



## NATURAL GAS VEHICLE FUEL SYSTEMS – **INSPECTION & TYPES**

What You Need to Know

Due to its low energy density, natural gas must be either compressed (CNG) or liquefied (LNG) in order to use it as a vehicle fuel.



CNG is stored under high pressure in fuel storage cylinders.



LNG is stored in insulated, thermos-like tanks.

### **VEHICLE FUEL SYSTEM INSPECTION**

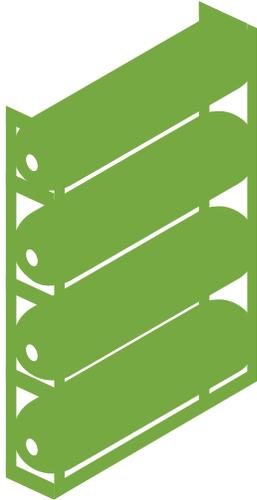
Industry best practices and safe operating procedures suggest that fleets:

1. Have equipment serviced and maintained as per the fuel system manufacturer's recommendations.
2. Conduct a visual inspection of the fuel system on a routine basis to check for surface damage.
3. Have a qualified fuel system inspector carry out a more thorough inspection:
  - Every 36 months; or
  - Every 60,000 km; and
  - After an accident

Inspections are the responsibility of the vehicle owner. Consult and follow the instructions in the owner's manual provided by the vehicle and/or fuel system manufacturer.

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## CNG FUEL STORAGE CYLINDERS



There are well-established standards that detail the requirements for CNG fuel storage cylinders. As per Transport Canada's regulations, new factory-built natural gas vehicles can use CNG fuel storage tanks that meet the requirements of either CSA B51 Boiler, Pressure Vessel and Pressure Piping Code or ANSI NGV 2-2007 – American National Standard for Natural Gas Vehicle Containers. For aftermarket conversions, most provinces require compliance with the CSA B51 standard.

For CNG, the main consideration for fuel storage cylinders is safe storage of the fuel under high pressure. There are four types of CNG fuel storage tanks available. Type 3 and 4 cylinders weigh less than half of what a Type 1 steel tank weighs.

1. **Type 1 – all metal (aluminum or steel)**
2. **Type 2 – metal liner reinforced by composite wrap (glass or carbon fibre) around middle (“hoop wrapped”)**
3. **Type 3 – metal liner reinforced by composite wrap around tank (“full wrapped”)**
4. **Type 4 – plastic gas-tight liner reinforced by composite wrap around tank (“full wrapped”)**

CNG fuel cylinders used on new factory-built vehicles are typically designed to last the life of the vehicle (15 years), but some manufacturers also offer 20-year cylinders.

All metal Type 1 cylinders are commonly used for aftermarket conversions and must be removed and hydrostatically tested every five years. Vehicle owners should review their vehicle owner's manual or consult their cylinder manufacturer's specifications for specific in-use CNG cylinder testing requirements.

## LNG FUEL STORAGE TANKS



For LNG, the main considerations for fuel storage tanks are minimizing heat transfer, keeping the fuel in a cold and liquid state, and managing vapour pressure. There is no single code or standard that currently details the requirements for LNG fuel storage tanks in Canada. In addition, Transport Canada does not have any specific regulations that apply to LNG fuel tanks on new factory-built vehicles, but the tanks are designed to meet the requirements of various standards that govern strength and durability in extreme conditions. Such standards include: NFPA 52 – Vehicular Gaseous Fuel Systems Code, SAE J2343 – Recommended Practices for LNG Powered Heavy-Duty Trucks, and ASME (Section 8, Division 1) – Rules for Construction of Pressure Vessels.

There are two main types of LNG fuel tanks for vehicles available in North America:

1. **Double-walled, insulated tanks for use with saturated (warm) LNG. The fuel system relies entirely on vapour pressure. If unsaturated (cold) LNG is used, the fuel system is not able to maintain minimum pressure to the engine unless a pressure booster is used.**
2. **Double-walled, insulated tanks that have a cryogenic pump in the tank to move the fuel through the system to the engine. This type of fuel system can use either saturated (warm) or unsaturated (cold) LNG, although vehicle mileage improves with the use of unsaturated LNG.**

LNG fuel tank volumes are described based on their water volume capacity. For more information, consult the “Natural Gas Vehicle - Weights & Dimensions” factsheet.