



**TECHNICAL
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CNG VEHICLE CONVERSION EXAM SYLLABUS

**Compressed natural gas (CNG) vehicle conversion
certificate of qualification**

Gas Safety Management
September 2020



Syllabus for the CNG Vehicle Conversion/ Automotive Technician Certificate Examination

1. PREREQUISITES TO CHALLENGE A CNG VEHICLE CONVERSION CERTIFICATE OF QUALIFICATION

- An applicant for a compressed natural gas (CNG) vehicle conversion certificate of qualification must meet the requirements of the Safety Standards Act, Safety Standards General Regulation and Gas Safety Regulation, and must:
 - be the holder of a 3 year automotive industry training credential or an equivalent 3 year automotive trade, or
 - have documented evidence, acceptable to a provincial safety manager, of a minimum of 3 years of automotive tune-up experience, and
 - have successfully completed a course in the conversion of vehicles to compressed natural gas that is acceptable to a provincial safety manager.

2. SCOPE OF A CNG VEHICLE CONVERSION CERTIFICATE OF QUALIFICATION

- A compressed natural gas vehicle conversion certificate of qualification entitles the holder to maintain, alter, repair and install compressed natural gas vehicle fuel systems under an *operating permit. The scope of work without a manufacturer's specific endorsement, is limited to service, inspection and maintenance only. Installation and/or alteration of approved compressed natural gas vehicle fuel systems requires an additional endorsement specific to the applicable manufacturer's fuel system. If **approved training has been acquired for the specific system(s), an endorsement will be attached to the individual's certification. In some cases multiple endorsements may/will be required.
- Certification does not entitle the holder to work on CNG related systems as part of an LNG equipped vehicle. An LNG endorsement must be acquired for this purpose and attached to the CNG automotive technician certification.

**Operating Permit refers to the facility (shop) permit issued by Technical Safety BC as required by Gas Safety Regulations section 28 (d).*

***Specific manufacturers must apply to Technical Safety BC in advance for recognition of training programs prior to delivery for the purpose of a certification endorsement (see Directive No: D-GA-2018-02)*





3. SUBJECT AREAS OF STUDY

Percentage (%) on Exam

3.1 DESCRIBE CNG SYSTEMS AND INDUSTRY SAFETY STANDARDS

25%

3.1.1 Properties of natural gas

- a. Identify the chemical formula
- b. Describe the calorific value
- c. Describe the specific gravity
- d. Define the limits of flammability
- e. Select and describe the ignition temperature
- f. Identify and describe the octane rating
- g. Identify the odourant added and its purpose
- h. Describe compressed natural gas (CNG)
- i. Describe compression/volume ratios

3.1.2 CNG fuel systems

- a. Describe storage containers and assembly mounting
- b. Identify container valves and pressure relief devices
- c. Describe refueling receptacles
- d. Identify high pressure solenoid and inline valves
- e. Select high pressure tubing, hoses, piping and fittings
- f. Describe the operation of high pressure regulators

3.1.3 CSA B109-17 Natural gas for vehicles installation code, Part 1

- a. Define the scope of the CSA B109-17, Natural gas for vehicles installation code, Part 1
- b. Describe the application of the code and certification requirements
- c. Inspect a CNG fueled vehicle and compare with CSA B109-17 code requirements

3.1.4 Act and Regulations

- a. Apply the Safety Standards Act to CNG vehicles and conversion facilities
- b. Apply the Safety Standards General Regulation to CNG vehicles and conversion facilities
- c. Apply the Gas Safety Regulation to CNG vehicles and conversion facilities
- d. Describe directives, bulletins and safety orders
- e. Describe CNG vehicle conversion qualification permissions





- f. Describe CNG vehicle conversion qualification responsibilities
- g. List the shop's regulatory requirements

3.2 ASSESS CNG FUEL CONTAINERS AND MOUNTING

25%

3.2.1 CNG fuel storage containers

- a. Describe CNG container construction
- b. Describe containers, container assemblies and prohibited alterations
- c. Describe container isolation and pressure relief devices
- d. Describe protection requirements from collision and impact
- e. State the restrictions on structural alterations
- f. List restrictions on relocation of existing components

3.2.2 CNG fuel storage container mounting

- a. Determine mounting requirements

3.2.3 CNG fuel storage container ventilation

- a. Apply ventilation requirements

3.2.4 CNG fuel containers and fuel system components

- a. Remove and install fuel containers and fuel system components

3.3 SERVICE CNG FUEL SYSTEMS

25%

3.3.1 CNG fuel system components

- a. List CNG component requirements
- b. Describe the principles and purposes for lock-off devices
- c. Install piping, tubing, hose and fittings
- d. Install pressure relief devices and vent lines
- e. Describe the requirements for pressure regulators and their operation
- f. Recognize multi-fuel components and the requirements of a CNG conversion

3.3.2 CNG vehicle decaling and manuals

- a. Describe decaling and manuals
- b. List vehicle inspection and testing requirements

3.3.3 Servicing CNG fuel system components

- a. Describe vehicle service, collision repair and fuel container testing
- b. Perform fuel container depressurization
- c. Demonstrate component re-installation





- d. Demonstrate inert gas leak testing
- e. Perform a conversion evaluation as per the vehicle checklist

3.4 ANALYZE CNG FUEL SYSTEM OPERATION

25%

3.4.1 CNG fuel system components

- a. Describe the operation of manually operated components
- b. Describe the operation of electronically operated components
- c. Describe the control parameters

3.4.2 CNG engine sub-systems

- a. Describe the effect cooling system integrity has on CNG regulators
- b. Provide examples of engine compression requirements
- c. Describe compression ratio on dedicated (single-fuel) natural gas vehicles
- d. Identify the effects of the ignition system on system performance
- e. Identify the effects of system performance on exhaust systems
- f. Describe compression ignited CNG engines

3.4.3 Diagnostic equipment for CNG Vehicles

- a. Describe test methods and test points
- b. Describe short- and long-term trims in relation to natural gas operation
- c. Describe MIL illumination and DTCs
- d. Explain how CNG is introduced on a diesel engine to operate as dual-fuel

3.4.4 Diagnosing and repairing CNG fuel systems based on system faults

- a. List basic troubleshooting techniques
- b. Read and interpret exhaust emissions
- c. Explain open and closed loop systems for electronic fuel injection systems
- d. State how baseline engine performance on gasoline is determined
- e. Diagnose an array of simulated CNG system faults
- f. Explain the technician's responsibility to the end user

