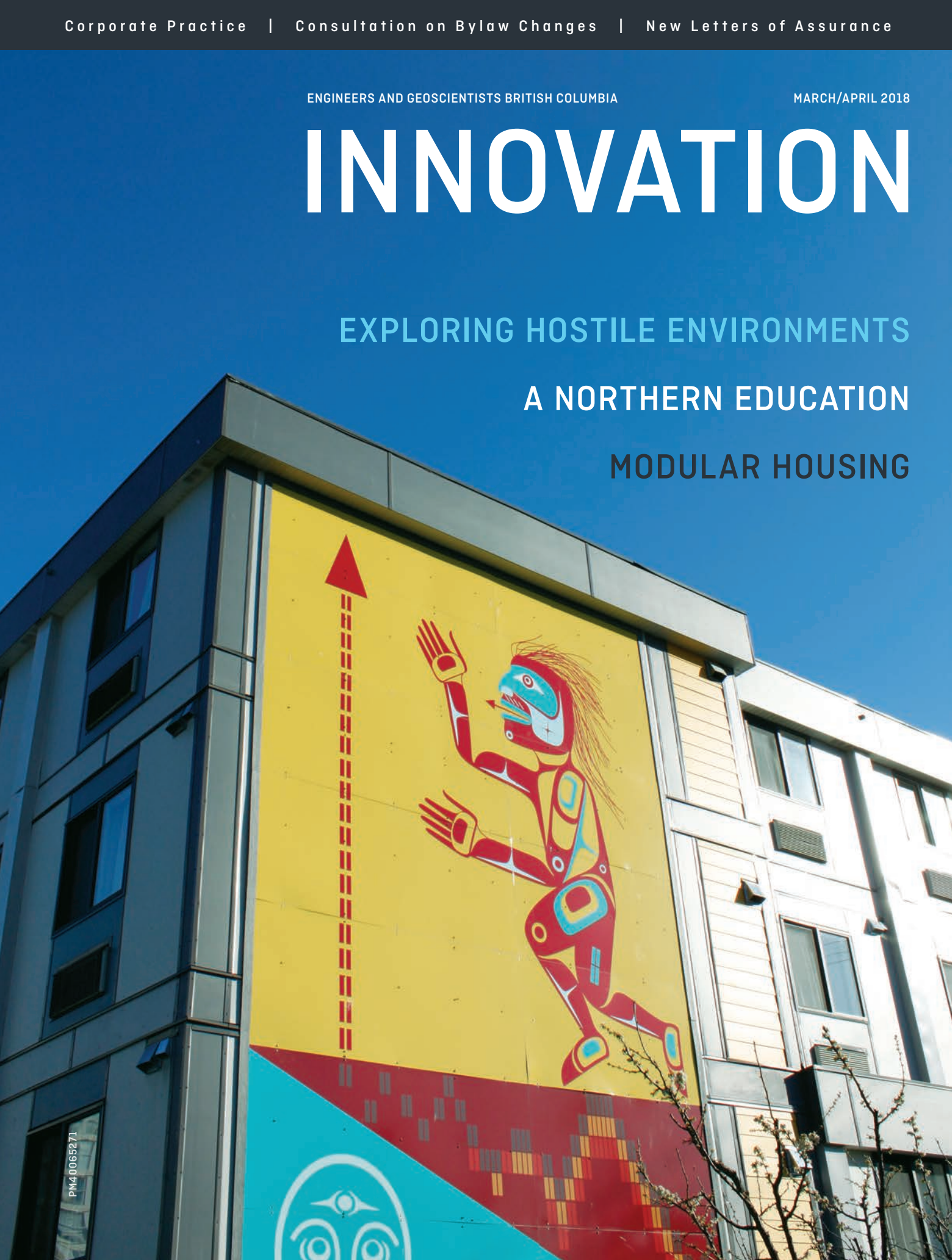
ENGINEERS AND GEOSCIENTISTS BRITISH COLUMBIA MARCH/APRIL 2018

INNOVATION

EXPLORING HOSTILE ENVIRONMENTS

A NORTHERN EDUCATION

MODULAR HOUSING



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MODULAR HOUSING

Engineering solutions for British Columbians experiencing homelessness

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Community leaders across British Columbia are calling for solutions to the growing homelessness issue in which more people each year find themselves without stable housing. In early 2017, 3,605 people were found to be experiencing homelessness in Metro Vancouver, and 1,387 homeless people were counted in Greater Victoria in 2016. Regional centres are similarly affected, with 95 people found to be homeless in Kamloops in 2016 and 63 people in Terrace in 2017. In response to this crisis, the provincial government launched the Modular Housing Initiative in 2017.

Vancouver's first modular housing project designed to provide affordable housing for lower-income and homeless residents.
(All photos courtesy of Vancouver Affordable Housing Agency)

One of 40 self-contained suites at the modular housing project located at 220 Terminal Avenue in Vancouver, which will house those in need until they can find permanent housing. Due to the modular construction, the site can easily be redeveloped for its next use.

Through the initiative, which is being coordinated by BC Housing, the government initially invested $291 million over two years to build 1,300 modular units throughout BC for people on low or fixed incomes who are experiencing or at risk of homelessness. As well, the government will contribute more than $216 million over three years for around-the-clock staffing and support services.

According to information provided by BC Housing, the Province has made a commitment in Budget 2018 for 2,500 additional modular homes with 24/7 support, bringing the total number of homes around the province to 3,800. A team of real estate, funding, management, and construction partners will work on each development.

The urgency of the problem made modular construction, which involves building individual units in a factory and then transporting them to a site for final assembly, a natural choice. According to manufacturers, modular construction is 30 to 50 percent faster and often less expensive than conventional construction methods, for a building that appears no different from its neighbours and is just as safe and sturdy. Modular home construction has some high-profile supporters, including Canadian builder Mike Holmes of *Holmes on Homes* TV fame.

BC Housing issued a request in October 2016 and subsequently prequalified modular-home manufacturers who possessed the capability to handle design, manufacturing, transportation, and on-site installation. Horizon North, a Calgary-based company with an office and a manufacturing facility in Kamloops, was selected to build the first few Vancouver projects. Overseen by the municipal Vancouver Affordable Housing Agency (VAHA), Horizon North completed the city's first modular housing project designed to provide affordable homes for lower-income and homeless residents at 220 Terminal Avenue in Vancouver. Finished in March 2017, the complex consists of 40 self-contained suites for one person that will house those in need until they can find permanent housing. Due to the modular nature of the foundation and building, the site can easily be redeveloped when the time comes.

"Modular is a form of construction, a building method, not a separate building code," explained Joseph Kiss, P.Eng. (AB) and senior vice-president of modular solutions for commercial and residential construction at Horizon North. "We have to meet all the same building code requirements as any other structure in the same jurisdiction."

At Horizon North's large, climate-controlled manufacturing facility in Kamloops, the company has adopted efficient

production processes from the car manufacturing industry in order to significantly reduce the waste associated with traditional building construction. Horizon North's modules are built to meet the building code requirements of the jurisdiction where they will be installed, and they are also inspected and certified by a third party to ensure they adhere to CSA A277, the Procedure for certification of prefabricated buildings, modules and panels.

Pat Ryan, P.Eng., Chief Building Official for the City of Vancouver, visited Horizon North's Kamloops facility with his team once the first Vancouver project was approved in late 2016 and met with Horizon North staff members to look over their products and identify any potential code issues.

"The City of Vancouver building codes align closely with the provincial building code, but there are some nuances in our codes that we wanted to address early, to make sure there were no hurdles to overcome," said Ryan. The City of Vancouver team found the modules to be "very well-built, high-quality, excellent products" and reviewed Horizon North's protocols and CSA standards against City of Vancouver building bylaws. The buildings that are constructed from the modules meet City of Vancouver bylaws completely, just using a different type of construction from usual.

With modular construction, site preparation can get under way while the modules are being built in the factory, resulting in fewer disturbances for neighbours and nearby businesses. At the Terminal Avenue site in Vancouver, an innovative foundation was also used, the first of its kind in Vancouver.

"With the Horizon North projects, they are using a new foundation type made by Triodetic which is completely modular and can be disassembled, moved, and used again," said Erv Hildebrandt, technical supervisor with the City of Vancouver's Development, Buildings, and Licensing department. "It floats on top [of the soil] and is not a typical foundation where they need to excavate down below the frost lines."

Triodetic is a Canadian company that specializes in creating foundations for buildings on unstable soils, such as in permafrost regions or those subject to frequent flooding. The Triodetic foundation used at Terminal Avenue consists of an engineered steel or aluminum rigid platform that sits on the top of the soil and keeps the building level, regardless of soil heaving and settling due to permafrost or sinking.

"A couple of our sites have soil contamination issues, so we weren't able to disturb the soil. This foundation is a raft-slab kind of system that sits in the ground in such a way that it still meets all our seismic requirements," said Hildebrandt.

Once the foundation at Terminal Avenue had been installed and the completed modular units inspected against CSA A277 at the Kamloops facility, Horizon North used its fleet of trucks to transport the units to the site, then set them in place using a crane.

"It's like playing Tetris," said Kiss about the final stages of modular construction. "These modules are designed to be flexible in terms of interconnectivity to suit the varied sites we're working on. In a matter of days, a site will go from no building to the full building on-site, literally in under a week." Vancouver's second affordable modular housing project, completed in Marpole by Horizon North in March 2018, took four months from when the contract was signed to occupancy.

Modular construction is used more widely in the United

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Temporary modular housing on underused sites offers a rapid, interim solution to help tackle homelessness.

Kingdom and other parts of Europe, but Kiss says he's seeing an increase in interest in this country. He estimates that modular currently makes up about 2 percent of the construction market.

"Here in Canada, weather constraints and conditions have a major impact on construction projects," said Kiss. "Because modular is done indoors, you take weather out of the equation and we can take a counter-seasonal approach. [It's easier] when the ground is frozen—you have a firm base to stand a crane on."

Kiss continued, "We're seeing increased interest in modular and an increase in projects being conducted. The interest is not just in affordable housing but across the board, from hotels to single-family residences, senior and student housing, to affordable and First Nations housing."

As of early March 2018, BC Housing has announced modular housing projects in and around Vancouver, including in Maple Ridge, Surrey, and Richmond, and in Nanaimo, Penticton, Kamloops, Kelowna, Prince Rupert, Terrace, and Vernon. With the additional funding announced in the 2018 budget, thousands of new homes will be delivered to homeless and vulnerable BC residents, thanks to some clever engineering. ◆