Evergreen Community Health Centre – Make-up Air Unit Electrification Retrofit Case study

PREPARED BY: FRESCo

Building Name/Address	Evergreen Community Health Centre, 3425 Crowley Dr., Vancouver
Building's Asset Class	Office and Health Centre
Building Size	~1,877 sq.m (~20,207 sq.ft.)
Year Built	1999
Building Owner & Manager	Concert Properties / Concert Realty Services
Engineering & Mechanical Consultant	FRESCo

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Project Overview and Background

The Evergreen Community Health Centre is located at 3425 Crowley Drive, Vancouver, one block south of the Joyce Street SkyTrain Station. It is a three-storey, single tenant building constructed in 1999. The main floor consists of office and clinic space with the remaining floors as office space. The site provides 36 underground secured stalls. The building is leased by Vancouver Coastal Health and is professionally managed by Concert Realty Services.

An energy study, commissioned by Concert, revealed the building's existing makeup air (MUA) system was at the end of its useful lifespan. The MUA system delivers tempered outdoor air to the plenum space in all three floors, P1 and P2. At the main three floors, air is then taken in by the plenum mounted heat pumps, conditioned and distributed to different spaces within the building.

FRESCo was engaged by Concert Properties to first provide an options assessment report to evaluate the different MUA options suitable for the building, including:

- Heat pump with electric backup
- Heat pump with natural gas backup
- High efficiency gas
- High efficiency gas with variable speed fan controls

Figure 1 Original MUA unit - low efficiency natural gas

As part of Concert Properties sustainability framework, they have a goal of reducing their building's operational carbon emissions by 80% by 2050. Since the MUA upgrade presented an opportunity to reduce energy and GHGs, there was an opportunity to apply for rebates offered by Clean BC.

Gas-fired backup heating was selected for this project since there was a concern with existing utility service capacity for a full electrification project. Electric resistance for backup heating requires 2 to 3 times the electrical power as the heat pump compressors.

Rebates offered by Clean BC also made the MUA upgrade a preferred choice over the alternatives. CleanBC Custom Lite offers up to 50% of the energy study cost and, a rate of $60/tCO2e (for heat pumps) of lifetime greenhouse gas savings, up to $48,000 per customer towards the capital cost.

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Incentives are capped at the lesser of 50% of a project's incremental cost, or to the point where the payback for the measure is less than 4 years after the incentive.

Project Implementation

Once Concert Properties made the decision to go ahead with a heat pump MUA with natural gas backup, FRESCo was engaged to provide implementation support. This consisted of engineering design, tendering and summary of contractor bids, building permit documentation, construction support as needed with final review, and professional Letters of Assurance.

Figure 2: New MUA unit – heat pump with gas backup

Options assessment timeline: initiated August, 2019; completed November, 2019

Implementation timeline: initiated January 2020; installed September 2020; commissioned August 2021; completed December 2021.

Measured savings

Measure Description	Total Cost Savings/ Year	Total Project Cost	Rebate	Net Incremental Project Cost	Simple Payback (Years)	GHG Savings / Year (tCO_2e)
Heat Pump MUA; Gas Backup	$9,926	$120,000	$20,744	$56,307	6	26

Utilities adjustments	
Total Calculated Electricity Increase	44 MWh/yr.
Total Calculated Gas Reduction	526 Gj/yr.

Realized benefits associated with the upgrade included:

1. Annual energy & GHG savings
2. Addition of ventilation air cooling, thereby reducing the cooling load on other HVAC systems and equipment
3. Commissioning to improve indoor environmental quality

Challenges encountered

The main challenge for this project was obtaining a building permit through the City of Vancouver. The building permit process added 4 months to the project timeline along with the added costs for building permit fees and additional engineering fees.

A second challenge encountered was incomplete system commissioning. During the engineers' final review, the MUA unit was functional but relying on the back-up heat source instead of the heat pump due to incorrect control settings. Additionally, the control and monitoring point connections to the Building Automation System had not been completed.

The final challenge was finalizing complete operations and maintenance (O&M) manuals, which is an EGBC engineering practice requirement and specified in the project contract documents. The project closeout and building permit signoff were both significantly delayed despite the fact that the new system was installed and operational. Delay between initial installation and the Engineers' final acceptance of the MUA systems (including commissioning, O&Ms & closeout) was almost a year. The contractor completing this portion of the project had been vetted by the owner, having worked with them on prior projects. And while the contractor did a great technical job and was a decent communicator, they simply struggled in addressing any of the higher construction-management functions that were outlined as part of their contract, hence the resulting delays.

Lessons learned

- Commissioning, in most cases, is best provided by a 3rd party separate from the installing contractor, to objectively verify that the system installation is complete, properly balanced, and thoroughly tested to confirm sequence of operation control.

- Owners should always adhere to the Builder's Lien Act guideline of 10% holdback for final payment on projects, to incentivize contractors to complete all aspects of the project in a timely fashion. Payment holdback is intended specifically to ensure that the contractor has delivered ALL items necessary for a fully functioning system and proper closeout. In this case, the contractor completing the commissioning and O&M took almost a year to complete their work. Had the owner held back their fee, they might have been more earnest to complete the project in a timely manner.

Future Opportunities

Another concurrent project replaced the old cooling tower with a modern, water-efficient misting drycooler. Other opportunities may lie with the main building HVAC system, which consists of Water-Source Heat Pumps serving each zone in the building. These are nearing the end of their lifespans and upgrading them to new, more efficient technology could save electricity.