Project Completion Report

Project information

GMF number: 15103
Name of funding recipient: Municipality of Middlesex Centre
Project title: Construction of 9,900sq/ft Net Zero Energy (NZE) Carbon Neutral Fire Hall in Coldstream, ON
Date of Project Completion Report: June 19, 2018
Project Construction Start Date: 03/29/2017
Project Substantial Completion Date:11/28/2017
Total Project Cost (actual): $3,215,477.68

Project Implementation:

There were no project delays associated with the construction of the new Fire Hall. The project met substantial completion on November 28th, 2017 in advance of the anticipated completion date set out in Section 2.03 of the agreement being December 29th, 2017.

Lessons Learned:

Design, Procurement and Contracting:

The Municipality selected an architect with experience and know how in building a rural fire hall. Vallee Architects were selected through an RFP process over two other architectural firms. Vallee brought a wealth of experience as they could provide most aspects through the design phase such as mechanical, civil and structural engineers in house. The initial design changed throughout the process from the original vision of the project. Recognizing that this was a Volunteer Fire Hall that sits empty majority of the time, the idea of a sustainable facility with Geothermal and Solar etc… seemed out of the norm for this type of facility. The Municipality of Middlesex Centre have always prided themselves as a leader in sustainability. Recognizing that, the project team felt it was important to look at sustainable options on the new facility. Through the completion of the Net Zero Feasibility Study completed by Ameresco, the municipality felt confident that the addition of sustainable features was achievable and made practical sense when designing the Fire Hall. Through a Design Charrette facilitated by Ameresco along with the architects, engineers, consultants and staff, the ultimate design and functionality of the sustainable features started to come together.
Getting to a final design with sustainable features that would see a 15% premium on top of the project budget was a challenge for staff to gain Municipal Council support. The base price for a typical build for this type of facility was approximately $2.2 million dollars. To add an additional $330,000 to the base build, a detailed business plan was required to provide Council the benefits of going with this approach in the long run.

In procuring the General Contractor for the build, the Municipality pre-approved General Contractors who would be fully qualified to bid on the project. In the end 12 General Contractors were invited to bid on the project. This served the municipality well as it ensured a quality contractor who had the expertise and knowledge to perform this work.

Consultation and Community Engagement (prior to and during construction):

A number of Municipal Council meetings were held throughout the initial project approval stage where the community could listen to the various proposals being made by staff. The community certainly voiced their opinion both good and bad to their elected officials.

Construction of the Project:

The project was initially scheduled to start in the late fall. Recognizing that in doing so meant the need for winter heat in order to build during the winter months which in turns would mean increased construction costs. Therefore, the project start date was shifted to late March so that the work could be completed through the spring/summer months. As noted above, with pre-qualifying the General Contractor, the contractor selected came with significant experience in constructing this type of facility.

Completing the Project On Time and On Budget:

In the design process, the Municipality undertook two Class D estimates and then one Class C estimate to confirm that the project scope fell within the project budget. By doing so allowed the municipality to adjust and make changes as need in certain areas that may otherwise would have been deemed as provisional in the Form of Tender before issuing the Request for Tender. The project schedule was slightly delayed as the original completion date was to be November 10th, 2017. The total project costs listed above were $3,215,477.68. Costs identified and presented to Council in September 2015 in the Project Charter, estimated the total project costs to be $3,365,291 which includes site preparation, consultant fees, construction costs, sustainable features, Feasibility Studies, contingencies and Furniture Fixtures and Equipment.

As noted above, at the beginning of this project, it was not initially to have any sustainable features and would simply be a traditional build to replace the old Fire Hall. The project team worked hard to fully understand what it meant to be a 'Net Zero' facility and determined that constructing a facility with sustainable features made a lot of business sense for the life of the facility. With Hydro rates being unpredictable, by being self sustaining, the municipality can recognize those saving for years to come. The Municipality recognized the significant social, economic and environmental benefits would be realized with this approach. With the completion of the Net Zero Energy Feasibility Study, it assisted the Municipality and its Council to see the benefits. The overall vision of the Municipal Energy Plan for Middlesex Centre is to begin fostering and facilitating the development of net zero energy communities within the municipality and to provide leadership to the broader public sector. The NZE Coldstream firehall could demonstrate to the community, if proved feasible, that environmentally friendly buildings can not only be economically viable but they can have lower total lifecycle costs and create an economic environment of long term cost certainty.

Did you use any approach(es), that are not business as usual over the course of the Project (e.g. decision making approach, consultation methodology, non-typical procurement, full-cost accounting)? Were there any benefits or drawbacks of this approach?

Sustainable Design and Construction:

A	B	C
Sustainable design and construction element	As described in your GMF application	Describe the implementation of the measure (one paragraph)
Site characteristics		
Uses a remediated brownfield or underutilized site (i.e. not a greenfield)		
Uses existing buildings/ infrastructure/equipment		
Avoids, protects or enhances sensitive environmental areas		
Restores land for wildlife habitat		
Utilizes natural systems to provide environmental		

benefits within the project (e.g. wetlands)		
Does not contribute to urban sprawl		
Part of the urban transport network and encourages the use of sustainable transportation		
Project Activities During Construction:		
Green Procurement		
Use of energy efficient practices (e.g. reducing fuel consumption from transportation)	The design of fire hall comprises of standard wood-framing with continuous insulation and concrete block mass walls with continuous insulation on the outside. In other words, a high energy efficiency building envelope is being utilized for this building. The building envelope will include a well-insulated roof and glass and high performance glazing with thermally broken windows. The baseline reflects the ASHRAE 2010 standard for the climatic zone for Coldstream. However, the actual design exceeds this baseline and will ensure 25% energy savings in comparison with baselines design. The building envelope, structure and orientation have been designed in a way to maximize passive heating, day lighting and solar photo voltaic (PV) output. The use of LED lighting in the entire building and outdoor, occupancy sensors, natural lighting via solatubes technology (see pg. 30 of feasibility report) will ensure an energy effective lighting design. All appliances and fixtures for the fire hall will be EPA ENERGY STAR rated. Other technical details of the energy efficiency of the building envelope can be obtained on page 26 of feasibility study report. There are other sustainable building designs such as Insulated Concrete Forms and Structural Insulated Panels that are described in the municipality's sustainability manual. These types of sustainable designs are not being considered for this project.	The project successfully implemented all aspects outlined in the original application.
Consideration of renewable energy	Preliminary solar designs indicate that the new roof structure configuration will accommodate solar systems that can produce 60 to 70 MWh annually. These systems will both produce enough green electricity to ensure the facility is cost Net Zero Energy. The larger system will also qualify the building as an electric Net Zero Energy facility. Any excess electric produced by the system will used to offset other electric on the master metered site.	The Fire hall has an array of 60 KW solar panels. It has been designed in such a way that when there is an excess of power at the Fire Hall that it be used at the office/community centre on the same campus. In the end, the municipality decided to move forward with the option of utilizing ground source heat pumps to meet all space

	• Installation of a ground source heat pump (GSHP) system would be one way to achieve site NZE performance. • Installing an additional ~50 kW of photovoltaics is another way to reach site NZE performance. A total annual PV system output of 125 MWh would be required to achieve site NZE. The additional 50 kW of PV modules cannot be installed on the roof of the fire hall due to space limitations, but could be installed as a ground mount solar system (flood retention area), as a parking cover system, or even on the roof of a nearby building since this building will be built in a master-metered site. • A total annual PV system output of 217 MWh would be required to achieve emissions NZE. This would require installing an additional ~75 kW of PV modules, which would bring the total system size to ~220 kW. This additional PV generation would offset the on-site combustion of natural gas. # With all the above options considered in the feasibility study, the study finally settled for a 60kW solar array that has the capability to produce 70,600kWh of clean energy annually. This is enough to render the Coldstream fire Hall a net zero energy (Climate Positive) building.	cooling and heating needs. A total 52 vertical Geothermal wells were installed on site to achieve this function.
Minimal site disturbance, use of in-situ options if available		
Re-use of available construction material on-site		
Uses construction materials with recycled content		
Construction site waste management, including diverting construction waste from the landfill through recycling and reuse (off-site)		
Minimizes expected impacts of construction activities (e.g. dust creation or soil erosion)		
Other (please specify)		

Environmental, Social and Economic Outcomes:

Environmental:
The Fire Hall will now consume less energy, which will result in lower greenhouse gas emissions. The facility is now 'In Service' as of May 2018 and during testing, facility was generating 58 KW of power at that time. All power not used within the Fire Hall was re-allocated to the Municipal Office/Community Centre to help offset those costs therefore lowering annual greenhouse gas emissions. By being a leader within the municipal sector with respect to Net Zero Facilities, by doing so will encourage other municipalities to follow Middlesex Centre's lead and therefore resulting in further environmental benefits.

Social:
There are few if any similar projects in Ontario, so as a result, the Coldstream Fire Hall will serve as a demonstration project that can be leveraged to educate other municipalities and the building industry about ways to design, construct, and operate NZE facility. The project is now the first Net Zero Fire Hall in Canada. With the installation of 'Intellimeter' software on site, the municipality can share the with the community its energy savings, cost savings and Greenhouse Gas emissions over time. The facility has already gained recognition within the Municipal community and has proven itself as a leader in environmental stewardship. Other municipalities such as the City of Mississauga have already reached out to look to Middlesex Centre in how to get there within their own communities.

Economical:
The project has been designed in a way that leverages passive energy efficiency measures, including: high insulation levels in walls and windows; energy-effective window type, placement, and area; thermal mass to store heat; clerestory windows and Solatubes for daylighting. These strategies will provide ongoing energy savings automatically and will require little maintenance over time. The reduced demand for grid-supplied electricity will put less strain on the utility grid infrastructure, which means that there may be incrementally less need for utility capital investments in the near future. With all excess power produced at the fire hall being re-distributed to the municipal office/community centre, hydro savings will be recognized annually at both locations.

Project Champion:

Scott Mairs, Director, Community Services
mairs@middlesexcentre.on.ca
519-666-0190 Ext. 227

Next steps

With the installation of the 'Intellimeter' software at the Coldstream Fore Station, staff can easily monitor and report on usage down to the individual circuit level. Information from this software is to be used to report on the facility's success over its first year of being 'in service'.

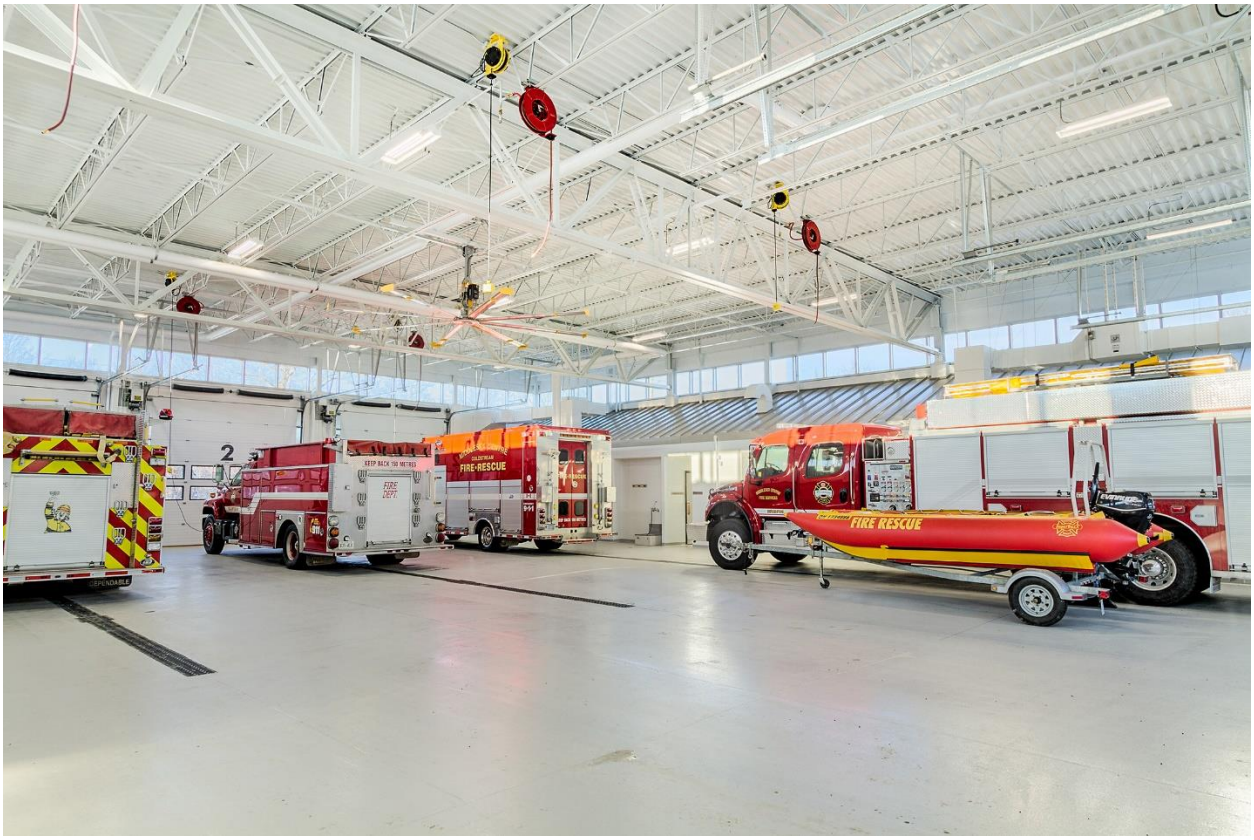
Publicity

The new Fire Hall has recently been featured in 'Municipal World' magazine and has been featured in articles locally. The project has also received attention from other municipalities looking to Middlesex Centre as a template to do something similar in their organizations.

Coldstream Fire Station – Exterior
Photo Credit: Jamie Smith Photography

Coldstream Fire Station – Bunker Gear Room
Photo Credit: Jamie Smith Photography

Coldstream Fire Station – Training Room
Photo Credit: Jamie Smith Photography



Coldstream Fire Station – Apparatus Bay
Photo Credit: Jamie Smith Photography

Coldstream Fire Station – Solar Panels
Photo Credit: Jamie Smith Photography