Natural gas is a safe transportation fuel. It has been used in vehicles in North America for three decades and as a fuel for heating homes for more than a century. The properties of natural gas whether stored on a vehicle as compressed natural gas (CNG) or liquefied natural gas (LNG) are well understood. Globally, there are more than 17 million natural gas vehicles and 24,000 refueling stations.

**NATURAL GAS**

- odourless
- colourless
- non-toxic

CNG has odourant added (a “rotten egg” smell) so that, in the event of a fuel leak, the gas is detectable at very low concentrations.

For LNG, odourant cannot be added as it interferes with the liquefaction process. As a result, all LNG vehicles incorporate methane detectors which are typically mounted in both the cab and the engine compartment of the vehicle and provide visual and audible warnings in the event of a natural gas leak.

**NATURAL GAS VEHICLES**

Natural gas vehicles incorporate proven technologies and natural gas-specific safety features. CNG fuel cylinders and LNG storage tanks are made of durable materials and are subject to rigorous safety testing and certification to proven standards.

CNG fuel storage cylinders on new factory-built vehicles are designed to last the life of the vehicle. These cylinders incorporate pressure relief devices that are activated by heat so that, in the event of a fire, there is no risk of the cylinder breaking. CNG cylinders hold natural gas under high pressure. They are designed to withstand pressures significantly higher than what they will be used for.

LNG fuel storage tanks are made of rigid, double-walled steel and are designed to minimize heat transfer and keep the LNG in a cold, liquid state. These tanks are designed to comply with existing technical standards and are subject to rigorous test conditions such as drop tests and bonfire tests in order to verify their safe performance and fuel hold time. LNG tanks incorporate pressure relief strategies to ensure that excess fuel pressure is relieved in a controlled and safe manner in the event of an accident.

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REFUELING STATIONS

Natural gas refueling stations are designed to ensure safe operation and are subject to review, approval, and inspection by provincial Authorities. There is a well-established industry knowledge base and set of best practices that station designers can draw upon. Codes, standards, and regulations are in place for CNG and LNG stations with LNG refueling having been added as an annex to Canada’s LNG code in 2013.

Companies that install natural gas refueling stations must meet with the local municipal and provincial Authorities early in the station planning process to identify local requirements and regulations. The provincial Authority for fuel safety and for pressure vessels enforces requirements to verify that station equipment complies with recognized safety standards. Periodic station inspection, maintenance, and re-certification are also required to ensure that natural gas refueling stations are safe.

Emergency shutdown devices are designed into all natural gas refueling stations, whether CNG or LNG. These systems allow personnel to immediately stop station operation in the event of an emergency situation. Many CNG and LNG refueling stations also incorporate sophisticated remote monitoring systems which continuously monitor station conditions and can automatically shut down the station in the event of a fault condition.

CODES, STANDARDS & REGULATIONS

There are strict safety standards, codes, and regulations in place for the use of natural gas as a vehicle fuel in Canada. The main codes and standards are listed below. In addition, there are many standards for individual pieces of equipment. Canada also has federal Motor Vehicle Safety Standards and Regulations that apply to new factory-built natural gas vehicles which are the responsibility of Transport Canada.

CSA B108-14 – CNG FUELLING STATIONS INSTALLATION CODE

This code details the technical requirements for public, private, outdoor, and indoor CNG refueling stations. The code was updated in March 2014. As a result, public stations in Canada can now refuel to a settled pressure of 3,600 psi. This change harmonizes Canadian requirements with those of the United States where both public and private stations can refuel to a settled pressure of 3,600 psi.

CSA B109-14 – NATURAL GAS FOR VEHICLES INSTALLATION CODE - PART 1 CNG

This code details the technical requirements for the installation, servicing, and repair of CNG fuel systems for aftermarket conversions. At present, this code does not apply to LNG vehicles, but work is underway to add LNG vehicles to the code in 2015.

Aftermarket conversions are subject to the approval of provincial Authorities who issue Canada Registration Numbers (CRNs) for fuel storage cylinders. By comparison, new factory-built CNG or LNG vehicles are governed by Transport Canada’s safety regulations and Environment Canada’s emissions requirements, and do not require CRN numbers for their fuel storage cylinders or tanks.

CSA B51-14 – BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE

This code is broad in scope as it includes boilers, pressure vessels, and pressure piping and fittings. There are three parts to the code, one of which focuses specifically on fuel storage cylinders for CNG vehicles and one of which focuses on the requirements for CNG refueling station pressure piping systems, fittings, and ground storage vessels.

CSA Z276-11 – LNG PRODUCTION, STORAGE & HANDLING STANDARD - ANNEX D

This standard details the technical requirements and minimum standards for the design, installation, and safe operation of large, industrial-scale LNG production facilities. A new section has been added to the standard for permanent LNG refueling stations. This new section, called Annex D, was added to the standard in late 2013.