

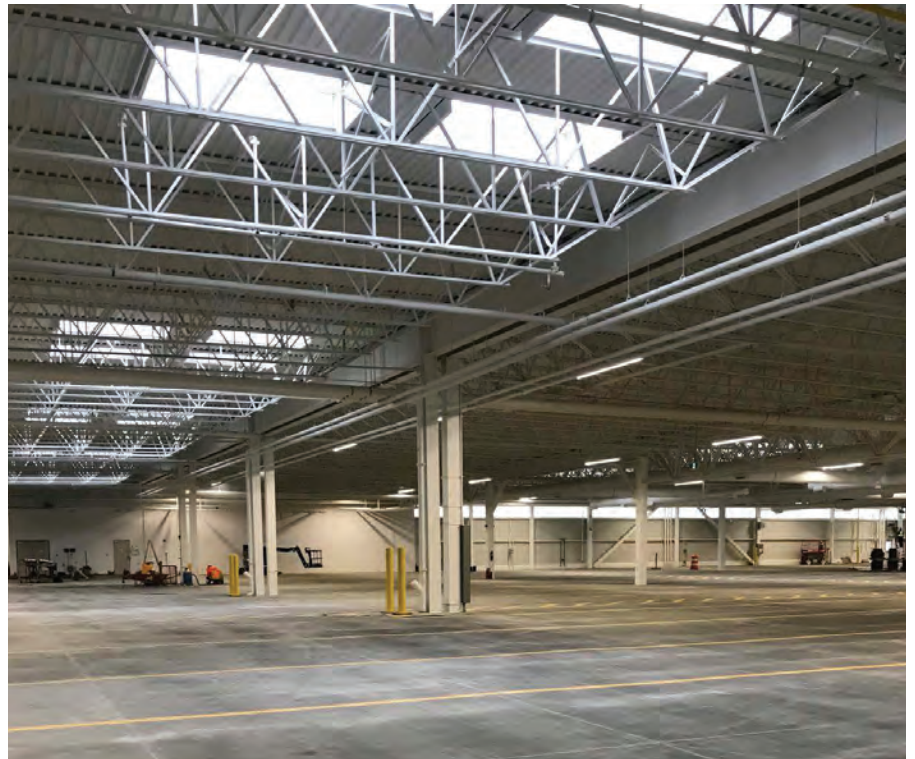
# CCE AWARDS 2020

**Stoney Transit Facility**

The lower half of the page features an abstract background composed of overlapping, semi-transparent blue geometric shapes, primarily triangles and polygons, creating a dynamic and layered visual effect.

## 75 Word Summary

The City of Calgary is switching to Compressed Natural Gas (CNG) buses for the financial and environmental benefits, and needed to house the new fleet. AECOM was the lead designer for the Stoney Transit Facility, The City's first Public-Private-Partnership. The new 44,300m<sup>2</sup> facility can store over 450 40-foot CNG and diesel buses, has maintenance and administration facilities, and employs over 700 people. The LEED Gold certified building contains hundreds of skylights and open sightlines.



## Innovation

Completing this project as a Public-Private-Partnership enabled innovations. This encouraged the exploration of many design options in order to reduce building footprint, lower energy costs, and find efficiencies wherever possible.

### Compressed Natural Gas

The biggest innovations were realized regarding the site usage of compressed natural gas. A Compressed Natural Gas compound onsite takes utility provided natural gas and compresses it to 31,000 kPa to fuel the CNG powered buses.

The equipment used in the CNG process is conventional, but the application is innovative. Compressed natural gas fuel facilities have not been used in Alberta to date, so AECOM utilized its subject matter expertise from our colleagues in California as well as from subconsultant Pura Energy. This enabled us to design the largest CNG fuelling facility in North America.

Six buses can be fuelled at a time, and each station has both diesel and CNG dispensers. Buses are filled with CNG in three minutes. Alberta is a pioneer in natural gas exploration and production, and there is an abundance of supply in the province. The gas supply is reliable, clean, safe, and cheaper than diesel. While the facility still has diesel to service older buses stored onsite, the move to natural gas reduces the emissions and potential for spills from trucking in diesel. It's a marriage leveraging new technology with local resources and expertise to bring an incremental benefit to all Albertans.

The CNG fueled buses will lower green house gas emissions as compared to the former diesel fueled buses in the order of 20%. The fuel savings have been estimated at \$10,000 per bus annually. This means the City could realize a \$4 million savings per year when the fleet of 400 CNG buses is operational.

### Ventilation

With buses continually being driven around in the storage facility, the ventilation needed to be designed properly to remove hazardous gases and provide employees with a safe atmosphere in which to work. AECOM completed computational fluid dynamic (CFD) modeling of bus emissions in order to design the ventilation system in a fashion that best evacuates the emissions from the Storage Garage. CFD analysis is used to simulate the performance and flow of gases to understand how they will move in an area. This sophisticated analysis is used to accurately understand how air / gas moves in complex scenarios, providing results that help represent what will actually happen. The results from this extensive modelling indicate that the overhead system that was constructed has technically equivalent performance to the low level ducting systems previously seen in The City of Calgary's parking and storage facilities.

The overhead ducting provides supply air to the floor level. Specialized nozzles force the air to the ground where it washes the lower areas of contaminants, while providing fresh air. Having the air pumped from above also means that ducts won't be blocked by vehicle wheels and won't be subject to damage. Also, overhead ducting keeps the sightlines clear and provides a more open space without ducting drops obstructing movement of people and buses.

Although the overhead ventilation system is an innovative approach to ventilating bus garages, it has been used extensively in industrial scenarios including oil and gas facilities. Such scenarios typically require highly effective ventilation systems in order to remove very toxic gases from an area cluttered with equipment. Applying this theory to the storage garage allows for a versatile ventilation system that provides the necessary contaminant control.

### Cogeneration

The facility also has a cogeneration component. Enmax designed the plant and AECOM designed the linkage from the cogeneration plant to the transit facility. Waste heat from the cogeneration facility is exchanged with the hydronic system from the Stoney Transit facility to maximise energy efficiency which is paramount to the objectives of the facility. The facility can consume power from the cogeneration plant. If the cogeneration plant produces excess energy, it can be sold to the grid.

### Sustainable Design

Many project innovations and improvements are tied directly to environmental and sustainable measures. Many of these measures contributed towards the facility's LEED Gold rating including rainwater harvesting for use in bus wash systems, vegetated roof, exterior amenity spaces, preservation of wetland and existing environmental reserves, use of dry pond for storm water management to mimic natural environment, the preservation of prairie ecology around the edges of the site and carried through the property and cogeneration compound.

The building envelope and associated systems such as green roofs and solar panels complement the intent of the building performance. The building was designed to operate on as little energy as possible.







## Complexity

Completing this project as a Public-Private-Partnership offered significant challenges as multiple stakeholders were involved. AECOM worked with The City of Calgary, construction lead PCL, specialty subcontractors, various regulatory and environmental approval groups and other stakeholders. While there were many items to review and resolve, AECOM was ultimately successful in delivering our work on time and on budget. The finished facility reflects the original design intent as it is a bright, open facility that provides a positive work environment for Calgary Transit staff.

The tight schedule added to the project's degree of difficulty. Construction began in November 2016, and the building was operational in March 2019.

Maintaining open sightlines and bus storage configuration flexibility was aided by an overhead ventilation system.

The project site presented some challenges as the parcel of land is bordered by two environmental reserve areas . This significantly impacted the building configuration. As a result, the finished facility departs from traditional transit facility models.

The size of the project also added a degree of difficulty as all the different disciplines and inputs had to be coordinated to design a variety of different spaces from storage, maintenance, administration, and employee amenities.

### Building Facts:

- Building size of almost ½ million square feet (44,300 m<sup>2</sup>)
- Parking for over 450 buses inside
- 83 garage doors
- 30 maintenance pits
- Over 300 skylights
- A CNG bus is filled with natural gas in three minutes
- Employs 700 people directly over a 24 hour / 7 days a week / 365 days a year.



## Social and/or Economic Benefits

This facility provides many social and economic benefits. The value of Calgary's buses will be retained as they can be stored indoors. Additionally, the move to CNG buses will save approximately \$10,000 per bus each year. This means The City could realize a \$4 million savings per year when the fleet of 400 CNG buses is operational. The facility includes sustainable design features such as rainwater harvesting and cogeneration that allow it to operate with lower costs and, lower water usage, and less environmental impact.

Alberta has an abundance of natural gas in the province. The gas supply is reliable, clean, safe, and cheaper than diesel. The move to CNG buses leverages new technology with local resources and expertise to benefit all Albertans. While the facility still has diesel to service older buses stored onsite, the move to natural gas reduces the emissions and potential for spills from trucking in diesel.

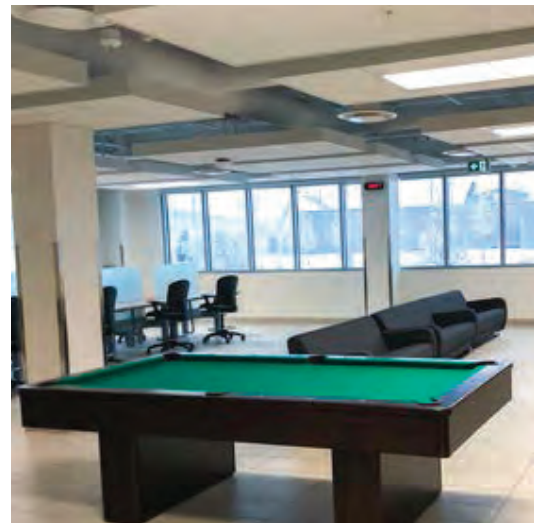
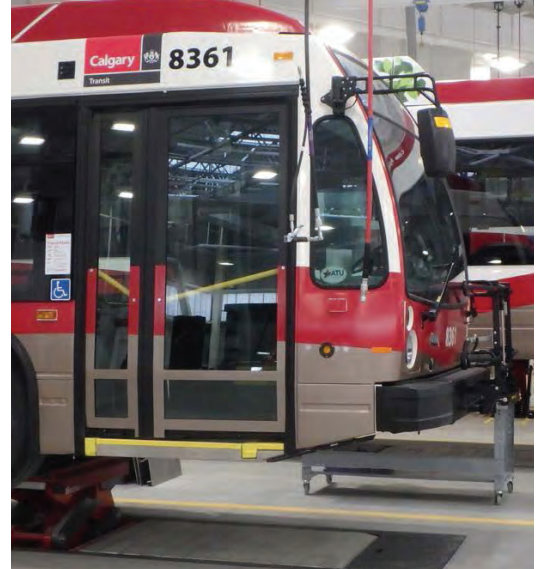
Furthermore, by using a more environmentally friendly mode of transit, Calgarians can use transit services that in turn help reduce congestion and promote mobility.

The facility provides more job opportunities for Calgarians as it employs 700 people directly over a 24 hour / 7 days a week / 365 days a year. These people will be able to work in a safe, bright workplace.

The construction of a facility that is much different than a typical industrial facility provides added social benefits. The design carried through on The City's intent to have a bright, open facility. With white walls and ceilings and hundreds of skylights, the facility provides a positive working atmosphere.

Outside of the storage, maintenance and administration areas there are plenty of amenities for employees to enjoy. In the midst of a semi-industrial area there are patios, green roofs, a gym, a nature reserve, and easy access to the regional pathways. It also has a spacious kitchen, and large washroom and change room facilities.

All these amenities have been designed to high standards and will help promote employee wellbeing and assist with employee retention.



## Environmental Benefits

Built on a parcel of land bordered by existing environmental reserves, the facility achieved LEED Gold certification, going through the new v4 process. The certification process took many elements into consideration from location and transit and bike access to the type of carpet selected.

Engineering design concepts incorporated include measures that are sustainable such as heat plates for exhaust air heat recovery, displacement ventilation and rainwater harvesting for vehicle wash facilities. Other measures, that may or may not be related, include heat recovery from a cogeneration plant and the implementation of absorption chillers. Occupancy sensors and LED lights make sure that only the areas in use are lit. AECOM also implemented innovative zoning and sizing of air handling units. There is a mixture of hydronic and gas burners for heating in order to maximize cogeneration heat recovery. The enhanced building envelope is efficient and has solar panels. The site has low flow fixtures including waterless urinals.

The storage and maintenance bays are fitted with hundreds of skylights allowing for more natural light in the space. This helps to maintain an open feeling and reduces the need for artificial lighting. The skylights make a lot of difference, even on overcast days.

The facility uses a dry pond for stormwater management to mimic the natural environment. This maintains capacity, reduces maintenance, and minimized construction impact on the environmental reserve. The facility also boasts a rooftop patio by the administration offices.

Environmental value is also achieved through the purchase of CNG buses that offer lower greenhouse gas emissions and are quieter than diesel buses. They also offer longer service life and better reliability. If compressed natural gas is spilled, it will disperse quickly as it is lighter than air. Conversely, diesel spills can cause soil or water contamination. As a result, compressed natural gas offers multiple environmental benefits.





## Meeting Client's Needs

AECOM's direct client on the Stoney Transit Facility was the Design-Builder, PCL Construction Management Ltd. However, the ultimate client is the City of Calgary and its citizens.

Our client's expectations were that AECOM could provide the technical basis and expertise in the integration of the following knowledge areas; site development, geotechnical engineering, water, storm sewer and sanitary storm conveyance, stormwater ponds, wetlands, roads, landscaping, structural building, industrial and commercial architecture, electrical building, site-wide electrical lighting, electrical integration with third party cogeneration, mechanical building systems (boilers, air handling units, exhaust, fueling, automatic vehicle cleaning, degrease cleaning, detailed cleaning, storage, shop maintenance) and natural gas dehydration and compression design.

Of equal importance to providing the technical knowledge, was the client's expectation that AECOM staff had the ability to deliver as a nimble, cohesive project team with the design-builder, subcontractors and City of Calgary inspection services. The project was to be constructed in a design build pace. Therefore, in order to meet the schedule goals of the client, fluid and transparent communication was necessary at all levels while not compromising the design quality deliverables.

In the end the client sought a relationship of professional respect and assurance that design and inspection services would be completed on time and at the highest calibre. AECOM was able to successfully complete the design work and meet the client's needs for this innovative project.



## About AECOM

AECOM is the world's premier infrastructure firm, delivering professional services throughout the project lifecycle – from planning, design and engineering to consulting and construction management. We partner with our clients in the public and private sectors to solve their most complex challenges and build legacies for generations to come. On projects spanning transportation, buildings, water, governments, energy and the environment, our teams are driven by a common purpose to deliver a better world. AECOM is a Fortune 500 firm with revenue of approximately \$20.2 billion during fiscal year 2019. See how we deliver what others can only imagine at [aecom.com](http://aecom.com) and [@AECOM](https://twitter.com/AECOM).