TECHNICAL SAFETY BC

Safe technical systems. Everywhere.

APPLIANCE SERVICE EXAM SYLLABUS

Appliance Service Certificate of Qualification

Gas Safety Management

April 2026

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Syllabus for the Appliance Service Certificate Examination

1. PREREQUISITES TO CHALLENGE THE APPLIANCE SERVICE CERTIFICATE OF QUALIFICATION EXAMINATION

An applicant for an appliance service certificate of qualification must meet the requirements of the *Safety Standards Act, Safety Standards General Regulation* and *Gas Safety Regulation,* and must have successfully completed a course in gas appliance service training recognized by the provincial safety manager.

2. SCOPE OF THE APPLIANCE SERVICE CERTIFICATE OF QUALIFICATION

A gas appliance service certificate of qualification entitles the holder to perform the servicing of the following gas systems while employed by a licensed gas contractor or under an appropriate permit:

- gas appliances for residential use; or
- light commercial appliances up to an input of 82 kW (280,000 Btuh)

The gas appliance service certificate of qualification is intended for servicing (maintenance) and repair of gas-fired residential and light commercial appliances. It does *not* allow or *include* the following:

- the installation of new or replacement appliances,
- the installation of gas piping, or
- the repair or installation of venting

An appliance service certification is *not* a prerequisite to a class B gas fitter certification. Individuals who acquire this certification and wish to obtain a class B gas fitter certification *must* also complete a recognized apprenticeship program.

3. SUBJECT AREAS OF STUDY — Percentage (%) on Exam

3.1 APPLY INDUSTRY SAFETY STANDARDS AND REGULATIONS — 5%

3.1.1 Codes, regulations, and standards

a. Apply the CSA B149.1, Natural gas and propane installation code to an existing installation.
b. Apply the Safety Standards Act.
c. Apply the Safety Standards General Regulation.
d. Apply the Gas Safety Regulation.
e. Describe safety orders, directives, and bulletins.

TECHNICAL SAFETY BC

3.1.2 Manufacturer and supplier documentation

a. Describe documentation types.
b. List the information contained in manufacturer and supplier documentation.
c. Source manufacturer's documentation.
d. Use commissioning documentation for high efficiency furnaces and condensing boilers.

3.2 DESCRIBE GAS PROPERTIES 4%

3.2.1 Properties of natural gas and propane

a. Identify the chemical formula.
b. Apply calorific values.
c. Describe specific gravity.
d. Define the limits of flammability.
e. Identify and describe the ignition temperature.
f. Identify the flame speed.
g. Describe the odourant added and its purpose.
h. Identify the state based on temperature and pressure.

3.3 USE COMBUSTION ANALYSIS EQUIPMENT 10%

3.3.1 Combustion theory & measuring equipment

a. Describe perfect combustion.
b. Describe complete and incomplete combustion.
c. Apply combustion formulas.
d. Determine theoretical products of combustion and volumes.
e. Calculate required air supply such as combustion, excess and dilution.
f. List the types of combustion analyzers.
g. Perform flue gas analysis.
h. Determine flue gas composition and efficiencies.
i. Describe carbon monoxide and how it is produced.
j. List the hazards of carbon monoxide.
k. List the acceptable levels of carbon monoxide.

3.4 ASSESS VENTING AND AIR SUPPLY SYSTEMS 6%

3.4.1 Venting systems

a. State the purpose of a venting system.
b. List and describe appliance categories based on vent pressures and flue loss.

c. List the types and classification of venting material permitted for gas-fired appliances.
d. Determine if the venting system is operating as required.
e. Visually inspect the venting system for damaged or defective components.
f. Describe how type BH venting systems are sized.
g. Determine when a gasfitter would be required to repair a damaged or defective venting system.

3.4.2 Air supply systems

a. Explain the purpose of a passive air supply system.
b. Verify that the size of a passive air supply system is adequate.
c. Visually inspect the air supply system for damaged or defective components.
d. Describe mechanical air supply systems.

3.4.3 Draft control systems

a. List the types of draft controls found on residential appliances and their operation.
b. Verify that the installation of the draft control device meets the requirements of the CSA B149.1 code and manufacturer's specifications.
c. Verify the operation of the draft control device.
d. Explain the process to commission a barometric damper.
e. Perform a spillage test to verify that the draft control device is not discharging flue gas into the mechanical room.

3.4.4 Venting and air supply principles

a. Define the building as a system.
b. Describe draft and how it is created.
c. List combustion air supply methods.

3.5 ASSESS FUEL DELIVERY SYSTEMS 14%

3.5.1 Piping, tubing, and components for fuel systems

a. List the types of piping, tubing and hose permitted by the CSA B149.1 code.
b. Determine if joining methods used for pipe and tubing are code compliant.
c. Visually inspect piping, tubing, and hose installation for code compliance.

d. Isolate piping systems including lockout and tagout procedures.
e. Describe the types of manual valves and their installation and operational requirements.
f. Describe the types of automatic valves and their installation and operational requirements.
g. Verify that the size of the piping system in a residential installation is adequate.
h. Describe the sizing and installation of Corrugated Stainless-Steel Tubing (CSST).
i. Measure and record inlet and outlet pressures to ensure they are within manufacturers' specifications and code.
j. Identify damaged or defective components.
k. Check for leaks using electronic leak detectors and leak detection solutions.
l. Determine when a gasfitter would be required to repair a damaged gas distribution system.

3.5.2 Gas metering devices

a. List the types of gas meters.
b. Describe the operation of diaphragm and rotary gas meters.
c. Clock a gas meter to determine appliance input.
d. Interpret gas meter readings.
e. Perform a dial test to determine if there are leaks downstream of the meter.

3.5.3 Regulators

a. Recognize the types of gas pressure regulators found in residential and small commercial installations.
b. Explain the purpose and operation of gas pressure regulators found in residential and commercial installations.
c. Adjust gas pressure regulators to manufacturer and system requirements.
d. State the manufacturer, code, and regulatory installation requirements for gas pressure regulators.
e. List items to consider when performing the inspection of a regulator, such as static, and operating inlet and outlet pressures and venting system operation.
f. Visually inspect regulators for damage, defects, and operating deficiencies.
g. Determine when a gasfitter would be required to repair a damaged or defective regulator.

TECHNICAL SAFETY BC

3.5.4 Fuel train systems

a. Describe the components of a gas valve train for appliances with a maximum input of 120 kW.
b. Explain the operation of gas valve trains for residential appliances.
c. Perform the inspection of fuel train system such as visual, electrical parameters, tightness of closure, regulator lockup and manifold pressure.
d. List items to consider when making a repair, such as isolation, removing faulty components and returning to service.

3.6 APPLY ELECTRICAL CONCEPTS 16%

3.6.1 Principles of electricity and electronics

a. Describe electrical safety hazards and safe work practices.
b. Describe protective devices such as fuses, circuit breakers, and overloads.
c. Identify electrical components as either switches, loads or sources.
d. Describe electrical components used with gas-fired appliances such as relays, transformers, and capacitors.
e. Describe electronic components used with gas-fired appliances such as resistors, thermistors, and diodes.
f. Apply electricity principles such as Ohm's Law and Kirchhoff's Laws.
g. Verify capacity and phasing of transformers.

3.6.2 Electrical wiring diagrams and schematics

a. Describe pictorial/wiring, ladder/schematic, and connection wiring diagrams.
b. Describe common electrical symbols.
c. Analyze heating circuits for residential appliances and commercial appliances with inputs that do not exceed 82 kW.
d. Use residential heating system wiring diagrams.
e. Describe the sequence of operation for residential furnaces and hydronic heating systems.

3.6.3 Single-phase and Electronically Commutated Motor (ECM) Technology

a. List the types of single-phase motors.
b. Describe the operation of a single-phase motor.
c. Explain motor protection methods.
d. Describe the principles of operation for starter relays, capacitors and motor protectors in a single-phase motor.
e. List the mechanical and electrical checks for a single-phase motor.

f. Identify the causes of motor failure for single-phase motors.
g. Describe ECM's and their application.
h. Describe the operation of an ECM.
i. Adjust an ECM to manufacturer and system requirements.

3.6.4 Troubleshooting

a. List common electrical faults.
b. Describe the types of electrical meters and their application.
c. Interpret electrical meter readings.
d. Calculate anticipated resistance, voltage drop and circuit ampacity.
e. Troubleshoot residential heating system electrical circuits.

3.7 APPLY CONTROLS AND INSTRUMENTATION TECHNOLOGY

17%

3.7.1 Communication and networking technology

a. Identify wireless networks such as Wi-Fi, ZigBee, and Z-Wave for residential heating systems.
b. Identify basic network protocols for residential heating systems such as HTTP, BACnet and ARP.
c. Describe types of cable connectors.

3.7.2 Automation and instrumentation control systems

a. Describe the installation and operation of outdoor reset controls for residential hydronic heating systems.

3.7.3 Flame safeguards

a. List the flame detector types and their application.
b. List the ignition system types and their application.
c. Describe flame safeguard systems and their sequence of operation.

3.7.4 Safety and operating control circuits

a. Describe the types of switches found on residential appliances including limits and interlocks.
b. List the types of switches and loads found on combustion safety circuits.
c. List the types of switches and loads found on operating control circuits.
d. Describe types of circuits such as series, parallel and series-parallel.
e. Describe the installation and adjustment of operating controls found on residential appliances including furnaces, boilers, domestic water heaters, cooking equipment and fireplaces.
f. Verify the installation and set up a programmable thermostat.

g. Verify that the operation of millivolt and class 2 heating control circuits meet manufacturer and regulatory requirements.
h. Verify that the operation of combustion safety circuits meets manufacturer and regulatory requirements.

3.7.5 Mechanical safety devices

a. Describe the types of mechanical safety devices such as pressure relief, temperature relief, vacuum relief, and safety valves.
b. Describe the application of mechanical safety devices.

3.7.6 Control processes and systems

a. Determine residential hydronic heating system flow requirements.
b. Describe the balancing requirements for residential hydronic and forced air space heating systems.
c. Identify required return water temperatures.
d. Describe the application for mixing valves.
e. Determine supply water temperatures for residential hydronic heating systems.
f. Describe residential hydronic heat transfer units.

3.8 SERVICE APPLIANCES AND EQUIPMENT 28%

3.8.1 Burners

a. Describe the types of burners found on residential appliances.
b. Explain the operation of an atmospheric burner.
c. Size burner orifices.
d. Verify that the installation of atmospheric and mechanical burners is in accordance with the manufacturer's specifications.
e. Describe the procedures for servicing gas burners.
f. Perform pilot turndown test to confirm smooth lighting of burners.
g. Inspect burner performance using a combustion test analyzer to verify air gas mix, combustion air volume, CO levels and stack temperature.
h. Clean and adjust burners.

3.8.2 Appliances

a. List the types of appliances found in residential and small commercial facilities.
b. Verify that the installation of residential gas-fired appliances is in accordance with the CSA B149.1 code.
c. Verify that the installation of a commercial gas-fired appliance with an input of 82 kW or less is in accordance with the CSA B149.1 code.

d. Describe the maintenance requirements of residential gas-fired appliances.
e. Describe documentation such as maintenance reports, check sheets, logbooks, and operating permits.
f. Describe sequence of operation to assist with troubleshooting.
g. Inspect mechanical components such as switches, valves, dampers, fans, motors, and air differential proving switches.
h. Check operation of flame detection system.
i. Check and measure spark electrode and gaps to ensure that it is set to manufacturers' specifications.
j. Test safety limits such as high limit, high and low water cut-offs, flow switches to verify operation.
k. Verify condensate lines are clean and clear of debris.
l. Replace components such as belts, flame rods, filters, and gaskets according to maintenance schedule.
m. Document repairs.
n. Monitor equipment performance to identify faults or erratic operation.
o. Select and use diagnostic tools such as manometers, draft gauges, combustion analyzers, multimeters, and ammeters.
p. Verify replacement parts meet manufacturer's requirements and operate according to specifications.
q. Lock-out and tag-out system by isolating energy sources.
r. Remove and reassemble protective covers, shields, and other components to access repair area.

3.8.3 Ancillary equipment

a. Describe the servicing of ancillary equipment for residential heating boilers such as pumps, zone valves, mixing valves, expansion tanks and pressure reducing valves.
b. Describe the servicing of ancillary equipment for residential furnaces such as electronic air filters, cooling coils and condensate pumps.

3.8.4 Commissioning gas-fired appliances

a. Determine the commissioning requirements for gas fired appliances.
b. Commission a storage type water heater with a standing pilot and atmospheric burner.
c. Commission a high efficiency furnace.
d. Commission a condensing boiler.
e. Commission a residential range.

f. Commission a commercial range with a maximum input that does not exceed 82 kW.
g. Commission a residential dryer.