

## PROGRAM OUTLINE

Recreation Vehicle Service  
Technician



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# **RECREATION VEHICLE SERVICE TECHNICIAN PROGRAM OUTLINE**

**APPROVED BY INDUSTRY  
NOVEMBER 2018**

**BASED ON  
NOA 2012**

**Developed by  
Industry Training Authority  
Province of British Columbia**



## TABLE OF CONTENTS

<b>Section 1 INTRODUCTION.....</b>	<b>3</b>
Foreword .....	4
Acknowledgements .....	5
How to Use this Document.....	6
<b>Section 2 PROGRAM OVERVIEW.....</b>	<b>8</b>
Program Credentialing Model .....	9
Occupational Analysis Chart .....	10
Training Topics and Suggested Time Allocation.....	13
Training Topics and Suggested Time Allocation.....	15
Training Topics and Suggested Time Allocation.....	17
<b>Section 3 PROGRAM CONTENT .....</b>	<b>18</b>
Level 1 Recreation Vehicle Service Technician.....	19
Level 2 Recreation Vehicle Service Technician.....	57
Level 3 Recreation Vehicle Service Technician.....	94
<b>Section 4 ASSESSEMENT GUIDELINES.....</b>	<b>123</b>
Assessment Guidelines – Level 1 .....	124
Assessment Guidelines – Level 2.....	125
Assessment Guidelines – Level 3.....	126
<b>Section 5 TRAINING PROVIDER STANDARDS .....</b>	<b>127</b>
Facility Requirements.....	128
Tools and Equipment .....	129
Reference Materials .....	131
Instructor Requirements.....	132
<b>Appendices .....</b>	<b>133</b>
Appendix A Acronyms.....	134
Appendix B Previous Contributors .....	135



# **Section 1**

# **INTRODUCTION**

# **Recreation Vehicle Service Technician**



## Foreword

This Recreation Vehicle Service Technician Program Outline is intended as a guide for instructors, apprentices, and employers of apprentices as well as for the use of industry organizations, regulatory bodies, and provincial and federal governments. It reflects updated standards based on the 2012 Red Seal National Occupational Analysis (NOA) and was developed by British Columbia industry and instructor subject matter experts. This Program Outline will form the basis for further updating of the British Columbia Recreation Vehicle Service Technician Program by the Industry Training Authority (ITA).

Practical instruction by demonstration and student participation should be integrated with classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the apprenticeship.

This Program Outline includes a list of recommended reference textbooks that are available to support the learning objectives and the minimum shop requirements needed to support instruction.

Competencies are to be evaluated through written exams and practical assessments. A passing grade is achieved by getting an overall mark of 70%. See the Assessment Guidelines for more details.

Achievement Criteria are included for those competencies that require a practical assessment. The intent of including Achievement Criteria in the Program Outline is to ensure consistency in training across the many training institutions in British Columbia. Their purpose is to reinforce the theory and to provide a mechanism for evaluation of the learner's ability to apply the theory to practice. It is important that these performances be observable and measureable and that they reflect the skills spelled out in the competency as those required of a competent journeyman. The conditions under which these performances will be observed and measured must be clear to the learner as well as the criteria by which the learner will be evaluated. The learner must also be given the evaluation criteria.

The performance spelled out in the Achievement Criteria is a suggested performance and is not meant to stifle flexibility of delivery. Training providers are welcome to substitute other practical performances that measure similar skills and attainment of the competency. Multiple performances may also be used to replace individual performances where appropriate.

### **SAFETY ADVISORY**

Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation. The current Standards and Regulation in BC can be obtained on the following website: <http://www.worksafebc.com>. Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.



## Acknowledgements

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- Victor Flint, Instructor, Okanagan College, Owner Operator, Family First RV
- Jordan Hill, Technician, Snowy Peaks RV, Fernie
- Jon Itterman, Instructor, Okanagan College
- Byron Scott, Owner Operator, Courtenay RV Specialists
- Bill Smith, Technician, Travelhome RV, Abbotsford

Subject Matter Experts retained as outline reviewers:

- Victor Flint, Instructor, Okanagan College, Owner Operator, Family First RV
- Jordan Hill, Technician, Snowy Peaks RV, Fernie
- Jon Itterman, Instructor, Okanagan College
- Byron Scott, Owner Operator, Courtenay RV Specialists
- Bill Smith, Technician, Travelhome RV, Abbotsford

The Industry Training Authority would like to acknowledge the dedication and hard work of all participants in identifying the training requirements of the Recreation Vehicle Service Technician (RVST) trade.



## How to Use this Document

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
<b>Program Credentialing Model</b>	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
<b>OAC</b>	Communicate the competencies that industry has defined as representing the scope of the occupation	Understand the competencies that an apprentice is expected to demonstrate in order to achieve certification	View the competencies they will achieve as a result of program completion	Understand the competencies they must demonstrate in order to challenge the program
<b>Training Topics and Suggested Time Allocation</b>	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the relative weightings of various competencies of the occupation on which assessment is based
<b>Program Content</b>	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measureable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels





Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
<b>Training Provider Standards</b>	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment
<b>Appendix – Glossary of Acronyms</b>			Defines program specific acronyms	



# **Section 2**

## **PROGRAM OVERVIEW**

### **Recreation Vehicle Service Technician**

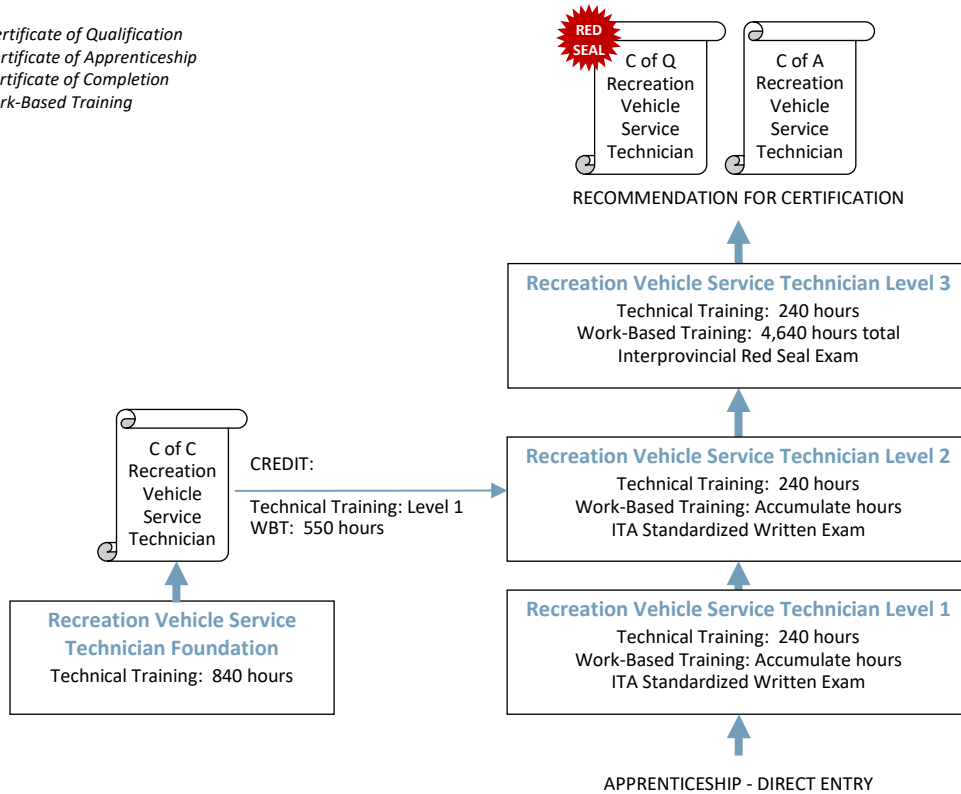


## Program Credentialing Model

### Apprenticeship Pathway

This graphic provides an overview of the Recreation Vehicle Service Technician apprenticeship pathway.

*C of Q = Certificate of Qualification  
 C of A = Certificate of Apprenticeship  
 C of C = Certificate of Completion  
 WBT = Work-Based Training*



**CROSS-PROGRAM CREDITS**

*Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program*

None



## Occupational Analysis Chart

### RECREATION VEHICLE SERVICE TECHNICIAN

**Occupation Description:** Recreation vehicles (RV) are vehicles designed as temporary living quarters for recreational, camping, travel or seasonal use. RVs may be motorized (motorhomes) or towable (travel trailers, folding camping trailers, truck campers, and park models). RVs do not include off-road vehicles. RV service technicians work on systems and components of recreation vehicles, including electrical components, plumbing, propane gas components, appliances, exterior and interior components, structural frames and towing systems. They diagnose, repair, replace, install, adjust, test, maintain and modify these components and systems. They may also perform maintenance and repairs on trailer frames and running gear. They must be knowledgeable about each system's function and the interaction among various systems. However, it is important to note that they do not work on the motor or drive train components of motorized RVs. RV service technicians are typically employed at RV dealerships, independent RV repair shops, RV manufacturers and may also be self-employed. They may work at indoor shops and outdoors at RV sites. Safety is important due to risks and hazards such as: working at heights, with electricity, with explosive and volatile materials, in the outdoor environment, and under vehicles.

<b>PERFORM SAFETY-RELATED ACTIVITIES</b>  A	Use personal protective equipment (PPE) and safety equipment  A1 1	Maintain safe work environment  A2 1		
<b>USE TOOLS AND EQUIPMENT</b>  B	Use tools and equipment  B1 1	Use lifting, moving and access equipment  B2 1		
<b>PERFORM COMMON WORK PRACTICES</b>  C	Use technical information  C1 1      3	Perform pre-delivery inspections (PDI)  C2 1	Use communication techniques  C3 1      3	Perform estimation procedures  C4 3
<b>SERVICE WATER SYSTEMS</b>  D	Service potable water systems  D1 1	Service waste water systems  D2 1		



<b>SERVICE ELECTRICAL SYSTEMS</b> <span style="float: right;">F</span>	Apply electrical theory <span style="float: right;">F1</span> 1	Service AC electrical systems <span style="float: right;">F2</span> 1   2   3	Service DC electrical systems <span style="float: right;">F3</span> 1   2   3	Service vehicle networking systems <span style="float: right;">F4</span> 1     3
	<b>SERVICE LIQUID PETROLEUM (LP) GAS SYSTEMS</b> <span style="float: right;">H</span>	Maintain LP gas systems <span style="float: right;">H1</span> 1   2	Install LP gas systems <span style="float: right;">H2</span>   2	Diagnose LP gas systems <span style="float: right;">H3</span>   2
<b>SERVICE WATER HEATERS</b> <span style="float: right;">I</span>	Maintain water heaters <span style="float: right;">I1</span> 1   2	Install water heaters <span style="float: right;">I2</span>   2	Diagnose water heaters <span style="float: right;">I3</span>   2	Repair water heaters <span style="float: right;">I4</span>   2
	<b>SERVICE FURNACES</b> <span style="float: right;">J</span>	Maintain furnaces <span style="float: right;">J1</span> 1   2	Install furnaces <span style="float: right;">J2</span>   2	Diagnose furnaces <span style="float: right;">J3</span>   2
<b>SERVICE COOKTOPS AND OVENS</b> <span style="float: right;">K</span>	Maintain cooktops and ovens <span style="float: right;">K1</span> 1   2	Install cooktops and ovens <span style="float: right;">K2</span>   2	Diagnose cooktops and ovens <span style="float: right;">K3</span>   2	Repair cooktops and ovens <span style="float: right;">K4</span>   2
	<b>SERVICE REFRIGERATORS</b> <span style="float: right;">L</span>	Maintain refrigerators <span style="float: right;">L1</span> 1   2	Install refrigerators <span style="float: right;">L2</span>   2	Diagnose refrigerators <span style="float: right;">L3</span>   2



## Program Overview

<b>SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND HEAT PUMPS</b> <b>M</b>	Maintain A/C, refrigeration and heat pumps M1 1    3	Install A/C, refrigeration and heat pumps M2 2	Diagnose A/C, refrigeration and heat pumps M3 3	Repair A/C, refrigeration and heat pumps M4 3		
<b>SERVICE EXTERIOR COMPONENTS</b> <b>O</b>	Maintain exterior components O1 2	Install exterior components O2 2	Diagnose exterior components O3 2	Repair exterior components O4 2 3		
<b>SERVICE INTERIOR COMPONENTS</b> <b>P</b>	Maintain interior components P1 2	Install interior components P2 2	Diagnose interior components P3 2	Repair interior components P4 2	Service consumer products P5 3	
<b>SERVICE CHASSIS AND MECHANICAL COMPONENTS</b> <b>Q</b>	Maintain chassis and mechanical components Q1 1    3	Install chassis and mechanical components Q2 3	Diagnose chassis and mechanical components Q3 1    3	Repair chassis and mechanical components Q4 1    3	Service slideout systems Q5 3	Service levelling systems Q6 3
	Service folding camping trailers Q7 3					
<b>SERVICE TOWING SYSTEMS</b> <b>R</b>	Maintain towing systems R1 1	Install towing systems R2 1    3	Diagnose towing systems R3 1	Repair towing systems R4 1		



## Training Topics and Suggested Time Allocation

### RECREATION VEHICLE SERVICE TECHNICIAN – LEVEL 1

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
<b>Line A</b>	<b>PERFORM SAFETY-RELATED ACTIVITIES</b>	<b>8%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
A1	Use personal protective equipment (PPE) and safety equipment		✓	✓	
A2	Maintain safe work environment		✓	✓	
<b>Line B</b>	<b>USE TOOLS AND EQUIPMENT</b>	<b>8%</b>	<b>20%</b>	<b>80%</b>	<b>100%</b>
B1	Use tools and equipment		✓	✓	
B2	Use lifting, moving and access equipment		✓	✓	
<b>Line C</b>	<b>PERFORM COMMON WORK PRACTICES</b>	<b>13%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
C1	Use technical information		✓	✓	
C2	Perform pre-delivery inspections (PDI)		✓	✓	
C3	Use communication techniques		✓	✓	
<b>Line D</b>	<b>SERVICE WATER SYSTEMS</b>	<b>12%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
D1	Service potable water systems		✓	✓	
D2	Service waste water systems		✓	✓	
<b>Line F</b>	<b>SERVICE ELECTRICAL SYSTEMS</b>	<b>25%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
F1	Apply electrical theory		✓		
F2	Service AC electrical systems		✓	✓	
F3	Service DC electrical systems		✓	✓	
F4	Service vehicle networking systems		✓	✓	
<b>Line H</b>	<b>SERVICE LIQUID PETROLEUM (LP) GAS SYSTEMS</b>	<b>10%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
H1	Maintain LP gas systems		✓	✓	
<b>Line I</b>	<b>SERVICE WATER HEATERS</b>	<b>3%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
I1	Maintain water heaters		✓	✓	
<b>Line J</b>	<b>SERVICE FURNACES</b>	<b>3%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
J1	Maintain furnaces		✓	✓	
<b>Line K</b>	<b>SERVICE COOKTOPS AND OVENS</b>	<b>2%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
K1	Maintain cooktops and ovens		✓	✓	
<b>Line L</b>	<b>SERVICE REFRIGERATORS</b>	<b>3%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
L1	Maintain refrigerators		✓	✓	
<b>Line M</b>	<b>SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND HEAT PUMPS</b>	<b>1%</b>	<b>75%</b>	<b>25%</b>	<b>100%</b>
M1	Maintain A/C, refrigeration and heat pumps		✓	✓	



% of Time Allocated to:

		% of Time	Theory	Practical	Total
<b>Line Q</b>	<b>SERVICE CHASSIS AND MECHANICAL COMPONENTS</b>	<b>6%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
Q1	Maintain chassis and mechanical components		✓	✓	
Q3	Diagnose chassis and mechanical components		✓	✓	
Q4	Repair chassis and mechanical components		✓	✓	
<b>Line R</b>	<b>SERVICE TOWING SYSTEMS</b>	<b>6%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
R1	Maintain towing systems		✓		
R2	Install towing systems		✓	✓	
R3	Diagnose towing systems		✓	✓	
R4	Repair towing systems		✓		
<b>Total Percentage for Recreation Vehicle Service Technician Level 1</b>		<b>100%</b>			





## Training Topics and Suggested Time Allocation

### RECREATION VEHICLE SERVICE TECHNICIAN – LEVEL 2

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
<b>Line F</b>	<b>SERVICE ELECTRICAL SYSTEMS</b>	<b>13%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
F2	Service AC electrical systems		✓	✓	
F3	Service DC electrical systems		✓	✓	
<b>Line H</b>	<b>SERVICE LIQUID PETROLEUM (LP) GAS SYSTEMS</b>	<b>22%</b>	<b>75%</b>	<b>25%</b>	<b>100%</b>
H1	Maintain LP gas systems		✓	✓	
H2	Install LP gas systems		✓	✓	
H3	Diagnose LP gas systems		✓	✓	
H4	Repair LP gas systems		✓	✓	
<b>Line I</b>	<b>SERVICE WATER HEATERS</b>	<b>5%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
I1	Maintain water heaters		✓	✓	
I2	Install water heaters		✓	✓	
I3	Diagnose water heaters		✓	✓	
I4	Repair water heaters		✓	✓	
<b>Line J</b>	<b>SERVICE FURNACES</b>	<b>5%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
J1	Maintain furnaces		✓	✓	
J2	Install furnaces		✓	✓	
J3	Diagnose furnaces		✓	✓	
J4	Repair furnaces		✓	✓	
<b>Line K</b>	<b>SERVICE COOKTOPS AND OVENS</b>	<b>5%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
K1	Maintain cooktops and ovens		✓	✓	
K2	Install cooktops and ovens		✓	✓	
K3	Diagnose cooktops and ovens		✓	✓	
K4	Repair cooktops and ovens		✓	✓	
<b>Line L</b>	<b>SERVICE REFRIGERATORS</b>	<b>5%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
L1	Maintain refrigerators		✓	✓	
L2	Install refrigerators		✓	✓	
L3	Diagnose refrigerators		✓	✓	
L4	Repair refrigerators		✓	✓	
<b>Line M</b>	<b>SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND HEAT PUMPS</b>	<b>3%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
M2	Install A/C, refrigeration and heat pumps		✓	✓	
<b>Line O</b>	<b>SERVICE EXTERIOR COMPONENTS</b>	<b>21%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
O1	Maintain exterior components		✓	✓	
O2	Install exterior components		✓	✓	



% of Time Allocated to:

		% of Time	Theory	Practical	Total
O3	Diagnose exterior components		✓	✓	
O4	Repair exterior components		✓	✓	
<b>Line P</b>	<b>SERVICE INTERIOR COMPONENTS</b>	<b>21%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
P1	Maintain interior components		✓	✓	
P2	Install interior components		✓	✓	
P3	Diagnose interior components		✓	✓	
P4	Repair interior components		✓	✓	
<b>Total Percentage for Recreation Vehicle Service technician Level 2</b>		<b>100%</b>			



## Training Topics and Suggested Time Allocation

### RECREATION VEHICLE SERVICE TECHNICIAN – LEVEL 3

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
<b>Line C</b>	<b>PERFORM COMMON WORK PRACTICES</b>	<b>19%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
C1	Use technical information		✓	✓	
C3	Use communication techniques		✓	✓	
C4	Perform estimation procedures		✓	✓	
<b>Line F</b>	<b>SERVICE ELECTRICAL SYSTEMS</b>	<b>20%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
F2	Service AC electrical systems		✓	✓	
F3	Service DC electrical systems		✓	✓	
F4	Service vehicle networking systems		✓	✓	
<b>Line M</b>	<b>SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND HEAT PUMPS</b>	<b>12%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
M1	Maintain A/C, refrigeration and heat pumps		✓	✓	
M3	Diagnose A/C, refrigeration and heat pumps		✓	✓	
M4	Repair A/C, refrigeration and heat pumps		✓	✓	
<b>Line O</b>	<b>SERVICE EXTERIOR COMPONENTS</b>	<b>12%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
O4	Repair exterior components		✓	✓	
<b>Line P</b>	<b>SERVICE INTERIOR COMPONENTS</b>	<b>3%</b>	<b>100%</b>	<b>0%</b>	<b>100%</b>
P5	Service consumer products		✓		
<b>Line Q</b>	<b>SERVICE CHASSIS AND MECHANICAL COMPONENTS</b>	<b>21%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
Q1	Maintain chassis and mechanical components		✓		
Q2	Install chassis and mechanical components		✓		
Q3	Diagnose chassis and mechanical components		✓		
Q4	Repair chassis and mechanical components		✓		
Q5	Service slideout systems		✓	✓	
Q6	Service levelling systems		✓	✓	
Q7	Service folding camping trailers		✓	✓	
<b>Line R</b>	<b>SERVICE TOWING SYSTEMS</b>	<b>13%</b>	<b>100%</b>	<b>0%</b>	<b>100%</b>
R2	Install towing systems		✓		
<b>Total Percentage for Recreation Vehicle Service Technician Level 3</b>		<b>100%</b>			



# **Section 3**

## **PROGRAM CONTENT**

### **Recreation Vehicle Service Technician**



# Level 1

## Recreation Vehicle Service Technician





### LEARNING TASKS

4. Describe PPE

### CONTENT

- Personal apparel
  - Clothing
  - Hair and beards
  - Jewellery
- Personal protection
  - Head
  - Hands
  - Lungs
  - Eyes
  - Face
  - Ears
  - Feet
- Fall protection equipment









### Achievement Criteria

Performance The learner will use tools to fabricate a U-tube manometer.

Conditions The learner will be given

- Marking rubric
- Tools
- Materials
- Specifications

Criteria The learner will be evaluated on

- Safety
- Time management
- Detail





**Line (GAC):** C **PERFORM COMMON WORK PRACTICES**  
**Competency:** C1 **Use technical information**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe shop business practices.
- Describe shop management systems.

**LEARNING TASKS**

1. Describe shop business practices
  
2. Describe shop management systems

**CONTENT**

- Time management
  - Flat rate
  - Hourly
  - Productivity
- Invoicing
- Parts ordering
- Service information
- Time keeping
- Diagnostic





**Line (GAC):** C **PERFORM COMMON WORK PRACTICES**  
**Competency:** C3 **Use communication techniques**

**Objectives**

To be competent in this area, the individual must be able to:

- Use communication techniques.

**LEARNING TASKS**

1. Demonstrate two-way communication
  
2. Use active listening
  
3. Use digital communication technologies

**CONTENT**

- Verbal and written instructions
- Record keeping
  - Service/work orders
  - Technical reports
  - Parts requisition
- Attention
- Open-ended questions
- Clarification
- Hand-held devices



**Line (GAC):** D **SERVICE WATER SYSTEMS**

**Competency:** D1 **Service potable water systems**

**Objectives**

To be competent in this area, the individual must be able to:

- Service potable water systems.

**LEARNING TASKS**

1. Describe potable water systems

2. Repair potable water systems

3. Install potable water systems

**CONTENT**

- Codes
- Types
  - Demand
  - City
  - Manual
- Components
  - Lines
  - Polyvinyl chloride (PVC)
  - Polyethylene (Pex)
  - Polybutylene (PB)
  - High pressure vinyl hose
  - Check valves
  - Pumps
  - Filters
  - Tanks
  - Accumulator tanks
  - Fittings
  - Fixtures
- Tank filler systems
- Tank drainage systems
- Water level monitor systems
- Diagnosis and repair of
  - Components
  - Tank filler systems
  - Tank drainage systems
- Testing
  - Verification of operation
- Installation procedures for
  - Components
  - Tank filler systems
  - Tank drainage systems
- Testing
  - Verification of operation



**LEARNING TASKS**

- 4. Maintain potable water systems

**CONTENT**

- Tanks
  - Cleaning
  - Sanitizing
  - Winterizing/summerizing
    - Antifreeze
    - Air
- Lines
  - Cleaning
  - Sanitizing
  - Winterizing/summerizing
    - Antifreeze
    - Air





**Line (GAC): D SERVICE WATER SYSTEMS**

**Competency: D2 Service waste water systems**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe servicing waste water systems.

**LEARNING TASKS**

1. Describe recreation vehicle (RV) waste water systems
  
2. Describe repairing waste water systems
  
3. Describe installing waste water systems
  
4. Describe maintaining waste water systems

**CONTENT**

- Canadian Standards Association (CSA) codes
- Types
  - Gray
  - Black
- Components
  - Tanks
  - Piping
  - Termination valves
  - Toilets
  - Sink/shower drains
  - Macerators
  - Tank flush valves
- Diagnosis and repair of
  - Components
- Testing
  - Verification of operation
- Installation procedures for
  - Components
- Testing
  - Verification of operation
- Tanks
  - Cleaning
  - Treatment
  - Flushing
  - Winterizing/summerizing
- Piping
  - Cleaning
  - Treatment
  - Flushing
  - Winterizing/summerizing
- Components
  - Cleaning
  - Lubrication
  - Winterizing/ summerizing





**LEARNING TASKS**

4. Describe wire connections

**CONTENT**

- Types
  - Solderless
  - Self-sealing
  - Soldered
  - Bonding lugs
- Characteristics of solder and fluxes
- Insulating methods
  - Tape
  - Heat shrink







**LEARNING TASKS**

3. Install battery systems
  
4. Maintain battery systems
  
5. Troubleshoot battery systems
  
6. Verify operation of DC electrical systems

**CONTENT**

- Mounting
- Venting
- Connecting
- Disconnecting
- Verifying operation
- Procedures
  - Water level
  - Load test
  - Connections
- Tools
  - Hydrometer
  - Voltmeter
  - Ammeter
  - Load tester
- Tests
  - Voltage
  - Polarity
  - Connections
- Selecting tools
- Energy sources
  - Batteries
  - Solar
  - Converter
- 12VDC interior lights
- 12VDC plug and receptacles
- 12VDC circuits
- Polarity



**Line (GAC): F SERVICE ELECTRICAL SYSTEMS**

**Competency: F4 Service vehicle networking systems**

**Objectives**

To be competent in this area, the individual must be able to:

- Operate vehicle networking systems.

**LEARNING TASKS**

1. Operate vehicle network systems

2. Operate multiplexing systems

**CONTENT**

- Network fundamentals
- Network configurations
  - Ring
  - Parallel
  - Bus
- Components
  - Touch screen
- Wiring and connectors
  - Single wire
  - Twisted pair
  - Fiber optic
- Network types
  - Controller Area Network (CAN)
  - Local Interconnect Network (LIN)
  - FlexRay
  - Media Oriented Systems Transport (MOST)
- Operation
- Faults
- Multiplexing fundamentals
  - Switch inputs
  - Control Modules
  - Body Control Module (BCM)
  - Outputs
  - Faults







**LEARNING TASKS**

- 4. Fabricate with copper tube

**CONTENT**

- American Society of Mechanical Engineers (ASME)
- Tanks
  - Types and components
  - Inspection
  - Purging
  - Filling
- Cutting
- Flaring
- Bending

**Achievement Criteria**

Performance The learner will use hand tools to fabricate a 70% valve.

Conditions The learner will be given

- Marking rubric
- Tools
- Materials
- Specifications

Criteria The learner will be evaluated on

- Safety
- Time management
- Detail











**Line (GAC):**        **M**    **SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND HEAT PUMPS**

**Competency:**     **M1**   **Maintain A/C, refrigeration and heat pumps**

**Objectives**

To be competent in this area, the individual must be able to:

- Verify operation of air conditioners, refrigeration and heat pumps.

**LEARNING TASKS**

**CONTENT**

1. Describe refrigeration, air conditioners and heat pumps
  
2. Verify operation of refrigeration, air conditioners and heat pumps

- Types
  - Refrigerators
  - Roof mount A/C and heat pumps
  - Basement A/C and heat pumps
  - Wall mount A/C
- Operations
  - 120VAC
- Codes
- Safety
- Operation





## LEARNING TASKS

5. Describe towable braking systems
  
6. Describe electric braking systems
  
7. Describe the principles of hydraulic brakes
  
8. Describe hydraulic surge braking systems
  
9. Describe electric over hydraulic braking systems

## CONTENT

- Load rating and sizing
- Inflation
- Scheduled maintenance intervals
  
- Types
  - Electric
  - Hydraulic
  - Electric over hydraulic
- Sequence of operation
- Scheduled maintenance intervals
- Backing plates
- Shoes
  - Friction
- Magnets
  - Testing
- Adjuster
- Drums
  - Measuring
- Breakaway systems
  - Battery
- Sequence of operation
- Hydraulic theory (Pascal's law)
- Types of friction
- Surge coupler
  - Reverse lock out
  - Weight ratings
- Master cylinder
- Backing plates
- Wheel cylinders
- Shoes
- Drums
  - Measuring
- Breakaway systems
- Brake lines
- Adjuster
- Operation
  - Controllers
  - Actuators (servos)
- Pads
- Discs
  - Measuring





**LEARNING TASKS**

10. Describe hubs and drums

**CONTENT**

- Calipers
- Breakaway systems
- Brake lines
- Wheel bearings and races
- Grease seals
- Bearing buddy system
- Tools for bearing, race and seal service
- Scheduled maintenance intervals



**Line (GAC):** Q **SERVICE CHASSIS AND MECHANICAL COMPONENTS**  
**Competency:** Q3 **Diagnose chassis and mechanical components**

**Objectives**

To be competent in this area, the individual must be able to:

- Diagnose towable chassis and mechanical components.

**LEARNING TASKS**

1. Diagnose frames
  
2. Diagnose axles
  
3. Diagnose wheels
4. Diagnose tires
5. Diagnose braking systems
6. Diagnose hubs and drums

**CONTENT**

- Inspection
- Troubleshooting
- Alignment
  - Camber
  - Caster
  - Toe in/out
- Troubleshooting
  - Axle and wheel alignment procedures
- Undercarriage inspection
  - Springs
  - Shackles
  - Hangers
  - Spring bolts
  - U-bolts
  - Bushings
  - Equalizers
  - Shocks
- Inspection
- Inspection
  - Wear patterns
- Inspection
- Troubleshooting
- Inspection
  - Hubs and drums
  - Wheel bearings and races
  - Seals
- Troubleshooting
- Criteria for replacement
- Re-assembly procedures



**Line (GAC):** Q **SERVICE CHASSIS AND MECHANICAL COMPONENTS**  
**Competency:** Q4 **Repair chassis and mechanical components**

**Objectives**

To be competent in this area, the individual must be able to:

- Repair chassis and mechanical components.

**LEARNING TASKS**

1. Replace frame components
  
2. Replace axles
  
3. Replace wheels
  
4. Replace tires
  
5. Service braking systems
  
6. Service hubs and drums

**CONTENT**

- Stabilizer jacks
- Landing gear
- Tongue jacks
  
- Order forms
- Measurements
- Remove & Replace
- Torque specifications
- Verify operation and alignment
  
- Type
- Rating
- Sizing
- Bolt pattern
- Offset
- Torque specifications
  
- Type
- Load rating
- Sizing
- Inflation
  
- Remove & Replace
- Bleeding
- Adjustment
  
- Wheel bearings and seals
- Repacking
  - Assembly procedures
- Replacing
  - Assembly procedures
  - Bearings
  - Race



**Achievement Criteria**

Performance The learner will repair chassis and mechanical components.

Conditions The learner will be given

- Tools and equipment
- Supplies
- Documentation

Criteria The learner will be evaluated on

- Safety
- Time management
- Detail



**Line (GAC): R SERVICE TOWING SYSTEMS**

**Competency: R1 Maintain towing systems**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe towing systems.
- Describe maintaining towing systems.

**LEARNING TASKS**

1. Describe tow vehicles
  
2. Describe receivers
3. Describe hitches
  
4. Describe sway control
  
5. Describe wiring systems
  
6. Describe maintenance of towing systems

**CONTENT**

- Codes
- Gross Vehicle Weight Rating (GVWR)
- Transmission coolers
- Classes
- Types
  - Weight carrying
  - Weight distributing
  - Fifth wheels
- Hitch balls
- Hitch pins
- Lubricants
- Active
- Passive
- Electronic
- Types of wiring systems
  - Towables
  - Slide in truck campers
- Types of wiring plugs
  - 4-pin
  - 6-pin
  - 7-pin
- Schematics
- Types of adapters
- Color codes
- Inspection
- Cleaning
- Lubrication



**Line (GAC): R SERVICE TOWING SYSTEMS**

**Competency: R2 Install towing systems**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe installing towing systems.
- Describe camper tie down systems.
- Describe truck camper jacks.
- Describe camper loading and unloading.

**LEARNING TASKS**

1. Describe installing receivers
  
2. Describe installing fifth wheel hitches and goose necks
  
3. Describe installing towable hitches
  
4. Describe installing sway control

**CONTENT**

- Selection
- Procedures
  - Instructions
  - Frame drilling
  - Torque specifications
  
- Selection
- Procedures
  - Instructions
  - Frame drilling
  - Torque specifications
- Pins
- Hitch balls
- Lubricants
- Verfying operation
- Selection
  - Weight carrying
  - Weight distributing
- Procedures
  - Instructions
  - Frame drilling
  - Torque specifications
- Pins
- Hitch balls
- Lubricants
- Verfying operation
- Selection
  - Active
  - Passive
  - Electronic



## LEARNING TASKS

5. Describe installing wiring systems
  
6. Describe installing brake control systems
  
7. Describe camper tie down systems
  
8. Describe truck camper jacks

## CONTENT

- Procedures
  - Instructions
  - Frame drilling
  - Torque specifications
- Verifying operation
- Selection
  - Plug and play
  - Full wiring
- Procedures
  - Instructions
- Verifying operation
- Selection
  - Controllers
  - Actuators
  - Wiring
- Procedures
  - Instructions
- Verifying operation
- Types
- Frame mount
- Bed mount
- Load capacities
- Codes
- Manufacturers' specifications
- Components
- Turnbuckles
- Load cinches
- Chains
- Straps
- Types
- Hydraulic
- Mechanical
- Electric
- Cable (yard) jacks
- Maintenance
  - Servicing
  - Safety
  - Inspection
  - Cleaning
  - Adjusting



**LEARNING TASKS**

**CONTENT**

9. Describe camper loading and unloading

- Lubricating
  - Fluid Level
  - Seals
  - Motor
  - Switches
  - Valves
  - Pumps
  - Verifying operation
  - Testing
  - Repairing
  - Replacement
  - Installing
  - Brackets
  - Mounting points
- Safety
- Wind
- Ground
- Ground pads
- Storage support

**Achievement Criteria (OPTIONAL)**

Performance The learner will build a towable light tester, including

- 7-pin
- 4-pin

Conditions The learner will be given

- 4-pin plugs
- 7-pin plugs
- Wires
- Schematics

Criteria The learner will be evaluated on

- Safety
- Time management
- Detail







**Line (GAC): R SERVICE TOWING SYSTEMS**

**Competency: R4 Repair towing systems**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe repairing towing systems.

**LEARNING TASKS**

1. Describe repairing receivers
2. Describe repairing hitches
3. Describe repairing sway control
4. Describe repairing wiring systems

**CONTENT**

- Removal
- Replacement
- Removal of components
- Replacement of components
- Removal of components
- Cleaning
- Testing
- Replacement of components
- Verifying operation
- Removal of components
- Cleaning
- Testing
- Replacement of components
- Verifying operation



# Level 2

## Recreation Vehicle Service Technician





**LEARNING TASKS**

converters

5. Describe repairing 120VAC wiring systems and converters
6. Describe maintaining 120VAC wiring systems and converters
7. Describe wire connecting
8. Fabricate test equipment

**CONTENT**

- Troubleshooting procedures
  - Polarity
  - Continuity
- Mounting
- Connections
- Circuit loads
- Safety
- Identification of repair
- Repair procedures
- Verifying operation
- Safety
- Inspection
  - Wiring
  - Circuitry
  - Power cords
  - Cooling fans
- Contaminant removal
- Applications
- Procedures
  - Wire connecting
  - Stripping
  - Crimping tools
  - Wire nuts
- Forming and soldering splices
- Wiring
- Soldering
- Verifying operation

**Achievement Criteria**

- Performance** The learner will wire a 15-amp grounding plug to a GFCI mounted in an electrical box.
- Conditions** The learner will be given
- Supplies
  - Tools and equipment
  - Schematic
- Criteria** The learner will be evaluated on
- Safety
  - Time management
  - Detail





**LEARNING TASKS**

4. Describe repairing 12VDC wiring systems
  
5. Describe maintaining 12VDC wiring systems

**CONTENT**

- Circuit loads
- Safety
- Identification of repair
- Repair procedures
  - Soldering
  - Desoldering
- Verifying operation
- Safety
- Inspection
  - Wiring
  - Connections
  - Circuitry
- Batteries







**LEARNING TASKS**

4. Maintain LP gas systems

**CONTENT**

- Inspection
- Adjustments
  - Working pressure
- Tests
  - Lock up test
  - Timed pressure drop test
- Verifying operation
- Recordkeeping

**Achievement Criteria**

Performance The learner will perform an LP gas system service.

Conditions The learner will be given

- Documentation
- Tools and equipment

Criteria The learner will be evaluated on

- Safety
- Time Management
- Detail



**Line (GAC): H SERVICE LP GAS SYSTEMS**

**Competency: H2 Install LP gas systems**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe the installation and design of LP gas systems.
- Perform black pipe cutting and threading.

**LEARNING TASKS**

1. Describe installation of LP gas systems
  
2. Describe designing an LP gas system
  
3. Perform black pipe cutting and threading

**CONTENT**

- Tools and procedures for black pipe
  - Cutting
  - Threading
  - Lubricants
  - Joining
  - Installation
  - Sealants
  
- Codes
- Pipe sizing
  - Number of appliances
  - Btu/h of appliances
  - Propane system codes
  - Length of propane piping/tubing
  
- Safety
- Procedures

**Achievement Criteria**

**Performance** The learner will perform black pipe cutting and threading.

**Conditions** The learner will be given

- Marking rubric
- Materials
- Tools

**Criteria** The learner will be evaluated on

- Safety
- Time management
- Detail



**Line (GAC):** H **SERVICE LP GAS SYSTEMS**

**Competency:** H3 **Diagnose LP gas systems**

### Objectives

To be competent in this area, the individual must be able to:

- Diagnose LP gas systems.

### LEARNING TASKS

1. Diagnose LP gas systems

### CONTENT

- Inspection
- Test procedures
  - Working pressure
  - Lock up
  - Leak test
- External factors effecting pressure



**Line (GAC):** H SERVICE LP GAS SYSTEMS

**Competency:** H4 Repair LP gas systems

### Objectives

To be competent in this area, the individual must be able to:

- Describe repairing LP gas systems.

### LEARNING TASKS

1. Describe repairing LP gas systems

### CONTENT

- Repair procedures
- Components
  - Removal
  - Inspection
  - Cleaning
  - Replacement
- Verifying operation





**Line (GAC):** I **SERVICE WATER HEATERS**  
**Competency:** I2 **Install water heaters**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe the installation and removal of water heaters.

**LEARNING TASKS**

1. Describe the installation and removal of water heaters

**CONTENT**

- Codes
- Manufacturers' installation instructions
- Sealing
- Fastening
- Ventilation
- Verifying operation



**Line (GAC):** I **SERVICE WATER HEATERS**  
**Competency:** I3 **Diagnose water heaters**

### Objectives

To be competent in this area, the individual must be able to:

- Describe diagnosing water heaters.

### LEARNING TASKS

1. Describe diagnosing water heaters

### CONTENT

- Manufacturers' documentation
- Inspection
  - Tank
  - Gas
  - Electrical
  - Water fittings
  - Hardware



**Line (GAC):** I **SERVICE WATER HEATERS**  
**Competency:** I4 **Repair water heaters**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe repairing water heaters.

**LEARNING TASKS**

1. Describe repairing water heaters

**CONTENT**

- Repair procedures
- Manufacturers' documentation
- Components
  - Removal
  - Inspection
  - Cleaning
  - Replacement
- Verifying operation







**Line (GAC):** J **SERVICE FURNACES**  
**Competency:** J2 **Install furnaces**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe the installation and removal of furnaces.

**LEARNING TASKS**

1. Describe the installation and removal of furnaces

**CONTENT**

- Codes
  - Location
- Manufacturers' installation instructions
  - Sealing
  - Fastening
  - Ventilation
  - Ducting
- Verifying operation



**Line (GAC):** J **SERVICE FURNACES**  
**Competency:** J3 **Diagnose furnaces**

### Objectives

To be competent in this area, the individual must be able to:

- Describe diagnosing furnaces.

### LEARNING TASKS

1. Describe diagnosing furnaces

### CONTENT

- Manufacturers' documentation
- Inspection
  - Heat exchanger
  - Gas
  - Electrical
  - Hardware
  - Venting
  - Ducting



**Line (GAC):** J **SERVICE FURNACES**  
**Competency:** J4 **Repair furnaces**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe repairing furnaces.

**LEARNING TASKS**

1. Describe repairing furnaces

**CONTENT**

- Repair procedures
- Manufacturers' documentation
- Components
  - Removal
  - Inspection
  - Cleaning
  - Replacement
- Verifying operation





**Line (GAC):**        **K    SERVICE COOKTOPS AND OVENS**  
**Competency:**      **K2    Install cooktops and ovens**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe the installation and removal of cooktops and ovens .

**LEARNING TASKS**

1. Describe the installation and removal of cooktops and ovens

**CONTENT**

- Codes
  - Location
- Manufacturers' installation instructions
  - Fastening
  - Ventilation
- Verifying operation



**Line (GAC):**        **K**    **SERVICE COOKTOPS AND OVENS**

**Competency:**     **K3**   **Diagnose cooktops and ovens**

### Objectives

To be competent in this area, the individual must be able to:

- Describe diagnosing cooktops and ovens.

### LEARNING TASKS

1. Describe diagnosing cooktops and ovens

### CONTENT

- Manufacturers' documentation
- Inspection
  - Gas
  - Electrical
  - Hardware
  - Venting



**Line (GAC):**        **K**    **SERVICE COOKTOPS AND OVENS**

**Competency:**     **K4**   **Repair cooktops and ovens**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe repairing cooktops and ovens.

**LEARNING TASKS**

1. Describe repairing cooktops and ovens

**CONTENT**

- Repair procedures
- Manufacturers' documentation
- Components
  - Removal
  - Inspection
  - Cleaning
  - Replacement
- Verifying operation







**Line (GAC):** L **SERVICE REFRIGERATORS**  
**Competency:** L2 **Install refrigerators**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe the installation and removal of refrigerators.

**LEARNING TASKS**

1. Describe the installation and removal of refrigerators

**CONTENT**

- Codes
- Manufacturers' installation instructions
  - Sealing
  - Fastening
  - Ventilation
- Verifying operation



**Line (GAC):** L **SERVICE REFRIGERATORS**  
**Competency:** L3 **Diagnose refrigerators**

### Objectives

To be competent in this area, the individual must be able to:

- Describe diagnosing refrigerators.

### LEARNING TASKS

1. Describe diagnosing refrigerators

### CONTENT

- Manufacturers' documentation
- Inspection
  - Cooling unit
  - Gas
  - Electrical
  - Cabinet
  - Venting



**Line (GAC):** L SERVICE REFRIGERATORS  
**Competency:** L4 Repair refrigerators

**Objectives**

To be competent in this area, the individual must be able to:

- Describe repairing refrigerators.

**LEARNING TASKS**

1. Describe repairing refrigerators

**CONTENT**

- Repair procedures
- Manufacturers' documentation
- Components
  - Removal
  - Inspection
  - Cleaning
  - Replacement
- Verifying operation



**Line (GAC):**        **M**    **SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND HEAT PUMPS**

**Competency:**     **M2**   **Install A/C, refrigeration and heat pumps**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe the installation and removal of refrigeration, air conditioners and heat pumps.

**LEARNING TASKS**

1. Describe the installation and removal of refrigeration, air conditioners and heat pumps

**CONTENT**

- Codes
- Manufacturers' installation instructions
  - Sealing
  - Fastening
  - Ventilation
  - Ducting
  - Electrical connections
- Verifying operation





**LEARNING TASKS**

- 6. Maintain exterior components

**CONTENT**

- Baggage doors
- Entrance doors
- Ladders
- Roof racks
- Vents
  - Roof
  - Fridge
  - Stove
  - Furnace
  - Plumbing
  - Washer/dryer
- Skylights
- Awnings
- Add-a-rooms
- Grab handles
- Storage hatches
- Catches
- Fender skirts
- Rock guards
- Clearance/tail lights
- Mouldings
- Vinyl inserts
- Slide-outs
- Inspection
- Fasteners
- Cleaning
- Sealants
- Lubricants
- Slide seals
- Verifying operation



**Line (GAC):**        **O**   **SERVICE EXTERIOR COMPONENTS**  
**Competency:**       **O2**   **Install exterior components**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe installing exterior components
- Build walls.

**LEARNING TASKS**

1. Describe building and installing components of exterior construction
  
2. Describe installing exterior components
  
3. Build walls

**CONTENT**

- Safety
- Walls
- Siding
- Roofing
- Floor systems
  
- Safety
- Manufacturers' installation instructions
  - Fastening
  - Sealing
- Verifying operation
- Material selection
- Blueprint reading

**Achievement Criteria**

- |             |  |
|-------------|--|
| Performance | The learner will build walls: <ul style="list-style-type: none"> <li>• Stick and tin wall</li> <li>• Laminated</li> </ul>                    |
| Conditions  | The learner will be given <ul style="list-style-type: none"> <li>• Tools and equipment</li> <li>• Materials</li> <li>• Blueprints</li> </ul> |
| Criteria    | The learner will be evaluated on <ul style="list-style-type: none"> <li>• Safety</li> <li>• Time management</li> <li>• Detail</li> </ul>     |





**Line (GAC):**        **O**    **SERVICE EXTERIOR COMPONENTS**  
**Competency:**      **O3**   **Diagnose exterior components**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe diagnosing exterior components.

**LEARNING TASKS**

1. Describe diagnosing exterior components

**CONTENT**

- Inspection
  - Sealants
  - Fasteners
  - Condition
- Criteria for replacement
- Replacement procedures







**LEARNING TASKS**

3. Describe maintaining interior components

**CONTENT**

- Furniture
- Bed lifts
- Sink covers
- Shower surrounds
- Inspection
- Adjustments
- Lubricants
- Cleaning
- Aesthetic details



**Line (GAC):** P **SERVICE INTERIOR COMPONENTS**  
**Competency:** P2 **Install interior components**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe installing interior construction and components.
- Build cabinets.

**LEARNING TASKS**

1. Describe building and installing components of interior construction
2. Describe installing interior components
3. Build cabinets

**CONTENT**

- Cabinets
- Countertops
- Manufacturers' installation instructions
  - Fastening
  - Filling
  - Sealing
- Aesthetic details
- Verifying operation
- Material selection
- Blueprint reading

**Achievement Criteria**

**Performance** The learner will build a cabinet with top.

- Conditions** The learner will be given
- Marking rubric
  - Materials
  - Tools and equipment
  - Blueprints

- Criteria** The learner will be evaluated on
- Safety
  - Time management
  - Detail



**Line (GAC):** P **SERVICE INTERIOR COMPONENTS**  
**Competency:** P3 **Diagnose interior components**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe diagnosing interior components.

**LEARNING TASKS**

1. Describe diagnosing interior components

**CONTENT**

- Inspection
  - Sealants
  - Fasteners
  - Condition
- Criteria for replacement
- Replacement procedures





# Level 3

## Recreation Vehicle Service Technician







**Line (GAC):** C **PERFORM COMMON WORK PRACTICES**  
**Competency:** C3 **Use communication techniques**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe internal and external communication techniques.

**LEARNING TASKS**

1. Describe two-way communication
  
2. Describe respectful communication
  
3. Describe customer courtesy and personal conduct
  
4. Describe customer needs and expectations

**CONTENT**

- Internal facing
  - Management
  - Service writer
  - Foreman
  - Journeyperson/mentor
  - Co-workers
- External facing
  - Customers
  - Vendors
  - Insurance adjustors
  - Inspectors
- Conflict resolution
  - External
  - Internal
- Harrassment
  - Bullying
  - Sexual
- Customer value
- Business etiquette
- Cleanliness
- Appearance
- Cleanliness
- Completion time
- Competent work





Criteria

The learner will be evaluated on

- Calculator
- Safety
- Time management
- Detail







**LEARNING TASKS**

6. Describe repairing generators

7. Describe inverters

8. Describe transfer switches

**CONTENT**

- Repair procedures
  - Remove and reinstall unit
- Manufacturers' documentation
- Components
  - Removal
  - Inspection
  - Cleaning
  - Replacement
- Verifying operation
- Codes
- Principles of operation
- Types
  - Pure sine wave
  - Modified sine wave
  - Inverter chargers
- Ratings
- Capacities
- Servicing
- Troubleshooting
- Installing
  - Manufacturers' installation instructions
- Codes
- Types
  - Manual
  - Automatic
- Ratings
- Capacities
- Operation
- Servicing
- Troubleshooting
- Installing
  - Manufacturers' installation instructions

**Achievement Criteria**

Performance The learner will perform routine maintenance and confirm proper generator function and output.

Conditions The learner will be given

- Tools and equipment



Criteria

The learner will be evaluated on

- Materials
- Marking rubric
- Safety
- Time management
- Detail





**Line (GAC): F SERVICE ELECTRICAL SYSTEMS**

**Competency: F3 Service DC electrical systems**

### Objectives

To be competent in this area, the individual must be able to:

- Describe photovoltaic systems.
- Describe monitoring panels.

### LEARNING TASKS

1. Describe photovoltaic systems

2. Describe monitoring panels

### CONTENT

- Panels
  - Cells
  - Modules
  - Arrays
- Solar electric principles
- Charge controllers
  - Simple one or two stage
  - Maximum power point tracking (MPPT)
  - Pulse width modulation (PWM)
- Wiring and connections
- Diodes
- Installation
  - Mounting hardware
- Servicing
  - Expansion
  - Verifying operation
  - Troubleshooting
  - Repairing
- Types
- Operation
- Wiring and connections
- Resistors
- Installation
  - Mounting
- Troubleshooting
- Servicing
  - Inspection
  - Cleaning
  - Removal
  - Replacement
  - Verifying operation



**LEARNING TASKS****CONTENT**

- Wireless system connections
  - Requirements
    - OneControl Application installed on phone/tablet
    - System Set Identifier (SSID) on WiFi hub
    - Password on WiFi hub
  - Navigation of the OneControl Application
- System configuration
  - System can be configured to operate many different functions
  - Navigation of the configurator file on the OCTP
    - Identifying icons
    - Group selection
    - Naming of the function
    - Configuring fuses



**Line (GAC): M SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND HEAT PUMPS**

**Competency: M1 Maintain A/C, refrigeration and heat pumps**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe components of air conditioners, refrigeration and heat pumps.
- Describe maintaining air conditioners, refrigeration and heat pumps.

**LEARNING TASKS**

**CONTENT**

- |  |   |
|--|---|
| <p>1. Describe air conditioner components</p>                                  | <ul style="list-style-type: none"> <li>• Evaporator</li> <li>• Condenser</li> <li>• Compressor</li> <li>• Orifice/expansion valve</li> <li>• Accumulator</li> <li>• Controls</li> </ul>   |
| <p>2. Describe heat pump components</p>  | <ul style="list-style-type: none"> <li>• Inside coil</li> <li>• Outside coil</li> <li>• Compressor</li> <li>• Orifice/expansion valve</li> <li>• Reversing valve</li> <li>• Accumulator</li> <li>• Controls</li> </ul>  |
| <p>3. Describe compressor refrigerator components</p>                          | <ul style="list-style-type: none"> <li>• Evaporator</li> <li>• Condenser</li> <li>• Compressor</li> <li>• Orifice/expansion valve</li> <li>• Accumulator</li> <li>• Controls</li> </ul>   |
| <p>4. Describe maintaining air conditioners, refrigeration, and heat pumps</p> | <ul style="list-style-type: none"> <li>• Access</li> <li>• Inspection</li> <li>• Clean components</li> <li>• Wiring diagrams</li> <li>• Verify air flow             <ul style="list-style-type: none"> <li>○ Ducting</li> <li>○ Separation</li> <li>○ Comb fins</li> </ul> </li> <li>• Verifying operation</li> </ul> |



**Achievement Criteria**

Performance The learner will confirm A/C performance.

Conditions The learner will be given

- Tools and equipment
- Materials
- Marking rubric

Criteria The learner will be evaluated on

- Safety
- Time management
- Detail



**Line (GAC):** M SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND, HEAT PUMPS

**Competency:** M3 Diagnose A/C, refrigeration and heat pumps

### Objectives

To be competent in this area, the individual must be able to:

- Describe diagnosing air conditioners, refrigeration, and heat pumps.

### LEARNING TASKS

1. Describe diagnosing air conditioners, refrigeration, and heat pumps

### CONTENT

- Safety
- Manufacturers' specifications
- Inspection
- Wiring diagrams
- Troubleshooting electrical system
  - Calculating electrical load ratings
  - Ohm's law
- Verifying Delta T



**Line (GAC):**        **M**    **SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND, HEAT PUMPS**

**Competency:**      **M4**   **Repair A/C, refrigeration and heat pumps**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe repairing air conditioners, refrigeration and heat pumps.

**LEARNING TASKS**

1. Describe repairing air conditioners, refrigeration, and heat pumps

**CONTENT**

- Safety
- Repair procedures
- Manufacturers' documentation
- Components
  - Removal
  - Inspection
  - Cleaning
  - Replacement
- Verifying operation







**LEARNING TASKS**

4. Describe plastic welding

**CONTENT**

- Tools and equipment
- Repair methods
- Repair materials
- Repair procedures
- Decals and graphics
- Identifying plastics
  - ISO codes
  - Sanding test
  - Melt test
  - Float test
  - Repair manuals
- Plastic welding
  - Airless
  - Hot air
  - Joint fit up
  - Welding procedures

**Achievement Criteria 1**

- Performance The learner will perform repairs to composite panels.
- Conditions The learner will be given
- Tools and equipment
  - Materials
  - Marking rubric
- Criteria The learner will be evaluated on
- Safety
  - Time management
  - Detail

**Achievement Criteria 2**

- Performance The learner will perform plastic welding.
- Conditions The learner will be given
- Tools and equipment
  - Materials
  - Marking rubric
- Criteria The learner will be evaluated on
- Safety
  - Time management
  - Detail





**Line (GAC):** Q **SERVICE CHASSIS AND MECHANICAL COMPONENTS**  
**Competency:** Q1 **Maintain chassis and mechanical components**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe maintaining hydraulic systems.
- Describe maintaining motorized chassis.

**LEARNING TASKS**

1. Describe hydraulic theory
2. Describe hydraulic systems
3. Describe hydraulic system components
4. Describe maintaining hydraulic systems

**CONTENT**

- Pascal's law
- Hydrodynamics
- Slideouts
- Levelling
- Lifting
- Pumps
- Tanks
- Lines
- Fittings
  - Types
- Actuators
  - Single acting
  - Double acting
- Valves
  - Pressure
  - Directional
- Filters
- Controls
  - Electrical
  - Manual
- Retractors
  - Springs
- Seals
- Fluid
- Safety
- Manufacturers' specifications
- Inspection
- Cleaning
- Fluid level
- Electrical connections
- Verifying operation



**LEARNING TASKS**

5. Describe motorized chassis
  
6. Describe Gross Vehicle Weight Rate (GVWR)
  
7. Describe suspension systems
  
8. Describe maintaining motorized chassis systems

**CONTENT**

- Construction
  - Class A
  - Class B
  - Class C
  
- Regulations
  - Federal
  - Provincial
  
- Load ratings
- Tow rating
- Hitch capacity
  
- Air bag
- Coil
- Leaf
- Torsion Bar
- Suspension aids
  - Overloads
  - Air bags
  
- Safety
- Inspection
- Manufacturers' specifications



**Line (GAC):**        **Q**    **SERVICE CHASSIS AND MECHANICAL COMPONENTS**  
**Competency:**     **Q2**   **Install chassis and mechanical components**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe installing mechanical components for chassis.

**LEARNING TASKS**

1. Describe installing mechanical components for chassis

**CONTENT**

- Safety
- Manufacturers' installation instructions
- Verifying operation



**Line (GAC):**        **Q    SERVICE CHASSIS AND MECHANICAL COMPONENTS**  
**Competency:**     **Q3   Diagnose chassis and mechanical components**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe diagnosing chassis and mechanical components.

**LEARNING TASKS**

1. Describe diagnosing chassis and mechanical components

**CONTENT**

- Safety
- Manufacturers' specifications
- Inspection
- Troubleshooting
- Verifying operation



**Line (GAC):** Q **SERVICE CHASSIS AND MECHANICAL COMPONENTS**  
**Competency:** Q4 **Repair chassis and mechanical components**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe repairing chassis and mechanical components.

**LEARNING TASKS**

1. Describe repairing chassis and mechanical components

**CONTENT**

- Manufacturers' specifications
- Cleaning
- Adjustment
- Removal
- Replacement
- Verifying operation



**Line (GAC): Q SERVICE CHASSIS AND MECHANICAL COMPONENTS**

**Competency: Q5 Service slideout systems**

**Objectives**

To be competent in this area, the individual must be able to:

- Describe servicing and repairing slideout systems.

**LEARNING TASKS**

1. Describe slideout systems

**CONTENT**

- Types
  - Flush floor
  - Raised floor
  - In-Wall
- Power source
  - Electric
  - Hydraulic
  - Manual
- Hydraulic components
  - Cylinders
  - Cables
  - Chains
  - Gears
  - Controls
- Electric components
  - Motors
  - Cables
  - Chains
  - Gears
  - Controls
  - In-Wall systems
- Room
  - Rollers
  - Guides
  - Seals
  - Weight ratings
  - Travel locks
- Manufacturers' specifications
- Safety
- Inspection
- Troubleshooting
- Cleaning
- Lubrication and conditioning

2. Describe servicing slideout systems





**LEARNING TASKS**

3. Describe repairing slideout systems

**CONTENT**

- Adjustments
- Verifying operation
- Safety
- Manufacturers' specifications
- Removal/replacement
  - Components
  - Room
- Cleaning
- Aesthetic details
- Verifying operation









# Section 4

## ASSESSMENT GUIDELINES



## Assessment Guidelines – Level 1

### Level 1 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		RECREATION VEHICLE SERVICE TECHNICIAN LEVEL 1	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
A	PERFORM SAFETY-RELATED ACTIVITIES	8%	0%
B	USE TOOLS AND EQUIPMENT	8%	20%
C	PERFORM COMMON WORK PRACTICES	13%	30%
D	SERVICE WATER SYSTEMS	11%	0%
F	SERVICE ELECTRICAL SYSTEMS	25%	0%
H	SERVICE LIQUID PETROLEUM (LP) GAS SYSTEMS	10%	20%
I	SERVICE WATER HEATERS	3%	0%
J	SERVICE FURNACES	3%	0%
K	SERVICE COOKTOPS AND OVENS	2%	0%
L	SERVICE REFRIGERATORS	4%	0%
M	SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND HEAT PUMPS	1%	0%
Q	SERVICE CHASSIS AND MECHANICAL COMPONENTS	6%	15%
R	SERVICE TOWING SYSTEMS	6%	15%
	Total	100%	100%
<b>In-school theory / practical subject competency weighting</b>		50%	50%
<b>Final in-school mark</b>		IN-SCHOOL %	



## Assessment Guidelines – Level 2

### Level 2 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		RECREATION VEHICLE SERVICE TECHNICIAN LEVEL 2	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
F	SERVICE ELECTRICAL SYSTEMS	10%	25%
H	SERVICE LIQUID PETROLEUM (LP) GAS SYSTEMS	25%	25%
I	SERVICE WATER HEATERS	5%	0%
J	SERVICE FURNACES	5%	0%
K	SERVICE COOKTOPS AND OVENS	5%	0%
L	SERVICE REFRIGERATORS	5%	0%
M	SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND HEAT PUMPS	5%	0%
O	SERVICE EXTERIOR COMPONENTS	20%	25%
P	SERVICE INTERIOR COMPONENTS	20%	25%
	Total	100%	100%
<b>In-school theory / practical subject competency weighting</b>		50%	50%
<b>Final in-school mark</b>		IN-SCHOOL %	



## Assessment Guidelines – Level 3

### Level 3 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		RECREATION VEHICLE SERVICE TECHNICIAN LEVEL 3	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
C	PERFORM COMMON WORK PRACTICES	20%	32%
F	SERVICE ELECTRICAL SYSTEMS	20%	32%
M	SERVICE AIR CONDITIONERS (A/C), REFRIGERATION AND HEAT PUMPS	12%	18%
O	SERVICE EXTERIOR COMPONENTS	12%	18%
P	SERVICE INTERIOR COMPONENTS	4%	0%
Q	SERVICE CHASSIS AND MECHANICAL COMPONENTS	20%	0%
R	SERVICE TOWING SYSTEMS	12%	0%
	Total	100%	100%
<b>In-school theory / practical subject competency weighting</b>		50%	50%
<b>Final in-school percentage score</b> Apprentices must achieve a minimum 70% as the final in-school percentage score to be eligible to write the Interprovincial Red Seal exam.		IN-SCHOOL %	

All apprentices who complete Level 3 of the Recreation Vehicle Service Technician program with a FINAL level percentage score of 70% or greater will write the Interprovincial Red Seal examination as their final assessment.

A minimum percentage score of 70% on the examination is required for a pass.





# Section 5

## TRAINING PROVIDER STANDARDS



## Facility Requirements

### Classroom Area

- Comfortable seating and tables suitable for training, teaching, lecturing
- Compliance with all local and national fire code and occupational safety requirements
- Lighting controls to allow easy visibility of projection screen while also allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating / Air conditioning for comfort all year round
- In-room temperature regulation to ensure comfortable room temperature
- In-room ventilation sufficient to control training room temperature
- Acoustics in the room must allow audibility of the instructor
- White marking board with pens and eraser (optional: flipchart in similar size)
- Projection screen or projection area at front of classroom
- Overhead projector and/or multi-media projector

### Shop Area

- Ceiling shall be a minimum height of 16' or as varied by good engineering practices and code
- Length and width of shop must be adequate to accommodate RV with multiple slideouts
- Appropriate lifting devices (hoists) used in industry
- Suitable demonstration area
- Lighting appropriate for good vision in ambient light
- Compliance with all local and national fire code and occupational safety requirements
- Must meet Municipal and Provincial bylaws in regards to waste water management and environmental laws
- Adequate hoist/lifting devices to student ratio

### Lab Requirements

N/A

### Student Facilities

- Eating area as per WorkSafeBC regulations
- Washroom facilities as per WorkSafeBC regulations
- Personal storage lockers

### Instructor's Office Space

N/A

### Other

N/A



## Tools and Equipment

### Shop Equipment

#### *Required*

- Air compressor and components
- Band saw
- Battery charger
- Battery load tester
- Break
- Creepers
- Drill press
- Floor jacks
- Grinders, bench and angle
- Jack stands
- Parts cleaner
- Shop vacuum
- Sliding compound mitre saw
- Table saw

#### *Recommended*

- N/A

### Shop (Facility) Tools

#### *Standard Tools*

- A/C tester
- Adjustable crescent wrenches, 8", 10"
- Air blow gun
- Air flow meters
- Air impact driver, 1/2"
- Air riveting guns
- Air shears
- Ammeter
- Aviation snip set, left, right, straight
- Battery carrying straps
- Battery pliers
- Battery post cleaner
- Battery terminal puller
- Battery terminal spreader/reamer
- Bearing and race installing tool
- Body clip removal tools
- Brake tools
- Chalk line
- Chisel set, wood and metal
- Circuit board tester
- Clutch head screw driver set (scrulox)
- Cordless screwdriver/drill
- Fibreglass repair tools
- Flashlight
- Framing square
- Hex key sets, allen wrench set, standard & metric
- Hole saw kit
- Hose clamp pliers
- Hydrometer
- Jigsaw
- Key hole saw
- Kregs cabinet jig
- Laminate trimmers and bits
- Levels, 2' and 4'
- Manometer
- Multimeter (DVOM and analogue)
- Paint equipment
- Pipe wrench, 10"
- Plastic welding
- Portable circular saw
- Portable sanders
- Pressure gauge
- Punch set
- Reciprocating saw
- Refractometer
- Rivet guns
- Routers and bits



- Rubber mallet
- Seal removing tool
- Set torx screwdriver set
- Single and double cut files, 10"
- Spin weld tool and equipment
- Standard socket sets, 1/4", 3/8", 1/2"
- Torque wrench, standard and metric, 1/2", 0-150 ft./lb.
- Tubing cutter flaring tool kit
- Tubing, 3/8" – 1" std. & 6mm – 19mm
- Vise-grips (Locking pliers)
- Wire brushes deep socket sets, standard and metric, 1/4", 3/8", 1/2"
- Wrenches (flare nut), 3/8" -7/8"

**Specialty Tools**

- N/A

**Student Equipment (supplied by school)**

**Required**

- 12V DC test light
- Ball-peen hammer
- Channel locks
- Circuit tester, polarity and GFCI
- Claw hammer, 16 oz.
- Combination square
- Combination wrench set
- Crimping tools
- Diagonal cutters
- Flat tip screw driver set
- Hack saw with replacement blades
- Needle-nose pliers
- Nut driver set, 3/16" to 1/2", metric
- Phillips screw driver set
- Putty knives
- Robertson screw driver set
- Scratch awl
- Slip joint pliers
- Tape measure, 1"-25'
- Utility knife
- Wire strippers
- Wonder bar

**Recommended**

N/A

**Student Tools (supplied by student)**

**Required**

None

**Recommended**

None



## Reference Materials

### Required Reference Materials

- Local materials developed by training providers
- Recreation Vehicle Industry Association (RVIA) textbooks  
[https://my.rvia.org/NC\\_Product?id=a1B41000003jdmQEAQ](https://my.rvia.org/NC_Product?id=a1B41000003jdmQEAQ), (2012 or most recent)

### Recommended Resources

- National Highway Traffic Safety Administration <https://www.nhtsa.gov/> (for recall notices)

### Suggested Texts

N/A



## Instructor Requirements

### Occupation Qualification

The instructor must possess:

- BC Recreational Vehicle Service Technician Certificate of Qualification with Red Seal Endorsement
- Certificate of Qualification from another Canadian jurisdiction with Red Seal Endorsement

### Work Experience

The instructor must possess:

- A minimum of 5 years experience working in the industry as a journeyman
- Diverse industry experience, including that which would cover all competencies in this program

### Instructional Experience and Education

It is preferred that the instructor also possesses one of the following:

- Instructor's Certificate
- Instructor's Diploma
- Bachelor's or Master's Degree in Education



# Appendices



## Appendix A Acronyms

<b>A/C</b>	Air conditioning
<b>AC</b>	Alternating current
<b>AGM</b>	Absorbed glass matt
<b>ASME</b>	American Society of Mechanical Engineers
<b>AWG</b>	American wire gauge
<b>CAN</b>	Controller Area Network (CAN)
<b>CO</b>	Carbon monoxide
<b>CSA</b>	Canadian Standards Association
<b>DC</b>	Direct current
<b>DOT</b>	Department of Transportation
<b>EPDM</b>	Ethylene Propylene Diene Monomer
<b>FRP</b>	Fibre reinforced plastic
<b>GFCI</b>	Ground fault circuit interrupter
<b>GPS</b>	Global positioning system
<b>GVWR</b>	Gross vehicle weight rating
<b>ISO</b>	International Organization for Standardization
<b>LIN</b>	Local Interconnect Network
<b>LP</b>	Liquid petroleum
<b>LPG</b>	Liquid petroleum gas
<b>MOST</b>	Media Oriented Systems Transport
<b>MPPT</b>	Maximum power point tracking
<b>NHTSA</b>	National Highway Traffic Safety Administration
<b>OCTP</b>	One Control Touch Panel
<b>PDI</b>	Pre-delivery inspection
<b>Pex</b>	Polyethylene
<b>PPE</b>	Personal protective equipment
<b>PVC</b>	Polyvinyl chloride
<b>PWM</b>	Pulse width modulation
<b>RV</b>	Recreation vehicle
<b>SSID</b>	System Set Identifier
<b>TC</b>	Transport Canada
<b>TPO</b>	Thermoplastic polyolefin
<b>VAC</b>	Volts of alternating current
<b>VIN</b>	Vehicle Identification number
<b>VOM</b>	Volt ohm meter
<b>WHMIS</b>	Workplace Hazardous Materials Information System





## Appendix B Previous Contributors

**The 2008 Program Outline was prepared with the advice and direction of industry subject matter experts:**

- Al Cohoe
- Jim Ingram

**The 2008 Program Outline was reviewed by the following:**

- Lloyd Stamm                      Automotive Training Standards Organization
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