

EXISTING BUILDING COMMISSIONING

Hoffmeister Building Recommissioning (RCx)

Project Summary

Building Name/Type: Major-General Bertram Meryl Hoffmeister Building – Office Building for the Department of National Defence (DND)

Location: Vancouver, BC

Main Project Objective: Reduction of greenhouse gas (GHG) emissions and energy consumption

Commissioning Scope: The RCx focused on ventilation, heating and cooling systems and lighting controls. Investigation started in fall of 2021 with final implementation completed in summer of 2023. A building automation system (BAS) contractor implemented the measures.

Size of Commissioned Area: 14,155 sq. m.

Total Commissioning Investment:

- Consultant fees: \$35,520
- Implementation of measures: \$92,000
- Incentive: \$23,997

Measured Results



ENERGY COST SAVINGS

\$20,889 per year (14.5%)



SIMPLE PAYBACK

**6.1 years
5 years (with incentive)**



ENERGY SAVINGS

**187,747 kWh electricity (15%)
410 GJ gas (29%)
per year**



GHG EMISSIONS SAVINGS

**22.6 tonnes CO₂e (26.7%)
per year**



WHAT IS RCx?

Recommissioning (RCx), along with other terms such as retro-commissioning (Re-Cx) and ongoing commissioning (OCx), are part of a broader concept known as existing building commissioning (EBCx).

The RCx process represents a cost-effective investment to ensure that a building operates optimally and as intended based on its current use. RCx:

- ✓ Provides a better environment for occupants
- ✓ Reduces issues with indoor air quality
- ✓ Reduces occupant complaints
- ✓ Reduces contractor call-backs and warranty issues
- ✓ Reduces energy consumption and operational costs

Project Overview and Background

The Major-General Bertram Meryl Hoffmeister building is located in Vancouver, BC. Constructed in 2016, it stands four stories tall and serves as the headquarters of the 39 Canadian Brigade Group, offering a total floor area of 14,155 square metres. The building accommodates offices, meeting rooms, classrooms, a fitness facility, and medical clinics. Since its construction in 2016, there have been no significant renovations to the building layout. Ventilation is facilitated by 100% outdoor air units, while a variable refrigerant flow (VRF) system is responsible for heating and cooling most areas of the building. Additionally, some zones are heated by a hydronic system with two non-condensing gas-fired boilers.

The building had not undergone any prior recommissioning efforts to ensure that occupancy aligns with equipment schedules, making it an interesting candidate for further review and assessment. Furthermore, DND aimed to evaluate the effectiveness of RCx in a modern, already efficient building before implementing the approach in other similar building in their portfolio. The building’s annual energy cost prior to the RCx project (April 2022 to March 2023) was \$144,321. The RCx study focused on GHG emissions reduction and energy savings. It also identified opportunities to decarbonize the gas-fired equipment. The study was partially funded through the BC Hydro Continuous Optimization (COp) program.

Project Scope of Work

All mechanical and lighting systems were reviewed during the investigation process. Ultimately, the implemented measures reduced the annual energy cost by \$20,889 (14.5%). Most opportunities identified involved the following systems:

Heating and cooling:

- A VRF system serves most of the building. It consists of outdoor air source heat pumps that pipe refrigerant directly to fan coil units in the zones for heating and cooling. The system can recover heat between zones, thus allowing different zones to be heated and cooled simultaneously.
- Two non-condensing gas-fired boilers heat a hydronic loop.

Ventilation: A 100% outdoor air heat recovery ventilator serves the entire building.

Controls: Reliable DDC system. The VRF system has its own controls, but is integrated with the Reliable DDC for scheduling.

Early in the Investigation phase, three functional tests were completed to assess potential measures. The tests verified that building scheduling disabled equipment as intended and checked the controllability of the 100% outdoor air heat recovery ventilator’s gas-heater.

While not the focus of the project, the RCx provider also identified capital measures to decarbonize the building: supplementing the hydronic boilers loop or domestic hot water system with an air source heat pump.

Project Management

An RCx project was carried out at this site for the first time. On-site building operations staff played a crucial role during the investigation phase, but the implementation itself was carried out by an external controls contractor hired by DND. The RCx provider offered comprehensive services, including investigation, implementation, and aiding in the development of a long-term plan to ensure the continued effectiveness of the measures. They assisted by providing descriptions of the specific energy conservation measures to be implemented, along with the methods and criteria used to verify performance.

Phases	Start Date	End Date	Duration
Planning	April 2021	August 2021	5 months
Investigation - Summer	September 2021	November 2021	3 months
Investigation - Winter	December 2021	March 2022	4 months
Implementation	April 2022	August 2023	18 months
Hand-off	September 2023	November 2023	3 months

Challenges Encountered

- ✓ Trend data was stored locally on the controllers, resulting in only 2–4 weeks of accessible history at a time. Ideally, one year or more of trend data would be available to support the analysis.
- ✓ The recently constructed building was already energy efficient, making it challenging to further identify energy reduction opportunities.



Figure 1 – Zone isolation dampers installed as part of measure 4



Figure 2 – Boilers that had programming modified as part of measure 5

Implemented Measures

Five measures were implemented:

- ✓ The gas heating setpoint for AHU-1 was reduced to transfer heating load to VRF system.
- ✓ The AHU-2 control was repaired to disable the unit when it is scheduled unoccupied.
- ✓ An occupancy sensor was installed in the Vehicle Maintenance zone to disable AHU-3 when unoccupied. This zone is rarely yet unpredictably occupied, so it is conditioned longer than necessary.
- ✓ Occupancy sensors, CO₂ sensors and zone isolation dampers were added for infrequently occupied zones, to disable or reduce ventilation, heating, and cooling when unoccupied.
- ✓ The reset range was increased for the heating water supply temperature to reduce thermal distribution losses.

Project Benefits



GHG emissions reduced by 23.8% even if the building was recently constructed and already energy efficient



Reduction of the energy consumption and energy cost



Strategies are in place to ensure the persistence of measures over time



Additional investment measures identified to decarbonize the building

Lessons Learned

- ✓ RCx can generate significant benefits even in a recently constructed and efficient building.
- ✓ Leveraging the RCx team's expertise for detailed measure specifications during implementation enhances project outcomes, seeing as they have a comprehensive understanding of how the measures are intended.
- ✓ Successful EBCx implementation requires strong coordination and field verification to ensure corrective measures are installed and commissioned as intended.
- ✓ Extended return on investment (ROI) periods in RCx projects may be justified when additional equipment installation is necessary for certain measures. For example, the ROI of 6.1 years is mainly explained by the zone isolation dampers in measure 4.

PROJECT PARTNERS/TEAM:

Building Owner/Manager (Firm): Department of National Defence
Commissioning Provider (Firm): Prism Engineering
Utility Incentive Provider: BC Hydro

Controls Contractor: Ainsworth
Technical Support: Natural Resources Canada –
Greening Government Operations