TECHNICAL SAFETY BC

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RECREATIONAL VEHICLE INSTALLATION AND SERVICE EXAM SYLLABUS

Recreational Vehicle Installation and Service Certificate of Qualification

Gas Safety Management

November 2019

TECHNICAL SAFETY BC

Syllabus for the Recreational Vehicle Installation and Service Certificate of Qualification Examination

1. PREREQUISITES TO CHALLENGE THE RECREATIONAL VEHICLE INSTALLATION AND SERVICE CERTIFICATE OF QUALIFICATION EXAMINATION

An applicant for a recreational vehicle installation and service certificate of qualification must:

- provide documented evidence, acceptable to a provincial safety manager, of a minimum of 2 years' experience in the installation or repair of recreational vehicle appliances and piping, and
- have successfully completed a course in recreational vehicle appliance installation and servicing that is acceptable to a provincial safety manager

2. SCOPE OF THE RECREATIONAL VEHICLE INSTALLATION AND SERVICE CERTIFICATE OF QUALIFICATION

A recreational vehicle installation and service certificate of qualification entitles the holder to maintain, alter, repair and install vehicle gas systems in recreational vehicles under an appropriate permit.

3. SUBJECT AREAS OF STUDY

Percentage (%) on Exam

3.1 PROPERTIES OF PROPANE — 9%

3.1.1 Propane properties and characteristics

a. Determine heat values
b. List specific gravities
c. Identify boiling points
d. Describe the limits of flammability
e. Describe ignition temperatures
f. Identify flame temperatures
g. Identify expansion ratios
h. Calculate capacity

3.2 PRINCIPLES OF COMBUSTION — 9%

3.2.1 Principles and Processes of Combustion

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a. Identify the products of incomplete combustion
b. Identify the products of complete combustion
c. Describe the requirements for combustion
d. List the causes of incomplete combustion
e. Troubleshoot poor flame characteristics such as; flame liftoff, waving flames, floating flames and flashback
f. Describe flue gas analysis and the equipment required
g. Determine combustion air supply requirements such as primary, secondary, excess and dilution

3.3 REGULATORS 18%

3.3.1 Regulators, operation and regulations

a. Describe propane regulator types
b. Describe the requirements for venting
c. Identify propane regulator components
d. Identify single-stage and two-stage propane regulators
e. State the manufacturer, code and regulatory installation requirements for gas pressure regulators
f. Describe the purpose and operation of gas pressure regulators found in recreational vehicles
g. Describe setpoint and lockup pressure
h. List the information required to select a regulator
i. Troubleshoot regulator problems
j. List the procedures for repairing a regulator such as; isolation, replacing components and confirming operation
k. Service a regulator that is damaged or is not meeting system performance requirements
l. Adjust gas pressure regulators to manufacturer and system requirements
m. Commission a propane pressure regulator

3.4 PIPING THEORY 18%

3.4.1 Piping and regulations

a. Identify the types of piping, tubing and hose permitted by the CSA Z240.4.2 code
b. Design a gas piping or tubing installation utilizing the CSA Z240.4.2 code
c. List the types of manual valves and their installation requirements
d. Determine system pressures and maximum allowable pressure drops
e. Size piping systems for propane
f. Determine piping and tubing support requirements

g. Describe the types propane storage systems used to supply gas in recreational vehicles
h. Describe propane cylinder/tank equipment and valves
i. Describe propane cylinder markings and requalification requirements

3.4.2 Testing and Commissioning

a. Inspect fuel delivery components
b. Determine testing requirements including pressure and duration
c. Select testing equipment
d. List the procedures to commission piping and tubing systems
e. Identify the purging procedures for piping and tubing
f. List the process to purge and re-gasify the system
g. Measure and record inlet and outlet pressures to ensure they are within manufacturers' specifications and code
h. Check for leaks using electronic leak detectors and leak detection solutions

3.5 VENTILATION AND COMBUSTION AIR REQUIREMENTS 9%

3.5.1 Combustion Air Supply Sizing

a. Determine air supply requirements for appliances installed in recreational vehicles
b. Size air supply openings for appliances installed in recreational vehicles

3.5.2 Air Supply and Venting System Installation

a. Describe the installation requirements for air supply systems according to the CSA Z240.4.2 code
b. List the air supply clearance requirements from gasoline filler spouts and appliance venting systems
c. Describe the code and regulatory requirements for installing appliance venting systems

3.6 THERMOCOUPLES AND PILOT SYSTEMS 9%

3.6.1 Thermocouples and Thermopiles

a. Describe thermocouples and thermopiles and their voltages
b. Describe safety circuits and valves that utilize thermocouples and thermopiles
c. List maximum flame failure response times

3.6.2 Service and Maintenance of Millivoltage Circuits

a. Describe open and closed circuit tests
b. Determine anticipated millivoltage readings at various points in a circuit
c. Troubleshoot millivoltage circuits
d. Perform pilot turndown test to confirm smooth lighting of burners
e. Test flame safeguards to ensure that they meet manufacturer and regulatory requirements

3.7 APPLIANCE SERVICING 18%

3.7.1 Appliances

a. Describe gas fired appliances encountered in recreational vehicles
b. Describe the operation of gas ranges
c. Describe the operation of a furnace
d. Describe the operation of domestic water heaters
e. Describe the operation of 2-way and 3-way refrigerators
f. Describe the installation and adjustment of operating controls found on appliances including furnaces, domestic water heaters, cooking equipment and refrigerators
g. Describe and identify types of safety limits
h. Select safety limits
i. List types of gas valves and their operating characteristics
j. Describe and select ignition systems for appliances
k. Determine appliance efficiency

3.7.2 Wiring Diagrams

a. Identify appliance wiring diagrams
b. Interpret wiring diagrams
c. Determine sequence of operation from wiring diagrams
d. Troubleshoot systems utilizing wiring diagrams and schematics

3.7.3 Service and Maintenance

a. Determine if the appliance input is within manufacturer and regulatory requirements
b. Describe maintenance requirements for gas appliances
c. Troubleshoot appliance operational faults
d. List common electrical faults
e. Interpret electrical readings
f. Apply Ohm's Law
g. Select and use diagnostic tools such as manometers, draft gauges, combustion analyzers, multimeters and ammeters
h. Verify replacement parts meet manufacturer's requirements and operate according to specifications

i. Lock-out and tag-out system by isolating energy sources
j. Remove and reassemble protective covers, shields and other components to access repair area
k. Check for leaks to ensure that systems are safe
l. List the factors to consider when starting up a system
m. Determine the commissioning requirements for gas fired appliances
n. Perform the inspection of fuel train system such as; visual, electrical parameters, tightness of closure, regulator lockup and manifold pressure
o. Ensure temperature rise through the appliance is within acceptable limits
p. Set fan speeds
q. Inspect burner performance using a combustion test analyzer to verify air gas mix, combustion air volume and CO levels
r. Document repairs

3.8 CYLINDERS, TANKS AND REGULATIONS 10%

3.8.1 Cylinder and Tank Valves and Equipment

a. Describe the types of valves and equipment found on cylinders and tanks
b. Describe relief valve set points
c. Describe excess flow valves and their installation requirements
d. Describe the installation requirements for tanks and cylinders
e. List the installation requirements for propane containers in enclosures
f. Interpret the information found on tank data plates and cylinder neck rings