

WHITEHORSE GENERAL HOSPITAL EMERGENCY DEPARTMENT EXPANSION

WHITEHORSE | YUKON | CANADA

2020 CANADIAN CONSULTING ENGINEERING AWARDS SUBMISSION



BUSH, BOHLMAN & PARTNERS LLP
consulting structural engineers

"The Whitehorse General Hospital Expansion represents the latest delivery on our commitment to health care innovations and technologies that will support the very best acute care for all Yukoners."

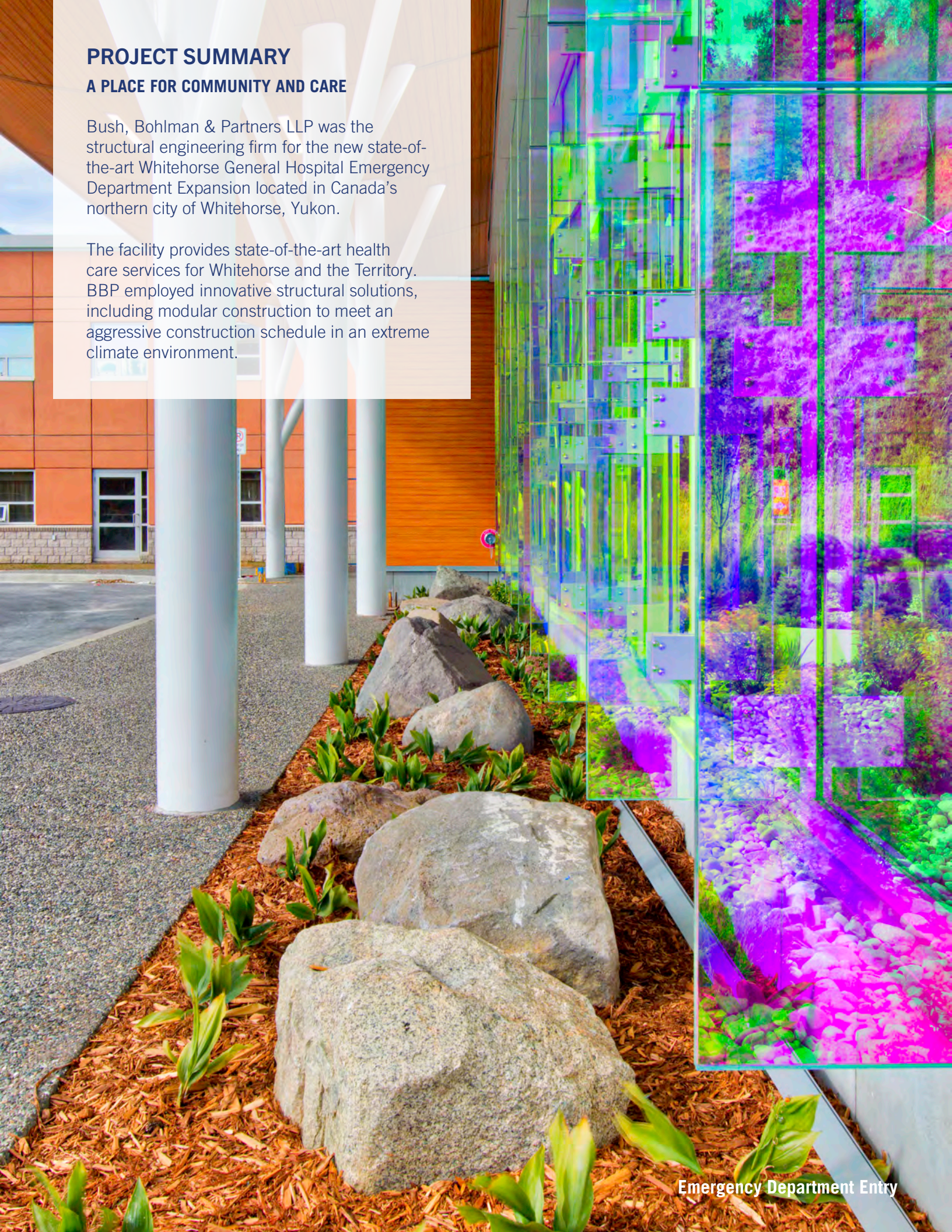
Government of Yukon

PROJECT SUMMARY

A PLACE FOR COMMUNITY AND CARE

Bush, Bohlman & Partners LLP was the structural engineering firm for the new state-of-the-art Whitehorse General Hospital Emergency Department Expansion located in Canada's northern city of Whitehorse, Yukon.

The facility provides state-of-the-art health care services for Whitehorse and the Territory. BBP employed innovative structural solutions, including modular construction to meet an aggressive construction schedule in an extreme climate environment.



Emergency Department Entry

INNOVATION

The new Whitehorse General Hospital Emergency Department addition includes a new fully functional emergency department, data centre for the Yukon Health Authority, emergency generator upgrade, additional medical imaging equipment, and stand-alone mechanical and electrical services. Bush, Bohlman, and Partners worked as part of the Design-Build team of PCL Constructors and HDR-CEI Architecture. The project demonstrates how modular construction contributed to the success of this project.

In response to the challenges of building during extreme winter weather conditions and the subsequent narrow window for construction in Whitehorse, the structural team employed an innovative solution that included the use of prefabricated 3-dimensional steel module construction to minimize construction time on site. The building's floor plate was divided into 4m x 9m bays and fabricated off site in a factory in Surrey, British Columbia. Steel floors were fabricated and fire sprayed in the factory.

The level 2 floors included a structural Mechanical, Electrical and Plumbing (MEP) rack suspended below the floor panels. This allowed the main building services to be installed in a shop environment, reducing the time on site required by skilled trades.

Working with the architect, an insulated metal panel was used for the exterior cladding. The high-performance panels allowed for quick erection and sealing of the buildings perimeter walls and minimized the back wall substructure.

Our team's solution to provide a construction method to erect and enclose the building in 5 months led to reduced construction costs, carbon footprint, and minimized construction time. Since the building was erected was enclosed prior to the first winter, construction continued on site through the winter with minimal temporary heating.



Steel Modular System



Prefabricated Steel Construction

COMPLEXITY

A primary challenge for the team was the aggressive construction schedule in a city with frigid and prolonged winters where temperatures often drop below -35C. Cold temperatures are typically managed with insulated construction hoarding and temporary heating that can add significant costs and increase the carbon footprint. Through the use of modular construction, the building was erected and the envelope completed in five (5) months.

To meet the construction schedule steel fabrication commenced 5 months ahead of site work in January of 2016 in Surrey, BC. Over the winter, three-dimensional steel modules for the buildings floor plate were constructed. The Level 2 floor structure included a suspended Mechanical, Electrical and Plumbing (MEP) rack. This rack allowed for the buildings MEP systems to be installed in a factory providing a higher level of precision and quality control. Steel modules were barged up the coast in spring and trucked to site from Skagway, Alaska.

On site construction started in May 2016. PCL was able to construct the foundations, erect the structural framing, and install the exterior envelope and roofs over the next 5 months. This eliminated the need for construction hoarding and minimized the heating costs over the winter.

Utilizing an integrated design process including input from the steel fabricator using 3D Revit modelling, the entire structure was modelled in 3D and the models were shared between the consultants and the steel fabricator for coordination. Clash detections between services and services and structure were carried out to reduce the number of changes during the construction. The services were installed into the modules via survey ensuring the installed systems were in conformance with the modelled design.

SOCIAL AND ECONOMIC BENEFIT

As the most populated city and the Yukon's capital, Whitehorse is a hub for medical care in the Territory. The expansion includes a state-of-the-art Emergency Department, additional CT and X-ray equipment, and a new data centre connecting Whitehorse General Hospital to the Territory's health authority.

The new building also includes floor space for a future fit out of a mental health facility on Level 2. This future space also takes into consideration of the capacity at the hospital to meet the future growth of the community.

This addition provides much needed medical services capacity for Whitehorse and the surrounding area. The relocation of the existing ER into the new building provides the opportunity for expansion of the Operating Rooms in the hospital. This added capacity ensures Yukoners are able to receive the medical services they need in their home community, while alleviating the need for patient transfers out of the territory.

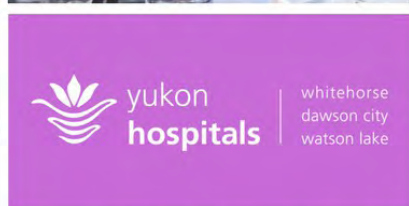
The facility is designed for post-disaster performance to provide much needed seismic and climate disaster resilience to the Whitehorse community.

ENVIRONMENTAL BENEFITS

By enclosing the building envelope prior to the winter, the structural team were able to provide an efficient thermal barrier around the job site. This minimized the amount of construction heating required keep the building at a temperature suitable for work to continue over the winter directly reducing the quantity of energy used and reducing green house gas emissions caused during construction.

By prefabricating 4m x 9m sections of floor complete with mechanical and electrical systems there was a reduction in construction waste and travel to the site.

Modular units were shipped by barge from the Vancouver area eliminating a 4800 km trucking round trip and replacing it with a 1600 km 1-way barge ride that further reduced green house gas emission during construction.



whitehorse
dawson city
watson lake



MEETING CLIENT'S NEEDS

The Yukon government aspired to build a state-of-the-art Emergency Department, increase building resiliency, improve digital connectivity, allow for future floor space to grow, and improve medical imaging.

Bush, Bohlman & Partners working with PCL Constructors, HDR-CEI and the rest of the design and construction team we were able to provide an innovative solution with the prefabrication and modularization of a steel structure that resolved the environmental constraints of working in a northern climate.

Our team approach in this Design Build project enabled a better collaboration between the design consultants and the trades. We were able to provide all of the requests of the owner on budget. The integrated design and construction team completed the project two (2) months ahead of schedule.



Radiology Room