



**Skilled  
Trades**  
Ontario

**Métiers  
spécialisés**  
Ontario

Apprenticeship  
Curriculum Standard

Recreational Vehicle  
Technician

Level 1

690H

2003



# Apprenticeship Pathway to a Certificate of Qualification

Phase 1: Registration

Submit Application for Apprenticeship Training through the on-line portal or to local Service Delivery Office

For on-line portal, please follow instructions for registration. You will need to create a *My Ontario* account to access online services.

Training agreement signed and registered by both apprentice and sponsor

Access your Apprenticeship Training Standard Logbook\*\*  
skilledtradesontario.ca/about-trades/trades-information

\*\* This is the official record of your training progress. You are responsible for keeping it up-to-date.

Complete on-the-job training

*Demonstrate and receive sign-off on the competencies/skills in your Apprenticeship Training Standard Logbook*

Complete in-school training

*Attend and complete the in-class training set out in the Curriculum Training Standard*

Apprentices eligible to apply for apprenticeship incentive grants (Red Seal trades) and loans.

Review and finalize your logbook with your sponsor

Submit proof of apprenticeship completion via email, in-person or digital portal

Your Apprenticeship Training Standard Logbook details completion requirements. Submit the following:

- completed Apprenticeship Training Standard Logbook with signatures
- proof of hours

Certificate of Apprenticeship is issued

Trades without examination

CofA is the final step of the program

Trades with examination (compulsory and non-compulsory trades)\*

Provisional Certificate of Qualification issued for a 12 month term

To prepare for the CofQ examination download the Provincial and/or Red Seal Exam preparation guides.

Make payment for your Certificate of Qualification examination

Call to make a payment (647-847-3000 or 1-855-299-0028)

Schedule a date to write your Examination

To schedule your examination, contact your local Service Delivery Office.

Pass Certificate of Qualification examination

Apprentices eligible to apply for Apprenticeship Completion Grant (Red Seal trades) or Apprentice Completion Bonus (non-Red Seal)

Certificate of Qualification is issued

Upon completion, Sponsors may be eligible for Apprenticeship grants, incentives, bonuses or tax credits

Phase 2: Apprenticeship

Phase 3: Certification

\* For a list of trades subject to a certification examination, visit: skilledtradesontario.ca

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**Please Note:** This Standard has been revised to reflect the visual identity of Skilled Trades Ontario (STO) which replaced the Ontario College of Trades on January 1, 2022. The content of this Standard may refer to the former organization; however, all trade specific information or content remains relevant and accurate based on the original date of publishing.

Please refer to STO's website: [skilledtradesontario.ca](https://skilledtradesontario.ca) for the most accurate and up to date information. For information about BOSTA and its regulations, please visit [\*\*Building Opportunities in the Skilled Trades Act, 2021 \(BOSTA\)\*\*](#).

Any updates to this publication are available on-line; to download this document in PDF format, please follow the link: [Skilled Trades Ontario.ca](https://skilledtradesontario.ca).

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*Maintained with transfer to Skilled Trades Ontario 2003 (V100)*

### **Preface**

This curriculum standard for the Recreational Vehicle Technician trade program is based upon the on-the-job performance objectives, located in the industry-approved training standard.

The curriculum is organized into 3 levels of training. The Reportable Subjects Summary chart (located on page 3) summarizes the training hours for each reportable subject.

The curriculum identifies the learning that takes place in-school. The in-school program focuses primarily on the theoretical knowledge and the essential skills required to support the performance objectives of the Apprenticeship Training Standards.

Employers/Sponsors are expected to extend the apprentice's knowledge and skills through practical training on a work site. Regular evaluations of the apprentice's knowledge and skills are conducted throughout training to verify that all apprentices have achieved the learning outcomes identified in the curriculum standard.

It is not the intent of the in-school curriculum to perfect on-the-job skills. The practical portion of the in-school program is used to reinforce theoretical knowledge. Skill training is provided on the job.

Please refer to Skilled Trades Ontario website ([www.skilledtradesontario.ca](http://www.skilledtradesontario.ca)) for the most accurate and up-to-date information about Skilled Trades Ontario. For information on *Building Opportunities in the Skilled Trades Act, 2021 (BOSTA)* and its regulations, please visit [Building Opportunities in the Skilled Trades Act, 2021, S.O. 2021, c. 28 - Bill 288 \(ontario.ca\)](http://www.skilledtradesontario.ca/building-opportunities-in-the-skilled-trades-act-2021-s.o.-2021-c.-28-bill-288)

### **Pre-requisites**

In order to advance to Level 2 of the apprenticeship program, an individual must have completed all of the units outlined in Level 1. Similarly, in order to advance to Level 3 of the program, an individual must have completed all of the units outlined in Level 1 and 2.

### **Hours Disclaimer** (if applicable)

It is agreed that Training Delivery Agents (TDAs) may need to make slight adjustments (with cause) according to particular apprentice needs and may deviate from the unit sequencing and the prescribed practical and theoretical hours shown within the standard. However, all TDAs will comply with the hours at the reportable subject level.

### **Suggested Equipment for Training Delivery Agencies**

The listing of tools on pages 74–77 does not list minimum quantities based on the understanding that the delivering TDA is in the best position to determine the need based on its delivery methodology.

Personal and Safety Equipment: Personal protective equipment is at the discretion of the TDA who must conform to Ontario Provincial Health and Safety Regulations.

## **Introduction**

This curriculum standard for the Recreational Vehicle (RV) Technician trade is designed down from the learning outcomes, which were in turn developed from the industry-approved training standard.

The curriculum is organized into 3 levels of training, each including reportable subjects containing like or similar learning outcomes to reflect the units of the training standard. The hours charts indicates how the curriculum can be delivered in the current block release format and summarizes the hours of training for each reportable by level. Since the reportable subjects are all divisible by three they can be adapted to accommodate a more flexible training delivery other than block release.

The reportable subjects are cross-referenced to the training standard for ease of comparison.

Each reportable subject and learning outcome identifies a recommended number of training hours. This hour allotment is broken into hours for instruction in theory and practical application. The division of the curriculum into reportable subjects that follow a natural progression of learning through the levels and branches of training will allow training centers and apprentices' flexibility in program delivery while still observing the importance of sequencing learning in a logical progression.

The curriculum is framed by and includes specific references to terminal performance objectives in the Apprenticeship Training Standards for the Recreational Vehicle (RV) Technician. However, it identifies only the learning that takes place off the job, in a training centre. The in-school program focuses primarily on the theoretical knowledge required to master the performance objectives of the Training Standards. Employers are expected to extend the apprentice's knowledge and skills through appropriate practical training on the work site. Regular evaluations of the apprentice's knowledge and skills is conducted throughout training to assure that all apprentices have achieved the learning outcomes identified in the curriculum standard. The balance between theoretical and practical evaluation is identified for each unit of learning outcomes.

### **Implementation date:**

September 2005

### Summary of Total Program In-School Training Hours

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical
<b>Level 1</b>				
1	Shop Practices	67	28	39
2	Plumbing and Gas Systems 1a	18	18	0
3	Electrical/Electronic Systems	66	34	32
4	RV Construction and Appearance 1	29	11	18
5	Plumbing and Gas Systems 1b	24	12	12
6	Welding Practices 1	48	18	30
	<b>Level 1 Totals</b>	<b>240</b>	<b>109</b>	<b>131</b>
<b>Level 2</b>				
1	Electrical/Electronic Systems 2	30	15	15
2	Shop Practices 2	12	7	5
3	Plumbing and Gas Systems 2	21	6	15
4	Heating, Refrigeration and A/C Systems 1	24	18	6
5	Welding Practices 2	51	15	36
6	Towed Unit Systems 2	24	9	15
7	Accessories 1	27	14	13
8	RV Construction and Appearance 2	51	15	36
	<b>Level 2 Totals</b>	<b>240</b>	<b>99</b>	<b>141</b>
<b>Level 3</b>				
1	Towed Unit Systems 3a	6	2	4
2	Shop Practices 3a	12	6	6
3	Accessories 2	36	17	19
4	Towed Unit Systems 3b	27	9	19
5	Electrical/Electronic Systems 3	18	10	8
6	Heating, Refrigeration and A/C Systems 2	42	25	17
7	Towed Unit Systems 3c	21	9	12
8	RV Construction and Appearance 3	54	12	42
9	Shop Practices 3b	24	12	12
	<b>Level 3 Totals</b>	<b>240</b>	<b>102</b>	<b>138</b>
	<b>Totals</b>	<b>720</b>	<b>310</b>	<b>410</b>

**Please note:**

RV Technician apprentices must complete their RV-2 LPG certification with T.S.S.A. prior to beginning Level 2 of instruction.

RV Technician apprentices must complete their RV-1 LPG certification with T.S.S.A. prior to beginning Level 3 of instruction.



# Level 1

**Summary of Total Program In-School Training Hours**

<b>Number</b>	<b>Reportable Subjects</b>	<b>Hours Total</b>	<b>Hours Theory</b>	<b>Hours Practical</b>
1	Shop Practices	67	28	39
2	Plumbing and Gas Systems 1a	18	18	0
3	Electrical/Electronic Systems	66	34	32
4	RV Construction and Appearance 1	29	11	18
5	Plumbing and Gas Systems 1b	24	12	12
6	Welding Practices 1	48	18	30
	<b>Total</b>	<b>240</b>	<b>109</b>	<b>131</b>

Number:	1		
<b>Title:</b>	<b>Shop Practices</b>		
Duration:	Total Hours: 67	Theory: 28	Practical: 39
Prerequisites:	None		
Co-requisites:	None		

1.1 Trade Calculations

6 Total Hours      Theory: 3 hours      Practical: 3 hours

1.2 Hand/Power Tools and Trade Equipment

12 Total Hours      Theory: 4 hours      Practical: 8 hours

1.3 Precision Measuring Tools and Diagnostic Equipment

9 Total Hours      Theory: 3 hours      Practical: 6 hours

1.4 Lifting and Blocking Systems

6 Total Hours      Theory: 4 hours      Practical: 2 hours

1.5 Fastening and Mounting Devices

6 Total Hours      Theory: 4 hours      Practical: 2 hours

1.6 Workplace Charts and Diagrams I

12 Total Hours      Theory: 6 hours      Practical: 6 hours

1.7 Workplace Communications I

6 Total Hours      Theory: 4 hours      Practical: 2 hours

1.8 Applied Computer Skills

10 Total Hours      Theory: 0 hour      Practical: 10 hours

Number:	1.1		
Title:	<b>Trade Calculations</b>		
Duration:	Total Hours: 6	Theory: 3	Practical: 3
Cross Reference to Training Standard: 6066, 6071, 6075, 6080			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of basic arithmetic, applied calculation, formula calculations, and systems of measurement.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 1.1.1 Explain and perform the fundamentals of basic arithmetic.
- 1.1.2 Explain and perform applied calculations.
- 1.1.3 Explain and perform formula calculations.
- 1.1.4 Explain and perform Metric and Imperial calculations.

**Learning Content:**

- 1.1.1 Explain and perform the fundamentals of basic arithmetic.  
[.5/.5]
  - whole number operations (add, subtract, multiply, divide)
  - use of calculators
- 1.1.2 Explain and perform applied calculations.  
[.5/.5]
  - percents
  - fractions
  - decimals
  - percent/fraction/decimal conversion
  - apply calculations to complete:
    - work orders
    - estimates
    - invoices

1.1.3 Explain and perform formula calculations.  
[1/1]

- exponents
- square roots
- formulas for:
  - perimeter
  - circumference
  - area
  - volume
  - mass
  - pressure

1.1.4 Explain and perform Metric and Imperial calculations.  
[1/1]

- Metric measurement units
- Imperial measurement units
- Metric/Imperial conversion (charts/tables)

Number:	1.2		
Title:	<b>Hand/Power Tools and Trade Equipment</b>		
Duration:	Total Hours: 12	Theory: 4	Practical: 8
Cross Reference to Training Standard: 6068-6074, 6076-6079			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the types, construction, principles of operation, maintenance, and safe workplace usage of hand and power tools.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 1.2.1 Define the conditions of a safe workplace.
- 1.2.2 Describe OHS (Occupational Health and Safety Act).
- 1.2.3 Describe workplace hazards.
- 1.2.4 Describe the construction, type and application of safety devices and equipment used in the workplace.
- 1.2.5 Describe the construction, type and application of hand/power tools used in the workplace.
- 1.2.6 Explain and demonstrate the principles of operation for safety devices and equipment.
- 1.2.7 Explain and demonstrate the principles of operation for hand/power tools.
- 1.2.8 Maintain workplace tools and equipment.

**Learning Content:**

- 1.2.1 Define the conditions of a safe workplace.  
[0.5/0]
- clean and orderly work area
  - removal of fire hazards
  - clean up grease, oil spills, fluids
  - remove obstructions from work area
  - first aid equipment
  - fire suppression equipment
  - safe use and storage of tools and equipment
  - adequate ventilation and lighting
  - safe from electrical shock
    - good ground connection
    - cable connection
    - no water/conductive elements
  - rules of safe conduct
    - no horseplay
    - caution against use of reaction-impairing drugs
    - designated smoking areas only
    - report unsafe working conditions
- 1.2.2 Describe OHSA (Occupational Health and Safety Act).  
[0.5/0]
- legislation
  - obligation of employer and employee
- 1.2.3 Describe workplace hazards.  
[0.5/0]
- glass
  - primers
  - epoxy
  - urethane
  - dust fumes
  - exhaust
  - explosive
  - fumes
  - equipment
    - ladders
    - scaffolding
  - gas and alternate fuels

- lighting
- sound levels
- electrical hazards
- mechanical hazards
  - damaged/faulty air lines
  - high pressure hydraulic systems
  - lift systems
- inadequate ventilation

1.2.4 Describe the construction, type and application of safety devices and equipment used in the workplace.

[0.5/0]

- safety harness
- safety cages
- personal protection
  - hearing protection
  - safety glasses
  - protective head gear
  - goggles
  - hand protection
  - safety boots
  - protective clothing
  - respirators and breathing apparatus

1.2.5 Describe the construction, type and application of hand/power tools used in the workplace.

[1/0]

- hand tools
  - hammer
  - wire brush
  - side cutters
  - chipping hammer
  - cold chisel/chisels
  - pliers
  - vise grips
  - vise
  - hack saw/saws
  - screwdrivers
  - scalers
  - wheel grinders
  - disc grinders
  - pipe cutters (copper/plastic)
  - flaring tool
  - tube bender



- wrenches
- torque wrench
- sockets
- clamps
- files
- augers
- punches
- ratchets
- plane
- rivet gun
- cotter pin puller
- allen keys – wrench set
- tin snips
- nut drivers
- shears/nibblers
- hole saw kit
- power tools
  - wheel grinders
  - disc grinders
  - bench grinders
  - abrasive cut-off saws
  - die grinders
  - drills
  - air tools
  - air compressor
  - rivet guns
  - nibblers
  - drill presses
  - electric saws (skill, table, radial, miter, and band)
  - electric impact wrenches
  - electric pipe cutters
  - threading machines
  - sanders
  - routers
  - planes
  - chisels
  - augers
  - battery charger
- speciality tools
  - crimping tools
  - pop rivet kit
  - wheel seal puller
  - awning spring wind tool
  - awning rail straightener tool
  - pressure relief valve tool
  - gas valve tool
  - antenna tool

- butane soldering equipment
- Venturi cleaning brush (flue-baffle)
- ring seater tool (Atwood hot water tanks)
- related equipment
  - extension cords
  - testing devices
  - power sources
  - hydraulic equipment and fluid levels
  - hoists and jacks
  - mechanical stands

1.2.6 Explain and demonstrate the principles of operation for safety devices and equipment.

[0.5/1]

- safety harness
- safety cages
- personal protection
  - hearing protection
  - safety glasses
  - protective head gear
  - goggles
  - hand protection
  - safety boots
  - protective clothing
  - respirators and breathing apparatus
- set up and proper usage of ladders and scaffolds

1.2.7 Explain and safely demonstrate the principles of operation for hand/power tools.

[0.5/6]

- safe operating procedures
  - holding techniques for hand tools
  - angles and appropriate pressure application
  - extension cords of proper length
  - floor protection against exposed wires
  - grounding wires
  - spark-proof tools in hazardous areas
  - grounding and bonding of flammable liquids
  - safe sheet metal handling
- hand tools
  - hammer
  - wire brush
  - side cutters
  - chipping hammer

- cold chisel/chisels
- pliers
- vise grips
- vise
- hack saw/saws
- screwdrivers
- scalers
- wheel grinders
- disc grinders
- pipe cutters (copper/plastic)
- flaring tool
- tube bender
- wrenches
- torque wrench
- sockets
- clamps
- files
- augers
- punches
- ratchets
- plane
- rivet gun
- cotter pin puller
- allen keys – wrench set
- tin snips
- nut drivers
- shears/nibblers
- hole saw kit
- power tools
  - wheel grinders
  - disc grinders
  - bench grinders
  - abrasive cut-off saws
  - die grinders
  - drills
  - air tools
  - air compressor
  - rivet guns
  - nibblers
  - drill presses
  - electric saws (skill, table, radial, miter, and band)
  - electric impact wrenches
  - electric pipe cutters
  - threading machines
  - sanders
  - routers
  - planes

- chisels
- augers
- battery charger
- specialty tools
  - crimping tools
  - pop rivet kit
  - wheel seal puller
  - awning spring wind tool
  - awning rail straightener tool
  - pressure relief valve tool
  - gas valve tool
  - antenna tool
  - butane soldering equipment
  - Venturi cleaning brush (flue-baffle)
  - ring seater tool (Atwood hot water tanks)
- related equipment
  - extension cords
  - testing devices
  - power sources
  - hydraulic equipment and fluid levels
  - hoists and jacks
  - mechanical stands

1.2.8 Maintain workplace tools and equipment.  
[0/1]

- basic tool maintenance procedures
  - cleaning
  - storage
  - lubrication
  - methods of restoring critical surfaces
  - store gas cylinders upright
  - sharpening
  - design and proper use of guards
  - warning signs and tag systems
  - machine lockout procedure
  - inspect for defective/damaged equipment

Number:	1.3		
Title:	<b>Precision Measuring Tools and Diagnostic Equipment</b>		
Duration:	Total Hours: 9	Theory: 3	Practical: 6
Cross Reference to Training Standard: 6067-6080			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, construction, principles of operation, and maintenance of precision measuring tools and diagnostic equipment.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 1.3.1 Define the purpose and fundamentals of precision tools and diagnostic equipment.
- 1.3.2 Describe the construction, types and application of precision measuring tools and diagnostic equipment.
- 1.3.3 Explain and demonstrate the principles of operation of precision measuring tools and diagnostic equipment.
- 1.3.4 Perform maintenance and calibration procedures of precision measuring tools and diagnostic equipment.

**Learning Content:**

- 1.3.1 Define the purpose and fundamentals of precision tools and diagnostic equipment.  
[1/0]

- measurement systems – Metric/Imperial
- measurement terms
  - datum line
  - centreline
  - symmetrical
  - asymmetrical
  - length
  - width
  - height
  - diagonal

- diagnostic testing - areas of diagnosis
  - plumbing
  - heating, ventilation and air conditioning
  - bodywork
  - LPG
  - electrical systems
  - tires
  - welding
  - slide-out systems
  - chassis and undercarriage
  - supplemental braking systems
  - accessories
- testing:
  - pressure
  - leaks
  - temperature
  - venting
  - CO
  - flow
  - wear
  - voltage
  - amperage
  - cracks/fractures

1.3.2 Describe the construction, types and application of precision measuring tools and diagnostic equipment.

[1/0]

- tools
  - micrometers (inside, outside, depth)
  - calipers
  - vernier
  - straight edges
  - dial indicators
  - torque wrenches
  - measuring tape
  - ruler
  - level
  - multimeter
  - CO detector
  - monometer
  - hydrometer
  - load tester

- gauges
  - universal
  - pressure
  - gas pressure (low pressure test set)
  - HWH high pressure fluid gauge
  - vacuum
- leak-detectors
  - electronic
  - bubble solution
  - combustionable gas detector
  - handheld gas leak detector
- temperature
  - glass thermometers
  - digital pocket thermometers
  - electronic thermometers (thermocouple and thermistor sensors)
  - non-contact infra-red thermometers
- specialty tools and devices
  - industry supplied diagnostic tools
  - Dometic PAL RV appliance diagnostic kit
  - Fenwal Gas Ignition field tester
  - Kwik test (electric step tester)
- test lights (12-volt)
- A/C D/C amp clamps
- Tekonsha brake control tester
- Tekonsha circuit testers

1.3.3 Explain and demonstrate the principles of operation of precision measuring tools and diagnostic equipment.

[1/5]

- tools
  - micrometers (inside, outside, depth)
  - calipers
  - vernier
  - straight edges
  - dial indicators
  - torque wrenches
  - measuring tape
  - ruler
  - level
  - multimeter
  - CO detector
  - monometer
  - hydrometer
  - load tester

- gauges
  - universal
  - pressure
  - gas pressure (low pressure test set)
  - HWH high pressure fluid gauge
  - vacuum
- leak-detectors
  - electronic
  - bubble solution
  - combustionable gas detector
  - handheld gas leak detector
- temperature
  - glass thermometers
  - digital pocket thermometers
  - electronic thermometers (thermocouple and thermistor sensors)
  - non-contact infra-red thermometers
- specialty tools and devices
  - industry supplied diagnostic tools
  - Dometic PAL
  - PAL RV appliance diagnostic kit
  - Fenwal Gas Ignition field tester
  - Kwik test (electric step tester)
- test lights (12-volt)
- A/C D/C amp clamps
- Tekonsha brake control tester
- Tekonsha circuit testers

1.3.4 Perform maintenance and calibration procedures of precision measuring tools and diagnostic equipment.

[0/1]

- tool maintenance procedures
  - storage
  - lubrication
  - methods of restoring critical surfaces
  - adjustments, calibration
  - micrometer calibrating kit
- diagnostic equipment maintenance and storage



Number:	1.4		
Title:	<b>Lifting and Blocking Systems</b>		
Duration:	Total Hours: 6	Theory: 4	Practical: 2
Cross Reference to Training Standard: 6065, 6073, 6074, 6075, 6078			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, construction, and safe operating principles of lifting and blocking systems.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 1.4.1 Define the purpose and fundamentals of lifting and blocking systems.
- 1.4.2 Describe the construction, types, styles and application of lifting and blocking procedures.
- 1.4.3 Explain the safe operating principles of lifting and blocking systems.
- 1.4.4 Perform lifting and blocking procedures according to manufacturers' specifications and industry-accepted standards.

**Learning Content:**

- 1.4.1 Define the purpose and fundamentals of lifting and blocking systems.  
[0.5/0]
  - safety issues
    - lift devices
    - blocking
  - background
    - development of lifting and blocking systems

1.4.2 Describe the construction, types, styles and application of lifting and blocking procedures.

[1/0]

- lift systems
  - hydraulic
  - electric
  - floor
  - pneumatic
- blocking devices
  - wheel chocks
  - jack stands
  - safety issues
- rollers/skids
  - wood
  - steel
  - skids with lubricant
  - skid plates with lubricant

1.4.3 Explain the safe operating principles of lifting and blocking systems.

[2.5/0]

- lift systems
  - weight ratings
  - hydraulic
  - electric
  - floor
  - pneumatic
- blocking devices
  - wheel chocks
  - jack stands
  - safety issues
- rollers/skids
  - wood
  - steel
  - skids with lubricant
  - skid plates with lubricant

1.4.4 Perform lifting and blocking procedures according to manufacturers' specifications and industry-accepted standards.

[0/2]

- demonstrate blocking procedures
- demonstrate use of rollers/skids
  - wood
  - steel
  - skids with lubricant
  - skid plates with lubricant
- demonstrate lift systems
  - weight ratings

Number:	1.5		
Title:	<b>Fastening and Mounting Devices</b>		
Duration:	Total Hours: 6	Theory: 4	Practical: 2
Cross Reference to Training Standard: 6068-6079			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, construction, and principles of fastening and mounting devices.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 1.5.1 Define the purpose and fundamentals of fastening and mounting devices.
- 1.5.2 Describe the construction, types, styles and application of fastening and mounting devices.
- 1.5.3 Explain the principles of operation of fastening and mounting devices.
- 1.5.4 Perform installation and removal procedures for fastening and mounting devices.

**Learning Content:**

- 1.5.1 Define the purpose and fundamentals of fastening and mounting devices.  
[1/0]
  - vibration
  - thread terminology
  - fastener grades/application
  - Society of Automotive Engineers (SAE)
  - Systems International (SI)
  - tensile strength
  - shear strength
  - yield strength
  - grade, pitch, threads per inch
  - diameter, length, head size, yield point and fatigue
  - loctite grades
  - anti-seize

- factors that affect torque
  - thread condition
  - lubrication
  - temperature
  - fastener composition
- oxy-fuel and welding

1.5.2 Describe the construction, types, styles and application of fastening and mounting devices.

[1.5/0]

- bolts/nuts
- screws
- studs
- locking devices
- pins
- rivets
- keys
- washers
- retaining rings
- helicoils
- thread sealants and adhesives
- welds
- castellated nuts
- cotter pins
- d-washers
- nutserts

1.5.3 Explain the principles of operation of fastening and mounting devices.

[1.5/0]

- torque effects of wet, dry and clean threads
- locking devices
- helicoil thread repair principles
- temperature
- compatibility
- clamping force

1.5.4 Perform installation and removal procedures for fastening and mounting devices.

[0/2]

- verify thread strengths and torque requirements for wet and dry
- thread repair
  - freeing seized threads, removal of broken studs/cap screws
  - installation of helicoils, locking devices
- metal working practices
  - drilling
  - tapping
  - hack sawing
  - filing
  - grinding
- sealant selection, removal and installation practices
- loctite and anti-seize applications

Number:	1.6		
<b>Title:</b>	<b>Workplace Charts and Diagrams I</b>		
Duration:	Total Hours: 12	Theory: 6	Practical: 6
Cross Reference to Training Standard: 6088			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, types, principles of operation, and interpretation of workplace charts and diagrams.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 1.6.1 Define the purpose and fundamentals of workplace charts and diagrams.
- 1.6.2 Describe the types, styles and application of workplace charts and diagrams.
- 1.6.3 Explain the principles of operation of workplace charts and diagrams.
- 1.6.4 Read and interpret workplace charts and diagrams.

**Learning Content:**

- 1.6.1 Define the purpose and fundamentals of workplace charts and diagrams.  
[1/0]
  - purpose of a drawing
  - location of devices
  - routing of wire
  - vents
  - plumbing
  - system notes
    - dimensions
    - materials
    - specification
  - follow repair procedures
  - accuracy of installation/repair/removal
  - safety

1.6.2 Describe the types, styles and application of workplace charts and diagrams.  
[1.5/0]

- components of drawing
  - lines
  - views
  - symbols
  - title block
  - list of materials
  - notes and specifications
- working drawings
  - flow charts
  - ladder diagrams
  - repair diagrams
  - schematics

1.6.3 Explain the principles of operation of workplace charts and diagrams.  
[3.5/0]

- common lines
  - object lines
  - hidden lines
  - centre lines
  - dimension and extension lines
  - leader lines
  - break lines
  - cutting plane lines
  - hatch lines
- common symbols
  - electrical
  - electronic
  - mechanical
  - hydraulic
- repair sequences
- repair diagrams
- flowcharts
- diagnostic/troubleshooting charts

1.6.4 Read and interpret workplace charts and diagrams.  
[0/6]

- convert schematics to ladder diagrams
- identify location of devices, dimensions, materials and specifications
- identify type and model of vehicle, parts, components and assemblies
- interpret proper flowchart sequence



Number:	1.7		
Title:	<b>Workplace Communications I</b>		
Duration:	Total Hours: 6	Theory: 4	Practical: 2
Cross Reference to Training Standard: 6066			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, principles, and applications of effective workplace communication.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 1.7.1 Define the purpose of effective communication with co-workers and with clients.
- 1.7.2 Describe different types of communication.
- 1.7.3 Describe listening and verbal communication techniques.
- 1.7.4 Perform applications of effective communication as to client and company standards.

**Learning Content:**

- 1.7.1 Define the purpose of effective communication with co-workers and with clients.  
[1/0]
  - co-workers
    - safety
    - accuracy
    - efficiency
    - trust
    - improved workplace environment
    - improved morale

- clients
  - customer service
  - repeat business
  - word-of-mouth referrals
  - accuracy
  - efficiency
  - trust

1.7.2 Describe different types of communication.  
[1/0]

- communication methods
  - verbal
  - written
  - body language
- communication media
  - face-to-face
  - telephone
  - e-mail
  - video
  - mail
- levels of communication
  - collegial (peers and co-workers)
  - professional (clients from all knowledge levels)

1.7.3 Describe listening and verbal communication techniques.  
[2/0]

- listening skills
  - active
  - passive
  - critical
  - body language
  - listener response
- verbal skills
  - asking questions
  - paraphrasing communications
  - type of language (trade, plain, jargon)
  - attitude (positive, condescending, encouraging, negative)
  - type of communication (brief, efficient, lengthy, technical)

1.7.4 Perform applications of effective communication as to client and company standards.

[0/2]

- identify personal communication styles
- identify attitudes (positive, respect for others)
- verbal communication
- use computers where relevant
- enact appropriate classroom client-technician scenarios

Number:	1.8		
<b>Title:</b>	<b>Applied Computer Skills</b>		
Duration:	Total Hours: 10	Theory: 0	Practical: 10
Cross Reference to Training Standard: 6080			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, functions, and usage of a personal computer (PC).

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 1.8.1 Define the purpose, function and applications of computers.
- 1.8.2 Perform fundamental operating tasks for a PC.

**Learning Content:**

- 1.8.1 Define the purpose, function and applications of computers.  
[1/1]

- introduction to computing
- hardware components
  - floppy disk drive
  - hard drive
  - CD-ROM
  - Mouse
  - Keyboard
  - modem
  - CPU
  - RAM
  - Printers
  - Cables and connectors
- software
  - operating system (o/s)
  - word-processing
  - spreadsheet
  - database
  - e-mail
  - web browsers

1.8.2 Perform fundamental operating tasks for a PC.  
[0/4]

- boot-up and shut down procedures
- operating procedures
  - mouse
  - return/enter key
  - navigation arrows
- accessing and opening software
  - Start Menu
  - Desktop Icons
  - Windows Explorer
- saving files
  - floppy drive
  - hard drive
  - CD-rom
- software menus
- cut/copy/paste
- creating/opening files
- dealing with common errors
  - ctrl/alt/del
- use common software
  - word-processing
  - spreadsheet
  - database
  - e-mail
  - browser
- use specialized software
  - entering customer information
  - repair estimate

<b>Evaluation Structure</b>			
Theory Testing	Practical Application Exercises	Research Project	Notebook and Organizational Skills
40%	35%	15%	10%

Number:	2		
<b>Title:</b>	<b>LPG Systems 1a</b>		
Duration:	Total Hours: 18	Theory: 18	Practical: 0
Prerequisites:	None		
Co-requisites:	Level 1: Unit 1		

2.1 Plumbing and Gas Systems

18 Total Hours      Theory: 18 hours      Practical: 0 hours

Number:	2.1		
Title:	<b>Plumbing and Gas Systems</b>		
Duration:	Total Hours: 18	Theory: 18	Practical: 0
Cross Reference to Training Standard: 6068, 6070			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, applications, scientific principles, and equipment used in plumbing and gas systems.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 2.1.1 Define the purpose and trade-relevant applications of plumbing and gas systems.
- 2.1.2 Describe the scientific principles fundamental to plumbing and gas systems.
- 2.1.3 Describe the construction, types, styles, and application common to plumbing and gas systems.
- 2.1.4 Explain the safe operating principles of components common to plumbing and gas systems.
- 2.1.5 Define the purpose and fundamentals of LPG.
- 2.1.6 Identify and describe the construction, types, styles, and application of LPG components.
- 2.1.7 Explain the safe operating principles of LPG.

**Learning Content:**

2.1.1 Define the purpose and trade-relevant applications of plumbing and gas systems.  
[0.5/0]

- history and background
- plumbing
- hydraulics
- LPG
- welding
- accessories

2.1.2 Describe the scientific principles fundamental to plumbing and gas systems.  
[5.5/0]

- pressure
- energy
  - kinetic
- Charles' Law, Boyle's Law
- Pascal's Law and application to static fluids
- Bernoulli's Principle
- siphons
- trap seals
- properties of water
  - gravity
  - states
  - volume through temperature change
  - chemical composition
  - weights and measures
  - viscosity
  - cohesion
- properties of gases
  - chemical composition
  - volume, temperature, pressure



2.1.3 Describe the construction, types, styles, and components common to plumbing and gas systems.

[5/0]

- valves
- regulators
- lines
- pipes and piping
- fittings
  - composites
  - LP fittings
  - water fittings
- hoses
  - shielded gas
  - composites
- manifolds
- seals
- gaskets
- tanks
- cylinders

2.1.4 Explain the safe operating principles of components common to plumbing and gas systems.

[7/0]

- valves
- regulators
- lines
- pipes and piping
- fittings
  - composites
  - LP fittings
  - water fittings
- hoses
  - shielded gas
  - composites
- manifolds
- seals
- gaskets
- tanks
- cylinders

2.1.5 Define the purpose and fundamentals of LPG.  
[1/0]

- compliance with TSSA (Technical Standards and Safety Authority)
- certification process
- RV applications
  - gas appliances (high and low pressure)
  - generators
- history and background
- properties of liquid and vapour

2.1.6 Identify and describe the construction, types, styles, and application of LPG components.  
[3/0]

- tanks/cylinders
  - horizontal
  - vertical
- couplers
- sensors
- mechanical and electronic controls
- warning devices
- switches
- manifold
- fittings
  - flared
  - forged
  - compression
  - quick-connect
- REVIEW AS NECESSARY:
  - regulators
  - lines
  - hoses
  - valves
  - seals
  - piping

2.1.7 Explain the safe operating principles of LPG.  
[2/0]

- safe storage
  - fenced compound
  - valves
  - tank and cylinder expiry identification
- safe usage of valves and all other equipment
  - open valve slowly
  - do not tamper with relief valves
  - contact with skin, first aid

<b>Evaluation Structure</b>			
Theory Testing	Practical Application Exercises	Research Project	Notebook and Organizational Skills
80%	0%	10%	10%

Number:	3		
<b>Title:</b>	<b>Electrical and Electronic Systems</b>		
Duration:	Total Hours: 66	Theory: 34	Practical: 32
Prerequisites:	None		
Co-requisites:	Level 1: Unit 1		

3.1 Electrical and Electronic Systems

15 Total Hours      Theory: 15 hours      Practical: 0 hours

3.2 D/C Electrical and Electronic Systems I

30 Total Hours      Theory: 12 hours      Practical: 18 hours

3.3 A/C Electrical and Electronic Systems I

21 Total Hours      Theory: 7 hours      Practical: 14 hours

Number:	3.1		
Title:	<b>Electrical and Electronic Systems</b>		
Duration:	Total Hours: 15	Theory: 15	Practical: 0
Cross Reference to Training Standard: 6065, 6069			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, applications, scientific principles, and equipment used in electrical and electronic systems.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 3.1.1 Define the purpose and trade-relevant applications of electrical and electronic systems.
- 3.1.2 Describe the scientific principles fundamental to electrical and electronic systems.
- 3.1.3 Describe the construction, types, styles, and application of trade-relevant electrical and electronic components.
- 3.1.4 Explain the safe operating principles of trade-relevant electrical and electronic components.

**Learning Content:**

- 3.1.1 Define the purpose and trade-relevant applications of electrical and electronic systems.  
[2/0]
  - history
  - A/C
  - D/C
  - generators
  - converters/invertors
  - batteries
  - solar power
  - charging systems
  - RV applications

3.1.2 Describe the scientific principles fundamental to electrical and electronic systems.

[4/0]

- atomic structure
- conductors and insulators
- magnetism
  - laws of magnetism
  - magnetic field
  - flux density
  - permeability
  - reluctance
- electromagnetism
- electron and conventional theories
- sources of electricity
  - heat
  - pressure
  - static
  - chemical
  - light
  - magnetism
- Ohm's Law, Kirchoff's Law, Watt's Law
- current flow, heat and resistance
- Metric/Imperial system
- units of measurement
  - ohms
  - volts
  - coulombs
  - amps
  - amp hours
  - watts
  - kilo-watt hour
- voltage
- amperage
- resistance
- wattage
- electrical circuit
  - series
  - parallel
  - series parallel
- opens, shorts, grounds

3.1.3 Describe the construction, types, styles, and application of trade-relevant electrical and electronic components.

[5/0]

- motors
- solenoids
- batteries
  - automotive
  - deep cycle
  - gel
- fuses
- circuit breakers
- switches
- relays
- circuit protection devices
- sensors
- modules
- wiring harnesses
- diagnostic lights
- connectors
- circuit boards
- display panels
- inverter and converter systems
- solar panels
- generators

3.1.4 Explain the safe operating principles of trade-relevant electrical and electronic components.

[4/0]

- OHSA
- safe workplace
- unintentional grounding of watches/rings
- eye and hand protection
- static electricity interference
- motors
- solenoids
- batteries
- fuses
- circuit breakers
- switches
- relays

- circuit protection devices
- sensors
- modules
- wiring harnesses
- diagnostic lights
- connectors
- circuit boards
- display panels
- inverter and converter systems
- solar panels
- generators



Number:	3.2		
Title:	<b>D/C Electrical and Electronic Systems I</b>		
Duration:	Total Hours: 30	Theory: 12	Practical: 18
Cross Reference to Training Standard: 6069			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, types, operating principles, inspection, diagnosis, and repair of D/C electrical and electronic systems.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 3.2.1 Define the purpose and fundamentals of D/C electrical and electronic systems.
- 3.2.2 Identify and describe the construction, types, styles, and application of D/C electrical and electronic systems components.
- 3.2.3 Explain the operating principles of D/C electrical and electronic systems.
- 3.2.4 Perform inspection and testing procedures on D/C electrical and electronic systems following manufacturers' recommendations.
- 3.2.5 Perform diagnostics and troubleshooting on D/C electrical and electronics systems according to manufacturers' specifications.
- 3.2.6 Perform assigned operations for the following as to manufacturers' recommendations.

**Learning Content:**

3.2.1 Define the purpose and fundamentals of D/C electrical and electronic systems.

[2/0]

- history and development
- difference between A/C current and D/C current
- batteries
  - hot cranking amps (HCA)
  - amp-hour rating (AH)
  - cranking amps (CA)
  - reserve capacity (RC)
  - cold cranking amps (CCA)
  - chemical action during charging and discharging
  - temperature effects
  - internal resistance factors
  - safe usage and storage
  - deep cycle batteries
  - gel batteries
  - automotive battery
- electrical circuits
  - series
  - parallel
  - combination
  - voltage, resistance and current
- CSA code standards (z240) as relevant

3.2.2 Identify and describe the construction, types, styles, and application of D/C electrical and electronic systems components.

[4/0]

- electrical circuits
  - conductors
  - manual and automatic switches
  - load devices
  - over-load devices
- batteries
  - lead acid
  - low maintenance
  - maintenance-free batteries
  - gelled cell batteries
  - deep cycle batteries
- fusible links
- cables
- lighting

- REVIEW AS NECESSARY:
  - motors
  - solenoids
  - fuses
  - circuit breakers
  - switches
  - piping relays
  - circuit protection devices
  - sensors
  - modules
  - wiring harnesses
  - diagnostic lights
  - connectors
  - circuit boards
  - display panels
  - inverter and converter systems
  - generators

3.2.3 Explain the operating principles of D/C electrical and electronic systems.  
[6/0]

- safe handling precautions
- batteries
- motors
- solenoids
- fuses
- inverter and converter systems
- fusible links
- cables
- lighting
- circuit breakers
- switches
- relays
- circuit protection devices
- sensors
- modules
- wiring harnesses
- diagnostic lights
- connectors
- circuit boards
- display panels

3.2.4 Perform inspection and testing procedures on D/C electrical and electronic systems following manufacturers' recommendations.

[0/6]

- visual and physical inspection
  - corrosion
  - worn, loose, damaged, missing, defective parts
  - temperature
  - odour
  - vibration
  - noise
- testing with meters
  - voltage and voltage drop
  - amperage
  - specific draws
- state of charge
- surface discharge
- load test
- testing converter and inverter systems

3.2.5 Perform diagnostics and troubleshooting on D/C electrical and electronic systems according to manufacturers' specifications.

[0/6]

- use inspection/testing techniques
- check inputs, outputs, grounds
- consult appropriate resource materials (workplace drawings, manuals)
- use computer for research where relevant

3.2.6 Perform assigned operations for the following as to manufacturers' recommendations.

[0/6]

- install, replace, repair batteries, D/C components
- verify
  - inputs, outputs, grounds
  - operations
- maintenance
  - safe cleaning
  - storage
- charging procedures
- activation

Number:	3.3		
Title:	<b>A/C Electrical and Electronic Systems I</b>		
Duration:	Total Hours: 21	Theory: 7	Practical: 14
Cross Reference to Training Standard: 6069			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, types, operating principles, inspection, diagnosis and repair of A/C electrical and electronic systems.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 3.3.1 Define the purpose and fundamentals of A/C electrical and electronic systems.
- 3.3.2 Identify and describe the construction, types, styles, and application of A/C electrical and electronic systems components.
- 3.3.3 Explain the operating principles of A/C electrical and electronic systems.
- 3.3.4 Perform inspection and testing procedures on A/C electrical and electronic systems following manufacturers' recommendations.
- 3.35 Perform diagnostics and troubleshooting on A/C electrical and electronic systems according to manufacturers' specifications.
- 3.3.6 Perform assigned operations for the following as to manufacturers' recommendations.

**Learning Content:**

3.3.1 Define the purpose and fundamentals of A/C electrical and electronic systems.

[1.5/0]

- history and background
- difference between A/C current and D/C current
- magnetism
- inductance
- impedance
- capacitance
- dielectric strength
- capacitive resistance
- apparent power
- power factor
- three phase voltages

3.3.2 Identify and describe the construction, types, styles, and application of A/C electrical and electronic systems components.

[2/0]

- capacitors
- panel box
- receptacles
- power cords
  - 15 amp
  - 30 amp
  - 50 amp
- ground fault interrupters
- surge protection devices
- REVIEW AS NECESSARY:
  - motors
  - fuses
  - circuit breakers
  - switches
  - relays
  - sensors
  - modules
  - wiring harnesses
  - diagnostic lights
  - connectors
  - circuit boards

- display panels
- inverter and converter systems
- energy management systems

3.3.3 Explain the operating principles of A/C electrical and electronic systems.  
[3.5/0]

- safe operations
- motors
- fuses
- circuit breakers
- switches
- relays
- sensors
- modules
- wiring harnesses
- diagnostic lights
- connectors
- circuit boards
- display panels
- inverter and converter systems
- energy management systems
- capacitors
- panel box
- receptacles
- power cords
  - 15 amp
  - 30 amp
  - 50 amp
- ground fault interrupters
- surge protection devices

3.3.4 Perform inspection and testing procedures on A/C electrical and electronic systems following manufacturers' recommendations.  
[0/4]

- visual and physical inspection
  - corrosion
  - worn, loose, damaged, missing, defective parts
  - connections
  - temperature
  - odour
  - vibration
  - noise

- testing with meters
  - voltage and voltage drop
  - amperage
- specific draws
- grounding
- polarity

3.3.5 Perform diagnostics and troubleshooting on A/C electrical and electronic systems according to manufacturers' specifications.  
[0/4]

- use inspection/testing techniques
- check voltage, polarity, ground
- consult appropriate resource materials (workplace drawings, manuals)
- use computer for research where relevant

3.3.6 Perform assigned operations for the following as to manufacturers' recommendations.  
[0/6]

- install, replace, repair A/C operations in RVs
- verify
  - voltage, polarity and ground
  - operations
- maintain
- adjust

<b>Evaluation Structure</b>			
Theory Testing	Practical Application Exercises	Research Project	Notebook and Organizational Skills
55%	25%	15%	10%



Number:	4		
<b>Title:</b>	<b>RV Construction and Appearance 1</b>		
Duration:	Total Hours: 29	Theory: 11	Practical: 18
Prerequisites:	Level 1: Unit 1		
Co-requisites:	None		

4.1 Vehicle Detailing- Interior and Exterior

9 Total Hours      Theory: 3 hours      Practical: 6 hours

4.2 Tires, Wheels and Rims (Towed)

20 Total Hours      Theory: 8 hours      Practical: 12 hours

Number:	4.1		
Title:	<b>Vehicle Detailing – Interior and Exterior</b>		
Duration:	Total Hours: 9	Theory: 3	Practical: 6
Cross Reference to Training Standard: 6065, 6077			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, components, operating principles, inspection and performance of detailing RVs.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 4.1.1 Define the purpose and fundamentals of vehicle detailing.
- 4.1.2 Identify and describe the construction, types, styles, and application of detailing equipment.
- 4.1.3 Identify and describe the construction, types, styles, and application of component units that require detailing on RVs.
- 4.1.4 Explain the basic operating principles of detailing.
- 4.1.5 Perform inspection, testing, and diagnostic procedures on RV components following manufacturers' recommendations.
- 4.1.6 Perform detailing operations for the following as to manufacturers' recommendations.
- 4.1.7 Verify detailing operations for the following as to industry standards.

**Learning Content:**

- 4.1.1 Define the purpose and fundamentals of vehicle detailing.  
[0.5/0]
  - appearance
  - protection

4.1.2 Identify and describe the construction, types, styles, and application of detailing equipment.

[0.5/0]

- soap and water
- wipes
- lights
- vacuum
- shampoo
- stain remover
- deodorizer
- polish
- cleaning supplies (sponge, chamois, cleaning agents)
- paint
- lubricants
- power buffer

4.1.3 Identify and describe the construction, types, styles, and application of component units that require detailing on RVs.

[0.5/0]

- windows
- walls
- floor coverings
- ceiling coverings
- upholstery
- appliances
- water and waste water systems
- kitchen
- bathroom furnishings and fittings
- doors
- vents
- cabinets
- hardware
- lighting fixtures
- wheels
- stripes, decals
- trim
- mouldings
- glass
- paint finish
- awnings

- accessories
- underbody
- storage and engine compartments
- fastening, mounting and mechanical devices

4.1.4 Explain the basic operating principles of detailing.  
[1.5/0]

- cleaning procedures for the following:
  - light scratches
  - dirt in paint, paint imperfections
  - water stains
  - bacteria and mould
  - interior stains (gum, urine, grease)
  - exterior stains (tar, road film)
  - vinyl maintenance
  - soiled carpet
  - paint overspray
  - discolouration
  - oxidization
  - dirt and debris
  - odours
  - undercoating
  - cracks, fractures
  - worn, loose, missing, damaged, defective parts
- detailing methods
  - washing
  - compounding
  - polishing
  - wiping with solvent
  - vacuuming
  - shampooing
  - treating
  - painting
  - deodorizing
  - removing mould and bacteria
- safety
  - eye and hand protection
  - skin protection (barrier creams)
  - breathing apparatus

4.1.5 Perform inspection, testing, and diagnostic procedures on RV components following manufacturers' recommendations.

[0/1.5]

- visual and physical inspection
  - lights
  - wipes
  - locate and record all interior and exterior contaminants
- determine cleaning sequence
- inspecting and testing for:
  - appearance
  - performance
  - function
- consult appropriate resource materials (workplace drawings, manuals)
- use computer for research where relevant

4.1.6 Perform detailing operations for the following as to manufacturers' recommendations.

[0/4]

- use test area first
- wash with soap and water
- chamois
- compound light scratches and overspray
- polish
- remove stains with solvent
- clean glass
- clean tires and wheels
- vacuum interior
- clean interior furnishings
- shampoo
- deodorize
- remove bacteria, mould
- touch-up painting
- lubricate where necessary
- aligning

4.1.7 Verify detailing operations for the following as to industry standards.  
[0/0.5]

- thorough visual inspection
- detailing checklist

<b>Evaluation Structure</b>			
Theory Testing	Practical Application Exercises	Research Project	Notebook and Organizational Skills
20%	65%	10%	10%

Number:	4.2		
Title:	<b>Tires, Wheels and Rims (Towed)</b>		
Duration:	Total Hours: 20	Theory: 8	Practical: 12
Cross Reference to Training Standard: 6073			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, construction, principles of operation, inspection, diagnosis, and repair of tires, wheels, and rims.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 4.2.1 Define the purpose and fundamentals of tires, wheels, and rims.
- 4.2.2 Identify and describe the functions, construction, composition, types, styles and applications of tires, wheels and rims.
- 4.2.3 Explain the principles of operation of tires, wheels and rims.
- 4.2.4 Perform inspection and testing procedures on tires, wheels and rims following manufacturers' recommendations.
- 4.2.5 Perform diagnostics and troubleshooting on tires, wheels and rims according to manufacturers' specifications.
- 4.2.6 Perform repairs, replacement, and installation according to manufacturers' recommendations.

**Learning Content:**

- 4.2.1 Define the purpose and fundamentals of tires, wheels, and rims.  
[0.5/0]
  - history and development
    - split rims
    - safety cages
  - torquing wheel nuts
  - effects of water (hydroplaning)
  - sliding and rolling friction
  - tire sizes, load rating

- static and dynamic balance
- tread wear depth minimum
- tire and rim matching
- tire materials

4.2.2 Identify and describe the functions, construction, composition, types, styles and applications of tires, wheels and rims.

[1/0]

- tires, wheel and hubs for towed vehicles
- tire materials
- tire tread designs
- bias tire
- run-flat tires
- balancing
- air pressure
- tread design and traction
- valves
- valve extensions
- caps
- wheel discs
- wheel liners
- spacers
- balance weights
- sensors and related components
- fastening and mounting devices

4.2.3 Explain the principles of operation of tires, wheels and rims.

[2.5/0]

- tire static and dynamic balance
- tire action under various operating conditions
- bias ply applications
- radial applications
- tires, wheel and hubs for towed vehicles
- tire materials
- tire tread designs
- run-flat tires
- balancing
- air pressure
- tread design and traction
- valves



- valve extensions
- caps
- wheel discs
- wheel liners
- spacers
- balance weights
- sensors and related components
- fastening and mounting devices

4.2.4 Perform inspection, testing and diagnostic procedures on tire and rim assemblies following manufacturers' recommendations  
[0/0.5]

- tire type mixing
- tire ratings and size
- perform tire, wheel, and rim safety inspection
- visual inspection
  - radial and lateral run-out
  - tire matching for dual application
  - tire condition
  - wear
  - defects
  - corrosion
- physical inspection
  - overheated components
  - loose, missing, damaged parts
  - contamination
  - tire pressure and leaks
  - vibration
  - noise
  - cracks and fractures
  - tire matching
  - measure radial and lateral wheel and tire run-out
- air pressure precautions
- vehicle lift and support precautions
- torque wrench
- tire gauge

4.2.5 Perform diagnostics and troubleshooting on tires, wheels and rims according to manufacturers' specifications.

[0/0.5]

- determine factors that affect tire wear
- determine factors that cause cord separation
- use inspection/testing techniques
- use diagnostic equipment
- consult appropriate resource materials (workplace drawings, manuals)
- use computer for research where relevant

4.2.6 Perform repairs, replacement, and installation according to manufacturers' recommendations.

[0/1]

- observe static and dynamic wheel assembly balance
  - mechanical
  - computer-assisted
- removal and installation of tire on rim
- observe recommended tire repair procedures
- tire type mixing and rotation
- wheel bearing pre-load and end-play
- verify integrity of repairs and operations

<b>Evaluation Structure</b>			
Theory Testing	Practical Application Exercises	Research Project	Notebook and Organizational Skills
50%	30%	10%	10%

Number:	5		
<b>Title:</b>	<b>Plumbing and Gas Systems 1b</b>		
Duration:	Total Hours: 24	Theory: 12	Practical: 12
Prerequisites:	Level 1: Unit 1, 2		
Co-requisites:	None		

5.1 Plumbing I

24 Total Hours      Theory: 12 hours      Practical: 12 hours

Number:	5.1		
Title:	<b>Plumbing I</b>		
Duration:	Total Hours: 24	Theory: 12	Practical: 12
Cross Reference to Training Standard: 6068			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, construction, principles of operation, inspection, diagnosis and repair of plumbing systems.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 5.1.1 Define the purpose and fundamentals of plumbing systems.
- 5.1.2 Identify and describe the construction, types, styles, and application of plumbing system components.
- 5.1.3 Explain the operating principles of plumbing systems.
- 5.1.4 Perform inspection and testing procedures on plumbing systems following manufacturers' recommendations.
- 5.1.5 Perform diagnostics and troubleshooting on plumbing systems according to manufacturers' specifications.
- 5.1.6 Perform assigned operations for the following as to manufacturers' recommendations.

**Learning Content:**

- 5.1.1 Define the purpose and fundamentals of plumbing systems.  
[2/0]
  - history
  - industry changes
  - water systems
    - fresh (potable, city) water
    - black (waste) water
    - grey water

- chemicals used in waste systems
  - changes
  - environmental

5.1.2 Identify and describe the construction, types, styles, and application of plumbing system components.

[3/0]

- toilets
- sinks
- showers, tubs
- drains
- flushing systems
  - vacuum
  - gravity
- pipes
  - copper
  - plastic
  - PVC (ABS)
  - tubing
- vents
- caps
- fittings
- clamps
- insulation systems
  - tank heating
  - heat tape
- valves
  - gate
  - globe
  - ball
  - angle
- freeze protection devices and fluids
- REVIEW AS NECESSARY:
  - regulators
  - lines
  - hoses
  - manifolds
  - seals
  - gaskets
  - tanks

5.1.3 Explain the operating principles of plumbing systems.  
[7/0]

- cold water and hot water (as relevant)
- drain waste
- drain venting
  - wet
  - dry
- city water connections
- holding tank waste and vents
- holding tanks
- freshwater tanks
- float valves
- gravity tanks
- vacuum waste system
- p-traps
- freeze protection devices and fluids
- toilets
- sinks
- showers, tubs
- drains
- flushing systems
  - vacuum
  - gravity
- pipes
  - copper
  - plastic
  - PVC (ABS)
  - tubing
- vents
- caps
- fittings
- clamps
- insulation systems
  - tank heating
  - heat tape
- valves
  - gate
  - globe
  - ball
  - angle

- REVIEW AS NECESSARY:
  - regulators
  - lines
  - hoses
  - manifolds
  - seals
  - gaskets
  - tanks

5.1.4 Perform inspection and testing procedures on plumbing systems following manufacturers' recommendations.  
[0/4]

- visual and physical inspection
  - temperature
  - pressure
  - worn, loose, missing, damaged, defective parts
  - leaks
  - levels
  - flows
  - venting
  - corrosion
  - vibration
  - noise
  - misalignment
  - odours
  - colour
- use appropriate gauges

5.1.5 Perform diagnostics and troubleshooting on plumbing systems according to manufacturers' specifications.  
[0/3]

- use inspection/testing techniques
- consult appropriate resource materials (workplace drawings, manuals)
- use computer for research where relevant

5.1.6 Perform assigned operations for the following as to manufacturers' recommendations.  
[0/5]

- maintain, repair, replace, install common RV plumbing operations
  - replace toilet valves
- flow direction
- winterization processes/bypass operation
  - refrigerators, washing machines, appliances
- verify operations

Number:	6		
<b>Title:</b>	<b>Welding Practices 1</b>		
Duration:	Total Hours: 48	Theory: 18	Practical: 30
Prerequisites:	Level 1: Unit 1, 2		
Co-requisites:	None		

6.1 Oxy-Fuel Heating and Cutting

48 Total Hours      Theory: 18 hours      Practical: 30 hours



Number:	6.1		
Title:	<b>Oxy-Fuel Heating and Cutting</b>		
Duration:	Total Hours: 48	Theory: 18	Practical: 30
Cross Reference to Training Standard: 6065, 6071, 6074			

**General Learning Outcome:**

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a working knowledge of the purpose, construction, safe operating principles, inspection and usage of oxy-fuel equipment for heating and cutting.

**Learning Outcomes:**

Upon successful completion, the apprentice is able to:

- 6.1.1 Define the purpose and fundamentals of heating and cutting practices.
- 6.1.2 Describe the functions, construction, types, styles, and application of oxy-fuel welding equipment.
- 6.1.3 Describe the functions, construction, types, styles, and application of structures and devices that require welding on RVs.
- 6.1.4 Explain the safe operating principles of oxy-fuel welding equipment.
- 6.1.5 Perform inspection and testing procedures on unit parts following manufacturers' recommendations.
- 6.1.6 Perform diagnostics and troubleshooting on oxy-fuel welding equipment and unit parts according to manufacturers' specifications.
- 6.1.7 Perform assigned operations for the following as to manufacturers' recommendations.

**Learning Content:**

6.1.1 Define the purpose and fundamentals of heating and cutting practices.

[2/0]

- fuel
  - acetylene
  - propane
- history
- basic metallurgy
  - frames and chassis
- flames
  - primary
  - secondary
  - oxidizing
  - neutral
  - carbonizing
- oxy-fuel
- plasma cutters
- fundamental safety issues

6.1.2 Describe the functions, construction, types, styles, and application of oxy-fuel welding equipment.

[4/0]

- tanks
- identification features
- fittings
- pressure regulators
- tips
- oxyacetylene valves
- manual valves
- gauges
- heating and cutting
- hoses
- wire brushes
- descalers
- abrasives
- fire retardant shielding

6.1.3 Describe the functions, construction, types, styles, and application of structures and devices that require welding on RVs.

[4/0]

- full and space frame structures
- sheet metal parts
- fastening and mounting devices
- galvanized and conventional metals
- high strength steel
- aluminum
- heavy gauge steel frames and assemblies

6.1.4 Explain the safe operating principles of oxy-fuel welding equipment.

[8/0]

- storage
- pressure settings
- fire extinguisher availability
- safety protection (eye, face, hand, foot, clothing)
- setup sequence
- ignition sequence
- shutdown sequence
- cylinder handling
- fire prevention
- flammable container precautions
- tanks
- identification features
- fittings
- pressure regulators
- tips
- oxyacetylene valves
- manual valves
- gauges
- heating and cutting
- hoses
- wire brushes
- descalers
- abrasives
- fire retardant shielding

6.1.5 Perform inspection and testing procedures on unit parts following manufacturers' recommendations.

[0/3]

- visual and physical inspection
  - pressure
  - cracks
  - leaks
  - foreign matter
  - wear
  - proper setting
  - connections
  - obstructions
  - burns
  - loose and missing parts
  - distortion
  - bends
  - misalignment
  - dents
  - seized parts
- use appropriate gauges

6.1.6 Perform diagnostics and troubleshooting on oxy-fuel welding equipment and unit parts according to manufacturers' specifications.

[0/3]

- use inspection/testing techniques
- consult appropriate resource materials (workplace drawings, manuals)
- use computer for research where relevant

6.1.7 Perform assigned operations for the following as to manufacturers' recommendations.

[0/24]

- install/remove
- heating/cutting seized nuts and bolts
- heating frame assemblies
- attaching/removing hitches
- cutting operations
- fabricating
- checking for distortion, damage to surrounding area
- recommend service
  - sub-trade referral (decision)
- verify integrity of operations

<b>Evaluation Structure</b>			
Theory Testing	Practical Application Exercises	Research Project	Notebook and Organizational Skills
30%	50%	10%	10%

## Reference Material

The following reference materials as listed are suggestions for resource materials. This is not a definitive list, nor is it mandatory. Additional reference material may be employed, particularly manufacturer-specific resource materials, including pamphlets and videos.

### **Trailer Life's Repair and Maintenance Manual**

Livingston, ISBN 0-934798-70-2

### **Automotive Mechanics**

Tenth Edition, Crouse and Anglin. ISBN 0-02-800943-6

### **Basic Blueprint Reading and Sketching**

6th Edition, Olivio. ISBN 0-8273-5740-0

### **Basic Wiring for Canada**

Creative Homeowner Press, ISBN 1-58011-018-5

### **Modern Plumbing**

Blankenbaker, ISBN 0-87006-939-X

### **Auto Body Repair and Refinishing**

3rd Edition, Hogg. ISBN 0-07-548869-8

### **Practical Heating Technology**

Johnson. ISBN 0-8273-4881-9

### **Impact: A Guide to Business Communications**

3rd Edition, Northey. ISBN 0-13-452541-8

**CSA 240 RV Standard Code Book** – can be ordered on-line at [www.csa.com](http://www.csa.com).

Product ID number: 2411671

**Ontario Propane Code Books** – distributed through CSA  
*Natural Gas and Propane Installation Code (B149.1-00)*  
*Propane Storage and Handling Code*

### **RVIA Technical Series**

printed and distributed through Okanagan University College in B.C.

### **Getting Started in Electronics**

Radio Shack book, Mims, catalogue #: 276-5003a

## Suggested Minimum Equipment List for Training Delivery Agencies

### Ontario RV Technician Apprenticeship Program

<b>Power Sources and Equipment</b>	<b>Number of Apprentices for Each Tool</b>
Oxy-Fuel-Gas Manual Cutting equipment	1

<b>Basic Hand Tools and Equipment</b>	<b>Number of Apprentices for Each Tool</b>
Hammer	1
Side Cutters	1
Chipping Hammer	1
Vise Grips	1
Screwdrivers (set)	1
Wrenches (set)	1
Ratchets	1
Sockets (set)	1
Wire Brush	2
Hacksaw/Saws	2
Punches (set)	2
Pliers (set)	3
Pipe Cutters (copper/plastic)	3
Plane	3
Cold Chisel/Chisels (set)	4
Vise	4
Scalers	4
Disc Grinders	4
Flaring Tool	4
Tube Bender	4
Clamps (set)	4
Files (set)	4
Augers (set)	4
Rivet Gun	4
Nut Drivers (set)	4
Allen Keys – Wrench Set	4
Wheel Grinders	5
Hole Saw Kit	5
Cotter Pin Puller	5
Tin Snips (set)	5

### Optional Hand Tools

Shears/Nibblers

### Power Tools

### Number of Apprentices for Each Tool

Wheel Grinders	3
Disc Grinders	3
Drills (Battery & 110v)	3
Bench Grinders	4
Rivet Guns	4
Sanders	4
Abrasive Cut-Off Saws	5
Die Grinders	5
Air Tools (assorted)	5
Drill Presses	5
Electric Impact Wrenches	5
Routers	5
Nibblers (Handheld)	10
Planes	10
Battery Charger	10
Chisels	20
Electric Saws (skill, table, radial, mitre, and band)	20

### Optional/As Required Power Tools

Air Compressor  
 Electric Pipe Cutters  
 Threading Machines  
 Augers

### Specialty Tools

### Number of Apprentices for Each Tool

Crimping Tools	2
Pop Rivet Kit	4
Wheel Seal Puller	5
Butane Soldering Equipment	5
Venturi Cleaning Brush (flue-baffle)	5
Pressure Relief Valve Tool	10
Gas Valve Tool	10
Awning Spring Wind Tool	20
Awning Rail Straightener Tool	20
Antenna Tool	20
Ring Seater Tool (Atwood Hot Water Tanks)	20



**Related Equipment, as required**

Extension Cords  
Testing Devices  
Hydraulic Equipment and Fluid Levels  
Hoists and Jacks  
Mechanical Stands  
Ladders  
Scaffolds  
Fastening and Mounting Devices

**Precision Measuring Tools  
& Diagnostic Equipment**

**Number of Apprentices for Each Tool**

Measuring Tape	1
Ruler	1
Multimeter	1
Micrometers (Inside, Outside, Depth)	2
Vernier Caliper	2
Test Lights (12-volt)	2
Torque Wrench	3
Calipers	4
Dial Indicators	4
Level	4
Pressure Gauge	4
Bubble Solution (Leak Detector)	4
A/C D/C amp clamps	4
Straight Edges	5
CO detector	5
Digital Pocket Thermometer	5
Monometer	10
Hydrometer	10
Load Tester	10
Universal Gauge (set)	10
Gas Pressure Gauge (Low Pressure Test Set)	10
HWH High Pressure Fluid gauge	10
Vacuum Gauge	10
Electronic Leak Detector	10
Glass Thermometer	10
Electronic Thermometer (thermocouple and thermistor sensors)	10
Non-Contact Infra-Red Thermometers	10
Dometic PAL RV Appliance Diagnostic Kit	10

## Recreational Vehicle Technician

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Fenwal Gas Ignition Field Tester	10
Tekonsha Circuit Testers	10
Combustionable Gas Detector	20
Handheld Gas Leak Detector	20
Kwik Test (Electric Step Tester)	20
Tekonsha Brake Control Tester	20

### **Safety Equipment**

### **Number of Apprentices for Each Tool**

Goggles	1
Earplugs (sound suppression devices)	1
Masks	1
Gloves	1
Safety Glasses	1
Face Shields	3
Respirators	4
Safety Harness	4
Fire Blankets	5
Fire Extinguisher	5
Safety Cage (optional)	

### **Resource Materials, as required**

Codebooks  
Engineering Specifications  
Manufacturer's Specifications, manuals and charts  
Safety Manuals

### **Additional Equipment**

### **Number of Apprentices for Each Tool**

Computer Workstation	1
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### **Personal and Safety Equipment**

Personal protective equipment is at the discretion of the TDA who must conform to Ontario Provincial Health and Safety Regulations.

RV Technician apprentices may supply their own work clothing, boots, coveralls, and prescription safety glasses.

Items such as hard hats, eye and hearing protection, and all other tools are frequently the responsibility of the employer.

Resource materials, charts, regulations, specifications, service bulletins, manufacturers' manuals, and logbooks are supplied by the employer or equipment owner.



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Recreation Vehicle Service Technician