



2021 Canadian Consulting Engineering Awards

HÔPITAL MAISONNEUVE- ROSEMONT – MODULAR COMPLEX

Buildings



ASSOCIATION OF CONSULTING
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Link from Modular Complex to the Main Hospital

ABOUT THE PROJECT

When the COVID-19 pandemic was declared in early 2020, the government of Quebec declared a state of emergency, which included preventive measures to inhibit and overcome the pandemic. As part of their response, the Maisonneuve- Rosemont Hospital of Montreal requested a Modular Complex to be built rapidly so that they could accommodate the increased patient load from COVID-19, but could be used post pandemic to serve haemo-oncology patients.

WSP Canada, alongside architectural partner Architecture49, was engaged to provide all mechanical, electrical, telecom, structural and civil engineering services to deliver the project successfully. Additionally, WSP provided all the environmental, geotechnical, surveying, laboratory studies and commissioned the project on time in a fast-paced environment

Further complicated by a challenged supply chain during the initial stages of the pandemic, the project was designed alongside local modular supplier, MECART. This allowed for an efficient delivery to site and allowed the Montreal based manufacturer to develop an enhanced product offering for the healthcare sector, which was previously unavailable.

The project was delivered successfully in under 8 months, with flexibility inherent in the design, allowing the building to address the future needs of the hospital once the COVID-19 pandemic is behind us.

INNOVATION

The Maisonneuve- Rosemont Hospital (HMR) 's Modular Complex was a fast-paced design and construction project that was required to address the unique challenges presented by the COVID-19 pandemic, while respecting the future healthcare needs for the hospital. Rather than simply provide a rapidly built field hospital, which would not serve any purpose after the pandemic was over, the hospital desired to rapidly construct a facility that would be able to address the pandemic needs and then could be reworked to accommodate the needs of its oncology program, serving cancer patients in Montreal.



Patient Room



Nursing Station

MODULAR CONSTRUCTION AND FUTURE FLEXIBILITY

To meet the aggressive construction timelines, the project was designed to accommodate modular construction methods. The modular constructor, MECART, was engaged with the design team throughout the design process, streamlining both design and construction. The engineering systems were designed to accommodate the healthcare needs, be constructible using modular techniques and be adaptable to a clinical change of usage once the pandemic is over. This represented unique design challenges that are not typical in traditional healthcare facility design.

For instance, the patient rooms had to be designed to be future-ready, meaning that the rooms had to accommodate COVID-19 affected patients as well as the future oncology patients. To accomplish this, the mechanical systems were designed to provide a negative pressurized room to provide infection control for the contagious COVID-19 patients. This creates a safer environment for staff and patients as they concentrate on combating the pandemic. When the pandemic is over, the systems can be easily reconfigured without major equipment changes to revise the rooms to positive pressure. This will accommodate a change in infection control needs for the immune compromised patients, who need to have minimal contact with viral pathogens while they are fighting their cancer. HEPA filters were also included to provide high efficiency filtration, supporting rigorous infection control protocols for both the COVID-19 and oncology operations. To ensure that operations can continue seamlessly in the building, full redundancy in HVAC and Electrical power is achieved through an emergency backup generator and distributions system for power interruption events. This also helps with maintenance activities, enabling power continuity while major components are repaired or replaced.

The design also takes the operation of the facility into consideration. Future maintenance is achieved through the detachable wall panels which can be easily reconfigured to include any future services or equipment. The floors are corrosion resistant and easily maintained. In addition to supporting the maintenance, the detachable wall panels allow for the services to be reworked to accommodate the clinical changes, equipment changes and technological advances over the lifespan of the facility.

In the end the 2-story, 3200 square meter facility was designed and constructed in under 8 months, using innovative constructive methods and a collaborative design approach. This allowed the hospital to adapt quickly to a changing healthcare crisis, while ensuring their investment would serve the community well into the future.



Patient Room



Nursing Station

COMPLEXITY

The Modular Complex had two major challenges; the aggressive schedule and the fact that the facility needed to be easily adaptable to serve immune compromised oncology patients after it was done serving infectious COVID patients.

The client needed to get their facility constructed as quickly as possible to meet the increased demand for rooms due to the COVID pandemic. To meet the schedule, a modular construction process was used. This meant that mechanical and electrical systems had to be designed and specified to accommodate the “plug and play” modules that were shipped to site from the modular construction facility.

The flexibility needed to accommodate the change of use was met by specifying mechanical components and controls that would allow for a change from negative pressured rooms to positive pressure with minimal intervention. The detachable wall panels were used to allow the wall mounted electrical and communication services to be easily reconfigured for changes in patient care.



Patient Room



Nursing Station

SOCIAL AND/OR ECONOMIC BENEFITS

This project has helped improve the quality of life for the communities in East Montréal. While utilizing modular construction methods, the project is built to last decades and to be easily adaptable to the public's future needs.

At the onset of the pandemic, interruptions to the traditional construction supply chain were identified as a major risk as international borders began to close to traffic and trade. The project encouraged acquiring the services of local manufacturers instead of sourcing international suppliers, encouraging local trade, enhancing the local economy, and reducing dependence on international supply chains. To enable the modular construction approach, it was necessary to look for a modular manufacturer close to the site. Working with Quebec based modular cleanroom manufacturer MECART allowed for a local company to gain experience in modular healthcare construction and contributed to the local economy by keeping most of the supply chain in Quebec. Local labour was also used for the construction, working with Pomerleau construction to assemble the building and construct the base building components to accept the MECART modular pods.

Furthermore, by trading locally, carbon emissions resulting from international transportation were omitted. The modular rooms being built off-site, in a quality controlled facility, also reduced the health and safety hazards related to on-site construction processes by reducing the construction time to almost 50 % of the initial estimated schedule. This also had the added benefit of reducing the disturbance from construction activities on the surrounding community.



Patient Room



Nursing Station

ENVIRONMENTAL BENEFITS

From conception through to occupancy, sustainability and minimized environmental impact was fundamental to the project. The central theme to the project, construct a facility for a temporary emergency that can be revised to serve cancer patients for the remainder of its lifespan, can itself be considered a sustainable design strategy.

The modular construction methods allowed for greater quality control, reduced construction waste, and minimized the amount of deliveries required to bring materials to site, reducing the carbon footprint of the construction supply chain. By keeping the majority of the supply chain local to Quebec, the overall emissions associated with the construction process were reduced.

Existing floor systems were reused by incorporating tiles and supports in an elevated floor system. By minimizing waste, reusing materials and minimizing the traffic needed to supply materials, the environmental impact of this fast-paced project was greatly reduced. This approach reduced the environmental impact of purchasing new flooring systems and discarding of the existing flooring, all while reducing the time of delivery and construction and taking advantage of the well-suited existing material.

Mechanical and electrical systems were selected to be energy efficient, helping to reduce the operational impact of the facility once occupied and serving patients. This helped reduce energy consumption and costs over the lifespan of the facility.



Patient Room



Nursing Station

MEETING THE NEEDS OF THE CLIENT

The primary goals of the project were to design a COVID-19 clinic that could be easily transitioned to a future cancer care center and to do this within as short a time span as possible.

FLEXIBILITY

To meet the flexibility requirements the building systems were selected to allow for future change of use. Mechanical systems were selected to allow for easy change of pressure relationships in the building, allowing it to be used for infectious COVID patients and then transitioned to accommodate immune compromised cancer patients. The modular architectural wall panel system allows for the seamless reworking of electrical, communications and mechanical services.

SCHEDULE

To meet the aggressive schedule, a modular construction approach was selected for the building with the contractor and modular manufacturer engaged early in the design process, ensuring that constructability issues were accounted for. Modular construction in the healthcare setting has long been touted as a promising technology to shorten construction time while maintaining or increasing quality control. Despite this, adoption of this methodology has been slow. The successful design and construction of the two storey RMH Modular Complex has helped set a precedent for rapid construction to support future crisis-management strategies.

The project is now a model for other hospitals wishing to respond rapidly to a crisis, while building a facility that addresses the future needs of the organization: once the COVID-19 crisis has passed, the 36 modular patient rooms will be easily repurposed to fit the needs of the hospital and are built to last decades.



PROJECT SUCCESS

Meeting an aggressive schedule, at the height of the COVID-19 pandemic, the HMR Modular Complex was successfully designed, manufactured and constructed in under 8 months. The building will allow HMR to accommodate an increased patient load due to the COVID-19 pandemic, meaning that the ability to both fight this disease and continue to treat patients with traditional ailments is enhanced. The project brings many benefits to the client including:

- Enhanced capacity to treat COVID-19 patients
- Project design and construction was completed in under 8 months, allowing the hospital to see patient earlier than using traditional construction methods
- Flexibility, allowing the building to flex and adapt over time to accommodate changes to the patient type and future technologies.

The project demonstrates that modular construction for healthcare facilities can help meet critical needs in a timely fashion, while still providing a robust environment that can accommodate the ever-changing needs of a hospital. The Modular Complex will continue to meet the healthcare needs of the people of Montreal for many years to come.

All photos by Raphaël Thibodeau photographe



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