular construction is one wave of the future that's already arrived.

BENEFITS OF MODULAR

SPEED

Prefabrication increases speed of construction by simultaneous construction of project elements that typically follow a linear schedule. At Yale, the riser components, which would have taken a crew 7 weeks to construct on-site, were installed in 2 days through prefabrication—that's a savings of 960 person hours on-site. At Guy's in London, Laing O'Rourke estimates that a modular approach allowed the project to be built 30% quicker than conventional building methods.

SAFETY

Prefabrication takes place in a controlled environment where the benefits of temperature control, ergonomics and standard safety protocols are present—aspects much harder to control on-site. Manufacturing, cutting, welding, even lifting can be done with the latest machinery, even robots, and OSHA (the Occupational Safety and Health Administration in the U.S.) engineering safety controls can be put in place. And that means a more consistent product, with much lower potential for harm to workers.

SUSTAINABILITY

With prefabricated components, there's far less waste produced. In a shop environment, the cuttings from making smart walls for Guy's, for example, can be reused or properly recycled whereas on-site, those cuttings are typically sent to landfill. This means that projects like Guy's can pick up points toward BREEAM certification.

QUALITY

Modular design approaches and the idea of architectural achievement are not always thought of synonymously—but perceptions are shifting thanks to projects like Guy's and Yale. The regularity of the laboratory systems at Yale, the quality of the finishes at Guy's Cancer Center have a lot to say about what can be designed and achieved using modularity. One look at these finished buildings and you can see the design quality that results from pre-fabrication. D

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MORE EDUCATION

Shawn Maley AIA, LEED AP is an architect and designer with more than two decades of experience. From Stantec's Butler, PA office, Shawn specializes in laboratory planning and design for educational, corporate, light industrial, and governmental institutions. **Anuradha Sabherwal** is Stantec's lead environmental architect in the UK. She's passionate about finding sustainable design solutions for highly complex hi-tech buildings.

Yale Science Building
New Haven, CT
Stantec/Pelli Clarke Pelli

Park Boulevard
Chicago, IL

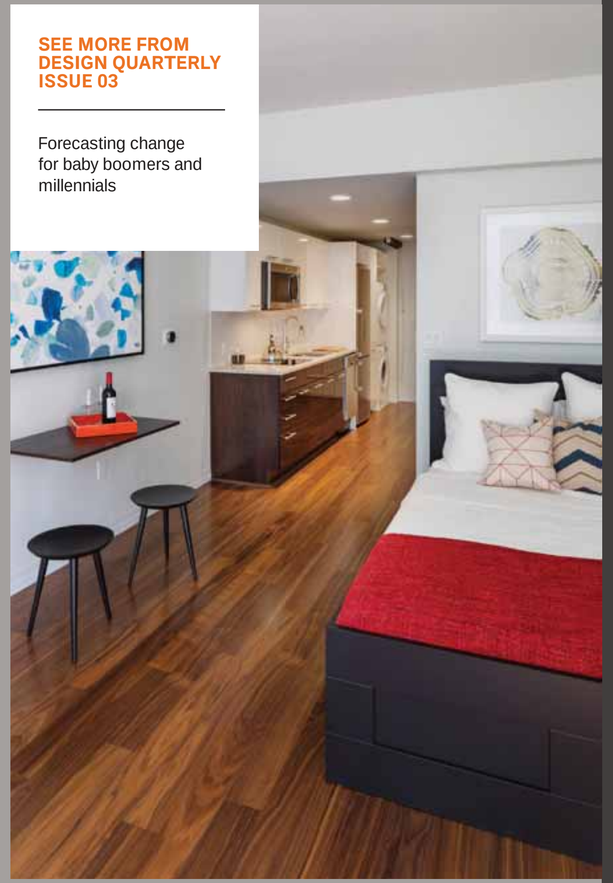
KEEPING THE CITY WITHIN REACH

Innovative approaches to housing for mixed-income, artists and young professionals

BY BILL KETCHAM

SEE MORE FROM DESIGN QUARTERLY ISSUE 03

Forecasting change for baby boomers and millennials



Seaport Watermark
Boston, MA

According to the UN Department of Economic and Social Affairs 2018 Revision of World Urbanization Prospects Report, more than 55% of the world's population currently lives in urban areas, but that number is expected to grow to 68% by 2050. And in North America city-living dominates, with 82% of the population crowded into urban settings where their long-lasting appeal now spans generations. All this interest means investment. But, the boom in urban real estate comes with rising housing costs.

This global trend toward urbanization puts greater pressure on designers to realize innovative approaches to housing. Cities are desirable and vibrant places when they're economically diverse. If our housing solutions are to enhance city life, they must succeed at making urban communities that are inclusive across all income groups.

In this context, the term "affordable housing"takes on new dimensions. An expanded understanding of how residential projects can meet the needs and price points of niche markets while achieving harmony with the urban context is changing how we approach housing in cities.

Considering these pressures, it's worthwhile to examine three current approaches to affordable living—housing for families, artists and young professionals. In each instance, the design balances cost and quality to achieve affordability, aesthetic appeal, and most importantly livability.

MIXED-INCOME HOUSING

Chicago public housing developments of the mid-20th Century created a large volume of housing, but it was often disconnected from the city's vibrant urban fabric. Today, at Park Boulevard, Lake Park Crescent and elsewhere in Chicago, we are realizing new approaches to mixed-income, socially-conscious housing. We've emphasized design priorities which result in desirable residences that connect to the community.

Connect to the urban fabric
By re-establishing the city grid destroyed by CHA (Chicago Housing Authority) high-rise construction decades ago, and designing buildings at scale to their surroundings, we can reweave the urban fabric that was frayed. The master plan at Park Boulevard re-establishes Chicago's street and alley infrastructures. The plan places buildings at the edge of blocks with facades that adhere to the development's building setback lines. This creates a welcoming neighborhood streetscape that brings people and activity back to the sidewalk. At the street level, the buildings on major arteries feature offices, tenant recreation space, retail or job service programs.

Create a variety of architecture
If we're interested in creating a vibrant, livable city, we need to vary the scale, height and architectural expression of these mixed-income buildings so they integrate seamlessly. We vary the type and scale of housing from contemporary rowhouse-inspired dwellings for single families to sleek modern mid-rise residential buildings.

Make it last
We favor long-lasting, high-performing materials in these residences, like insulated windows and masonry veneer cast-in-place concrete structures, so that they integrate into their historical context and last for decades to come.

Amenities that suit modern lifestyles
The new units feature desirable amenities typical in contemporary market-rate housing in the city: from individually-controllable HVAC to energy-efficient kitchen appliances and assigned parking. >

FOR MORE IDEAS ON LIVING SMALL CHECK OUT THE DESIGN QUARTERLY: **SUSTAINABLE CITIES** OR STANTEC'S IDEAS ON THE **CHANGING RESIDENTIAL LANDSCAPE**

Living small means sharing more within flexible common spaces, think event room at night – yoga studio by day

Troy Boston
Boston, MA

Fill with natural light and views
We opt for significant floor-to-floor heights, large windows, rooftop terraces and vegetated roofing whenever possible to achieve an airy feel and make connection with the outdoors. Bay windows connect to the local vernacular and offer views up and down the street.

Breaking social stigmas
This planning and design approach's most potent feature is nearly invisible, by design. It's literally impossible to distinguish between subsidized and market rate housing in these buildings. Both typologies look like the places where people of all walks of life want to live in in the city, because they are. They are designed and built to standard that makes them widely attractive and desirable places to live.

HOUSING FOR ARTISTS

It's not uncommon for the artists who found an affordable work/live space years ago to find themselves victims of gentrification—priced out of a now hot neighborhood they helped enrich. Can housing nurture the cultural diversity that make them unique and desirable?

Recognizing history
Chicago's Pullman District, now a National Landmark district, was once a company town for railway car manufacturing. Pullman artists are under pressure from rising housing costs and Artspace develops affordable residences for artists. Its Pullman project will be the first new housing in the area in sixty years and feature three residential buildings (two landmarks and one new building which replaces a building torn down in the thirties) to fill the gap for Pullman artists.

A sensitivity to the historic and neighborhood context is always important but in this residential project, it was paramount. Illinois Housing Development Authority (IHDA) and The Department of Housing and Urban Development (HUD) financed projects receive investment tax credits for their historical components. The buildings are stylized with details (masonry, colors, window forms and brick) that evoke historic Pullman. Artists and residents can network on the building stoops, which are emblematic of the neighborhood.

Balancing functionality and affordability
At Pullman, we've designed 38 units in total with flexible, durable spaces that click with creative residents. Concrete floors and unfinished drywall can be customized as needed. Bedroom closets are movable, to allow for greater workspace. And the ground floor features shared studio and gallery spaces. The result, opening in 2019, are high quality places for artists to live and work that will ensure that the neighborhood's creative culture remains vital for years to come. >

YOUNG PROFESSIONALS

Today's young professionals or aspiring professionals want to live downtown while they work their way up. But soaring real estate costs in cities like Boston and Chicago have pushed many standard apartments and condos within city centers well out of reach. Coinciding with this is a trend in millennial and Gen Z toward an appreciation for city experiences, entrepreneurial work and car-less lifestyle.

The city is your living room

Developers (and designers) have already recognized that urban residences that feature smaller units with greater shared amenities have a potent draw across generations while achieving an affordable housing option.

Co-living, meaning shared rental apartments in residential buildings with common amenities, takes this trend to the next level. The co-living movement has flourished in Europe in places like Copenhagen, Denmark —valued for its mix of community, affordability and ability to deliver that urban buzz that so many of us crave. Now, the North American market is starting to embrace similar ideas.

In Chicago's Fulton Market district, Quarters, a new co-living concept, offers compact housing for this emerging market with a mix of private 1BR apartments and private rooms in apartments where kitchen and baths are shared with up to five residents. In addition to residences, it features large public spaces on its upper floors (social space and dining) with commercial co-working space on the bottom floors.

Quarters is suited to urban dwellers that aren't ready for the commitment a lease entails and want their paycheck to go to a city experience, not an unused dining room.

It's clear that for many of us, the desire to live in cities is so potent that it's generating interest in new types of housing and lifestyles. Designers will continually be challenged to deliver residences that exceed the expectations of urban dwellers on a budget. One thing is clear, the allure of cities is not going away. D

Park Boulevard
Chicago, IL

AFFORDABLE HOUSING TAKES ON NEW DIMENSIONS

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MORE RESIDENTIAL

From Stantec's Chicago design studio **Bill Ketcham, AIA, LEED AP** creates beautiful spaces with attention to detail, light, and color for clients who understand what architecture can do to support their mission.

10 North Station
Philadelphia, PA

Cities as innovation centers

With tech hubs and innovation districts, research universities have the keys to unlocking reinvigorated cities

BY DON HENSLEY AND PABLO QUINTANA

In the past, research buildings or areas within universities were sealed-off; almost clinical spaces featuring easy to clean utility, probably few windows. Their inhabitants were serious, studious and not often seen. All of that has changed now as educational institutions have realized they benefit from building a bridge between that research and real-world application, both to provide an experience for their talented researchers (and recruit more of them) and to more fully reap the rewards from campus discoveries and innovation. >

Johns Hopkins Technology Ventures Incubator Space
Baltimore, MD
Stantec/Design Collective

At Johns Hopkins University in Baltimore, MD, for example, the university and medical campus were a magnet for innovation in medical technology, drug development, healthcare treatment—incubating ideas across the medical spectrum. But recently, the university observed that most of its research technology was being licensed by companies out of state. Keen to commercialize more research at home, universities like Johns Hopkins are exploring how best to accommodate business start-ups within walking distance of their own research labs.

An innovation hub for Baltimore

With **FastForward 1812** in East Baltimore, Maryland, Johns Hopkins has established a place where researchers can explore their ideas, hatch a business plan, and bring an innovative product to market. They married healthcare innovation labs with new technology innovation into a tech hub. Open to all start-ups, users can rent co-working space and lab space at the innovation hub. FastForward 1812 includes the start-up incubator space (it doubled the university's startup space), 8,000 SF of offices and co-working space, 15,000 SF of BSL2 wet lab space on the floor below and the offices of Hopkins Tech Ventures—a workplace for approximately 80 staff who run the Hopkins incubators. Upon its opening, 19 companies took space at FastForward 1812—proving the need is real.

GOOD DESIGN GIVES A CO-WORKING SPACE **A SENSE OF PLACE**

Johns Hopkins Technology Ventures Incubator Space
Baltimore, MD
Stantec/Design Collective

Design makes a difference

You wouldn't think a university medical project would hire a studio that designs hip, open workplaces for D.C.'s tech sector to design an incubator for health sector start-ups, but in today's cross-pollinating, innovation-focused world, that's just what happened.

Hopkins officials wanted the building itself to offer the chance for collaboration, so they and Baltimore-based Design Collective looked to Stantec's workplace studio in Washington, D.C. for input on how to create a collaborative, buzzing, "third place" with tech sector and coworking space energy at 1812. Hopkins was attracted to the energy and the vibe of spaces like **WeWork**, knowing intuitively that great work spaces attract talent.

And nothing has been as important to the success of co-working spaces as good design. Good design gives a co-working space a sense of place, provides opportunities for chance encounters and networking, catalyzing the social connections that fuel curiosity, discovery and ultimately innovation, their raison d'etre.

The FastForward hub has the look of a raw, co-working space—think cool urban coffeehouse meets the hip tech firm. Head downstairs and there's a community area that allows for chance encounters and unplanned collaboration before users reach their clean, controlled lab spaces. >

10 North Station
Philadelphia, PA

With FastForward the university created an environment that elevates the synergy between researchers, educators, entrepreneurs, and industry. Those universities that are both keen to attract the best researchers and monetize a portion of their research activity now recognize that the tech hub, innovation lab and collaborative start-up space are new must-haves.

Thinking bigger in innovation districts

But let's scale this innovative thinking up—how important is innovation to cities? In fact, we've seen it driving the development of entire neighborhoods. The Brookings Institution calls Innovation Districts "dense enclaves that merge the innovation and employment potential of research-oriented anchor institutions, high-growth firms, and tech and creative start-ups in well-designed, amenity-rich residential and commercial environments."

For years, developing economic districts were in suburban office parks and corporate campuses. That's changing. Brookings researchers say that innovation districts are essential to provide more and better jobs in the urban core. And that innovation districts are better poised to achieve a higher quality of work-life balance.

Driven in part by tax incentives passed by the U.S. Congress in 2017, private investment in "Opportunity Zones," innovation districts are in works in a number of U.S. cities, often connected to a tier one university with a robust research program and a parcel of land that university or city is keen to develop.

What's in it for universities?

Larger tech hubs are often anchored by major universities, but stakeholders can also include big high-tech firms and other institutions as well as real estate developers. As an anchor tenant in the innovation hub or incubator, the university has much to gain.

In the past, researchers with an idea to bring to market would leave the university with their idea and go to a private firm to launch it. By keeping innovation close at hand in tech hubs, >

universities can develop a direct revenue stream from the research they support.

In a typical tech hub agreement, a university–in return for their students, faculty, research tools and space–can enter into a patent agreement with company in exchange for a profit-sharing and some patent rights. This type of agreement unlocks a future revenue stream for the university.

But that's not all. Those start-ups will become new businesses and are more likely to stay near the university or in the city, keeping the talent and business activity nearby. That drives increased value not only for the university, but for the community as a whole.

There are recruitment benefits, too. Students will be drawn to access to the facilities and the potential industry connections within through their research, thereby creating a strong continuum from education to career opportunities.

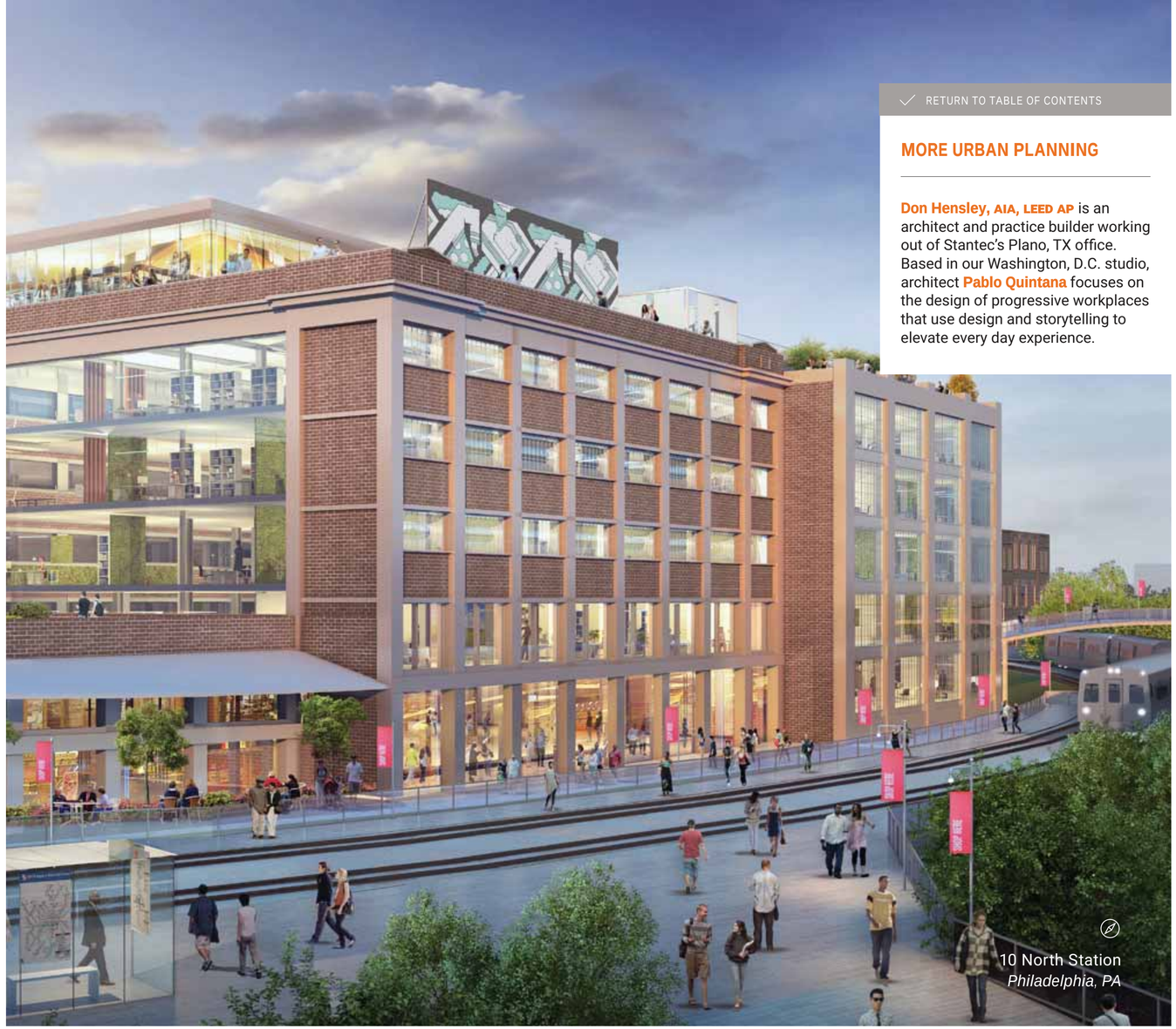
Investing in the livable city

Cities see investment in innovation hub-anchored neighborhoods as a way to support both entrepreneurs and local business, but also as a way to revitalize areas that need economic activity. City planners want to invest in ideas that create livable areas in these districts, not just isolated office parks, so they're counting on ripple effects that emerge when people live and work in a neighborhood.

Innovation is the cornerstone of just such a new neighborhood, 10 North Station, in Philadelphia near Temple University. The city targeted the underdeveloped district for growth and has identified innovation as a key driver. The new neighborhood envisions itself as an affordable, diverse community with easy access to transit, anchored by an innovation hub associated with Lewis Katz School of Medicine and the Temple University Health System.

Temple's plan for 10 North Station includes two towers, an innovation hub and coworking space for start-ups within its "INK" building, workforce training, retail and commercial, market-rate housing with a pedestrian connection to a light rail station.

As talent attractors, revenue generators, investment drivers, and their potential as city-builders innovation districts are a win-win-win for cities, universities and developers and as a result, we expect them to proliferate for years to come. D



10 North Station
Philadelphia, PA

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MORE URBAN PLANNING

Don Hensley, AIA, LEED AP is an architect and practice builder working out of Stantec's Plano, TX office. Based in our Washington, D.C. studio, architect **Pablo Quintana** focuses on the design of progressive workplaces that use design and storytelling to elevate every day experience.

THE NEW MINDSET

What's **driving disruption** in the energy sector

BY BILL SHELLEY, RACHEL BANNON GODFREY AND MARK WILSON

Everything we know about energy is about to change.

Not long ago, if the big utilities needed more power, they didn't think about it much. They built another power plant. They looked out thirty years on the horizon and planned for their energy needs, according to demand forecasts tied to economic growth. This core belief was so entrenched; energy consumption was considered a metric for GDP. But not anymore.

Today, the power industry sits at an inflection point. From how power is produced for us, to how it's sold to us, to how and where its consumed by us, everything about the energy industry is changing. We will experience more change in energy generation and distribution in the next ten years than we've seen in the previous hundred.

An unsustainable model
The whole electrical grid came into being as a means of lighting cities. As it grew and evolved, the grid moved from a somewhat distributed generation system to a centralized system with massive generators and an extensive transmission network. Electric utilities were founded on the premise that population and demand would grow.

Today, we understand these systems are unsustainable and, potentially unnecessary. Energy demand continues to be driven down by new, more efficient technology, improved building design and construction methodologies, and insulation. Consider those changes alongside a slowing population growth, an economic shift towards a digital and service-based economy combined with the offshoring of manufacturing and heavy industry, and it becomes clear that the traditional variables for energy planning are no longer valid.

In response, many energy utilities are pivoting to new roles, roles that extend beyond selling electrons. Many are recognizing the need to become energy service and solutions providers, renting equipment, managing demand, diversifying into emerging energy segments like digital power solutions or electric vehicles.

Society change, information and control
Societal perceptions about energy are changing. Consumers are more vested in energy generation and consumption than ever before. There is an unprecedented demand from consumers for information about and control of their energy options. The market is responding by developing new tools and technologies including customized power options that give consumers more control, resilient microgrids capable of securing community energy supply, self-generation options where they can generate their own power and feed it to the grid, and peer-to-peer energy sales. And there's a steadily escalating interest in electric power origination. Consumers clearly want to implement renewables.>

Architect of Record: Labbé, Laroche / Gagné, Leclerc et Associés.

There's a big push from corporate and residential consumers alike to be good stewards of the earth and make greener choices. The rise of energy savvy consumers across the globe is a strong driver of the energy market's revolution.

Magic inflection point and mindset

But who is going to pay for all this innovation? As always, investing in innovative technologies and approaches has a price point, but recently we've hit that magic inflection point; where there is a price impact, people are willing to invest in it, to a degree. In some markets, there's a higher tolerance for the cost of implementing more energy-efficient infrastructure and technology than there was in the past.

So, what's changed?

The market. Regulations. Corporate commitment to renewables. Really, awareness. Consumer desire drives down price. In many markets—particularly coastal areas—clients, municipalities and consumers want products and systems that are resilient, they want green power, they want something that looks to the future. In areas that are still dependent on heavy industry, this market may be softer. While today, one firm in twenty may embrace investment in efficient technology, soon it will be five, then ten. One day, in the not-to-distant future, the market will bloom.

Cross-disciplinary nature of energy innovation

Over the past century, cities and towns were designed and built on a conventional centralized energy distribution model, that was mono-directional. Disruption in energy is already influencing the way we plan and build cities. Energy harvesting, usage and community resources are increasingly intermixed in a bi-directional manner. As the lines between traditional power infrastructure continue to blur with other traditional markets, adapting to this disruption in energy is pushing energy into a more interdisciplinary engagement, requiring the integration of power, buildings, infrastructure and water engineers and designers to collaborate more closely than ever before.

Evolv1 Centre for Sustainability Excellence
Waterloo, Ontario

Community building

We already see the beginnings of change in energy approaches at the community level, initially with everything from community car parks with solar canopies and car share program to distributed community energy generation. And we'll see communities implementing existing technologies from microgrids to energy districts to technology that recaptures energy from braking commuter trains. We may find that self-sustaining micro communities are one answer to the commuter challenge. Eventually, we'll see communities transform and adopt in ways we can and can't predict. The energy revolution is just beginning. >

MORE SUSTAINABLE AND RESILIENT DESIGN IDEAS

Technologies and trends in energy disruption

Crescent Dunes Solar Energy Facility
Photo: SolarReserve, LLC

Technologies and trends in energy disruption.

Three trends grow up

MICROGRIDS

Energy security and independence

A microgrid is a local energy grid that typically operates independently on locally generated energy as needed. Microgrids provide added resilience and security, as they continue to function if there is an outage in the overall grid. A major feature of microgrids is the variability of their composition. They can incorporate energy storage, diverse generation sources, and custom distribution models.

ENERGY DISTRICTS

Saving money with load sharing

Office complexes have high cooling loads. Hospitals and factories generate excess heat. Can that excess heat be recovered and used elsewhere? Perhaps to heat residences at night? In the conventional model, each building needs healing and cooling to meet peak demand. But if we can transfer excess heat from one building to another, we can realize efficiencies. Depending on use, each building has a somewhat different load pattern. By moving energy between buildings based on demand and time of day needs means we can design smaller mechanical units, which means lower capital and operating costs. University districts and corporate campuses, with their shared facilities, power and metering, are excellent candidates to form energy districts.

ENERGY STORAGE

Save it when you're not using it

Local power generation and load-sharing, whether it be solar PV, off-peak gas, or recovered energy will depend on improvements in energy storage technology. As local energy markets continue to diversify, so too do energy storage options. In fact they are one of the fastest growing segments within the energy market, as equipment manufacturers, utilities and service providers all seek to meet the market's growing demand for the increased energy independence and resilience. >

Three trends to watch

ENERGY PRODUCTIVITY

Seeing energy as dollars

Energy analysis findings are often explained in industry jargon and metrics (EUI, pEUI) that do little to excite the business world. And the choice between energy efficiency and revenue growth has long been presented as a binary one. But what if we frame energy efficiency in the same terms that company CFOs and CEOs are familiar with? Energy productivity translates the metrics of energy consumption into business productivity terms that are more tangible to CFOs. Energy productivity quantifies a company's economic output for every unit of energy consumed. It decouples efficiency from profit, by showing an energy footprint reduction can accompany revenue growth—that efficiency is potentially a money saver. Thinking this way moves energy-efficiency away from a space-related, fixed-cost issue into the realm of strategic investment.

GRID-RESPONSIVE SMART THERMOSTATS

Reducing the load at home, remotely

Smart home owners already pay themselves off in energy saved. But grid operators and start-ups would love to connect with these homes (outfitted with smart plugs, smart thermostats, etc.), aggregate that home load flexibility to take pressure off the grid. Homeowners who sign up turn over large chunks of energy use to remote control. Pilot programs are already underway in California, paying superusers in cash.

ENERGY AS A SUBSCRIPTION

Making system upgrades a priority

People don't want a boiler and chiller, they just want to be warm in winter and cool in summer. We buy electricity from the grid, but are not required to personally buy and own the poles and wires connecting us back to the power plant, why must we own our own HVAC systems? In the subscription model, we pay for the power, not the equipment. D

Installation of 711.37kW roof-top photovoltaic system
Anheuser Busch

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MORE ON POWER SERVICES AND DESIGN

Bill Shelley, Operating out of Scarborough, ME, has decades of power sector business experience, and works on project development, and every phase of power asset lifecycle management. **Rachel Bannon-Godfrey ASSOCIATE AIA, LEED AP BD+C, ENV SP** has deep experience in the design, construction, and analysis of high-performance and net-zero energy buildings, along with energy efficient and renewable energy technologies. Based in Denver, CO, she is Stantec's sustainability discipline leader. **Mark Wilson** is sub-sector lead for Canada East's Thermal Generation team and sector lead for Atlantic Canada's Power business center, working with electrical utility and industrial clients from Fredericton, NB.

Q&A

Ask an Expert:

How are we designing for livable cities today?

INTERVIEW BY JOHN DUGAN

Nancy MacDonald thrives within multi-disciplinary teams. Now, with her background in planning, she takes on the director role of Stantec's Urban Places team, who shape the development of large projects that fuse diverse talent and expertise from Stantec to public and private sector clients. She loves the ability to apply the value of Stantec's integrated approach and expertise to cities, which are multilayered and complex.

What are the big issues facing cities now? Cities are so desirable right now, but the demand for living in the city is exposing these aspects of cities we could improve?

NANCY: Exactly. If we look at the population across North America, we see two strong generational changes. Boomers are aging and moving out. At the same time, millennials are looking for a different type of experience than their parents did at their age. We have two groups, a significant part of the population, looking for the same sort of way of living at different points in their lifecycle. Both are more focused on an experience than an acquisition. Boomers are looking to downsize and divest themselves of some of their assets. They want a smaller place and be able to travel, be a bit more mobile. That population shift has changed how people are living in the city—especially in second-tier cities where this is having a dramatic impact.

A lot of the investment that was going to the suburbs for decades is moving back into the city core. Businesses are looking for talent, and the creative class wants to live in an urban environment. So you have generational change, cultural change, and mobility that pulls this together.

How does mobility fit in?

NM: Mobility is dramatically changing. Infrastructure is aging and needs to be replaced. We have an aging population. And a population that isn't going to own cars. How are they getting around? Mobility is becoming a service industry, that's a big shift. You don't have to have a car anymore, you can use a carshare program or call an Uber. And we'll see a move to autonomous vehicles. But AV are only part of the mobility solution. There's going to be more investment in public infrastructure, in solutions like electric buses and streetcars. The other side of it is climate change and getting ourselves off an oil-dependent culture.

Affordability is a part of mobility, too. If you don't have to invest in a car, that's a big difference in how you can live. It has a big impact on the city for the good. More people can live in a more concentrated area. And places in the public realm aren't going to be dominated by cars as much. And good transport options make it possible to live further from the places we work.

In Bangkok, there's a lot of parks that are built for adults, they're built as outdoor gyms and that's where people exercise, you'll see people working out on the bars.

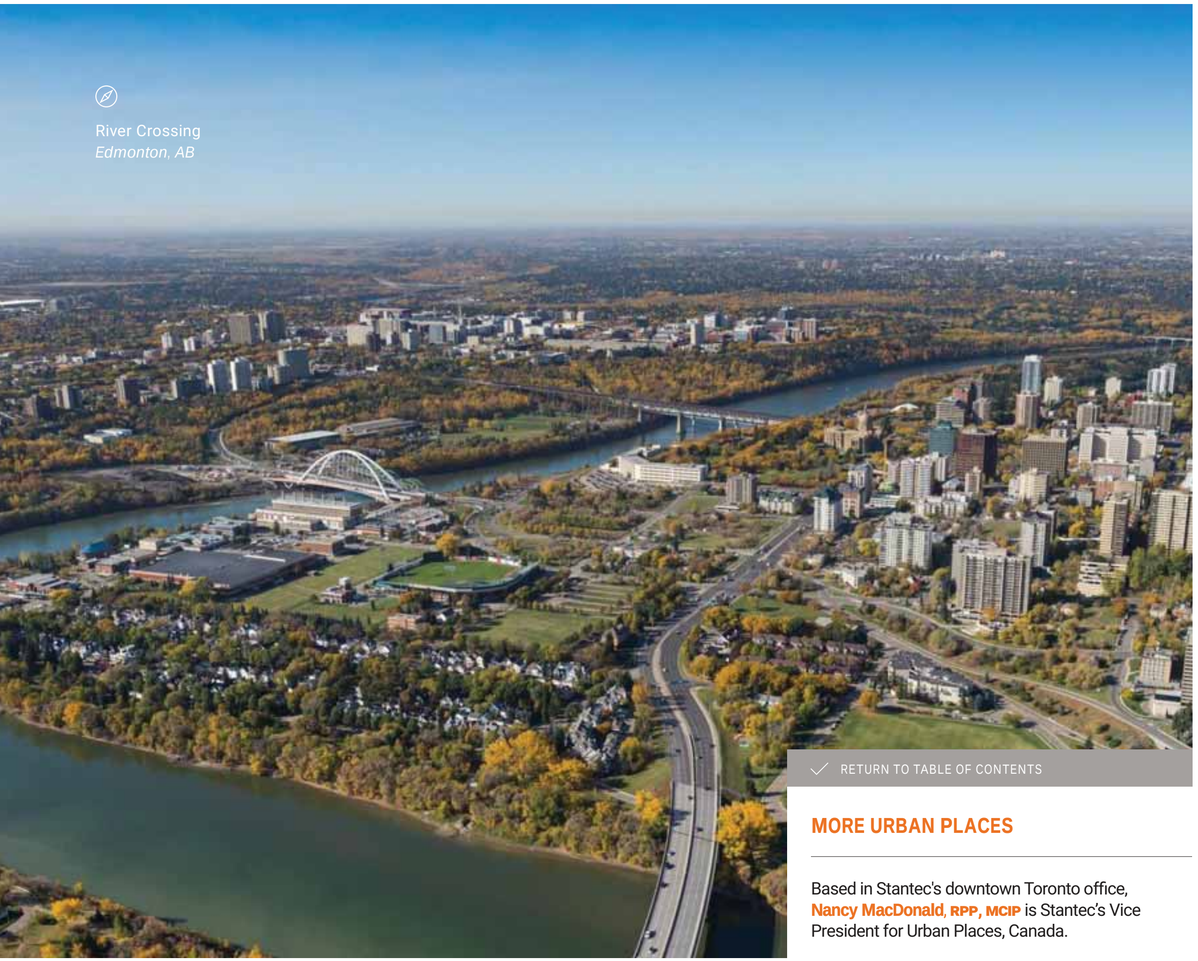
How important is density for quality of life and for tax base? Do you see cities planning for that?

NM: In Canada, our suburban areas are quite dense. The outer suburbs are built around a town center, which often relates to public transit node. But many recent policy changes in North America are focused on increasing density.

Again, transportation is a big issue. These outer suburbs are a series of nodes that sort of run together, but aren't necessarily linked in terms of public transportation. Transportation options in the core have to be improved, but we also have to improve transport on the external part of the city. Not everyone is going to live in core areas. But we have to be able to move people around more effectively than we do.

There's an affordability issue around cities, too. Land value is so high.Not everyone can afford to live near employment areas within the downtown core. That's a big problem in Toronto or New York, where people commute a couple hours to work, affecting their quality of life.

Thus, density is important from an affordability perspective, it's important from a critical mass >



River Crossing
Edmonton, AB

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MORE URBAN PLACES

Based in Stantec's downtown Toronto office, **Nancy MacDonald, RPP, MCIP** is Stantec's Vice President for Urban Places, Canada.

for infrastructure. If we are going to invest in transit, we need to invest in places where we can achieve density.

Q **Now you have lots of families that want to live in the city, but the actual design for the city doesn't necessarily have the amenities that families or kids want. What can we do about that?**

NM: That's a good point, the focus on users is changing, so more urban parks are being designed while thinking about the end users. There might be kids in the area, or the elderly–or both! Programming was very prescriptive before, with things like teeter-totters; you'll see less and less of those parks. Park spaces are still evolving as an attractor in some places. There's not enough of them yet. As more people move in and then demand gets higher and higher.

In Bangkok, there's a lot of parks that are built for adults. They're built as outdoor gyms, and that's where people exercise; you'll see people working out on the bars. It's an interesting approach to thinking about who is using the park space. Find out who your users are and design that park around it.

There are more requirements when you're designing a community. Who are the users? How are you designing for children? What are the components of the park that promote play? How are you dealing with play in that context? Play doesn't have to be a structured process or piece of equipment.

Another thing. When we design neighborhoods, with park spaces, with park spaces, we design spaces — everything is green, beautiful and lush. But in much of North America, that's only part of the year. Our focus needs to include winter design principles. How do you design those spaces for use in all seasons? How can you block wind and use color to enhance vibrancy? How can light extend the use of space?

Q **What projects are you excited about right now?**

NM: River Crossing in Edmonton. We are working with the City of Edmonton on this exciting project. It's in the historical center of the city, the indigenous center of the community, the former trading center. It's the history of the city going way back. There is a fantastic opportunity here for "place-making"—there's an historic generating station, there's a new iconic bridge that's just been built, there's a park component, >

there's some new mixed-use residential. It's a great example of the layers of complexity and putting all the pieces together and figuring out what how to activate the area for the future. How do you turn this into a place, how do you animate the space, how do you ensure that it's successful, that it has the right pieces? We are working through it with clients, community, consultants, financial analysts, and different stakeholders to make that reality. That's what I really like.

Q What's the most satisfying aspect of what you do?

NM: It's the multidisciplinary nature of bringing people together and finding a solution. I find that really interesting. I love the level of complexity in a city. Looking at the design for a community stormwater pond, for example. How can you help bring something of value in the community as an amenity space? Can you add a rain garden? It's the combination of the whole, learning how the pieces of the city fit together to create communities.

It doesn't have to be a city, but cities I find are very complex, there are so many different components and different trade-offs. It's always difficult and challenging. And you may be doing the same project a hundred times, but it's so layered, that it's never the same project twice. D

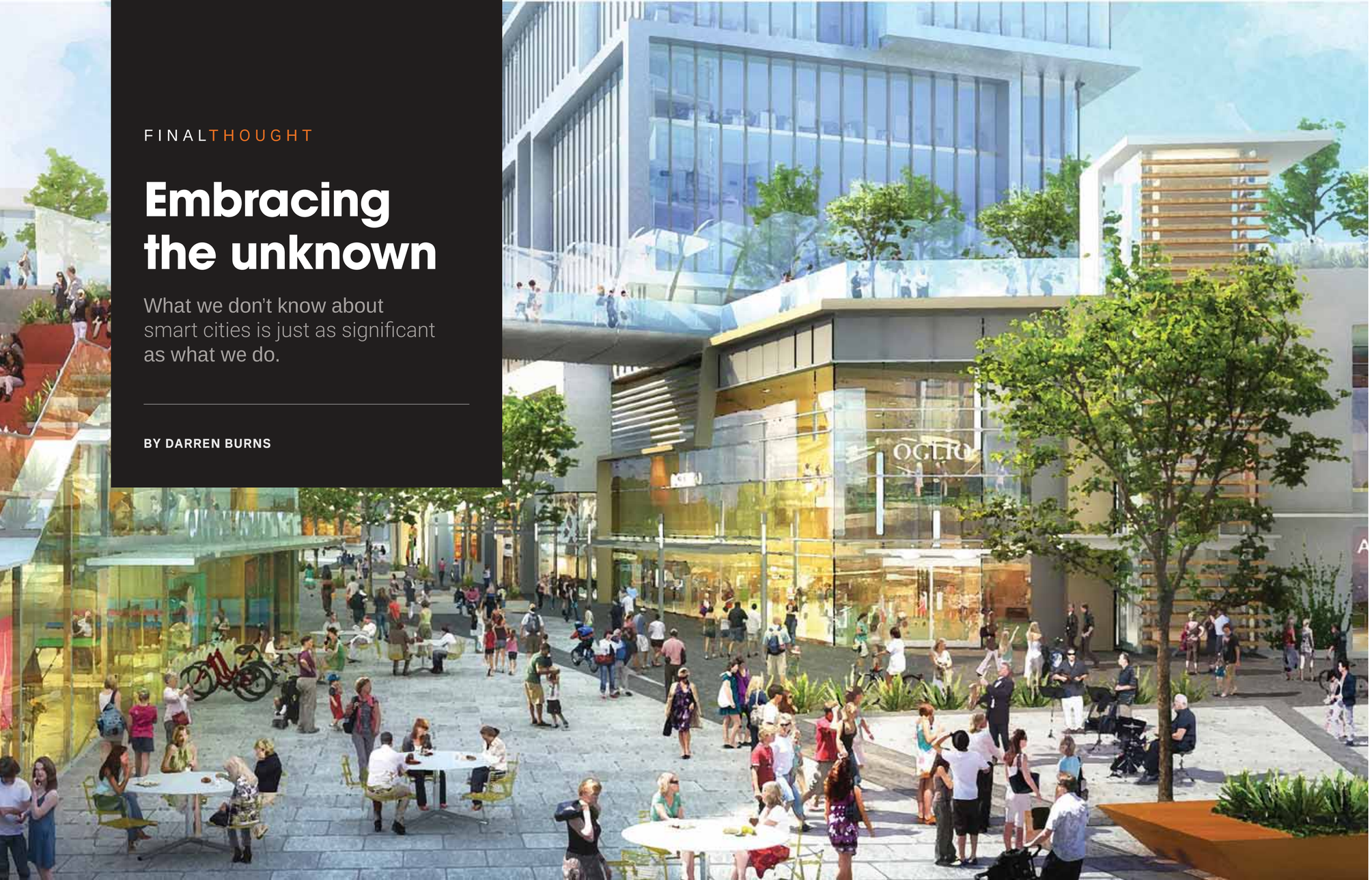
Multi-purpose, active, and engaging public space design enlivens urban and suburban settings.

FINAL THOUGHT

Embracing the unknown

What we don't know about smart cities is just as significant as what we do.

BY DARREN BURNS



ACCORDING TO CREATOR OF THE DOUBLING KNOWLEDGE CURVE BUCKMINSTER FULLER, UNTIL 1900 THE SUM OF HUMAN KNOWLEDGE DOUBLED EVERY CENTURY. DIFFERENT TYPES OF INFORMATION GROW AT DIFFERENT RATES. TODAY, OUR ONLINE ACTIVITY, NETWORKED DEVICES AND OBJECTS NETWORK GENERATE LARGE AMOUNTS OF DATA AND GROW THE KNOWLEDGE CURVE EXPONENTIALLY. WE'RE ENTERING **A DATA REVOLUTION**, AN ERA OF MONUMENTAL CHANGE THAT EXPERTS SAY COULD *RIVAL THE INDUSTRIAL REVOLUTION* IN ITS EFFECT ON HUMANITY.

→

“THIS POOL OF DATA WILL INFLUENCE OUR DESIGN AND URBAN PLANNING DECISIONS AND FEED INTO INVESTMENT CHOICES AROUND DEVELOPMENT, TRANSPORTATION AND MOBILITY. ULTIMATELY, THIS DATA-RICH ENVIRONMENT WILL DEFINE OUR FUTURE CITY MODEL.

DARREN BURNS

Some big questions are beginning to come into focus; How will smart city technology benefit us? How will we get to smart cities? And what will they look like? But it’s important for us, as designers, planners and architects, to admit that what we don’t know is just as important as what we can predict. So, what are some of the things we do know about the approaching smart city?

Big data is already here

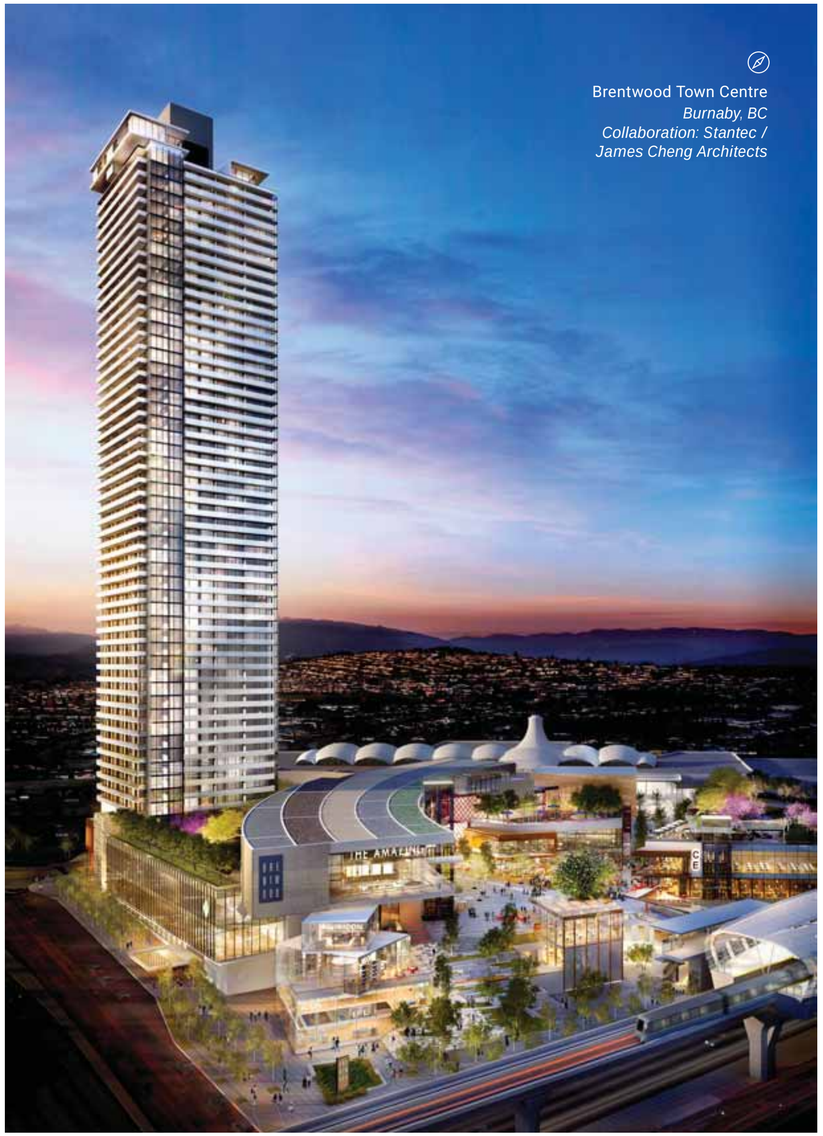
To a certain degree, this data revolution began without any warning. Private entities have been collecting data and using it for years. The general public now realizes that all this information isn’t meaningless, it’s meaningful—and potentially quite useful. Big tech companies harness data to make profit and big data informs and influences everything from targeted advertising to politics, and it’s not always used in our best interest.

We’ve only seen the tip of the iceberg. Technology advances onward. Objects (from the sewer line to a streetlight) that were previously inert, will be fit out with sensors, making them intelligent, and able to self-adjust their operations on the fly. 5G is on the way, a wireless network a hundred times faster than what we use today, which will be the cornerstone for this revolution. It is the digital infrastructure on which all this data is going to flow.

Institutions and industry are rushing to understand and harness the power of data. For me, it was seeing **Data Collider**, a project developed by MIT’s Senseable City Lab to help designers and planners visually express city data, at a conference a few years back that really sparked my interest in smart cities and networks of big data. I was amazed at the power of connected data at the city scale and the role design leaders could play in the advancement of smart city thinking at all scales of development. Visualizing data is key to harnessing the power of smart cities.

The promise

The promise of a more intelligent data-enriched city is that it enables us to be more efficient. Access to data empowers us to uncover existing synergies that we can’t imagine, to make better decisions, and to be more efficient. This pool of data will influence our design and urban planning decisions and feed into investment choices around development, transportation and mobility. Ultimately, this data-rich environment will define our future city model. >



Brentwood Town Centre
Burnaby, BC
Collaboration: Stantec / James Cheng Architects

Smart Cities
A Holistic Approach

A glimpse of the unknown
Predicting the future of smart cities is fuzzy as we can't foresee the social dimension of all these changes. We don't know what all the data points are going to be that guide a smart city. There is, however, some experimentation in the works and we will soon have case studies to learn from.

We can catch a glimpse of this beneficial interconnectivity already. One example is the evolution in district energy systems. Currently, few buildings communicate with other buildings enough to know that one might need to be cooled and one needs to be heated in the same area, a perfect opportunity to achieve greater efficiency and strive to Net Zero. By connecting smart buildings in energy districts on shared energy platforms, as opposed to heating and cooling isolated individualize buildings, we can realize remarkable energy savings. This is happening now.

Buildings will be smart but even smarter as elements in a connected network
We already see smart building elements emerging. Today, there are window systems that can self-adjust their opacity depending on sunlight exposure. That's an example of one element on a building being automated to benefit its energy consumption without a user input. Extrapolate that to thousands of elements within a building and you begin to see the high-performance potential for truly intelligent buildings.

What are the potential intelligent components that would then affect the ultimate design of that building? Zoom out. Take that idea outside the property line; what are the connected components from these smart buildings that plug into a broader city infrastructure? We can predict that communications networks, energy systems and wireless networks will be layered and interconnected. This interconnected, layered network will be the infrastructure that supports emergence of a smart city. At this point, we can't imagine all the elements that will comprise this layered network—there is so much more to discover and that's exciting.

But on the flip side, we must consider the social and cost implications of all this technology. Especially for cities that are contending with rising housing costs, social challenges and aging transportation infrastructure. As we implement smart city thinking at larger scales, the answers to these questions will emerge through trial and error.

Today's pilot projects will be revelatory
Where are the pilot projects for smart cities? In cities, of course, but in other places, too. An easy way to control the big picture is to own a lot of land. What sits on a lot of land? Retail malls are a good example. Deconstruct 40 acres of a suburban mall and you have a microcosm of a smart city. I am currently engaged on a project at Metrotown in British Columbia, where the conversation is centered around parking, AVs, future proofing, district energy systems and the transition from sales-oriented to experience-oriented retail. Each of these elements contributes to the promise of the smart city revolution. Effectively, these large development sites are incubators for everything "smart" and serve as incubators and precursors of what the larger city can tap into, explore and exploit.

This revolution will change the design profession
Over time, as technology in building systems became more complex, the role of the master architect transformed. As complexity increases, areas of responsibility break off from the traditional role. The singular master architect is no longer; one person holding all that complex, technical knowledge is just not possible. So today we have specialists: experts in envelope, code and municipal issues, elevators, each come into play on a major building project. >

Technology has transformed our design delivery process. Virtual reality, augmented reality and computational design have arrived and are gaining traction. These digital tools are exploding now with the data revolution. With more inputs entering the process, specialization and layering in design development will increase. The expanding toolset and the data infrastructure will open further windows of possibility for how much we can digest, manipulate and incorporate into the buildings emerging from our design process.

The architect's role as a natural coordinator will continue, of course. Our focus will be to bring together an incredibly diverse array of disparate components of connected design across disciplines. It's unlikely that many of us understand the complexity of what's coming, nor just how dramatic and pervasive those changes to the way we do things will be. But, that's what keeps things interesting.

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MORE ON MIXED-USE

Darren Burns is an architect, designer, and leader specializing in the commercial sector, particularly in retail, mixed-use, and complex project delivery. From our Vancouver, BC office, he focuses on projects that require a high level of design and create meaningful urban places.

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Executive Editor **Andrea Johnson**
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Graphic Design **Miranda Esteve**