

Red Seal Occupational Standard

Recreation Vehicle Service Technician



red-seal.ca
sceau-rouge.ca



Red Seal Occupational Standard

Recreation Vehicle Service Technician



Title: Recreation Vehicle Service Technician

This publication is available for download at canada.ca/publiccentre-ESDC. It is also available upon request in multiple formats (large print, Braille, MP3, audio CD, e-text CD, DAISY, or Accessible PDF), by contacting 1 800 O-Canada (1-800-622-6232). By teletypewriter (TTY), call 1-800-926-9105.

© Her Majesty the Queen in Right of Canada, 2022

For information regarding reproduction rights: droitdauteur.copyright@HRSDC-RHDCC.gc.ca.

PDF

Cat. No.: Em15-3/38-2022E-PDF

ISBN/ISSN: 978-0-660-44673-8

Foreword

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Red Seal Occupational Standard (RSOS) as the Red Seal standard for the recreation vehicle service technician trade.

Background

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to cooperate with provincial and territorial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. Employment and Social Development Canada (ESDC) sponsors the Red Seal Program, which, under the guidance of the CCDA, develops a national occupational standard for each of the Red Seal trades.

Standards have the following objectives:

- to describe and group the tasks performed by skilled workers;
- to identify which tasks are performed in every province and territory;
- to develop instruments for use in the preparation of Interprovincial Red Seal Examinations and assessment tools for apprenticeship and certification authorities;
- to develop common tools for apprenticeship on-the-job and technical training in Canada;
- to facilitate the mobility of apprentices and skilled workers in Canada;
- to supply employers, employees, associations, industries, training institutions and governments with occupational standards.

Any questions, comments, or suggestions for changes, corrections, or revisions to this standard or any of its related products may be forwarded to:

Trades and Apprenticeship Division
Apprenticeship and Sectoral Initiatives Directorate
Employment and Social Development Canada
140 Promenade du Portage, Phase IV, 6th Floor
Gatineau, Quebec K1A 0J9

Acknowledgements

The CCDA and ESDC wish to express sincere appreciation for the contribution of the many tradespersons, industrial establishments, professional associations, labour organizations, provincial and territorial government departments and agencies, and all others who contributed to this publication.

Special thanks are offered to the following representatives who contributed greatly to the original draft of the standard and provided expert advice throughout its development:

Heather Arthurson	Manitoba
Brian Boomer	Nova Scotia
Jordan Hill	British Columbia
Jon Itterman	British Columbia
Michael Jaecques	Ontario
Mitchell Peterson	Saskatchewan
William (Bill) Richardson	Ontario
Matthew Schaan	Saskatchewan

This standard was prepared by the Apprenticeship and Sectoral Initiatives Directorate of ESDC. The coordinating, facilitating and processing of this standard were undertaken by employees of the standards development team of the Trades and Apprenticeship Division and of Alberta, the host jurisdiction for this trade.

Structure of the Occupational Standard

This standard contains the following sections:

Methodology: an overview of the process for development, review, validation and weighting of the standard

Description of the Recreation Vehicle Service Technician trade: an overview of the trade's duties, work environment, job requirements, similar occupations and career progression

Trends in the Recreation Vehicle Service Technician trade: some of the trends identified by industry as being the most important for workers in this trade

Skills for Success Summary: an overview of how each of the skills for success (formerly called essential skills) is applied in this trade

Roles and Opportunities for Skilled Trades in a Sustainable Future: an overarching description of how in the context of climate change, skilled trades play a large role in implementing solutions and adjusting to changes in the world. In addition to highlighting the importance of this awareness, the standard may also contain more details on activities, skills and knowledge elements that are specific to the trade

Industry Expected Performance: description of the expectations regarding the level of performance of the tasks, including information related to specific codes, regulations and standards that must be observed

Language Requirements: description of the language requirements for working and studying in this trade in Canada

Pie Chart of Red Seal Examination Weightings: a graph which depicts the national percentages of exam questions assigned to the major work activities

Task Matrix: a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard and the national percentages of exam questions assigned to the major work activities and tasks

Harmonization of Apprenticeship Training: the aspects of apprenticeship training that participating provinces and territories have agreed upon to substantively align apprenticeship systems across Canada

Major Work Activity (MWA): the largest division within the standard that is comprised of a distinct set of trade activities

Task: distinct actions that describe the activities within a major work activity

Task Descriptor: a general description of the task

Sub-task: distinct actions that describe the activities within a task

Skills:

Performance Criteria: description of the activities that are done as the sub-task is performed

Evidence of Attainment: proof that the activities of the sub-task meet the expected performance of a tradesperson who has reached journeyperson level

Range of Variables: elements and examples (not all inclusive) that provide a more in-depth description of a term used in the performance criteria and evidence of attainment

Knowledge:

Learning Outcomes: describes what should be learned relating to a sub-task while participating in technical or in-school training

Learning Objectives: topics to be covered during technical or in-school training in order to meet the learning outcomes for the sub-task

Range of Variables: elements and examples (not all inclusive) that provide a more in-depth description of a term used in the learning outcomes and learning objectives

Appendix A – Acronyms: a list of acronyms used in the standard with their full name

Appendix B – Tools and Equipment / Outils et équipement: a non-exhaustive list of tools and equipment used in this trade

Appendix C – Glossary / Glossaire: definitions or explanations of selected technical terms used in the standard

Methodology

Development of the Standard

A draft standard is developed by a broad group of trade representatives, including tradespeople, instructors and employers at a National Workshop led by a team of facilitators. This draft standard breaks down all the tasks performed in the occupation and describes the knowledge and abilities required for a tradesperson to demonstrate competence in the trade.

Harmonization of Apprenticeship Training

An analysis of all provinces' and territories' apprenticeship programs is performed and recommendations are made on harmonizing the name of the trade, the hours of training required and the number of levels of training. Provinces and territories consult with their respective industry stakeholders on these elements and revisions are discussed until consensus is reached. Following the development of the workshop draft of the RSOS, participants discuss and come to consensus on the sequence of training topics, as expressed in the new standard. Their sequencing recommendations are reviewed by stakeholders in participating provinces and territories and further discussions are convened to reach consensus and to identify any exceptions.

Online Survey

Stakeholders are asked to review and validate the activities described in the new standard via an online survey. These stakeholders are invited to participate in this consultation through apprenticeship authorities, as well as national stakeholder groups.

Draft Review

The RSOS development team forwards a copy of the standard and its translation to provincial and territorial authorities who consult with industry representatives to review it. Their recommendations are assessed and incorporated into the standard.

Validation and Weighting

Participating provinces and territories also consult with industry to validate and weight the document for the purpose of planning the makeup of the Red Seal Interprovincial Examination for the trade. They validate and weight the major work activities (MWA), tasks and sub-tasks, of the standard as follows:

MWA	Each jurisdiction assigns a percentage of questions to each MWA for an examination that would cover the entire trade.
Tasks	Each jurisdiction assigns a percentage of exam questions to each task within a MWA.
Sub-Tasks	Each jurisdiction indicates, with a YES or NO, whether or not each sub-task is performed by skilled workers within the occupation in its jurisdiction.

The results of this exercise are submitted to the RSOS development team who then analyzes the data and incorporates it into the document. The RSOS provides the individual jurisdictional validation results as well as the national averages of all responses. The national averages for MWA and task weighting guide the Interprovincial Red Seal Examination plan for the trade.

The validation of the RSOS is used to identify common core sub-tasks across Canada for the occupation. If at least 70% of the responding jurisdictions' industry performs a sub-task, it shall be considered common core. Interprovincial Red Seal Examination questions are limited to the common core sub-tasks identified through this validation process.

Definitions for Validation and Weighting

YES	sub-task performed by qualified workers in the occupation in that province or territory
NO	sub-task not performed by qualified workers in the occupation in that province or territory
NV	standard <u>N</u> ot <u>V</u> alidated by that province or territory
ND	trade <u>N</u> ot <u>D</u> esignated in a province or territory
Not Common Core (NCC)	sub-task, task or MWA performed less than 70% of responding jurisdictions; these will not be tested by the Interprovincial Red Seal Examination for the trade
National Average %	average percentage of questions assigned to each MWA and task in Interprovincial Red Seal Examination for the trade

Provincial/Territorial Abbreviations

NL	Newfoundland and Labrador
NS	Nova Scotia
PE	Prince Edward Island
NB	New Brunswick
QC	Quebec
ON	Ontario
MB	Manitoba
SK	Saskatchewan
AB	Alberta
BC	British Columbia
NT	Northwest Territories
YT	Yukon Territory
NU	Nunavut

Description of the Recreation Vehicle Service Technician Trade

“Recreation Vehicle Service Technician” is this trade’s official Red Seal occupational title approved by the CCDA. This standard covers tasks performed by a recreation vehicle service technician.

Recreation vehicle (RV) service technicians work on systems and components of recreation vehicles, including electrical components, plumbing, liquefied petroleum (LP) 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 them. However, it is important to note that they do not work on the motor or drive train components.

Recreation vehicles serviced in this trade include: class A, B, B+ and C motorhomes, travel trailers, fifth wheel trailers, park model trailers, truck campers and pop-up camping trailers. RV service technicians also work on toy haulers, utility trailers, flat deck trailers, construction living trailers and an assortment of mobile vehicles.

While recreation vehicle service technicians are experienced in all facets of the trade, many may develop specialized skills in areas such as electronics, appliances, hitching systems, and interior and exterior finishing.

Recreation vehicle 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, and under vehicles.

Some important attributes include service, mechanical and mathematical skills, manual dexterity, an ability to plan and think sequentially and an ability to work as a team member. Customer relations skills are critical when providing on-site services. Sales skills are required when performing maintenance tasks and assisting customers with making decisions related to repair options.

The functions of recreation vehicle service technicians may overlap with a number of other trades such as parts technician, automotive service technician, construction electrician, plumber, gasfitter, carpenter, floorcovering installer, sheet metal worker, refrigeration and air conditioning mechanic, welder, auto body and collision technician, and appliance service technician.

Experienced recreation vehicle service technicians may advance to supervisory or training positions. They may also move into positions with manufacturers, wholesalers and sales divisions of RV dealerships.

Trends in the Recreation Vehicle Service Technician Trade

Technology

Many RVs have new communications technology such as Wi-Fi boosters, Bluetooth and smart technology controlled using manufacturers' apps on customers' personal devices. New digital interfaces in RVs are common. Technicians need to use manufacturers' digital updating tools to install and update these interfaces. There are also specialized tools that are needed to install and repair these devices.

Power levelling systems in RVs are popular with features such as remote, touch pad and automatic controls.

Tools and Equipment

Computerized testing equipment, including the use of handheld diagnostic computers, is becoming more popular. Training in the use of electronics, computerized systems and schematics is required.

The use of portable electronic devices for accessing and documenting information is becoming prevalent. Computerized testing equipment is becoming a requirement in the work place.

Products/Materials

RVs are being constructed from more environmental friendly and lightweight construction materials.

Appliances are often remote controlled and self-diagnosing. Electronic components are becoming smaller and self-diagnostics are being integrated into the controls, resulting in easier diagnosis. The use of light emitting diodes (LEDs) is increasing.

Self-ignition systems are more common in propane-fueled appliances.

Solar panels and inverters are more common in RVs, both as standard manufacturers' equipment and after-market add-ons.

There is an increased use of residential style conveniences in RVs such as multi-media, satellite systems, refrigerators, electric fireplaces, modern furniture, automated and remote control conveniences. On-demand water heaters are also becoming more common.

There is an increase in the use of spread axle configurations which provides a smoother ride and less tongue weight on the tow vehicle. The popularity of short box tow vehicles continues to grow and is resulting in an increase in more complex fifth wheel hitches and pin boxes. New technology in brake systems is advancing towards wireless connections. There is increasing popularity of factory installed braking and hitching systems on tow vehicles.

Environmental

Environmentally friendly products and components are making their way on the market, helping to reduce water consumption and waste.

There is increased industry attention and government legislation around the handling and disposal of hazardous waste, recyclables and other waste materials.

Other

More training options are becoming available to technicians including blended learning which combines e-learning and formal classroom training. There is an increase in knowledge requirements and a need for specialized training.

Skills for Success Summary

Skills for Success are needed in a quickly changing world for work, learning and life. They are foundational for building other skills and important for effective social interaction. Everyone benefits from having these skills as they help individuals get a job, progress at their current job and change jobs. They also help individuals become active members of their community and succeed in learning.

Through extensive research and consultations, the Government of Canada launched the new Skills for Success model renewing the previous Essential Skills framework to better reflect the needs of the current and future labour market.

The summary presented here is based on existing Essential Skills profiles and will be updated to align with the new [Skills for Success model](#) over time.

Reading

Recreation vehicle service technicians read labels on products and decals on equipment for instructions. They read code books, service bulletins, technical update sheets, work orders and recall notices from manufacturers. They also read service memos, warranty information, emails, texts, and notes from customers describing a problem. Recreation vehicle service technicians also read manuals for training purposes for example, when learning how to repair new or unfamiliar systems, or equipment.

Document Use

Recreation vehicle service technicians refer to Workplace Hazardous Materials Information System (WHMIS) labels and Safety Data Sheets (SDS) for information on how to handle, dispose of or mix products. They refer to code books, charts, checklists and work orders. They also refer to these work orders to determine what repairs need to be done. Recreation vehicle service technicians complete work orders, including information about problems encountered, the cause and how the issues were resolved. They also complete time sheets to record or track tasks done from a number of work orders.

Recreation vehicle service technicians may draw or read sketches to clarify steps in a procedure, refer to troubleshooting charts to diagnose a problem, or refer to wiring schematics, assembly diagrams and blueprints when installing equipment. They may also be required to take photos of equipment and service work for recordkeeping purposes.

Writing

Recreation vehicle service technicians write notes to themselves, other co-workers and service managers about job details, customer requests or supplies. They enter information in work orders to keep a record of tasks done for warranty purposes. They also write the reasons for recommending a particular procedure. They may also write warranty reports.

Oral Communication

Recreation vehicle service technicians call suppliers to obtain information about products. They also talk to other staff to clarify orders, to discuss complex repair problems and to provide explanations of service. They communicate with customers to explain features and to demonstrate proper operation of a system. They also explain and present repair options. This communication is done with tact and respect for customers. Recreation vehicle service technicians may also instruct and direct the work and learning of apprentices in the shop.

Numeracy

Recreation vehicle service technicians measure size and location openings for appliances and accessories. They also measure weights, voltage, amperage, resistance and pressures using various tools and equipment such as scales, multimeters and gauges. They develop material lists based on this information. They may also estimate how much time it will take to complete various jobs.

Thinking

Recreation vehicle service technicians use problem solving skills to assess problems with the vehicle and its components. They consider information provided to them by the customer to determine causes of a malfunction. They often depend on their experience, knowledge and observations to diagnose and repair problems as service manuals may not cover all possible issues. They may have to design replacement pieces that are no longer available. They also carry out detailed troubleshooting techniques to deal with unexpected problems or unique difficulties, for example when making customized changes to a recreation vehicle, when diagnosing recurring electrical failures or when locating the source of a leak. They research information using service manuals and online resources, contact manufacturers' technical support lines, or consult with co-workers to help resolve problems.

Recreation vehicle service technicians use decision making skills to decide which tools and supplies to use. They also decide what repair or reconstruction to recommend taking into consideration time, cost and safety.

Working with Others

Recreation vehicle service technicians work as part of a team which includes other technicians, service managers, salespersons, parts technicians, supervisors and support staff. However, they usually work independently on the particular unit assigned to them. They coordinate tasks with others as necessary and sometimes work with a partner, for example, when installing awnings and construction repair.

Digital Technology

Recreation vehicle service technicians may use computer applications. For example, they may use handheld diagnostic tools. They may have access to service and repair information through online resources. They may also use point of sale software.

Continuous Learning

Recreation vehicle service technicians learn continuously through hands-on experience with a range of repairs. They learn from co-workers as a first resource. They participate in training courses and access materials provided by manufacturers and suppliers. Recreation vehicle service technicians also consult with their customers who can give the history of their recreation vehicle.

Roles and Opportunities for Skilled Trades in a Sustainable Future

Climate change affects all of us. Trades play a large role in implementing solutions and adjusting to changes in the world.

Throughout this standard, there may be specific references to tasks, skills and knowledge that clearly show this trade's role in a more sustainable future. Each trade has different roles to play and contributions to make in their own way.

For example:

- Construction tradespeople need to consider the materials they are using, building methods, and improvements to mechanical and electrical installations. There are important changes to codes and standards to help meet the climate change goals and commitments set for 2030 and 2050. Retrofits and new construction of low-energy buildings provide enormous opportunities for workers in this sector. Concepts, such as energy efficiency and regarding buildings as systems are foundational.
- Automotive and mechanical trades are seeing a shift towards the electrification of vehicles and equipment. As a result, new skills and knowledge will be required for tradespeople working in this sector. There are mandates for sales of new light-duty zero-emission vehicles (ZEV) in Canada, with the goal of achieving 100% ZEV sales by 2035. Due to this mandate, the demand for these vehicles is growing quickly among consumers and fleets. With this escalating demand, the need for skilled workers to maintain and repair these vehicles is also increasing.
- In industrial and resource sectors, there is pressure to move towards increased electrification of industrial processes. Many industrial and commercial facilities are also being upgraded to improve energy efficiency in areas such as lighting systems, and new production processes and technologies. There are also opportunities in carbon capture, utilization and storage (CCUS), as well as the production and export of low-carbon hydrogen.
- Trades in the service sector may also need to be aware of responsible sourcing, as well as efficient use of products and materials. New ways of working better are always a part of the job.

There are fast-moving changes in guidelines, codes, regulations and specifications. Many are being implemented for the purpose of energy efficiency and climate change. Those that affect specific trades may be mentioned within the standard. Examples of these guidelines and legislation include:

- The National Energy Code of Canada for Buildings (NECB).
- The Canadian Net-Zero Emissions Accountability Act (CNZEAA).
- programs that encourage sustainable building design and construction such as Leadership in Energy and Environmental Design (LEED) and the Zero Carbon Building (ZCB) standards.
- the Montreal Protocol for phasing out R22 refrigerants.

- energy efficiency programs such as ENERGY STAR.
- principles of the United Nations Declaration for the Rights of Indigenous Peoples pertaining to energy sector development.

Apprentices and tradespeople need to increase their climate literacy and reinforce their own understanding of energy issues and environmental practices. It is important for them to understand why these changes are happening and their effect on trades' work. While individual tradespeople and apprentices may not be able to choose certain elements like; the architectural design of buildings, building material selection, regulatory requirements, use of electric vehicles and technologies, they must understand the impact of using these elements in their work. Impacts include using environmentally friendly products and following requirements related to the disposal and recycling of materials.

In apprenticeship, as well as in ongoing professional development, employers and instructors should encourage learning about these concepts, why they are important, how they are implemented, and the overarching targets they are aiming to achieve.

All in all, it's about doing the work better and building a better world.

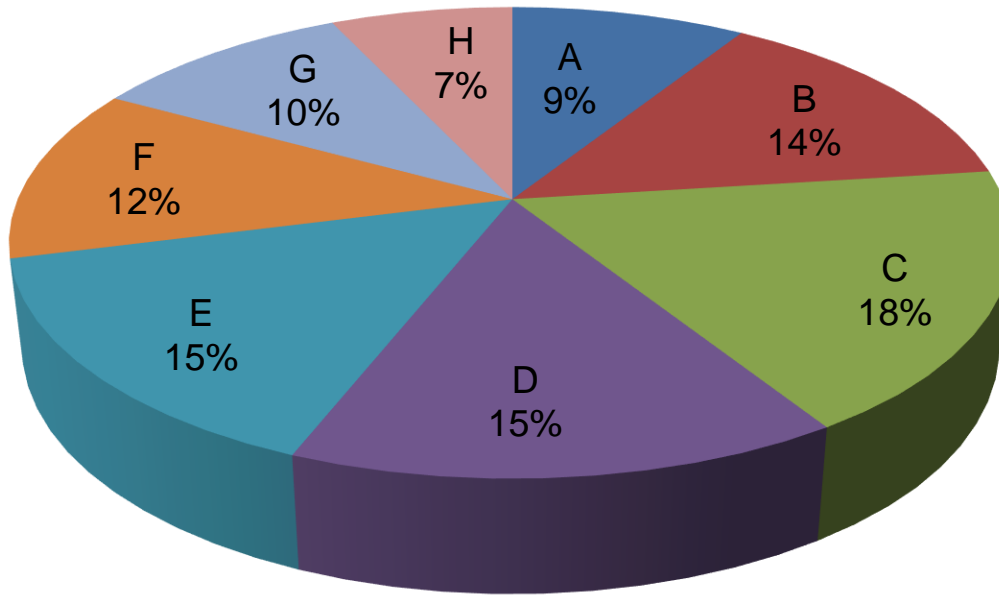
Industry Expected Performance

All tasks must be performed according to the applicable jurisdictional codes and standards. All health and safety standards must be respected and observed. Work should be performed efficiently and to a high quality without material waste or environmental damage. All requirements of employers, engineers, designers, manufacturers, customers and quality control policies must be met. At a journeyperson level of performance, all tasks must be done with minimal direction and supervision. As a journeyperson progresses in their career there is an expectation they continue to upgrade their skills and knowledge to maintain pace with industry and promote continuous learning in their trade through mentoring of apprentices.

Language Requirements

It is expected that journeypersons are able to understand and communicate in either English or French, which are Canada's official languages. English or French are the common languages of business as well as languages of instruction in apprenticeship programs.

Pie Chart of Red Seal Examination Weightings



MWA A	Common occupational skills	9%
MWA B	Plumbing systems	14%
MWA C	Electrical systems	18%
MWA D	LP gas systems	15%
MWA E	Appliances and consumer products	15%
MWA F	Interior and exterior components	12%
MWA G	Frames and mechanical components	10%
MWA H	Towing systems	7%

This pie chart represents a breakdown of the interprovincial Red Seal examination. Percentages are based on the collective input from workers from the trade from across Canada. The Task Matrix on the next pages indicates the breakdown of tasks and sub-tasks within each Major Work Activity and the breakdown of questions assigned to the Tasks. The Interprovincial examination for this trade has 120 questions.

Recreation Vehicle Service Technician

Task Matrix and Weightings

A – Common occupational skills

9%

Task A-1 Performs safety-related activities 27%	A-1.01 Uses personal protective equipment (PPE) and safety equipment	A-1.02 Maintains safe work environment	
Task A-2 Uses and maintains tools and equipment 24%	A-2.01 Uses tools and equipment	A-2.02 Uses lifting, moving and access equipment	
Task A-3 Performs common work practices and procedures 29%	A-3.01 Uses documentation	A-3.02 Identifies recalls and service bulletins	A-3.03 Performs pre-delivery inspections (PDI)
Task A-4 Uses communication and mentoring techniques 20%	A-4.01 Uses communication techniques	A-4.02 Uses mentoring techniques	

B – Plumbing systems

14%

Task B-5 Diagnoses plumbing systems 40%	B-5.01 Diagnoses potable water systems	B-5.02 Diagnoses waste water systems	
Task B-6 Services potable water systems 31%	B-6.01 Maintains potable water systems	B-6.02 Repairs potable water systems	B-6.03 Installs potable water systems
Task B-7 Services waste water systems 29%	B-7.01 Maintains waste water systems	B-7.02 Repairs waste water systems	B-7.03 Installs waste water systems

C – Electrical systems

18%

Task C-8 Diagnoses electrical systems 38%	C-8.01 Diagnoses AC electrical systems	C-8.02 Diagnoses DC electrical systems	C-8.03 Diagnoses generators
Task C-9 Services AC electrical systems 24%	C-9.01 Maintains AC electrical systems	C-9.02 Repairs AC electrical systems	C-9.03 Installs AC electrical systems
Task C-10 Services DC electrical systems 29%	C-10.01 Maintains DC electrical systems	C-10.02 Repairs DC electrical systems	C-10.03 Installs DC electrical systems
Task C-11 Services generators 9%	C-11.01 Maintains generators	C-11.02 Installs generators	

D – Liquefied petroleum (LP) gas systems

15%

Task D-12 Diagnoses LP gas systems 57%	D-12.01 Diagnoses LP gas supply systems (high pressure)	D-12.02 Diagnoses LP gas distribution systems (low pressure)	
Task D-13 Services LP gas systems 43%	D-13.01 Maintains LP gas systems	D-13.02 Repairs LP gas systems	D-13.03 Installs LP gas systems

E – Appliances and consumer products

15%

Task E-14 Diagnoses appliances 27%	E-14.01 Diagnoses water heaters	E-14.02 Diagnoses furnaces	E-14.03 Diagnoses cooktops and ranges
	E-14.04 Diagnoses refrigerators and ice makers	E-14.05 Diagnoses air conditioners and heat pumps	
Task E-15 Services water heaters 14%	E-15.01 Maintains water heaters	E-15.02 Repairs water heaters	E-15.03 Installs water heaters
Task E-16 Services furnaces 15%	E-16.01 Maintains furnaces	E-16.02 Repairs furnaces	E-16.03 Installs furnaces
Task E-17 Services cooktops and ranges 10%	E-17.01 Maintains cooktops and ranges	E-17.02 Repairs cooktops and ranges	E-17.03 Installs cooktops and ranges
Task E-18 Services refrigerators and ice makers 16%	E-18.01 Maintains refrigerators and ice makers	E-18.02 Repairs refrigerators and ice makers	E-18.03 Installs refrigerators and ice makers
Task E-19 Services air conditioners and heat pumps 12%	E-19.01 Maintains air conditioners and heat pumps	E-19.02 Repairs air conditioners and heat pumps	E-19.03 Installs air conditioners and heat pumps
Task E-20 Services consumer products 6%	E-20.01 Replaces consumer products	E-20.02 Installs consumer products	

F – Interior and exterior components

12%

Task F-21 Diagnoses interior and exterior components 44%	F-21.01 Diagnoses interior components	F-21.02 Diagnoses exterior components	
Task F-22 Services interior components 28%	F-22.01 Maintains interior components	F-22.02 Repairs interior components	F-22.03 Installs interior components
Task F-23 Services exterior components 28%	F-23.01 Maintains exterior components	F-23.02 Repairs exterior components	F-23.03 Installs exterior components

G – Frames and mechanical components

10%

<p>Task G-24 Diagnoses frames and mechanical components 34%</p>	<p>G-24.01 Diagnoses frames</p>	<p>G-24.02 Diagnoses running gear</p>	<p>G-24.03 Diagnoses levelling systems</p>
	<p>G-24.04 Diagnoses slide-out systems</p>	<p>G-24.05 Diagnoses lifting systems</p>	
<p>Task G-25 Services frames 8%</p>	<p>G-25.01 Maintains frames</p>	<p>G-25.02 Repairs frames</p>	
<p>Task G-26 Services running gear 16%</p>	<p>G-26.01 Maintains running gear</p>	<p>G-26.02 Repairs running gear</p>	
<p>Task G-27 Services levelling systems 14%</p>	<p>G-27.01 Maintains levelling systems</p>	<p>G-27.02 Repairs levelling systems</p>	<p>G-27.03 Installs levelling systems</p>
<p>Task G-28 Services slide-out systems 17%</p>	<p>G-28.01 Maintains slide-out systems</p>	<p>G-28.02 Repairs slide-out systems</p>	
<p>Task G-29 Services lifting systems 11%</p>	<p>G-29.01 Maintains lifting systems</p>	<p>G-29.02 Repairs lifting systems</p>	

H – Towing systems

7%

Task H-30 Diagnoses towing systems 51%	H-30.01 Diagnoses tow vehicle systems	H-30.02 Diagnoses towed vehicle systems	
Task H-31 Services tow vehicle systems 23%	H-31.01 Maintains tow vehicle systems	H-31.02 Repairs tow vehicle systems	H-31.03 Installs tow vehicle systems
Task H-32 Services towed vehicle systems 26%	H-32.01 Maintains towed vehicle systems	H-32.02 Repairs towed vehicle systems	H-32.03 Installs towed vehicle systems

Harmonization of Apprenticeship Training

Provincial and territorial apprenticeship authorities are each responsible for their respective apprenticeship programs. In the spirit of continual improvement, and to facilitate mobility among apprentices in Canada, participating authorities have agreed to work towards harmonizing certain aspects of their programs where possible. After consulting with their stakeholders in the trade, they have reached consensus on the following elements. Note that implementation of these elements may vary from jurisdiction to jurisdiction, depending on their own circumstances. For more information on the implementation in any province and territory, please contact that jurisdiction’s apprenticeship authority.

1. Trade Name

The official Red Seal name for this trade is Recreation Vehicle Service Technician.

2. Number of Levels of Apprenticeship

The number of levels of technical training recommended for this trade is three (3).

3. Total Training Hours

The total hours of training, including both on-the-job and in-school training for this trade is 5400.

4. Sequencing Topics and Related Sub-tasks

The topic titles in the table below are placed in a column for each apprenticeship level for technical training. Each topic is accompanied by the sub-tasks and their reference number.

Level 1	Level 2	Level 3
<p>Safety-Related Activities</p> <p>1.01 Uses personal protective equipment (PPE) and safety equipment</p> <p>1.02 Maintains safe work environment</p>		
<p>Tools and Equipment</p> <p>2.01 Uses tools and equipment</p> <p>2.02 Uses lifting, moving and access equipment</p>		
<p>Common Work Practices and Procedures</p> <p>3.01 Uses documentation</p> <p>3.02 Identifies recalls and service bulletins</p> <p>3.03 Performs pre-delivery inspections (PDI)</p>	<p>Common Work Practices and Procedures</p> <p>3.01 Uses documentation</p>	<p>Common Work Practices and Procedures*</p> <p>3.01 Uses documentation</p> <p>*For the purpose of work including estimating</p>

Level 1	Level 2	Level 3
Communication Techniques 4.01 Uses communication techniques		Mentoring Techniques 4.02 Uses mentoring techniques
Plumbing Systems (Diagnoses) 5.01 Diagnoses potable water systems 5.02 Diagnoses waste water systems		
Potable Water Systems (Services) 6.01 Maintains potable water systems 6.02 Repairs potable water systems 6.03 Installs potable water systems		
Waste Water Systems (Services) 7.01 Maintains waste water systems 7.02 Repairs waste water systems 7.03 Installs waste water systems		
	Electrical Systems (Diagnoses) 8.01 Diagnoses AC electrical systems 8.02 Diagnoses DC electrical systems	Electrical Systems (Diagnoses) 8.03 Diagnoses generators
AC Electrical Systems (Operates) 9.01 Maintains AC electrical systems	AC Electrical Systems (Services) 9.01 Maintains AC electrical systems 9.02 Repairs AC electrical systems 9.03 Installs AC electrical systems	AC Electrical Systems (Services) 9.01 Maintains AC electrical systems 9.02 Repairs AC electrical systems 9.03 Installs AC electrical systems
DC Electrical Systems (Operates) 10.01 Maintains DC electrical systems	DC Electrical Systems (Services) 10.01 Maintains DC electrical systems 10.02 Repairs DC electrical systems 10.03 Installs DC electrical systems	DC Electrical Systems (Services) 10.01 Maintains DC electrical systems 10.02 Repairs DC electrical systems 10.03 Installs DC electrical systems
		Generators (Services) 11.01 Maintains generators 11.02 Installs generators

Level 1	Level 2	Level 3
	<p>LP Gas Systems (Diagnoses) 12.01 Diagnoses LP gas supply systems (high pressure) 12.02 Diagnoses LP gas distribution systems (low pressure)</p>	
<p>LP Gas Systems (Operates) 13.01 Maintains LP gas supply systems</p>	<p>LP Gas Systems (Services) 13.01 Maintains LP gas supply systems 13.02 Repairs LP gas supply systems 13.03 Installs LP gas supply systems</p>	
	<p>Appliances (Diagnoses) 14.01 Diagnoses water heaters and components 14.02 Diagnoses furnaces and components 14.03 Diagnoses cooktops and ranges 14.04 Diagnoses refrigerators and ice makers 14.05 Diagnoses air conditioners and heat pumps</p>	<p>Appliances (Diagnoses) 14.02 Diagnoses furnaces and components 14.04 Diagnoses refrigerators and ice makers 14.05 Diagnoses air conditioners and heat pumps</p>
<p>Water Heaters (Operates) 15.01 Maintains water heaters</p>	<p>Water Heaters (Services) 15.01 Maintains water heaters 15.02 Repairs water heaters 15.03 Installs water heaters</p>	
<p>Furnaces (Operates) 16.01 Maintains furnaces</p>	<p>Furnaces (Services) 16.01 Maintains furnaces 16.02 Repairs furnaces 16.03 Installs furnaces</p>	<p>Furnaces (Services) 16.01 Maintains furnaces 16.02 Repairs furnaces 16.03 Installs furnaces</p>
<p>Cooktops and Ranges (Operates) 17.01 Maintains cooktops and ranges</p>	<p>Cooktops and Ranges (Services) 17.01 Maintains cooktops and ranges 17.02 Repairs cooktops and ranges 17.03 Installs cooktops and ranges</p>	

Level 1	Level 2	Level 3
Refrigerators and Ice Makers (Operates) 18.01 Maintains refrigerators and ice makers	Refrigerators and Ice Makers (Services) 18.01 Maintains refrigerators and ice makers 18.02 Repairs refrigerators and ice makers 18.03 Installs refrigerators and ice makers	Refrigerators and Ice Makers (Services) 18.01 Maintains refrigerators and ice makers 18.02 Repairs refrigerators and ice makers 18.03 Installs refrigerators and ice makers
Air Conditioners and Heat Pumps (Operates) 19.01 Maintains air conditioners and heat pumps		Air Conditioners and Heat Pumps (Services) 19.01 Maintains air conditioners and heat pumps 19.02 Repairs air conditioners and heat pumps 19.03 Installs air conditioners and heat pumps
Consumer Products (Operates) 20.01 Replaces consumer products 20.02 Installs consumer products		Consumer Products (Services) 20.01 Replaces consumer products 20.02 Installs consumer products
	Interior and Exterior Components (Diagnoses) 21.01 Diagnoses interior components 21.02 Diagnoses exterior components	
	Interior Components (Services) 22.01 Maintains interior components 22.02 Repairs interior components 22.03 Installs interior components	
	Exterior Components (Services) 23.01 Maintains exterior components 23.02 Repairs exterior components 23.03 Installs exterior components	
Frames and Mechanical Components (Operates) 24.01 Diagnoses frames 24.02 Diagnoses running gear 24.03 Diagnoses levelling systems 24.04 Diagnoses slide-out systems 24.05 Diagnoses lifting systems		Frames and Mechanical Components (Diagnoses) 24.01 Diagnoses frames 24.02 Diagnoses running gear 24.03 Diagnoses levelling systems 24.04 Diagnoses slide-out systems 24.05 Diagnoses lifting systems

Level 1	Level 2	Level 3
Frames (Operates) 25.01 Maintains frames		Frames (Services) 25.02 Repairs frames
Running Gear (Operates/Services) * 26.01 Maintains running gear 26.02 Repairs running gear *apprentices may have basic servicing included with running gears.		
Levelling Systems (Operates) 27.01 Maintains levelling systems		Levelling Systems (Services) 27.02 Repairs levelling systems 27.03 Installs levelling systems
Slide-Out Systems (Operates) 28.01 Maintains slide-out systems		Slide-Out Systems (Services) 28.02 Repairs slide-out systems
Lifting Systems (Operates) 29.01 Maintains lifting systems		Lifting Systems (Services) 29.02 Repairs lifting systems
	Towing Systems (Diagnoses) 30.01 Diagnoses tow vehicle systems	Towing Systems (Diagnoses) 30.02 Diagnoses towed vehicle systems
Tow Vehicle Systems (Operates) 31.01 Maintains tow vehicle systems	Tow Vehicle Systems (Services) 31.02 Repairs tow vehicle systems 31.03 Installs tow vehicle systems	Tow Vehicle Systems (Services) 31.02 Repairs tow vehicle systems 31.03 Installs tow vehicle systems
Towed Vehicle Systems (Operates) 32.01 Maintains towed vehicle systems		Towed Vehicle Systems (Services) 32.02 Repairs towed vehicle systems 32.03 Installs towed vehicle systems

Major Work Activity A

Common occupational skills

Task A-1 Performs safety-related activities

Task Descriptor

Recreation vehicle service technicians must be aware of jurisdictional safety and environmental acts and regulations to recognize and address potential hazards on the job. They must be competent in the use of personal protective equipment (PPE) and safety equipment to protect themselves and others from hazards that cannot be eliminated or mitigated to safe levels.

A-1.01 Uses personal protective equipment (PPE) and safety equipment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills		
	Performance Criteria	Evidence of Attainment
A-1.01.01P	select and wear PPE	PPE is selected and worn according to job task, manufacturers' specifications, company policies and procedures, and safety acts and regulations
A-1.01.02P	locate, select and use safety equipment	safety equipment is located, selected and used according to jurisdictional requirements
A-1.01.03P	inspect PPE and safety equipment	PPE and safety equipment is inspected to identify deficiencies and hazards
A-1.01.04P	store PPE and safety equipment	PPE and safety equipment is stored according to manufacturers' specifications
A-1.01.05P	report, tag and remove defective PPE and safety equipment	defective PPE and safety equipment are reported, tagged and removed from service
A-1.01.06P	document deficiencies and hazards	deficiencies and hazards are documented according to company policies and procedures

Range of Variables

PPE includes: safety glasses, safety boots, face shields, gloves, fall protection systems, respirators and cartridges, welding shields including protective wear

safety acts and regulations include: Workplace Hazardous Materials Information System (WHMIS), Occupation Health and Safety (OH&S) Acts, Transportation of Dangerous Goods (TDG), Environmental Acts, safety authorities

safety equipment includes: eyewash stations, first aid kits, fire extinguishers, spill kits

deficiencies and hazards include: expired fire extinguishers, exposed metal on steel toe boots, contaminated eyewash stations, damaged PPE, damaged equipment

Knowledge		
	Learning Outcomes	Learning Objectives
A-1.01.01L	demonstrate knowledge of PPE and safety equipment , their characteristics, applications and operation	identify terminology associated with PPE and safety equipment
		identify types of PPE and safety equipment , and describe their characteristics, applications and operation
		identify jurisdictional safety acts and regulations
		identify location of safety equipment
A-1.01.02L	demonstrate knowledge of procedures to use PPE and safety equipment	identify types of hazards, and describe their characteristics
		describe procedures to use PPE and safety equipment
		describe safety procedures to use PPE and safety equipment
		describe procedures to document deficiencies and hazards

Range of Variables

PPE includes: safety glasses, safety boots, face shields, gloves, fall protection systems, respirators and cartridges, welding shields including protective wear

safety equipment includes: eyewash stations, first aid kits, fire extinguishers, spill kits

safety acts and regulations include: WHMIS, OH&S Acts, TDG, Environmental Acts, safety authorities

deficiencies and hazards include: expired fire extinguishers, exposed metal on steel toe boots, contaminated eyewash stations, damaged PPE, damaged equipment

A-1.02 Maintains safe work environment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

Performance Criteria		Evidence of Attainment
A-1.02.01P	verify safety guards on equipment	safety guards on equipment are verified to ensure they are in place and in full working condition
A-1.02.02P	clean up and dispose of hazards	hazards are cleaned up and disposed of according to type of hazard, and safety acts and regulations
A-1.02.03P	store explosive and chemical hazards	explosive and chemical hazards are stored according to safety acts and regulations
A-1.02.04P	recognize and address safety hazards	safety hazards are recognized and addressed according to jurisdictional regulations, and company policies and procedures
A-1.02.05P	maintain clean and organized work area	clean and organized work area is maintained according to company policies and procedures
A-1.02.06P	locate emergency exits and safety equipment	emergency exits and safety equipment are located

Range of Variables

equipment includes: saws, grinders, power tools

hazards include: solvents, debris, waste, long hair, jewellery, loose clothing, spills

safety acts and regulations include: WHMIS, OH&S Acts, TDG, Environmental Acts, safety authorities

explosive and chemical hazards include: paints, solvents, sealants, epoxies, propane tanks, oxyacetylene tanks

safety hazards include: condition of power cords, damaged electrical receptacles, damaged hand rails, damaged lifting devices

safety equipment includes: eyewash stations, first aid kits, fire extinguishers, spill kits, fall protection systems, respirators and cartridges, welding shields including protective wear

Knowledge

Learning Outcomes		Learning Objectives
A-1.02.01L	demonstrate knowledge of maintaining safe work environment	identify terminology associated with maintaining safe work environment
		identify safety equipment , and describe their characteristics, applications and procedures for use
		identify location of safety equipment

		identify hazards and describe their characteristics
		identify safety hazards and describe their characteristics
A-1.02.02L	demonstrate knowledge of procedures to maintain safe work environment	describe procedures to maintain safe work environment
		describe procedures for maintaining cleanliness in work area
A-1.02.03L	demonstrate knowledge of regulatory requirements to maintain safe work environment	identify safety acts and regulations to maintain safe work environment, and describe their characteristics and applications

Range of Variables

safety equipment includes: eyewash stations, first aid kits, fire extinguishers, spill kits, fall protection systems, respirators and cartridges, welding shields including protective wear

hazards include: solvents, debris, waste, long hair, jewellery, loose clothing, spills

safety hazards include: condition of power cords, damaged electrical receptacles, damaged hand rails, damaged lifting devices

maintaining cleanliness includes: cleaning up spills, removing debris, removing hazards

safety acts and regulations include: WHMIS, OH&S Acts, TDG, Environmental Acts, safety authorities

Task A-2 Uses and maintains tools and equipment

Task Descriptor

Recreation vehicle service technicians use and maintain tools and equipment according to manufacturers' specifications, and company policies and procedures. This results in increased production and safety of self and others, and reduced damage to materials, tools, equipment and customer property. Appropriate PPE and safety equipment are used when using access equipment to work at heights. Various types of moving, hoisting and lifting equipment are used to position RVs for service.

A-2.01 Uses tools and equipment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
A-2.01.01P	identify testing equipment requiring calibration	testing equipment that requires calibration is identified and recalibrated or replaced according to manufacturers' specifications
A-2.01.02P	clean tools and equipment	tools and equipment are cleaned according to manufacturers' specifications, and company policies and procedures
A-2.01.03P	use tools and equipment	tools and equipment are used according to manufacturers' specifications, and company policies and procedures
A-2.01.04P	organize and store tools and equipment	tools and equipment are organized and stored according to manufacturers' specifications in designated areas
A-2.01.05P	lubricate and add fluids to tools	tools are lubricated and fluids added according to manufacturers' specifications
A-2.01.06P	identify, tag, remove from service and report tools to be serviced or replaced	tools to be serviced or replaced are identified, tagged, removed from service and reported according to company policies and procedures
A-2.01.07P	document work	work is documented according to company policies and procedures

Range of Variables

tools (requiring lubrication) include: jacks, trolley jacks, pneumatic, oxy-fuel cutting equipment

Knowledge

Learning Outcomes	Learning Objectives
A-2.01.01L demonstrate knowledge of hands tools, their characteristics, applications and procedures for use	identify types of hands tools, and describe their characteristics and applications
	describe procedures to use hand tools
	identify imperial or metric tool sizes
A-2.01.02L demonstrate knowledge of portable power tools, their characteristics, applications and procedures for use	identify types of portable power tools, and describe their characteristics and applications
	describe procedures to operate portable power tools
A-2.01.03L demonstrate knowledge of specialty tools, their characteristics, applications and procedures for use	identify types of specialty tools, and describe their characteristics and applications
	describe procedures to operate specialty tools
A-2.01.04L demonstrate knowledge of stationary power tools, their characteristics, applications and procedures for use	identify types of stationary power tools, and describe their characteristics and applications
	describe procedures to operate stationary power tools
A-2.01.05L demonstrate knowledge of oxy-fuel cutting equipment, its characteristics, applications and procedures for use	identify types of oxy-fuel cutting equipment, and describe their characteristics and applications
	identify welding limitations
	describe procedures to use oxy-fuel cutting equipment
	identify jurisdictional regulations that apply to use of oxy-fuel cutting equipment
	identify training and certification requirements that apply to use of oxy-fuel cutting equipment
A-2.01.06L demonstrate knowledge of measuring tools, their characteristics, applications and procedures for use	identify types of measuring tools, and describe their characteristics and applications
	describe procedures to use measuring tools
A-2.01.07L demonstrate knowledge of diagnostic tools, their characteristics, applications and procedures for use	identify types of diagnostic tools, and describe their characteristics and applications
	describe procedures to use diagnostic tools
A-2.01.08L demonstrate knowledge of regulatory requirements to maintain safe work environment	identify safety acts and regulations to maintain safe work environment

Range of Variables

safety acts and regulations include: WHMIS, OH&S Acts, TDG, Environmental Acts, safety authorities

A-2.02 Uses lifting, moving and access equipment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
A-2.02.01P	select lifting equipment	lifting equipment is selected according to job task
A-2.02.02P	select moving equipment	moving equipment is selected according to job task
A-2.02.03P	select access equipment	access equipment is selected according to job task
A-2.02.04P	determine lifting points	lifting points are determined according to manufacturers' specifications
A-2.02.05P	operate lifting equipment	lifting equipment is operated according to manufacturers' specifications and jurisdictional regulations
A-2.02.06P	operate moving equipment	moving equipment is operated according to manufacturers' specifications and jurisdictional regulations
A-2.02.07P	assemble and disassemble access equipment	access equipment is assembled and disassembled according to manufacturers' specifications and jurisdictional regulations

Range of Variables

lifting equipment includes: forklifts, jacks (floor, hydraulic, pallet), hoists, stands, material lifts, lifting table

moving equipment includes: front end loaders, forklifts, dollies

access equipment includes: scaffolding (sectional), ladders (step ladders, multipurpose ladders, rolling step ladders)

Knowledge

	Learning Outcomes	Learning Objectives
A-2.02.01L	demonstrate knowledge of lifting equipment , their characteristics, applications and procedures for use	identify lifting equipment , and describe their characteristics and applications
		describe procedures to operate lifting equipment

A-2.02.02L	demonstrate knowledge of moving equipment , their characteristics, applications and procedures for use	identify moving equipment , and describe their characteristics and applications
		describe procedures to operate moving equipment
A-2.02.03L	demonstrate knowledge of access equipment , their characteristics, applications and procedures for use	identify access equipment , and describe their characteristics and applications
		describe procedures to use access equipment
		describe procedures to assemble and disassemble access equipment
A-2.02.04L	demonstrate knowledge of licensing requirements to use lifting and moving equipment	identify licensing requirements to use lifting and moving equipment
A-2.02.05L	demonstrate knowledge of regulatory requirements to use lifting equipment	identify regulatory requirements to use lifting equipment

Range of Variables

lifting equipment includes: forklifts, jacks (floor, hydraulic, pallet), hoists, stands, material lifts, lifting table

moving equipment includes: front end loaders, forklifts, dollies

access equipment includes: scaffolding (sectional), ladders (step ladders, multipurpose ladders, rolling step ladders)

Task A-3 Performs common work practices and procedures

Task Descriptor

Recreation vehicle service technicians interpret drawings and prints, specifications, schematics and sketches. They also receive service bulletins, recall information, perform pre-delivery inspections (PDI) and report their findings.

A-3.01 Uses documentation

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
A-3.01.01P	interpret technical documents	technical documents are interpreted to determine actions to be performed
A-3.01.02P	use business documentation	business documentation is used according to job task, and company policies and procedures
A-3.01.03P	interpret symbols, dimensions and specifications	symbols, dimensions and specifications are interpreted
A-3.01.04P	perform metric/imperial conversions	metric/imperial conversions are performed
A-3.01.05P	measure dimensions	dimensions are measured according to technical documents
A-3.01.06P	sketch modifications of repairs and installations	modifications of repairs and installations are sketched according to manufacturers' specifications
A-3.01.07P	document work	work is documented according to company policies and procedures

Range of Variables

technical documents include: drawings, prints, diagrams, schematics, flow charts, sketches

business documentation includes: work orders, estimating guides, service or repair guides, check lists, certification documents (jurisdictional requirements)

installations include: liquefied petroleum (LP) gas systems, electrical systems, structural components

Knowledge

	Learning Outcomes	Learning Objectives
A-3.01.01L	demonstrate knowledge of technical and business documents , their characteristics and applications	identify terminology associated with technical and business documents
		identify types of technical and business documents , and describe their characteristics and applications
		identify common mechanical, hydraulic, electronic and electrical symbols
		describe metric/imperial systems and conversions
A-3.01.02L	demonstrate knowledge of procedures to use and interpret technical and business documents	describe procedures to use and interpret technical and business documents

Range of Variables

technical documents include: drawings, prints, diagrams, schematics, flow charts, sketches

business documentation includes: work orders, estimating guides, service or repair guides, check lists, certification documents (jurisdictional requirements)

A-3.02 Identifies recalls and service bulletins

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
A-3.02.01P	interpret recalls and service bulletins	recalls and service bulletins are interpreted to determine servicing requirements
A-3.02.02P	verify completion of servicing	completion of servicing is verified according to manufacturers' specifications
A-3.02.03P	update service records	service records are updated to reflect compliance with recalls and service bulletins according to company policies and procedures
A-3.02.04P	document work	work is documented according to company policies and procedures

Range of Variables

recalls and service bulletins include: National Transportation Safety Board (NTSB), manufacturer, Canadian Safety Authority (CSA), Canadian Electrical Code (CEC), jurisdictional safety authorities

Knowledge

	Learning Outcomes	Learning Objectives
A-3.02.01L	demonstrate knowledge of recalls and service bulletins	identify terminology associated with recalls and service bulletins describe importance of updating servicing records
A-3.02.02L	demonstrate knowledge of procedures to complete service records	describe procedures to complete service records based on various recall and service bulletin requirements

Range of Variables

recalls and service bulletins include: NTSB, manufacturer, CSA, CEC, jurisdictional safety authorities

A-3.03 Performs pre-delivery inspections (PDI)

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
A-3.03.01P	verify vehicle and component operation	vehicle and component operation is verified according to original equipment manufacturers' (OEM) checklists, dealer requirements and regulations
A-3.03.02P	record and report findings	findings are recorded and reported according to OEM checklists, and company policies and procedures
A-3.03.03P	access, record and file component serial numbers	component serial numbers are accessed, recorded and filed for warranty and service purposes

Knowledge

	Learning Outcomes	Learning Objectives
A-3.03.01L	demonstrate knowledge of PDI	identify terminology associated with PDI describe importance of recording and reporting findings identify PDI checklist items, and describe their characteristics and applications
A-3.03.02L	demonstrate knowledge of performing PDI	describe verification procedures for RV components, construction, assembly and operation

Task A-4 Uses communication and mentoring techniques

Task Descriptor

An apprenticeship is primarily completed in the workplace by mentors passing on their skills and knowledge to apprentices, as well as sharing knowledge among themselves. Apprenticeship has always succeeded by mentoring apprentices and passing on workplace skills, knowledge and techniques to perform the tasks to a high level of accuracy and minimal deficiencies. The importance of communication and mentoring is highly important to ensure accurate staff information, professional service and customer satisfaction.

A-4.01 Uses communication techniques

Skills		
	Performance Criteria	Evidence of Attainment
A-4.01.01P	demonstrate communication techniques with individuals or in a group	instructions and messages are interpreted using communication techniques by communicating with individuals or in a group
A-4.01.02P	listen using active listening practices	active listening practices are utilized
A-4.01.03P	speak clearly using correct industry terminology to ensure understanding	understanding of message is confirmed by both parties
A-4.01.04P	receive and respond to instructions	response to instructions indicates understanding
A-4.01.05P	receive and respond to feedback on work completed or performed	response to feedback indicates understanding and corrective measures are taken
A-4.01.06P	explain and provide feedback	explanation and feedback is provided and task is carried out as directed
A-4.01.07P	use questions to improve communication	questions are used to enhance understanding of task, on-the-job training and goal setting
A-4.01.08P	participate in safety and information meetings	meetings are attended, information is relayed to workforce, and is applied on-site
A-4.01.09P	send and receive electronic communications	electronic communications are sent and received using professionalism, plain language and clear expressions according to company policy

Range of Variables

active listening includes: hearing, interpreting, reflecting, responding, paraphrasing

electronic communications include: email, text messages

Knowledge

	Learning Outcomes	Learning Objectives
A-4.01.01L	demonstrate knowledge of trade terminology	define terminology used in trade
A-4.01.02L	demonstrate knowledge of effective communication practices	describe importance of using effective verbal and non-verbal communication with people in the workplace
		identify sources of information to effectively communicate
		identify communication and learning styles
		describe active listening and speaking skills
		describe how to receive and give instructions effectively
		identify personal responsibilities and attitudes that contribute to on-the-job success
		identify value of equity, diversity and inclusion in workplace
		identify communication that constitutes bullying, harassment and discrimination
		identify communication styles appropriate to different systems and applications of electronic communications

Range of Variables

people in the workplace include: other tradespeople, colleagues, apprentices, supervisors, customers, jurisdictional representatives, manufacturers

sources of information include: regulations, codes, occupational health and safety requirements, jurisdictional requirements, prints, drawings, schematics, sketches, specifications, company and customer documentation

learning styles include: visual, auditory, reading, writing, kinesthetic

active listening includes: hearing, interpreting, reflecting, responding, paraphrasing

personal responsibilities and attitudes include: asking questions, working safely, accepting constructive feedback, time management and punctuality, respect for others, respect knowledge of others, good stewardship of materials, tools and property, efficient work practice

harassment: as defined by the Canadian and jurisdictional Human Rights Commissions

discrimination: as defined by the Canadian Human Rights Act and jurisdictional human rights laws

electronic communications include: email, text messages

A-4.02 Uses mentoring techniques

Skills		
	Performance Criteria	Evidence of Attainment
A-4.02.01P	identify and communicate learning objective and point of lesson	apprentice or learner can explain objective and point of lesson
A-4.02.02P	link lessons to current task and project	lessons are linked to current task and project and unplanned learning opportunities are defined
A-4.02.03P	demonstrate performance of a skill to an apprentice or learner	steps required to demonstrate a skill are performed
A-4.02.04P	set up conditions required for apprentice or learner to practice a skill	practice conditions are set up so that skill can be practiced safely by apprentice or learner
A-4.02.05P	assess apprentice or learner's ability to perform tasks with increasing independence	performance of apprentice or learner improves with practice to a point where skill can be completed with full independence during practice conditions
A-4.02.06P	give supportive and corrective feedback	apprentice or learner adopts best practice after having been given supportive or corrective feedback
A-4.02.07P	support apprentices or learners in pursuing technical training opportunities	technical training is completed within timeframe prescribed by apprenticeship authority
A-4.02.08P	support anti- harassment and anti- discrimination practices in workplace	workplace is harassment and discrimination -free
A-4.02.09P	assess apprentice or learner suitability to trade during probationary period	apprentice or learner is given constructive feedback that helps them identify their own strengths and weaknesses and suitability for the trade

Range of Variables

steps required to demonstrate a skill include: understanding who, what, where, when, why, and how, explain point of lesson, link lesson, demonstrate skill, provide practice time and encouragement, skill is performed correctly, provide supportive or corrective feedback

practice conditions means: guided, limited independence, full independence

harassment: as defined by the Canadian and jurisdictional Human Rights Commissions

discrimination: as defined by the Canadian Human Rights Act and jurisdictional human rights laws

Knowledge		
	Learning Outcomes	Learning Objectives
A-4.02.01L	demonstrate knowledge of strategies for learning skills in workplace	describe importance of individual experience describe shared responsibilities for workplace learning

		determine one's own learning preferences and explain how these relate to learning new skills
		describe importance of different types of skills in workplace
		describe importance of essential skills in workplace
		identify different learning styles
		identify different learning needs and strategies to meet them
		identify strategies to assist in learning a skill
A-4.02.02L	demonstrate knowledge of strategies for teaching workplace skills	identify different roles played by workplace mentor
		describe teaching skills
		explain importance of identifying point of lesson
		identify how to choose an appropriate time to present lesson
		explain importance of linking lessons
		identify context for learning skills
		describe considerations in setting up opportunities for skill practice
		explain importance of providing feedback
		identify techniques for providing effective feedback
		describe a skills assessment
		identify methods of assessing progress
		explain how to adjust lesson to different situations

Range of Variables

essential skills are: reading, document use, writing, oral communication, numeracy, thinking, working with others, digital technology, continuous learning

learning styles include: visual, auditory, reading, writing, kinesthetic

learning needs include: learning disabilities, learning preferences, language proficiency

strategies to assist in learning a skill include: understanding the basic principles of instruction, developing coaching skills, providing practice time, being mature and patient, providing supportive or corrective feedback

teaching skills include: identifying point of lesson, linking lesson, demonstrating skill, providing practice, assessing skills and progress, providing supportive or corrective feedback

Major Work Activity B

Plumbing systems

Task B-5 Diagnoses plumbing systems

Task Descriptor

Recreation vehicle service technicians need to diagnose plumbing systems in order to identify and efficiently test, sanitize and repair potable and waste water system issues and customer concerns.

B-5.01 Diagnoses potable water systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
B-5.01.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
B-5.01.02P	select and use tools and equipment	tools and equipment are selected and used according to job task
B-5.01.03P	inspect potable water systems and venting for faults	potable water systems and venting are visually inspected for faults
B-5.01.04P	perform water leak test	water leak test is performed by pressurizing system with water or air according to codes
B-5.01.05P	activate pumps	pumps are activated to verify normal operation according to manufacturers' specifications
B-5.01.06P	verify connections to potable water system components	connections to potable water system components are verified according to requirements
B-5.01.07P	determine servicing required	servicing required is determined according to tests and inspections
B-5.01.08P	document work	work is documented according to company policies and procedures

Range of Variables

faults include: leaks, obstructions, low pressure, contaminants

components include: water pumps, water tanks, accumulator, tubing, fittings, seals, gaskets, valves, fixtures, filters, vents

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

servicing includes: replacing or repairing fittings, lines and components

Knowledge		
	Learning Outcomes	Learning Objectives
B-5.01.01L	demonstrate knowledge of potable water systems, their components , characteristics and applications	identify terminology associated with potable water systems
		identify types of antifreeze for potable water systems, and describe their characteristics and applications
		identify location of drains and bypass valves, and describe their characteristics and applications
		identify types of bypass systems, and describe their characteristics and applications
		describe impact of movement and vibration on tank and mounting hardware
		identify storage tanks and materials, and describe their characteristics and applications
		identify types of mounting hardware, materials, and describe their requirements, characteristics and applications
		identify tubing and piping materials, and describe their characteristics and applications
		identify types and sizes of thread, and describe their characteristics and applications
		identify types of fittings , and describe their characteristics and applications
		identify accumulators, and describe their characteristics and applications
		identify types of potable water system components , and describe their characteristics, applications and operation
		identify types of valves, seals, gaskets and hoses, and describe their characteristics and applications

		describe operation of pumps, valves and fixtures
		identify filtration systems, and describe their characteristics and applications
		identify potential leakage areas
		identify tank location and piping size, and describe venting requirements
B-5.01.02L	demonstrate knowledge of procedures to diagnose potable water systems	identify tools and equipment used to diagnose potable water systems, and describe their procedures for use
		describe procedures to diagnose potable water systems
		describe procedures to perform flow test
		describe flushing and sanitizing procedures
		describe winterizing procedures
		describe procedures to perform water leak test

Range of Variables

components include: water pumps, water tanks, accumulator, tubing, fittings, seals, gaskets, valves, fixtures, filters, vents

types of fittings include: compression, threaded, barbed

B-5.02 Diagnoses waste water systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
B-5.02.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
B-5.02.02P	select and use tools and equipment	tools and equipment are selected and used according to job task
B-5.02.03P	inspect waste water systems and venting for faults	waste water systems and venting are visually inspected for faults
B-5.02.04P	verify connections to waste water system components	connections to waste water system components are verified by performing leak test
B-5.02.05P	verify operation	operation is verified to confirm there are no leaks according to visual inspection

B-5.02.06P	determine cause of fault	cause of fault is determined according to flood test
B-5.02.07P	determine servicing required	servicing required is determined according to tests and inspections
B-5.02.08P	document work	work is documented according to company policies and procedures

Range of Variables

faults include: leaks, obstructions, contaminants

components include: toilets, sewer valves, tanks, connections, valves, fittings, seals, gaskets, sensors, wires, pipes, vents

cause of fault includes: damaged storage tank, blockage, physical leaks, corrosion

servicing includes: replacing or repairing fittings, pipes, tanks, valves, vents

Knowledge		
	Learning Outcomes	Learning Objectives
B-5.02.01L	demonstrate knowledge of waste water systems, their components , characteristics and applications	identify terminology associated with waste water systems
		identify waste water systems, and describe their characteristics and applications
		identify waste water system components , and describe their characteristics and applications
		identify types of toilet chemicals and treatments, and describe their characteristics and applications
		identify types, materials and sizes of storage tanks, and describe their characteristics and applications
		identify types of mounting hardware, and describe their requirements, characteristics and applications
		identify collection and discharge system location and operation
		identify types of fittings , and describe their characteristics and applications
		identify materials , and describe their characteristics and applications
		identify types of adhesives and sealants, and describe their characteristics and applications
		describe sealing techniques
		identify tank location and piping size, and describe venting requirements

		describe operation of pumps, valves and fixtures
		identify potential leakage areas
B-5.02.02L	demonstrate knowledge of procedures to diagnose waste water systems	identify tools and equipment used to diagnose waste water systems, and describe their procedures for use
		describe procedures to diagnose waste water systems
		describe procedures to perform flood test
		describe procedures to perform flow test
		describe flushing and sanitizing procedures

Range of Variables

components include: toilets, sewer valves, tanks, connections, valves, fittings, seals, gaskets, sensors, wires, pipes, vents

types of fittings include: glued, threaded, rubber, compression (waterless drain valve)

materials include: acrylonitrile butadiene styrene (ABS), composite flexible materials, sealants

sealing techniques include: spin welding, gluing, caulking

Task B-6 Services potable water systems

Task Descriptor

Recreation vehicle service technicians maintain, repair and install potable water systems. Correct parts are used, and installation methods, sanitation and final testing are performed to manufacturer and environmental standards. This ensures system integrity, and safety for RV owners and the environment. Completed work is documented ensuring specific customer service records and requirements of individual RV units are recorded, filed and available for review prior to future customer service appointments.

B-6.01 Maintains potable water systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
B-6.01.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
B-6.01.02P	flush system	system is flushed by filling fresh water tank, and flushing water lines and related components
B-6.01.03P	remove and replace potable water filters	potable water filters are removed and replaced
B-6.01.04P	clean potable water system components	potable water system components are cleaned
B-6.01.05P	sanitize potable water systems	potable water systems are sanitized
B-6.01.06P	winterize and de-winterize potable water systems	potable water systems are winterized and de-winterized according to company policies and procedures
B-6.01.07P	document work	work is documented according to company policies and procedures

Range of Variables

components include: water pumps, water tanks, accumulator, tubing, fittings, seals, gaskets, valves, fixtures, filters

Knowledge

Learning Outcomes	Learning Objectives	
B-6.01.01L	demonstrate knowledge of potable water systems, their components , characteristics and applications	identify terminology associated with potable water systems
		identify types of antifreeze for potable water systems, and describe their characteristics and applications
		identify location of drains and bypass valves, and describe their characteristics and applications
		identify types of bypass systems, and describe their characteristics and applications
		describe impact of movement and vibration on tank and mounting hardware
		identify storage tanks and materials, and describe their characteristics and applications
		identify types of mounting hardware and materials, and describe their requirements, characteristics and applications
		identify tubing and piping materials, and describe their characteristics and applications
		identify types and sizes of thread, and describe their characteristics and applications
		identify types of fittings , and describe their characteristics and applications
		identify accumulators, and describe their characteristics and applications
		identify types of potable water system components , and describe their characteristics, applications and operation
		identify types of valves, seals and hoses, and describe their characteristics and applications
		describe operation of pumps, valves and fixtures
	identify filtration systems, and describe their characteristics and applications	
	identify potential leakage areas	
	identify tank location and piping size, and describe venting requirements	

B-6.01.02L	demonstrate knowledge of procedures to maintain potable water systems	identify tools and equipment used to maintain potable water systems, and describe their procedures for use
		describe procedures to maintain potable water systems
		describe procedures to perform flow test
		describe flushing and sanitizing procedures
		describe winterizing procedures
		describe procedures to perform water leak test

Range of Variables

components include: water pumps, water tanks, accumulator, tubing, fittings, seals, gaskets, valves, fixtures, filters

types of fittings include: compression, threaded, barbed, glued

B-6.02 Repairs potable water systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
B-6.02.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
B-6.02.02P	access repair area	repair area is accessed by removing items
B-6.02.03P	repair or replace potable water system components	potable water system components are repaired or replaced according to diagnosis
B-6.02.04P	perform water leak test	water leak test is performed to ensure integrity of system
B-6.02.05P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: filter wrenches, hand tools, power tools, basin wrench, air-pressure gauge, caulking gun

items include: tank covers, access panels, cabinets

components include: water pumps, water tanks, accumulator, tubing, fittings, valves, seals, gaskets, fixtures, filters

Knowledge

Learning Outcomes	Learning Objectives	
B-6.02.01L	demonstrate knowledge of potable water systems, their components , characteristics and applications	identify terminology associated with potable water systems
		identify types of antifreeze for potable water systems, and describe their characteristics and applications
		identify location of drains and bypass valves, and describe their characteristics and applications
		identify types of bypass systems, and describe their characteristics and applications
		describe impact of movement and vibration on tank and mounting hardware
		identify storage tanks and materials, and describe their characteristics and applications
		identify types of mounting hardware and materials, and describe their requirements, characteristics and applications
		identify tubing and piping materials, and describe their characteristics and applications
		identify types and sizes of thread, and describe their characteristics and applications
		identify types of fittings , and describe their characteristics and applications
		identify accumulators, and describe their characteristics and applications
		identify types of potable water system components , and describe their characteristics, applications and operation
		identify types of valves, seals, gaskets and hoses, and describe their characteristics and applications
		describe operation of pumps, valves and fixtures
	identify filtration systems, and describe their characteristics and applications	
	identify potential leakage areas	
	identify tank location and piping size, and describe venting requirements	

B-6.02.02L	demonstrate knowledge of procedures to repair potable water systems	identify tools and equipment used to repair potable water systems, and describe their procedures for use
		describe procedures to repair potable water systems
		describe procedures to perform flow test
		describe winterizing procedures
		describe procedures to perform water leak test

Range of Variables

components include: water pumps, water tanks, accumulator, tubing, fittings, valves, seals, gaskets, fixtures, filters

types of fittings include: compression, threaded, barbed, glued

tools and equipment include: filter wrenches, hand tools, power tools, basin wrench, air-pressure gauge, caulking gun

B-6.03 Installs potable water systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
B-6.03.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
B-6.03.02P	calculate water weight, tank dimensions, system demands and materials required	water weight, tank dimensions, system demand and materials required are calculated to determine installation strategy according to requirements
B-6.03.03P	access installation area	installation area is accessed by removing items
B-6.03.04P	adjust area	area is adjusted to accommodate new potable water system components according to requirements
B-6.03.05P	install potable water system components	potable water system components are installed according to requirements
B-6.03.06P	verify potable water system operation	operation of potable water system is verified
B-6.03.07P	perform water leak test	water leak test is performed to ensure system integrity
B-6.03.08P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: cutters, crimpers, hand tools, power tools, air-pressure gauge, caulking gun

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

items include: beds, cabinets, access panels

components include: water pumps, water tanks, accumulator, tubing, fittings, seals, gaskets, sealants, spray foam, valves, fixtures, filters

Knowledge		
	Learning Outcomes	Learning Objectives
B-6.03.01L	demonstrate knowledge of potable water systems, their components , characteristics and applications	identify terminology associated with potable water systems
		identify types of antifreeze for potable water systems, and describe their characteristics and applications
		identify location of drains and bypass valves, and describe their characteristics and applications
		identify types of bypass systems, and describe their characteristics and applications
		describe impact of movement and vibration on tank and mounting hardware
		identify storage tanks and materials, and describe their characteristics and applications
		identify types of mounting hardware and materials, and describe their requirements, characteristics and applications
		identify tubing and piping materials, and describe their characteristics and applications
		identify types and sizes of thread, and describe their characteristics and applications
		identify types of fittings , and describe their characteristics and applications
		identify accumulators, and describe their characteristics and applications
		identify types of potable water system components , and describe their characteristics, applications and operation
		identify types of valves, seals, gaskets and hoses, and describe their characteristics and applications

		describe operation of pumps, valves and fixtures
		identify filtration systems, and describe their characteristics and applications
		identify potential leakage areas
		identify tank location and piping size, and describe venting requirements
B-6.03.02L	demonstrate knowledge of procedures to install potable water systems	identify tools and equipment used to install potable water systems, and describe their procedures for use
		describe procedures to install potable water systems
		describe sealant procedures
		describe procedures to perform flow test procedures
		describe winterizing procedures
		describe procedures to perform water leak test

Range of Variables

components include: water pumps, water tanks, accumulator, tubing, fittings, seals, gaskets, sealants, spray foam, valves, fixtures, filters

types of fittings include: compression, threaded, barbed, glued

tools and equipment include: cutters, crimpers, hand tools, power tools, air-pressure gauge, caulking gun

Task B-7 Services waste water systems

Task Descriptor

Recreation vehicle service technicians maintain, repair and install waste water systems. Correct parts are used, and installation methods, sanitation, winterizing and de-winterizing, and final testing must be performed to manufacturer and environmental standards. This ensures system integrity, and safety for RV owners and the environment. Completed work is documented ensuring specific customer service records and requirements of individual RV units are recorded, filed and available for review prior to future customer service appointments.

B-7.01 Maintains waste water systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
B-7.01.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
B-7.01.02P	clean holding tanks	holding tanks are cleaned using various methods
B-7.01.03P	lubricate or replace valves	valves are lubricated or replaced
B-7.01.04P	winterize and de-winterize waste water system	waste water system is winterized and de-winterized according to company procedures
B-7.01.05P	document work	work is documented according to company policies and procedures

Range of Variables

methods include: chemical treatments, rinsing systems

Knowledge

	Learning Outcomes	Learning Objectives
B-7.01.01L	demonstrate knowledge of waste water systems, their components , characteristics and applications	identify terminology associated with waste water systems
		identify waste water systems, and describe their characteristics and applications
		identify waste water system components , and describe their characteristics and applications

		identify types of toilet chemicals and treatments, and describe their characteristics and applications
		identify types, materials and sizes of waste tanks, and describe their characteristics and applications
		identify types of mounting hardware, and describe their requirements, characteristics and applications
		identify collection and discharge system location
		identify types of fittings , and describe their characteristics and applications
		identify materials , and describe their characteristics and applications
		describe collection and discharge system operation
		identify types of adhesives, and describe their characteristics and applications
		describe sealing techniques
		identify tank location and piping size, and describe venting requirements
		describe operation of pumps, valves and fixtures
		identify potential leakage areas
B-7.01.02L	demonstrate knowledge of procedures to maintain waste water systems	identify tools and equipment used to maintain waste water systems, and describe their procedures for use
		describe procedures to maintain waste water systems
		describe procedures to perform flood test
		describe procedures to perform flow test
		describe flushing and sanitizing procedures

Range of Variables

components include: toilets, sewer valves, tanks, connections, valves, fittings, seals, gaskets, sensors, wires, pipes, vents

types of fittings include: glued, threaded, rubber, compression (waterless drain valve)

materials include: ABS, composite flexible materials, polyvinyl chloride (PVC), sealants

sealing techniques include: spin welding, gluing, clamping, gasket, caulking

B-7.02**Repairs waste water systems**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
B-7.02.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
B-7.02.02P	access repair area	repair area is accessed by removing <i>items</i>
B-7.02.03P	replace <i>defective components</i>	<i>defective components</i> are replaced
B-7.02.04P	repair waste water system <i>components</i>	waste water system <i>components</i> are repaired according to job task
B-7.02.05P	perform water leak test	water leak test is performed to ensure system integrity
B-7.02.06P	document work	work is documented according to company policies and procedures

Range of Variables

items include: tank covers, access panels, appliances

defective components include: P-traps, gate valves, fittings, seals, gaskets, venting systems, tanks

components include: toilets, sewer valves, tanks, connections, valves, fittings, seals, gaskets, sensors, wires, pipes, vents

Knowledge

	Learning Outcomes	Learning Objectives
B-7.02.01L	demonstrate knowledge of waste water systems, their <i>components</i> , characteristics and applications	identify terminology associated with waste water systems
		identify waste water systems, and describe their characteristics and applications
		identify waste water system <i>components</i> , and describe their characteristics and applications
		identify types of toilet chemicals and treatments, and describe their characteristics and applications
		identify types, materials and sizes of waste tanks, and describe their characteristics and applications

		identify types of mounting hardware, and describe their requirements, characteristics and applications
		identify collection and discharge system location
		identify types of fittings , and describe their characteristics and applications
		identify materials , and describe their characteristics and applications
		describe collection and discharge system operation
		identify types of adhesives, and describe their characteristics and applications
		describe sealing techniques
		identify tank location and piping size, and describe venting requirements
		describe operation of pumps, valves and fixtures
		identify potential leakage areas
B-7.02.02L	demonstrate knowledge of procedures to repair waste water systems	identify tools and equipment used to repair waste water systems, and describe their procedures for use
		describe procedures to repair waste water systems
		describe procedures to perform flood test
		describe procedures to perform flow test
		describe procedures to perform water leak test

Range of Variables

components include: toilets, sewer valves, tanks, connections, valves, fittings, seals, gaskets, sensors, wires, pipes, vents

types of fittings include: threaded, rubber, glued, compression (waterless drain valve)

materials include: ABS, composite flexible materials, PVC, sealants

sealing techniques include: spin welding, gluing, solvent welding, clamping, caulking

B-7.03 Installs waste water systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
B-7.03.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
B-7.03.02P	determine installation strategy	installation strategy is determined according to requirements to calculate capacity and material required
B-7.03.03P	access installation area	installation area is accessed by removing items or lifting RV
B-7.03.04P	adjust area	area is adjusted to accommodate new waste water system components according to requirements
B-7.03.05P	install waste water system components	waste water system components are installed according to requirements
B-7.03.06P	verify waste water system operation	waste water system operation is verified according to requirements
B-7.03.07P	perform water leak test	water leak test is performed to ensure system integrity
B-7.03.08	document work	work is documented according to company policies and procedures

Range of Variables

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

items include: access panels, cabinets

components include: toilets, sewer valves, tanks, connections, valves, fittings, seals, gaskets, sensors, wires, pipes, vents

Knowledge

	Learning Outcomes	Learning Objectives
B-7.03.01L	demonstrate knowledge of waste water systems, their components , characteristics and applications	identify terminology associated with waste water systems
		identify waste water systems, and describe their characteristics and applications
		identify waste water system components , and describe their characteristics and applications

		identify types of toilet chemicals and treatments, and describe their characteristics and applications
		identify types, materials and sizes of waste tanks, and describe their characteristics and applications
		identify types of mounting hardware, and describe their requirements, characteristics and applications
		identify collection and discharge system location
		identify types of fittings , and describe their characteristics and applications
		identify materials , and describe their characteristics and applications
		describe collection and discharge system operation
		identify types of adhesives, and describe their characteristics and applications
		describe sealing techniques
		identify tank location and piping size, and describe venting requirements
		describe operation of pumps, valves and fixtures
		identify potential leakage areas
		identify tank location and piping size, and describe venting requirements
B-7.03.02L	demonstrate knowledge of procedures to install waste water system components	identify tools and equipment used to install waste water system components , and describe their procedures for use
		describe procedures to install waste water system components
		describe procedures to perform flood test
		describe procedures to perform flow test
		describe procedures to perform water leak test

Range of Variables

components include: toilets, sewer valves, tanks, connections, valves, fittings, seals, gaskets, sensors, wires, pipes, vents

types of fittings include: threaded, rubber, compression (waterless drain valve)

materials include: ABS, composite flexible materials, PVC, sealants

sealing techniques include: spin welding, gluing, clamping, caulking

Major Work Activity C

Electrical systems

Task C-8 Diagnoses electrical systems

Task Descriptor

Recreation vehicle service technicians must be able to differentiate between alternating current (AC) and direct current (DC) systems and efficiently diagnose any electrical problems to ensure a safe and reliable repair. They also need to be aware of the ongoing changes and updates relating to electrical systems.

While diagnosing electrical systems, including generators, recreation vehicle service technicians must be aware of the safety hazards associated with alternating and direct current.

C-8.01 Diagnoses AC electrical systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
C-8.01.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
C-8.01.02P	select and use tools and equipment	tools and equipment are selected and used according to job task
C-8.01.03P	access AC system components to perform tests	AC system components are accessed to perform tests
C-8.01.04P	inspect AC system components for damage	AC system components are visually inspected for damage
C-8.01.05P	check performance of power sources	performance of power sources is checked to ensure components comply with manufacturers' specifications
C-8.01.06P	check AC system components	AC system components are checked to identify system capacity
C-8.01.07P	test electrical system	electrical system is tested to identify possible faults
C-8.01.08P	determine cause of fault	cause of fault is determined by test results

C-8.01.09P	determine servicing required	servicing required is determined according to tests and inspections
C-8.01.10P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multi-meter, ground fault circuit interrupter (GFCI) tester, amp clamp, non-contact voltage tester, wire strippers, crimpers, wire cutters

components include: power cords, transfer switches, breakers, receptacles, inverters, conductors, connectors, wiring

tests include: sensory indicators, volts, ohms, amps, hertz

damage includes: electrolysis, abrasive damage, overheating, corrosion

power sources include: inverters, generators, shore power

faults include: shorts, open connections, grounds, defective components

servicing includes: replacing breakers, GFCI and wire

Knowledge		
	Learning Outcomes	Learning Objectives
C-8.01.01L	demonstrate knowledge of AC systems, and their components , characteristics and applications	identify terminology associated with AC systems and their components
		identify AC systems and their components , and describe their characteristics and applications
		describe Ohm's law and Watt's law formulas
		identify energy management systems, and describe their characteristics and applications
		identify and describe codes
C-8.01.02L	demonstrate knowledge of procedures to diagnose AC systems and their components	identify tools and equipment used to diagnose AC systems and their components , and describe their procedures for use
		describe procedures to diagnose AC systems and their components
		describe testing procedures for voltage, current, resistance and frequency
		describe diagnostic procedures for locating faults
C-8.01.03L	demonstrate knowledge of training and certification requirements to diagnose AC systems and their components	identify training and certification requirements to diagnose AC systems and their components
C-8.01.04L	demonstrate knowledge of regulatory requirements to diagnose AC systems and their components	identify codes , standards and jurisdictional regulations to diagnose AC systems and their components

Range of Variables

components include: power cords, transfer switches, breakers, receptacles, inverters, conductors, connectors, wiring

codes include: CEC, CSA

tools and equipment include: multi-meter, GFCI tester, amp clamp, non-contact voltage tester, wire strippers, crimpers, wire cutters

faults include: shorts, open connections, grounds, defective components

C-8.02 Diagnoses DC electrical systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
C-8.02.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
C-8.02.02P	select and use tools and equipment	tools and equipment are selected and used according to job task
C-8.02.03P	access DC system components	DC system components are accessed to perform tests
C-8.02.04P	inspect DC system components	DC system components are visually inspected for faults
C-8.02.05P	inspect DC system components for damage	DC system components are visually inspected for damage
C-8.02.06P	check performance of power sources	performance of power sources are checked to ensure compliance with codes and manufacturers' specifications
C-8.02.07P	perform checks and tests on battery	checks and tests on battery are performed to confirm condition of battery
C-8.02.08P	measure source voltage	source voltage is measured to ensure compliance with manufacturers' specifications
C-8.02.09P	check DC system components	DC system components are checked to determine system capacity
C-8.02.10P	test electrical system	electrical system is tested to identify possible faults
C-8.02.11P	determine cause of fault	cause of fault is determined according to test results
C-8.02.12P	determine servicing required	servicing required is determined according to tests and inspections

C-8.02.13P	determine operation of vehicle network systems	operation of vehicle network systems is determined according to manufacturers' specifications
C-8.02.14P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multi-meter, circuit tester, amp clamp, non-contact voltage tester, wire strippers, crimpers, wire cutters

components include: batteries, disconnect switches, fuses, conductors, connectors, breakers, solar panels, relays, wiring

faults include: shorts, open/closed connections, grounds, defective components

damage includes: electrolysis, abrasive damage, overheating, corrosion

power sources include: solar panels, converters, batteries, tow vehicle

codes include: CEC, CSA

checks and tests include: specific gravity, load test and water level, sensory indicators

servicing includes: replacing components, cleaning connections, replacing connectors

vehicle network systems include: remote control devices, CANbus, WiFi connections, Bluetooth connections

Knowledge		
	Learning Outcomes	Learning Objectives
C-8.02.01L	demonstrate knowledge of DC systems, their components , characteristics and applications	identify terminology associated with DC systems and their components
		identify DC systems and their components , and describe their characteristics and applications
		identify types of batteries, and describe their characteristics and applications
		describe Ohm's law and Watt's law formulas
		identify charging systems, and describe their characteristics and applications
C-8.02.02L	demonstrate knowledge of procedures to diagnose DC systems and their components	identify tools and equipment used to diagnose DC systems and their components , and describe their procedures for use
		describe procedures to diagnose DC systems and their components
		describe testing procedures for voltage, current, resistance and frequency
		describe diagnostic procedures for locating faults

C-8.02.03L	demonstrate knowledge of training and certification requirements to diagnose DC systems and their components	identify training and certification requirements to diagnose DC systems and their components
C-8.02.04L	demonstrate knowledge of regulatory requirements to diagnose DC systems and their components	identify codes, standards and regulations to diagnose DC systems and their components

Range of Variables

components include: batteries, disconnect switches, fuses, conductors, connectors, breakers, solar panels, relays, wiring

codes include: CEC, CSA

tools and equipment include: multi-meter, circuit tester, amp clamp, non-contact voltage tester, wire strippers, crimpers, wire cutters

faults include: shorts, open/closed connections, grounds, defective components

C-8.03 Diagnoses generators

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
C-8.03.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
C-8.03.02P	select and use tools and equipment	tools and equipment are selected and used according to job task
C-8.03.03P	verify generator components	generator components are verified according to manufacturers' specifications
C-8.03.04P	check filters	filters are checked for contamination
C-8.03.05P	inspect and test starting system switches and harnesses	starting system switches and harnesses are inspected and tested for operation according to manufacturers' specifications
C-8.03.06P	inspect fuel delivery systems	fuel delivery systems are visually inspected for fuel supply, connection and leaks according to manufacturers' specifications
C-8.03.07P	inspect installation and supporting hardware	installation and supporting hardware are visually inspected according to manufacturers' specifications
C-8.03.08P	verify electrical source	electrical source is verified for specified DC voltage and amperage according to manufacturers' specifications

C-8.03.09P	inspect wiring connections, gauge and routing	wiring connections, gauge and routing are inspected according to manufacturers' specifications
C-8.03.10P	verify generator operation	generator operation is verified by testing AC output voltage and frequency according to manufacturers' specifications
C-8.03.11P	check generator windings	generator windings are checked for shorts and continuity according to manufacturers' specifications
C-8.03.12P	perform tests	tests are performed according to requirements
C-8.03.13P	determine cause of fault	cause of fault is determined according to manufacturers' specifications
C-8.03.14P	determine servicing required	servicing required is determined according to tests, inspections and manufacturers' specifications
C-8.03.15P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multi-meters, compression tester, spark plug testers, amp clamp, non-contact voltage tester, wire strippers, crimpers, wire cutters

components include: fuel system components, air system components, connectors, ignition system components, power generation system components

filters include: fuel, air, oil

tests include: compression, ignition, ohms, volts, hertz, fuel flow

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

cause of fault includes: poor maintenance, defective parts

servicing includes: replacing filters, circuit boards, spark plugs and breakers, repairing fuel supply, repairing DC electrical, repairing connectors, repairing fittings and hoses

Knowledge		
	Learning Outcomes	Learning Objectives
C-8.03.01L	demonstrate knowledge of generators, their components , characteristics and operation	identify terminology associated with generators
		describe small engine operation
		identify generator systems, and describe their components , characteristics and operation
C-8.03.02L	demonstrate knowledge of procedures to diagnose generators	identify tools and equipment used to diagnose generators, and describe their procedures for use

		describe procedures to diagnose generators
C-8.03.03L	demonstrate knowledge of training and certification requirements to diagnose generators	identify training and certification requirements to diagnose generators

Range of Variables

components include: fuel system components, air system components, connectors, ignition system components, power generation system components

tools and equipment include: multi-meters, compression tester, spark plug testers, amp clamp, non-contact voltage tester, wire strippers, crimpers, wire cutters

Task C-9 Services AC electrical systems

Task Descriptor

The AC electrical system allows for the operation of consumer products contained within the vehicle. Recreation vehicle service technicians must be able to maintain, repair, replace and install AC electrical systems and components, and stay updated on changes and updates relating to AC electrical systems. While working on the electrical system, recreation vehicle service technicians must be aware of the safety hazards associated with alternating current.

C-9.01 Maintains AC electrical systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
C-9.01.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
C-9.01.02P	inspect shore power cords	shore power cords are visually inspected for damage
C-9.01.03P	perform maintenance tests	maintenance tests are performed according to manufacturers' specifications
C-9.01.04P	clean inverters	inverters are cleaned to prevent overheating
C-9.01.05P	isolate potential problems and determine required actions	potential problems are isolated and required actions determined
C-9.01.06P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multi-meter, GFCI tester, amp clamp, non-contact voltage tester, wire strippers, crimpers, wire cutters

damage includes: electrolysis, abrasive damage, overheating, corrosion

maintenance tests include: hot skin test, verification of AC power supply and distribution system operation and GFCI check, sensory indicators, volts, ohms, amps, hertz, continuity

Knowledge		
	Learning Outcomes	Learning Objectives
C-9.01.01L	demonstrate knowledge of AC systems and their components , characteristics and applications	identify terminology associated with AC systems and their components
		identify AC systems and their components , and describe their characteristics and applications
		describe Ohm's law and Watt's law formulas
		identify energy management systems, and describe their characteristics and applications
		identify and describe codes
		describe electrical load and demand
C-9.01.02L	demonstrate knowledge of procedures to maintain AC systems and their components	identify tools and equipment used to maintain AC systems and their components , and describe their procedures for use
		describe procedures to maintain AC systems and their components
		describe testing procedures for voltage, current, resistance and frequency
C-9.01.03L	demonstrate knowledge of training and certification requirements to maintain AC systems and their components	identify training and certification requirements to maintain AC systems and their components
C-9.01.04L	demonstrate knowledge of jurisdictional regulatory requirements to maintain AC systems and their components	identify codes, standards and jurisdictional regulations to maintain AC systems and their components

Range of Variables

components include: power cords, transfer switches, breakers, receptacles, inverters, conductors, connectors, wiring

codes include: CEC, CSA

wire containment techniques include: routing, fastening, wire protection

tools and equipment include: multi-meter, GFCI tester, amp clamp, non-contact voltage tester, wire strippers, crimpers, wire cutters

C-9.02**Repairs AC electrical systems**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
C-9.02.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
C-9.02.02P	access repair area	repair area is accessed by removing items
C-9.02.03P	repair or replace defective AC system components	defective AC system components are repaired or replaced according to manufacturers' specifications
C-9.02.04P	rewire damaged circuits	damaged circuits are rewired according to codes
C-9.02.05P	modify existing electrical system	existing electrical system is modified according to requirements
C-9.02.06P	verify AC power supply and distribution system operation	AC power supply and distribution system operation is verified to ensure compliance with manufacturers' specifications
C-9.02.07P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multi-meter, fish wires, wire strippers, hand tools, power tools, amp clamp, non-contact voltage tester, crimpers, wire cutters

items include: panels, seats, cabinets

components include: power cords, transfer switches, breakers, receptacles, inverters, conductors, connectors

codes include: CEC, CSA

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

Knowledge

	Learning Outcomes	Learning Objectives
C-9.02.01L	demonstrate knowledge of AC systems and their components , characteristics and applications	identify terminology associated with AC systems and their components
		identify AC systems and their components , and describe their characteristics and applications
		describe Ohm's law and Watt's law formulas

		identify energy management systems, and describe their characteristics and applications
		identify and describe codes
		describe electrical load and demand
		describe wire containment techniques , and their characteristics and applications
C-9.02.02L	demonstrate knowledge of procedures to repair AC systems and their components	identify tools and equipment used to repair AC systems and their components , and describe their procedures for use
		describe procedures to repair AC systems and their components
		describe testing procedures for voltage, current, resistance and frequency
C-9.02.03L	demonstrate knowledge of training and certification requirements to repair AC systems and their components	identify training and certification requirements to repair AC systems and their components
C-9.02.04L	demonstrate knowledge of regulatory requirements to repair AC systems and their components	identify codes , standards and jurisdictional regulations to repair AC systems and their components

Range of Variables

components include: power cords, transfer switches, breakers, receptacles, inverters, conductors, connectors

codes include: CEC, CSA

wire containment techniques include: routing, fastening, wire protection

tools and equipment include: multi-meter, fish wires, wire strippers, hand tools, power tools, amp clamp, non-contact voltage tester, crimpers, wire cutters

C-9.03 Installs AC electrical systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
C-9.03.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
C-9.03.02P	calculate electrical load , demand and material required	electrical load , demand and material required is calculated to determine installation strategy according to requirements

C-9.03.03P	access installation area	installation area is accessed by removing items
C-9.03.04P	install AC system components	AC system components are installed according to manufacturers' specifications
C-9.03.05P	verify AC system component operation	AC system component operation is verified to manufacturers' specifications
C-9.03.06P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multi-meter, fish wires, wire strippers, hand and power tools, amp clamp, non-contact voltage tester, crimpers, wire cutters

electrical load includes: wattage, amperage

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

items include: panels, seats, cabinets

components include: power cords, transfer switches, breakers, receptacles, inverters, conductors, connectors, wiring

Knowledge		
	Learning Outcomes	Learning Objectives
C-9.03.01L	demonstrate knowledge of AC systems and their components , characteristics and applications	identify terminology associated with AC systems and their components
		identify AC systems and their components , and describe their characteristics and applications
		describe Ohm's law and Watt's law formulas
		identify energy management systems, and describe their characteristics and applications
		identify and describe codes
		describe electrical load and demand
		describe wire containment techniques , and their characteristics and applications
C-9.03.02L	demonstrate knowledge of procedures to install AC systems and their components	identify tools and equipment used to install AC systems and their components , and describe their procedures for use
		describe procedures to install AC systems and their components
		describe testing procedures for voltage, current, resistance and frequency

C-9.03.03L	demonstrate knowledge of training and certification requirements to install AC systems and their components	identify training and certification requirements to install AC systems and their components
C-9.03.04L	demonstrate knowledge of regulatory requirements to install AC systems and their components	identify codes , standards and jurisdictional regulations to install AC systems and their components

Range of Variables

components include: power cords, transfer switches, breakers, receptacles, inverters, conductors, connectors, wiring

codes include: CEC, CSA

electrical load includes: wattage, amperage

wire containment techniques include: routing, fastening, wire protection

tools and equipment include: multi-meter, fish wires, wire strippers, hand tools, power tools, amp clamp, non-contact voltage tester, crimpers, wire cutters

Task C-10 Services DC electrical systems

Task Descriptor

The DC system supplies power for the operation of the RV. Recreation vehicle service technicians must be able to maintain, repair, replace and install DC systems and components.

While working on the electrical system, recreation vehicle service technicians must be aware of the safety hazards associated with direct current.

C-10.01 Maintains DC electrical systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
C-10.01.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
C-10.01.02P	maintain batteries	batteries are maintained using procedures according to manufacturers' specifications
C-10.01.03P	inspect DC system components	DC system components are visually inspected for faults
C-10.01.04P	clean and inspect DC system components and connections	DC system components and connections are cleaned and inspected

C-10.01.05P	verify DC system component operation	DC system component operation is verified to ensure compliance with manufacturers' specifications
C-10.01.06P	verify operation of vehicle network systems	operation of vehicle network systems is verified according to manufacturers' specifications
C-10.01.07P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multi-meter, battery load tester, battery straps, hand tools, power tools, circuit tester, amp clamp, wire strippers, crimpers, wire cutters

batteries include: lithium-ion, lead acid, gel cell, absorbed glass matt (AGM)

procedures include: checking water levels, charging battery, specific gravity test, load test

components include: breakers, receptacles, converters, conductors, connectors, fuses, solar panels, batteries, inverters, wiring

faults include: loose connections, connectors, corrosion, electrolysis, abrasive damage, overheating

vehicle network systems include: remote control devices, CANbus, WiFi connections, Bluetooth connections

Knowledge		
	Learning Outcomes	Learning Objectives
C-10.01.01L	demonstrate knowledge of DC systems and their components , characteristics and applications	identify terminology associated with DC systems and their components
		identify DC systems and their components , and describe their characteristics and applications
		describe Ohm's law and Watt's law formulas
		identify charging systems, and describe their characteristics and applications
		identify and describe codes
		describe electrical load and demand
		describe wire containment techniques , and their characteristics and applications
C-10.01.02L	demonstrate knowledge of procedures to maintain DC systems and their components	identify tools and equipment used to maintain DC systems and their components , and describe their procedures for use
		describe procedures to maintain DC systems and their components
		describe testing procedures for voltage, current and resistance

C-10.01.03L	demonstrate knowledge of training and certification requirements to maintain DC systems and their components	identify training and certification requirements to maintain DC systems and their components
C-10.01.04L	demonstrate knowledge of regulatory requirements to maintain DC systems and their components	identify codes, standards and jurisdictional regulations to maintain DC systems and their components

Range of Variables

components include: breakers, receptacles, converters, conductors, connectors, fuses, solar panels, batteries, inverters, wiring

codes include: CEC, CSA

wire containment techniques include: routing, fastening, wire protection

tools and equipment include: multi-meter, battery load tester, battery straps, hand tools, power tools, circuit tester, amp clamp, wire strippers, crimpers, wire cutters

C-10.02 Repairs DC electrical systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
C-10.02.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
C-10.02.02P	access repair area	repair area is accessed by removing items
C-10.02.03P	rewire damaged circuits	damaged circuits are rewired according to codes
C-10.02.04P	modify existing electrical system	existing electrical system is modified to meet requirements
C-10.02.05P	replace or repair defective DC system components	defective DC system components are replaced or repaired according to manufacturers' specifications
C-10.02.06P	verify DC power supply and distribution system operation	DC power supply and distribution system operation is verified to ensure compliance with manufacturers' specifications
C-10.02.07P	replace or repair defective vehicle network systems	defective vehicle network systems are replaced or repaired according to manufacturers' specifications
C-10.02.08P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multi-meter, battery load tester, fish wires, battery straps, wire strippers, wire crimpers, hand tools, power tools, test light, amp clamp, wire cutters

items include: panels, seats, cabinets

codes include: CEC, CSA

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

components include: breakers, receptacles, converters, conductors, connectors, fuses, solar panels, batteries, harnesses, relays, control panels, inverters

vehicle network systems include: remote control devices, CANbus, WiFi connections, Bluetooth connections

Knowledge		
	Learning Outcomes	Learning Objectives
C-10.02.01L	demonstrate knowledge of DC systems and their components , characteristics and applications	identify terminology associated with DC systems and their components
		identify DC systems and their components , and describe their characteristics and applications
		describe Ohm's law and Watt's law formulas
		identify charging systems, and describe their characteristics and applications
		identify and describe codes
		describe electrical load and demand
		describe wire containment techniques , and their characteristics and applications
C-10.02.02L	demonstrate knowledge of procedures to repair DC systems and their components	identify tools and equipment used to repair DC systems and their components , and describe their procedures for use
		describe procedures to repair DC systems and their components
		describe testing procedures for voltage, current, resistance
C-10.02.03L	demonstrate knowledge of training and certification requirements to repair DC systems and their components	identify training and certification requirements to repair DC systems and their components
C-10.02.04L	demonstrate knowledge of regulatory requirements to repair DC systems and their components	identify codes , standards and jurisdictional regulations to repair DC systems and their components

Range of Variables

components include: breakers, receptacles, converters, conductors, connectors, fuses, solar panels, batteries, harnesses, relays, control panels, inverters

codes include: CEC, CSA

wire containment techniques include: routing, fastening, wire protection

tools and equipment include: multi-meter, battery load tester, fish wires, battery straps, wire strippers, wire crimpers, hand tools, power tools, test light, amp clamp, wire cutters

C-10.03 Installs DC electrical systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
C-10.03.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
C-10.03.02P	calculate electrical load , demand and material required	electrical load , demand and material required are calculated to determine installation strategy according to requirements
C-10.03.03P	access installation area	installation area is accessed by removing items
C-10.03.04P	install DC system components	DC system components are installed according to manufacturers' specifications
C-10.03.05P	verify DC power supply and distribution system operation	DC power supply and distribution system operation is verified to ensure compliance with manufacturers' specifications
C-10.03.06P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multi-meter, battery load tester, fish wires, battery straps, wire strippers, wire crimpers, hand tools, power tools, amp clamp, wire cutters

electrical load includes: wattage, amperage

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

items include: panels, seats, cabinets

components include: breakers, receptacles, converters, conductors, connectors, fuses, solar panels, batteries, inverters, wiring

Knowledge

Learning Outcomes		Learning Objectives
C-10.03.01L	demonstrate knowledge of DC systems, their components , characteristics and applications	identify terminology associated with DC systems and their components
		identify DC systems and their components , and describe their characteristics and applications
		describe Ohm's law and Watt's law formulas
		identify charging systems, and describe their characteristics and applications
		identify and describe codes
		describe electrical load and demand
		describe wire containment techniques , and their characteristics and applications
C-10.03.02L	demonstrate knowledge of procedures to install DC systems and their components	identify tools and equipment used to install DC systems and their components , and describe their procedures for use
		describe procedures to install DC systems and their components
		describe testing procedures for voltage, current and resistance
C-10.03.03L	demonstrate knowledge of training and certification requirements to install DC systems and their components	identify training and certification requirements to install DC systems and their components
C-10.03.04L	demonstrate knowledge of regulatory requirements to install DC systems and their components	identify codes , standards and jurisdictional regulations to install DC systems and their components

Range of Variables

components include: breakers, receptacles, converters, conductors, connectors, fuses, solar panels, batteries, inverters, wiring

codes include: CEC, CSA

electrical load includes: wattage, amperage

wire containment techniques include: routing, fastening, wire protection

tools and equipment include: multi-meter, battery load tester, fish wires, battery straps, wire strippers, wire crimpers, hand tools, power tools, amp clamp, wire cutters

Task C-11 Services generators

Task Descriptor

Generators supply power for the operation of the RV. Recreation vehicle service technicians must be able to maintain, replace and install generators and components.

While working on generators, recreation vehicle service technicians must be aware of the safety hazards associated with generators.

C-11.01 Maintains generators

		Skills
	Performance Criteria	Evidence of Attainment
C-11.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
C-11.01.02P	check generator components	generator components are checked for compliance with manufacturers' service manuals
C-11.01.03P	change oil and filters	oil and filters are changed according to manufacturers' specifications
C-11.01.04P	inspect and test starting system switches and harnesses	starting system switches and harnesses are visually inspected and tested for functionality
C-11.01.05P	inspect fuel delivery systems	fuel delivery systems are visually inspected for fuel supply, connection and leaks according to manufacturers' specifications
C-11.01.06P	inspect installation and supporting hardware	installation and supporting hardware are visually inspected according to manufacturers' specifications
C-11.01.07P	check electrical source	electrical source is checked for specified DC voltage and amperage
C-11.01.08P	inspect wiring connections, gauge and routing	wiring connections, gauge and routing are inspected according to manufacturers' specifications
C-11.01.09P	verify generator operation	generator operation is verified by testing AC output voltage and frequency, and exercising generator according to manufacturers' specifications
C-11.01.10P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: multi-meter, battery load tester, load bank, wire strippers, wire crimpers, hand tools, power tools, compression tester, spark plug testers, amp clamp, wire cutters

filters include: fuel, air, oil filters

Knowledge		
	Learning Outcomes	Learning Objectives
C-11.01.01L	demonstrate knowledge of generators, their components, characteristics and applications	identify terminology associated with generators
		identify generators, and describe their characteristics and applications
		identify generator components, and describe their characteristics and applications
		describe small engine operation
C-11.01.02L	demonstrate knowledge of procedures to maintain generators	describe generator operating principles
		identify tools and testing equipment used to maintain generators, and describe their procedures for use
		describe maintenance procedures and service schedules to maintain generators
C-11.01.03L	demonstrate knowledge of training and certification requirements to maintain generators	describe procedures for checking power output
		identify training and certification requirements to maintain generators
C-11.01.04L	demonstrate knowledge of regulatory requirements to maintain generators	identify codes , standards and jurisdictional regulations to maintain generators

Range of Variables

tools and testing equipment include: multi-meter, battery load tester, load bank, wire strippers, wire crimpers, hand tools, power tools, compression tester, spark plug testers, amp clamp, wire cutters

codes include: CEC, CSA

C-11.02 Installs generators

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
C-11.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
C-11.02.02P	prepare location for installation	location is prepared for installation of generator according to manufacturers' specifications
C-11.02.03P	position and secure mounting components	mounting components are positioned and secured according to manufacturers' specifications
C-11.02.04P	position and secure generator	generator is positioned and secured according to manufacturers' specifications
C-11.02.05P	route and connect electrical wiring and fuel lines	electrical wiring and fuel lines are routed and connected according to manufacturers' specifications
C-11.02.06P	ensure exhaust system is installed to allow venting	exhaust system is installed to allow venting according to codes
C-11.02.07P	verify generator operation	generator operation is verified according to manufacturers' specifications
C-11.02.08P	select and use drawings, diagrams and schematics	drawings, diagrams and schematics are selected and used according to job task
C-11.02.09P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: multi-meter, load bank, wire strippers, wire crimpers, hand tools, power tools, amp clamp, wire cutters

codes include: CEC, CSA

Knowledge

	Learning Outcomes	Learning Objectives
C-11.02.01L	demonstrate knowledge of generators	identify terminology associated with generators
		identify generators, and describe their characteristics and applications
		describe generator specifications and requirements
		identify types of fuel , and describe its characteristics and applications

		identify drawings, diagrams and schematics, and describe their applications for use
C-11.02.02L	demonstrate knowledge of procedures to install generators	identify tools and testing equipment used to install generators, and describe their procedures for use
		describe procedures to install generators
C-11.02.03L	demonstrate knowledge of training and certification requirements to install generators	identify training and certification requirements to install generators
C-11.02.04L	demonstrate knowledge of regulatory requirements to install generators	identify codes , standards and jurisdictional regulations to install generators

Range of Variables

generator specifications and requirements include: intended electrical load, size, venting

fuel includes: gas, diesel, LP gas

tools and equipment include: multi-meter, load bank, wire strippers, wire crimpers, hand tools, power tools, amp clamp, wire cutters

codes include: CEC, CSA

Major Work Activity D

Liquefied petroleum (LP) gas systems

Task D-12 Diagnoses LP gas systems

Task Descriptor

Recreation vehicle service technicians require knowledge of codes and regulations related to LP gas systems to diagnose and to ensure a safe and reliable repair. They also need to understand and apply the basic principles of LP gas including the effects of temperature and pressure on the system. The high pressure gas system runs from the supply tank to the regulator, while the low pressure gas system runs from the regulator to the appliances.

D-12.01 Diagnoses LP gas supply systems (high pressure)

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
D-12.01.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
D-12.01.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
D-12.01.03P	inspect system and components	system and components are inspected according to requirements
D-12.01.04P	inspect system and containers	system and containers are visually inspected for expiry date and damage
D-12.01.05P	locate leaks	leaks are located according to tests
D-12.01.06P	perform tests	tests are performed according to requirements
D-12.01.07P	determine cause of fault	cause of fault is determined according to system tests and inspections
D-12.01.08P	determine servicing required	servicing required is determined according to tests and inspections
D-12.01.09P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

components include: hoses, container, protective coverings, fasteners, regulators, valves

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

damage includes: rust, dents, damaged welds, damaged supply lines and connections

tests include: leak, fuel level, visual inspections, sensory indicators

cause of fault includes: kinked hose, punctured hose, seized excess flow valve

servicing includes: repair or replacement of defective components

Knowledge		
	Learning Outcomes	Learning Objectives
D-12.01.01L	demonstrate knowledge of LP gas supply systems (high pressure), their components , characteristics and applications	identify terminology associated with LP gas supply systems (high pressure)
		identify LP gas supply systems (high pressure) and their components , and describe their characteristics and applications
		describe characteristics and applications of LP gas
		describe effects of contaminants
D-12.01.02L	demonstrate knowledge of procedures to diagnose LP gas supply systems (high pressure)	identify tools and testing equipment used to diagnose LP gas supply systems (high pressure), and describe their procedures for use
		describe procedures to diagnose LP gas supply systems (high pressure)
		describe procedures to perform tests
D-12.01.03L	demonstrate knowledge of certification requirements to diagnose LP gas supply systems (high pressure)	identify certification requirements to diagnose LP gas supply systems (high pressure)
D-12.01.04L	demonstrate knowledge of regulatory requirements to diagnose LP gas supply systems (high pressure)	identify codes, standards and regulations to diagnose LP gas supply systems (high pressure)

Range of Variables

components include: hoses, container, protective coverings, fasteners, regulators, valves

tests include: leak, fuel level, visual inspections, sensory indicators

D-12.02 Diagnoses LP gas distribution systems (low pressure)

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
D-12.02.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
D-12.02.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
D-12.02.03P	inspect low pressure distribution system	low pressure distribution system is visually inspected according to requirements and for damage
D-12.02.04P	perform tests	tests are performed according to requirements
D-12.02.05P	locate leaks	leaks are located according to system tests
D-12.02.06P	determine cause of fault	cause of fault is determined according to system tests
D-12.02.07P	determine servicing required	servicing required is determined according to tests and inspections
D-12.02.08P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: hand tools, power tools, leak detectors, manometer

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

damage includes: impacts, broken fittings, unsecured gas lines

tests include: working pressure, lockup, leak, visual inspection, sensory indicators

cause of fault includes: contaminants, punctured lines, defective components

servicing includes: repair or replacement of defective components

Knowledge

Learning Outcomes	Learning Objectives
D-12.02.01L demonstrate knowledge of LP gas distribution systems (low pressure), their components , characteristics and applications	identify terminology associated with LP gas distribution systems (low pressure)
	identify LP gas supply systems (low pressure) and their components , and describe their characteristics and applications
	identify containers, and describe their characteristics and applications
	describe characteristics and applications of LP gas
D-12.02.02L demonstrate knowledge of procedures to diagnose LP gas distribution systems (low pressure)	describe effects of contaminants
	identify tools and testing equipment used to diagnose LP gas distribution systems (low pressure), and describe their procedures for use
	describe procedures to diagnose LP gas distribution systems (low pressure)
D-12.02.03L demonstrate knowledge of certification requirements to diagnose LP gas distribution systems (low pressure)	describe procedures to perform tests
	identify certification requirements to diagnose LP gas distribution systems (low pressure)
D-12.02.04L demonstrate knowledge of regulatory requirements to diagnose LP gas distribution systems (low pressure)	identify codes, standards and regulations to diagnose LP gas distribution systems (low pressure)

Range of Variables

components include: hoses, containers, protective coverings, fasteners, regulators, valves

tools and testing equipment include: hand tools, power tools, leak detectors, manometer

tests include: working pressure, lockup, leak, visual inspection, sensory indicators

Task D-13 Services LP gas systems

Task Descriptor

Recreation vehicle service technicians must be able to maintain, repair, replace and install LP gas systems and their components according to jurisdictional regulations to ensure customer safety and satisfaction.

While working on the systems, recreation vehicle service technicians must be aware of the safety hazards associated with LP gas.

D-13.01 Maintains LP gas systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
D-13.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
D-13.01.02P	check regulator pressure	regulator pressure is checked according to requirements using tests
D-13.01.03P	adjust regulator	regulator is adjusted according to diagnosis
D-13.01.04P	verify regulator adjustments	regulator adjustments are verified according to requirements and tests
D-13.01.05P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: hand tools, power tools, leak detectors, manometer

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

tests include: working pressure, lockup, leak, sensory indicators

Knowledge

	Learning Outcomes	Learning Objectives
D-13.01.01L	demonstrate knowledge of LP gas systems, their components , characteristics and applications	identify terminology associated with LP gas systems and their components
		identify LP gas supply systems and their components , and describe their characteristics and applications

		identify types of valves, and describe their characteristics and applications
		identify types and sizes of pipes and hoses, and describe their characteristics and applications
		identify types of regulators, and describe their characteristics and applications
		identify types of sealants, fittings and threads, and describe their characteristics and applications
		describe effects of contaminants
D-13.01.02L	demonstrate knowledge of procedures to maintain LP gas systems	identify tools and testing equipment used to maintain LP gas systems, and describe their procedures for use
		describe procedures to maintain LP gas systems
		describe procedures to perform tests
D-13.01.03L	demonstrate knowledge of certification requirements to maintain LP gas systems	identify certification requirements to maintain LP gas systems
D-13.01.04L	demonstrate knowledge of regulatory requirements to maintain LP gas systems	identify codes, standards and regulations to maintain LP gas systems

Range of Variables

components include: hoses, containers, protective coverings, fasteners, regulators, valves

tools and testing equipment include: hand tools, power tools, leak detectors, manometer

tests include: working pressure, lockup, leak, sensory indicators

D-13.02 Repairs LP gas systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
D-13.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
D-13.02.02P	access repair area	repair area is accessed by removing items or by lifting RV
D-13.02.03P	replace or repair defective components	defective components are replaced or repaired according to diagnosis
D-13.02.04P	re-secure cylinders and distribution system	cylinders and distribution system is re-secured according to codes

D-13.02.05P	remove contaminants	contaminants are removed to maximize supply of LP gas
D-13.02.06P	perform drop pressure test and adjust pressure	drop pressure test is performed and pressure adjusted according to requirements
D-13.02.07P	verify repair	repair is verified by performing tests according to requirements
D-13.02.08P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: hand tools, power tools, leak detectors, manometer, flaring tools

items include: heat shields, tank covers, access panels

components include: hoses, containers, protective coverings, fasteners, regulators, valves

requirements include: component placement, codes, manufacturers' specifications, jurisdictional regulations

tests include: working pressure, lockup, leak, sensory indicators

Knowledge		
	Learning Outcomes	Learning Objectives
D-13.02.01L	demonstrate knowledge of LP gas systems, their components , characteristics and applications	identify terminology associated with LP gas systems and their components
		identify LP gas supply systems and their components , and describe their characteristics and applications
		identify types of valves, and describe their characteristics and applications
		identify types and sizes of pipes and hoses, and describe their characteristics and applications
		identify types of regulators, and describe their characteristics and applications
		identify types of sealants, fittings and threads, and describe their characteristics and applications
		describe effects of contaminants
D-13.02.02L	demonstrate knowledge of procedures to repair LP gas systems and their components	identify tools and testing equipment used to repair LP gas systems and their components , and describe their procedures for use
		describe procedures to repair LP gas systems and their components
		describe procedures to perform tests

		describe procedures to remove contaminants
D-13.02.03L	demonstrate knowledge of certification requirements to maintain LP gas systems	identify certification requirements to maintain LP gas systems
D-13.02.04L	demonstrate knowledge of regulatory requirements to maintain LP gas systems	identify codes, standards and regulations to maintain LP gas systems

Range of Variables

components include: hoses, containers, protective coverings, fasteners, regulators, valves

tools and testing equipment include: hand tools, power tools, leak detectors, manometer, flaring tools

tests include: working pressure, lockup, leak, sensory indicators

D-13.03 Installs LP gas systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
D-13.03.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
D-13.03.02P	calculate load , demand and material	load , demand and material are calculated to determine installation strategy according to requirements
D-13.03.03P	access installation area	installation area is accessed by removing items , covers or lifting RV
D-13.03.04P	adjust area to accommodate new components	area is adjusted to accommodate new components according to requirements
D-13.03.05P	install components	components are installed according to requirements
D-13.03.06P	perform tests	tests are performed according to requirements
D-13.03.07P	verify operation	operation is verified according to requirements
D-13.03.08P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: hand tools, power tools, leak detectors, manometer, tubing cutters, flaring tools

load includes: British thermal unit (BTU), volume, weight

requirements include: component placement, codes, manufacturers' specifications, jurisdictional regulations

items include: heat shields, tank covers, access panels

components include: hoses, containers, protective coverings, fasteners, regulators, valves

tests include: working pressure, lockup, leak, sensory indicators

Knowledge		
	Learning Outcomes	Learning Objectives
D-13.03.01L	demonstrate knowledge of LP gas systems their components , characteristics and applications	identify terminology associated with LP gas systems and their components
		identify LP gas supply systems and their components , and describe their characteristics and applications
		identify types of valves, and describe their characteristics and applications
		identify types and sizes of pipes and hoses, and describe their characteristics and applications
		identify types of regulators, and describe their characteristics and applications
		identify types of sealants, fittings and threads, and describe their characteristics and applications
D-13.03.02L	demonstrate knowledge of procedures to install LP gas systems and their components	describe effects of contaminants
		identify tools and testing equipment used to install LP gas systems and their components , and describe their procedures for use
		describe procedures to install LP gas systems and their components
		describe routing procedures
		describe procedures to perform tests
D-13.03.03L	demonstrate knowledge of certification requirements to maintain LP gas systems	identify certification requirements to maintain LP gas systems
D-13.03.04L	demonstrate knowledge of regulatory requirements to maintain LP gas systems	identify codes, standards and regulations to maintain LP gas systems

Range of Variables

components include: hoses, containers, protective coverings, fasteners, regulators, valves

tools and testing equipment include: hand tools, power tools, leak detectors, manometer, tubing cutters, flaring tools

tests include: working pressure, lockup, leak, sensory indicators

Major Work Activity E

Appliances and consumer products

Task E-14 Diagnoses appliances

Task Descriptor

Recreation vehicle service technicians diagnose appliances to determine faults and recommend appropriate solutions.

E-14.01 Diagnoses water heaters

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-14.01.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
E-14.01.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-14.01.03P	measure power and gas supply	power and gas supply are measured according to requirements
E-14.01.04P	inspect tank and related components	tank and related components are visually inspected and pressure tested for faults
E-14.01.05P	verify operation of components	operation of components is verified according to requirements using tools and testing equipment
E-14.01.06P	verify by-pass, mixing and check valves	by-pass, mixing and check valves are verified to determine flow direction according to manufacturers' specifications
E-14.01.07P	perform tests	tests are performed according to requirements
E-14.01.08P	determine servicing required	servicing required is determined according to tests and inspections
E-14.01.09P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: hand tools, power tools, multimeters, manometer, carbon monoxide (CO) detector, thermometer

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

faults include: corrosion, burnt wires, poor installation, foreign objects, pin holes, cracks

components include: thermostats, circuit boards, energy cut off (ECO), gas valves, electrodes, thermocouples, heating elements, combustion fans, tanks

tests include: working pressure, leak, flame characteristics, water flow, water temperature

servicing includes: adjustment or replacement of defective components

Knowledge		
	Learning Outcomes	Learning Objectives
E-14.01.01L	demonstrate knowledge of water heaters, their components , characteristics and applications	identify terminology associated with water heaters
		identify types of water heaters , and describe their characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their operation, characteristics and applications
		identify service requirements, and describe their characteristics and applications
		identify components , and describe their characteristics, applications and operation
E-14.01.02L	demonstrate knowledge of procedures to diagnose water heaters	identify tools and testing equipment used to diagnose water heaters, and describe their procedures for use
		describe procedures to diagnose water heaters
		describe sequence of operations to perform diagnosis
		describe procedures to perform tests
E-14.01.03L	demonstrate knowledge of certification requirements to diagnose water heaters	identify certification requirements to diagnose water heaters
E-14.01.04L	demonstrate knowledge of regulatory requirements to diagnose water heaters	identify codes, standards and regulations to diagnose water heaters

Range of Variables

components include: thermostats, circuit boards, ECO, gas valves, electrodes, thermocouples, heating elements, combustion fans, tanks

types of water heaters include: gas, electric, motor aid, hydronic, on-demand

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas, water, motor aid

tools and testing equipment include: hand tools, power tools, multimeters, manometer, CO detector, thermometer

tests include: working pressure, leak, flame characteristics, water flow, water temperature

E-14.02 Diagnoses furnaces

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-14.02.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
E-14.02.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-14.02.03P	measure power and gas supply	power and gas supply are measured according to requirements
E-14.02.04P	check air flow at registers	air flow at registers is checked for possible obstructions
E-14.02.05P	inspect intake and exhaust venting	intake and exhaust venting are visually inspected
E-14.02.06P	inspect combustion chambers and related components	combustion chambers and related components are visually inspected for faults
E-14.02.07P	verify burner operation	burner operation is verified by inspecting flame characteristics or CO detector
E-14.02.08P	verify operation of furnace components	operation of furnace components is verified according to manufacturers' specifications using testing equipment
E-14.02.09P	perform tests	tests are performed according to requirements
E-14.02.10P	determine servicing required	servicing required is determined according to tests and inspections
E-14.02.11P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

faults include: corrosion, burnt wires, poor installation, foreign objects, cracks

furnace components include: thermostats, circuit boards, high limit switches, micro switches, gas valves, electrodes, ducting, blower motor, blower wheels, sail switches, burners

testing equipment includes: multimeters, manometers, air speed indicator (anemometers)

tests include: temperature, LP gas, diesel, AC, DC, airflow

servicing includes: adjustment or replacement of defective components

Knowledge		
	Learning Outcomes	Learning Objectives
E-14.02.01L	demonstrate knowledge of furnaces, their components , characteristics and applications	identify terminology associated with furnaces
		identify types of heating systems , and describe their characteristics and applications
		identify ignition systems, and describe their characteristics and applications
		identify duct systems, and describe their routing and sizing, characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		describe service requirements
		identify components , and describe their characteristics, applications and operation
		describe system operation
E-14.02.02L	demonstrate knowledge of procedures to diagnose furnaces	identify tools and testing equipment used to diagnose furnaces, and describe their procedures for use
		describe procedures to diagnose furnaces
		describe sequence of operations to perform diagnosis
		describe procedures to perform tests
E-14.02.03L	demonstrate knowledge of certification requirements to diagnose furnaces	identify certification requirements to diagnose furnaces
E-14.02.04L	demonstrate knowledge of regulatory requirements to diagnose furnaces	identify codes, standards and regulations to diagnose furnaces

Range of Variables

components include: thermostats, circuit boards, high limit switches, micro switches, gas valves, electrodes, ducting, blower motor, blower wheels, sail switches, burners

types of heating systems include: gravity, forced air combustion, hydronic, catalytic heater

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas, water, diesel

testing equipment includes: multimeters, manometers, air speed indicator (anemometers)

tests include: temperature, LP gas, diesel, AC, DC, airflow

E-14.03 Diagnoses cooktops and ranges

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-14.03.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
E-14.03.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-14.03.03P	measure power and gas supply	power and gas supply are measured according to requirements using testing equipment
E-14.03.04P	inspect components	components are visually inspected for faults
E-14.03.05P	perform operational test	operational test is performed by cycling unit
E-14.03.06P	test thermostat	thermostat is tested to ensure oven is cycling at specified temperature
E-14.03.07P	perform tests	tests are performed according to requirements
E-14.03.08P	determine servicing required	servicing required is determined according to tests and inspections
E-14.03.09P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

testing equipment includes: high temperature thermometer, multimeters, manometers

components include: burners, pilots, valves, electrodes, thermostats, igniters, LP gas regulators, air shutters

faults include: corrosion, burnt wires, poor installation, foreign objects, defective valve, obstructed venting

tests include: working pressure, leak

servicing includes: adjustment or replacement of defective components

Knowledge		
	Learning Outcomes	Learning Objectives
E-14.03.01L	demonstrate knowledge of cooktops and ranges, their components , characteristics and applications	identify terminology associated with cooktops and ranges
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		describe service requirements
		identify components , and describe their characteristics, applications and operation
E-14.03.02L	demonstrate knowledge of procedures to diagnose cooktops and ranges	identify tools and testing equipment used to diagnose cooktops and ranges, and describe their characteristics and applications
		describe procedures to diagnose cooktops and ranges
		describe sequence of operations to perform diagnosis
		describe procedures to perform tests
E-14.03.03L	demonstrate knowledge of certification requirements to diagnose cooktops and ranges	identify certification requirements to diagnose cooktops and ranges
E-14.03.04L	demonstrate knowledge of regulatory requirements to diagnose cooktops and ranges	identify codes, standards and regulations to diagnose cooktops and ranges

Range of Variables

components include: burners, pilots, valves, electrodes, thermostats, igniters, LP gas regulators, air shutters

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas

testing equipment includes: high temperature thermometer, multimeters, manometers

tests include: working pressure, leak

E-14.04 Diagnoses refrigerators and ice makers

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-14.04.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
E-14.04.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-14.04.03P	measure power and gas supply	power and gas supply are measured according to requirements using testing equipment
E-14.04.04P	verify operation of refrigerator and ice maker components	operation of refrigerator and ice maker components is verified using testing equipment
E-14.04.05P	inspect refrigerator and ice maker components and cooling unit components	refrigerator and ice maker components and cooling unit components are visually inspected for faults
E-14.04.06P	measure temperatures of refrigerator and freezer compartments, and cooling unit components	temperatures of refrigerator and freezer compartments, and cooling unit components are measured according to manufacturers' specifications
E-14.04.07P	identify worn and damaged refrigerator and ice maker components	worn and damaged refrigerator and ice maker components to be replaced or repaired are identified according to manufacturers' specifications
E-14.04.08P	check venting and levelling	venting and levelling are checked to ensure proper conditions for testing
E-14.04.09P	inspect door gasket	door gasket is inspected to ensure adequate contact
E-14.04.10P	by-pass control and circuitry	control and circuitry are by-passed to check cooling performance according to manufacturers' specifications

E-14.04.11P	perform tests	tests are performed according to requirements
E-14.04.12P	determine servicing required	servicing required is determined according to tests and inspections
E-14.04.13P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

testing equipment includes: multimeters, manometers, thermometers

refrigerator and ice maker components include: thermostats, circuit boards, high limit switches, gas valves, electrodes, water valves, timer switches, thermocouples, burner assemblies, fans, heaters

cooling unit components include: boiler, condenser, evaporator, absorber

faults include: corrosion, burnt wires, poor installation, combustion, foreign objects

tests include: working pressure, leak, LP gas, flame characteristics, AC, DC, water

servicing includes: adjustment or replacement of defective components

Knowledge		
	Learning Outcomes	Learning Objectives
E-14.04.01L	demonstrate knowledge of refrigerators and ice makers, their components characteristics and applications	identify terminology associated with refrigerators and ice makers
		identify types of refrigerators and ice makers , and describe their characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		describe service requirements
		identify refrigerator and ice maker components , and describe their characteristics, applications and operation
		identify cooling unit components , and describe their characteristics and applications
E-14.04.02L	demonstrate knowledge of procedures to diagnose refrigerators and ice makers	identify tools and testing equipment used to diagnose refrigerators and ice makers, and describe their procedures for use
		describe procedures to diagnose refrigerators and ice makers
		describe sequence of operations to perform diagnosis

		describe procedures to perform tests
E-14.04.03L	demonstrate knowledge of certification requirements to diagnose refrigerators and ice makers	identify certification requirements to diagnose refrigerators and ice makers
E-14.04.04L	demonstrate knowledge of regulatory requirements to diagnose refrigerators and ice makers	identify codes, standards and regulations to diagnose refrigerators and ice makers

Range of Variables

refrigerator and ice maker components include: thermostats, circuit boards, high limit switches, gas valves, electrodes, water valves, timer switches, thermocouples, burner assemblies, fans, heaters

types of refrigerators and ice makers include: compressor, absorption

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas, water

cooling unit components include: boiler, condenser, evaporator, absorber

testing equipment includes: multimeters, manometers, thermometers

tests include: working pressure, leak, LP gas, flame characteristics, AC, DC, water

E-14.05 Diagnoses air conditioners and heat pumps

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-14.05.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
E-14.05.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-14.05.03P	measure power supply	power supply is measured according to requirements using testing equipment
E-14.05.04P	verify operation of components	operation of components is verified according to manufacturers' specifications using testing equipment
E-14.05.05P	inspect components	components are visually inspected for faults
E-14.05.06P	determine servicing required	servicing required is determined according to tests and inspections
E-14.05.07P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: hand tools, power tools, multimeters, thermometers, anemometer, ammeters

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

components include: capacitors, motors, relays, control units, condenser, compressor, evaporator, fans, reversing valves

faults include: corrosion, burnt wires, poor installation, foreign objects, physical damage

servicing includes: adjustment or replacement of defective components or units

Knowledge		
	Learning Outcomes	Learning Objectives
E-14.05.01L	demonstrate knowledge of air conditioners and heat pumps, their components , characteristics and applications	identify terminology associated with air conditioners and heat pumps
		identify types of air conditioning systems , and describe their characteristics and applications
		identify components , and describe their characteristics, applications and operation
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
E-14.05.02L	demonstrate knowledge of procedures to diagnose air conditioners and heat pumps	identify service requirements
		identify tools and testing equipment used to diagnose air conditioners and heat pumps, and describe their procedures for use
		describe procedures to diagnose air conditioners and heat pumps
		describe sequence of operations to perform diagnosis

Range of Variables

components include: capacitors, motors, relays, control units, condenser, compressor, evaporator, fans, reversing valves

types of air conditioning systems include: basement, roof, window

system requirements include: venting, structure, wiring, sizing, voltage

supply systems include: AC, DC

tools and testing equipment include: hand tools, power tools, multimeters, thermometers, anemometer, ammeters

Task E-15 Services water heaters

Task Descriptor

Recreation vehicle service technicians service water heaters and components to ensure product performance. Regular maintenance of water heaters is required. Recreation vehicle service technicians repair water heaters to restore products to working condition. New water heaters may be installed to replace, retrofit or as new installs requested by customers.

E-15.01 Maintains water heaters

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-15.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-15.01.02P	test operation of water heater	operation of water heater is tested according to manufacturers' specifications
E-15.01.03P	check water supply systems	water supply systems are checked for leaks and blockages
E-15.01.04P	perform tests	tests are performed according to requirements
E-15.01.05P	check and clean venting and combustion components	venting and combustion components are checked and cleaned for sooting and foreign object obstructions
E-15.01.06P	check and adjust air fuel mixture	air fuel mixture is checked and adjusted according to manufacturers' specifications
E-15.01.07P	clean and test connections of circuit board and components	connections of circuit board and components are cleaned and tested
E-15.01.08P	flush tank and replace anode rod	tank is flushed and anode rod is replaced according to manufacturers' specifications
E-15.01.09P	identify worn and damaged components	worn and damaged components are identified to recommend replacement or repair
E-15.01.10P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tests include: working pressure, leak, flame characteristics, water flow, water temperature

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

components include: thermostats, circuit boards, ECO, gas valves, electrodes, thermocouples, heating elements, combustion fans, inner tanks

Knowledge		
Learning Outcomes	Learning Objectives	
E-15.01.01L	demonstrate knowledge of water heaters, their components , characteristics and applications	identify terminology associated with water heaters
		identify types of water heaters , and describe their characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their operation, characteristics and applications
		identify service requirements, and describe their characteristics and applications
		identify components , and describe their characteristics, applications and operation
		identify hydronic systems, and describe their characteristics and applications
E-15.01.02L	demonstrate knowledge of procedures to maintain water heaters	identify motor aid systems, and describe their characteristics and applications
		identify tools and testing equipment used to maintain water heaters, and describe their procedures for use
		describe procedures to maintain water heaters
E-15.01.03L	demonstrate knowledge of certification requirements to maintain water heaters	describe procedures to perform tests
		identify certification requirements to maintain water heaters
E-15.01.04L	demonstrate knowledge of regulatory requirements to maintain water heaters	identify codes, standards and regulations to maintain water heaters

Range of Variables

components include: thermostats, circuit boards, ECO, gas valves, electrodes, thermocouples, heating elements, combustion fans, inner tanks

types of water heaters include: gas, electric, motor aid, hydronic, on-demand

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas, water

tests include: working pressure, leak, flame characteristics, water flow, water temperature

E-15.02 Repairs water heaters

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-15.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-15.02.02P	disconnect supply systems	supply systems to water heaters are disconnected according to codes and jurisdictional regulations
E-15.02.03P	drain water heater	water heater is drained to prevent damage to RV
E-15.02.04P	adjust electrodes	electrodes are adjusted to ensure spark gap, ground and position according to manufacturers' specifications
E-15.02.05P	adjust gas pressure	gas pressure is adjusted according to requirements
E-15.02.06P	adjust air shutter on burner tube	air shutter on burner tube is adjusted according to manufacturers' specifications
E-15.02.07P	replace defective water heater and their components	defective water heater and their components are replaced according to diagnosis
E-15.02.08P	perform tests	tests are performed according to requirements
E-15.02.09P	verify repair of water heater	repair is verified by testing water heater operation according to manufacturers' specifications
E-15.02.10P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: temperature and pressure relief valve socket, thread chaser, element socket, hand tools, power tools, multimeter, thermometer

supply systems include: AC, DC, LP gas, water

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

components include: thermostats, circuit boards, ECO, gas valves, electrodes, thermocouples, heating elements, inner tanks

tests include: working pressure, leak, flame characteristics, water flow, water temperature

Knowledge		
	Learning Outcomes	Learning Objectives
E-15.02.01L	demonstrate knowledge of water heaters, their components , characteristics and applications	identify terminology associated with water heaters
		identify types of water heaters , and describe their characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their operation, characteristics and applications
		identify components , and describe their characteristics, applications and operation
E-15.02.02L	demonstrate knowledge of procedures to repair water heaters	identify tools and testing equipment used to repair water heaters, and describe their procedures for use
		describe procedures to repair water heaters
		describe sequence of operations to perform repairs
		describe procedures to perform tests
E-15.02.03L	demonstrate knowledge of certification requirements to repair water heaters	identify certification requirements to repair water heaters
E-15.02.04L	demonstrate knowledge of regulatory requirements to repair water heaters	identify codes, standards and regulations to repair water heaters

Range of Variables

components include: thermostats, circuit boards, ECO, gas valves, electrodes, thermocouples, heating elements, inner tanks

types of water heaters include: gas, electric, motor aid, hydronic, on-demand

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas, water

tools and testing equipment include: temperature and pressure relief valve socket, thread chaser, element socket, hand tools, power tools, multimeter, thermometer

tests include: working pressure, leak, flame characteristics, water flow, water temperature

E-15.03 Installs water heaters

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-15.03.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-15.03.02P	identify and lay out location of installation	location of installation is identified and laid out according to codes and jurisdictional regulations
E-15.03.03P	cut out opening	opening is cut out according to manufacturers' specifications
E-15.03.04P	reinforce structure	structure is reinforced to support water heater according to manufacturers' specifications
E-15.03.05P	insert, secure and seal water heaters	water heaters are inserted, secured and sealed according to manufacturers' specifications
E-15.03.06P	connect supply systems	supply systems are connected to water heaters
E-15.03.07P	perform tests	tests are performed according to requirements
E-15.03.08P	verify operation	operation is verified according to manufacturers' specifications by cycling water heater
E-15.03.09P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: hand tools, power tools, multimeter, thermometer

supply systems include: AC, DC, LP gas, water

tests include: working pressure, leak, flame characteristics, water flow, water temperature

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

Knowledge		
	Learning Outcomes	Learning Objectives
E-15.03.01L	demonstrate knowledge of water heaters, their components , characteristics and applications	identify terminology associated with water heaters
		identify types of water heaters , and describe their characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their operation, characteristics and applications
		identify components , and describe their characteristics, applications and operation
		identify hydronic systems, and describe their characteristics and applications
E-15.03.02L	demonstrate knowledge of procedures to install water heaters	identify tools and testing equipment used to install water heaters, and describe their procedures for use
		describe procedures to install water heaters
		describe sequence of operations to perform installation
E-15.03.03L	demonstrate knowledge of certification requirements to install water heaters	describe procedures to perform tests
		identify certification requirements to install water heaters
E-15.03.04L	demonstrate knowledge of regulatory requirements to install water heaters	identify codes, standards and regulations to install water heaters

Range of Variables

components include: thermostats, circuit boards, ECO, gas valves, electrodes, thermocouples, heating elements, inner tanks

types of water heaters include: gas, electric, motor aid, hydronic, on-demand

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas, water

tools and testing equipment include: hand tools, power tools, multimeter, thermometer

tests include: working pressure, leak, flame characteristics, water flow, water temperature

Task E-16 Services furnaces

Task Descriptor

Recreation vehicle service technicians service furnaces and components to ensure product performance. Regular maintenance of furnaces is required.

Recreation vehicle service technicians repair furnaces to restore products to working condition. New furnaces may be installed to replace, retrofit or as new installs requested by customers.

E-16.01 Maintains furnaces

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-16.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-16.01.02P	test operation of furnace	operation of furnace is tested according to manufacturers' specifications
E-16.01.03P	disconnect supply systems	supply systems to furnace are disconnected according to codes and jurisdictional regulations
E-16.01.04P	clean and test components	components are cleaned and tested according to manufacturers' specifications
E-16.01.05P	identify worn and damaged components	worn and damaged components are identified to recommend replacement or repair
E-16.01.06P	perform tests	tests are performed according to requirements

E-16.01.07P	verify furnace operation	furnace operation is verified according to manufacturers' specifications
E-16.01.08P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

supply systems include: AC, DC, LP gas, water, diesel

components include: thermostats, circuit boards, high limit switches, micro switches, gas valves, electrodes, thermocouples, ducting, blower motor, blower wheels, sail switches, glycol mixtures

tests include: temperature, LP gas, diesel, AC, DC, airflow, glycol mixtures

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

Knowledge		
	Learning Outcomes	Learning Objectives
E-16.01.01L	demonstrate knowledge of furnaces, their components , characteristics and applications	identify terminology associated with furnaces
		identify types of heating systems , and describe their characteristics and applications
		identify ignition systems, and describe their characteristics and applications
		identify duct systems, and describe their routing and sizing, characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		identify components , and describe their characteristics, applications and operation
E-16.01.02L	demonstrate knowledge of procedures to maintain furnaces and their components	describe system operation
		identify tools and testing equipment used to maintain furnaces and their components , and describe their procedures for use
		describe procedures to maintain furnaces and their components
		describe sequence of operations to perform maintenance
		describe procedures to perform tests

E-16.01.03L	demonstrate knowledge of certification requirements to maintain furnaces and their components	identify certification requirements to maintain furnaces and their components
E-16.01.04L	demonstrate knowledge of regulatory requirements to maintain furnaces and their components	identify codes, standards and regulations to maintain furnaces and their components

Range of Variables

components include: thermostats, circuit boards, high limit switches, micro switches, gas valves, electrodes, thermocouples, ducting, blower motor, blower wheels, sail switches, glycol mixtures

types of heating systems include: gravity, forced air combustion, hydronic, catalytic heater

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas, water, diesel

tests include: temperature, LP gas, diesel, AC, DC, airflow, glycol mixtures

E-16.02 Repairs furnaces

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-16.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-16.02.02P	calibrate thermostat and anticipator	thermostat and anticipator are calibrated to ensure proper operation
E-16.02.03P	disconnect supply systems	supply systems to furnaces are disconnected according to codes and jurisdictional regulations
E-16.02.04P	disconnect ducting and venting	ducting and venting is disconnected to remove furnace
E-16.02.05P	add and modify ducting and venting	ducting and venting is added and modified to ensure proper air flow according to manufacturers' specifications
E-16.02.06P	adjust electrodes	electrodes are adjusted according to manufacturers' specifications to ensure spark gap, ground and position
E-16.02.07P	adjust gas pressure	gas pressure is adjusted according to requirements
E-16.02.08P	replace defective components	defective components are replaced
E-16.02.09P	test operation of furnace	operation of furnace is tested using independent power and gas supplies according to manufacturers' specifications

E-16.02.10P	reinstall furnace	furnace is reinstalled in RV by reconnecting ducting, venting, electrical and gas according to manufacturers' specifications, codes and jurisdictional regulations
E-16.02.11P	perform tests	tests are performed according to requirements
E-16.02.12P	verify repair of furnace	repair is verified by testing furnace operation according to manufacturers' specifications
E-16.02.13P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

supply systems include: AC, DC, LP gas, water

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

components include: thermostats, circuit boards, high limit switches, micro switches, gas valves, electrodes, thermocouples, ducting, blower motor, blower wheels, sail switches

tests include: temperature, LP gas, diesel, AC, DC, airflow, glycol mixtures

Knowledge

	Learning Outcomes	Learning Objectives
E-16.02.01L	demonstrate knowledge of furnaces, their components , characteristics and applications	identify terminology associated with furnaces
		identify types of heating systems , and describe their characteristics and applications
		identify ignition systems, and describe their characteristics and applications
		identify duct systems, and describe their routing and sizing, characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		identify components , and describe their characteristics, applications and operation
		describe system operation
E-16.02.02L	demonstrate knowledge of procedures to repair furnaces	identify tools and testing equipment used to repair furnaces, and describe their procedures for use
		describe procedures to repair furnaces

		describe sequence of operations to perform repairs
		describe procedures to perform tests
E-16.02.03L	demonstrate knowledge of certification requirements to repair furnaces	identify certification requirements to repair furnaces
E-16.02.04L	demonstrate knowledge of regulatory requirements to repair furnaces	identify codes, standards and regulations to repair furnaces

Range of Variables

components include: thermostats, circuit boards, high limit switches, micro switches, gas valves, electrodes, thermocouples, ducting, blower motor, blower wheels, sail switches

types of heating systems include: gravity, forced air combustion, hydronic, catalytic heater

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas, water

tests include: temperature, LP gas, diesel, AC, DC, airflow, glycol mixtures

E-16.03 Install furnaces

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-16.03.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-16.03.02P	identify and lay out location of installation	location of installation is identified and laid out according to manufacturers' specifications, codes and jurisdictional regulations
E-16.03.03P	cut out opening	opening is cut out according to manufacturers' specifications
E-16.03.04P	reinforce structure	structure is reinforced to support furnaces according to manufacturers' specifications
E-16.03.05P	insert, secure and seal furnaces	furnaces are inserted, secured and sealed according to manufacturers' specifications, codes and jurisdictional regulations
E-16.03.06P	connect supply systems	supply systems are connected to furnaces according to manufacturers' specifications, codes and jurisdictional regulations
E-16.03.07P	install ducting and venting	ducting and venting are installed to furnaces according to manufacturers' specifications

E-16.03.08P	perform tests	tests are performed according to requirements
E-16.03.09P	verify operation	operation is verified according to manufacturers' specifications by cycling furnace
E-16.03.10P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: cutting tools, hand tools, power tools, multimeter, thermometer

supply systems include: AC, DC, LP gas

tests include: temperature, LP gas, diesel, AC, DC, airflow, glycol mixtures

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

Knowledge		
	Learning Outcomes	Learning Objectives
E-16.03.01L	demonstrate knowledge of furnaces, their components , characteristics and applications	identify terminology associated with furnaces
		identify types of heating systems , and describe their characteristics and applications
		identify ignition systems, and describe their characteristics and applications
		identify duct systems, and describe their routing and sizing, characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		identify components , and describe their characteristics, applications and operation
		describe system operation
E-16.03.02L	demonstrate knowledge of procedures to install furnaces	identify tools and testing equipment used to install furnaces, and describe their procedures for use
		describe procedures to install furnaces
		describe sequence of operations to perform installation
		describe procedures to perform tests

E-16.03.03L	demonstrate knowledge of certification requirements to install furnaces	identify certification requirements to install furnaces
E-16.03.04L	demonstrate knowledge of regulatory requirements to install furnaces	identify codes, standards and regulations to install furnaces

Range of Variables

components include: thermostats, circuit boards, high limit switches, micro switches, gas valves, electrodes, thermocouples, ducting, blower motor, blower wheels, sail switches, glycol mixtures

types of heating systems include: gravity, forced air combustion, hydronic, catalytic heater

system requirements include: venting, structure, wiring, sizing, clearances

supply systems include: AC, DC, LP gas

tools and testing equipment include: cutting tools, hand tools, power tools, multimeter, thermometer

tests include: temperature, LP gas, diesel, AC, DC, airflow, glycol mixtures

Task E-17 Services cooktops and ranges

Task Descriptor

Recreation vehicle service technicians service cooktops and ranges to ensure product performance. Regular maintenance of cooktops and ranges is required. Recreation vehicle service technicians repair cooktops and ranges to restore products to working condition. New cooktops and ranges may be installed to replace, retrofit or as new installs requested by customers.

E-17.01 Maintains cooktops and ranges

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-17.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-17.01.02P	measure and calibrate gas pressure	gas pressure is measured and calibrated according to requirements using testing equipment
E-17.01.03P	measure AC and DC power supplies	AC and DC power supplies are measured according to manufacturers' specifications using testing equipment
E-17.01.04P	clean and adjust components	components are cleaned and adjusted according to manufacturers' specifications
E-17.01.05P	perform tests	tests are performed according to requirements

E-17.01.06P	identify worn and damaged components	worn and damaged components are identified to recommend replacement or repair
E-17.01.07P	verify cooktop, range and oven operation	cooktop, range and oven operation is verified according to manufacturers' specifications
E-17.01.08P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

tools and testing equipment: include: hand tools, power tools, high temperature thermometer, multimeters, manometers

components include: burners, pilots, valves, electrodes, thermostats, igniters, LP gas regulators, air shutters

tests include: working pressure, leak, temperature, flame characteristics, AC, DC

Knowledge		
	Learning Outcomes	Learning Objectives
E-17.01.01L	demonstrate knowledge of cooktops and ranges, their components , characteristics and applications	identify terminology associated with cooktops and ranges
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		identify components , and describe their characteristics, applications and operation
		describe system operation
E-17.01.02L	demonstrate knowledge of procedures to maintain cooktops and ranges	identify tools and testing equipment used to maintain cooktops and ranges, and describe their procedures for use
		describe procedures to maintain cooktops and ranges
		describe sequence of operations to perform maintenance
		describe procedures to perform tests
E-17.01.03L	demonstrate knowledge of certification requirements to maintain cooktops and ranges	identify certification requirements to maintain cooktops and ranges
E-17.01.04L	demonstrate knowledge of regulatory requirements to maintain cooktops and ranges	identify codes, standards and regulations to maintain cooktops and ranges

Range of Variables

components include: burners, pilots, valves, electrodes, thermostats, igniters, LP gas regulators, air shutters

system requirements include: venting, structure, wiring, sizing, clearances

supply systems include: AC, DC, LP gas

tools and testing equipment: include: hand tools, power tools, high temperature thermometer, multimeters, manometers

tests include: working pressure, leak, temperature, flame characteristics, AC, DC

E-17.02 Repairs cooktops and ranges

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-17.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-17.02.02P	disconnect supply systems	supply systems to ranges and ovens are disconnected according to codes and jurisdictional regulations
E-17.02.03P	replace cooktops and ranges, and their components	cooktops and ranges, and their components are replaced according to manufacturers' specifications, codes and jurisdictional regulations
E-17.02.04P	calibrate components	components are calibrated according to manufacturers' specifications
E-17.02.05P	reconnect supply systems	supply systems are reconnected to cooktops and ranges according to manufacturers' specifications, codes and jurisdictional regulations
E-17.02.06P	perform tests	tests are performed according to requirements
E-17.02.07P	verify repair	repair is verified by testing cooktop and range operation according to manufacturers' specifications
E-17.02.08P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: hand tools, power tools, thermometer, manometer

supply systems include: AC, DC, LP gas

components include: burners, pilots, valves, electrodes, thermostats, igniters, LP gas regulators, air shutters, pilots, electrodes

tests include: working pressure, leak, temperature, flame characteristics, AC, DC

Knowledge		
	Learning Outcomes	Learning Objectives
E-17.02.01L	demonstrate knowledge of cooktops and ranges, their components , characteristics and applications	identify terminology associated with cooktops and ranges
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		identify components , and describe their characteristics, applications and operation
E-17.02.02L	demonstrate knowledge of procedures to repair cooktops and ranges	identify tools and testing equipment used to repair cooktops and ranges, and describe their procedures for use
		describe procedures to repair cooktops and ranges
		describe sequence of operations to perform repairs
		describe procedures to perform tests
E-17.02.03L	demonstrate knowledge of certification requirements to repair cooktops and ranges	identify certification requirements to repair cooktops and ranges
E-17.02.04L	demonstrate knowledge of regulatory requirements to repair cooktops and ranges	identify codes, standards and regulations to repair cooktops and ranges

Range of Variables

components include: burners, pilots, valves, electrodes, thermostats, igniters, LP gas regulators, air shutters, pilots, electrodes

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas

tools and testing equipment include: hand tools, power tools, thermometer, manometer

tests include: working pressure, leak, temperature, flame characteristics, AC, DC

E-17.03 Installs cooktops and ranges

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-17.03.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-17.03.02P	identify and lay out location of installation	location of installation is identified and laid out according to codes and jurisdictional regulations
E-17.03.03P	cut out opening	opening is cut out according to manufacturers' specifications
E-17.03.04P	reinforce structure	structure is reinforced to support cooktops and ranges according to manufacturers' specifications
E-17.03.05P	insert, secure and seal cooktops and ranges	cooktops and ranges are inserted, secured and sealed according to manufacturers' specifications, codes and jurisdictional regulations
E-17.03.06P	connect supply systems	supply systems are connected to cooktops and ranges according to manufacturers' specifications, codes and jurisdictional regulations
E-17.03.07P	install ducting and venting	ducting and venting are installed to cooktops and ranges according to manufacturers' specifications, codes and jurisdictional regulations
E-17.03.08P	perform tests	tests are performed according to requirements
E-17.03.09P	verify operation	operation is verified according to manufacturers' specifications by cycling cooktops and ranges
E-17.03.10P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: hand tools, power tools, thermometer, manometer

supply systems include: AC, DC, LP gas

tests include: working pressure, leak, temperature, flame characteristics, AC, DC, water

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

Knowledge

Learning Outcomes	Learning Objectives
E-17.03.01L demonstrate knowledge of cooktops and ranges, their components , characteristics and applications	identify terminology associated with cooktops and ranges
	identify system requirements , and describe their characteristics and applications
	identify supply systems , and describe their characteristics and applications
	identify components , and describe their characteristics, applications and operation
E-17.03.02L demonstrate knowledge of procedures to install cooktops and ranges	describe system operation
	identify tools and testing equipment used to install cooktops and ranges, and describe their procedures for use
	describe procedures to install cooktops and ranges
E-17.03.03L demonstrate knowledge of certification requirements to install cooktops and ranges	describe sequence of operations to perform installation
	describe procedures to perform tests
E-17.03.04L demonstrate knowledge of regulatory requirements to install cooktops and ranges	identify certification requirements to install cooktops and ranges
	identify codes, standards and regulations to install cooktops and ranges

Range of Variables

components include: burners, pilots, valves, electrodes, thermostats, igniters, LP gas regulators, air shutters, pilots, electrodes

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas

tools and testing equipment include: hand tools, power tools, thermometer, manometer

tests include: working pressure, leak, temperature, flame characteristics, AC, DC, water

Task E-18 Services refrigerators and ice makers

Task Descriptor

Recreation vehicle service technicians service refrigerators and ice makers to ensure product performance. Regular maintenance of refrigerators and ice makers is required. Recreation vehicle service technicians repair refrigerators and ice makers to restore products to working condition. New refrigerators and ice makers may be installed to replace, retrofit or as new installs requested by customers.

E-18.01 Maintains refrigerators and ice makers

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-18.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-18.01.02P	test operation of refrigerators and ice makers	operation of refrigerators and ice makers is tested according to manufacturers' specifications
E-18.01.03P	turn off and disconnect supply systems	supply systems are turned off and disconnected according to manufacturers' specifications, codes and jurisdictional regulations
E-18.01.04P	measure and calibrate gas pressure	gas pressure is measured and calibrated according to requirements using tools and testing equipment
E-18.01.05P	measure AC and DC power supplies	AC and DC power supplies are measured according to manufacturers' specifications, codes and jurisdictional regulations using tools and testing equipment
E-18.01.06P	clean and adjust refrigerator and ice maker components	refrigerator and ice maker components are cleaned and adjusted according to manufacturers' specifications
E-18.01.07P	identify worn and damaged refrigerator and ice maker components	worn and damaged refrigerator and ice maker components are identified to recommend replacement or repair
E-18.01.08P	perform tests	tests are performed according to requirements
E-18.01.09P	reinstall refrigerator and ice maker components	refrigerator and ice maker components are reinstalled according to requirements

E-18.01.10P	verify refrigerator and ice maker operation	refrigerator and ice maker operation is verified according to requirements
E-18.01.11P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

supply systems include: AC, DC, LP gas, water

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

tools and testing equipment include: manometers, multimeters, thermometers, hand tools

refrigerator and ice maker components include: thermostats, circuit boards, high limit switches, gas valves, electrodes, water valves, timer switches, thermocouples, burner assemblies

tests include: working pressure, leak, AC, DC, temperature, water flow

Knowledge		
	Learning Outcomes	Learning Objectives
E-18.01.01L	demonstrate knowledge of refrigerators and ice makers, their components , characteristics and applications	identify terminology associated with refrigerators and ice makers
		identify types of refrigerators and ice makers , and describe their characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		identify refrigerator and ice maker components , and describe their characteristics, applications and operation
E-18.01.02L	demonstrate knowledge of procedures to maintain refrigerators and ice makers	identify cooling unit components , and describe their characteristics and applications
		identify tools and testing equipment used to maintain refrigerators and ice makers, and describe their procedures for use
		describe procedures to maintain refrigerators and ice makers
		describe sequence of operations to perform maintenance
		describe procedures to perform tests

E-18.01.03L	demonstrate knowledge of certification requirements to maintain refrigerators and ice makers	identify certification requirements to maintain refrigerators and ice makers
E-18.01.04L	demonstrate knowledge of regulatory requirements to maintain refrigerators and ice makers	identify codes, standards and regulations to maintain refrigerators and ice makers

Range of Variables

refrigerator and ice maker components include: thermostats, circuit boards, high limit switches, gas valves, electrodes, water valves, timer switches, thermocouples, burner assemblies

types of refrigerators and ice makers include: compressor, absorption

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas, water

cooling unit components include: boiler, condenser, evaporator, absorber

tools and testing equipment include: manometers, multimeters, thermometers, hand tools

tests include: working pressure, leak, AC, DC, temperature, water flow

E-18.02 Repairs refrigerators and ice makers

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-18.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-18.02.02P	disconnect supply systems	supply systems to refrigerator and ice maker are disconnected according to manufacturers' specifications, codes and jurisdictional regulations
E-18.02.03P	add and modify venting	venting is added and modified according to manufacturers' specifications to ensure adequate air flow
E-18.02.04P	adjust electrodes	electrodes are adjusted according to manufacturers' specifications to ensure spark gap and ground
E-18.02.05P	replace refrigerators, ice makers and their defective components	refrigerators, ice makers and their defective components are replaced according to manufacturers' specifications
E-18.02.06P	test operation	operation of refrigerators and ice makers is tested according to manufacturers' specifications
E-18.02.07P	perform tests	tests are performed according to requirements

E-18.02.08P	verify repair of refrigerator and ice maker	repair is verified by testing refrigerator and ice maker operation according to manufacturers' specifications
E-18.02.09P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: manometers, multimeters, thermometers, hand tools

supply systems include: AC, DC, LP gas, water

refrigerator and ice maker components include: thermostats, circuit boards, high limit switches, gas valves, electrodes, water valves, timer switches, thermocouples, burner assemblies, elements

tests include: working pressure, leak, AC, DC, temperature, water flow

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

Knowledge		
	Learning Outcomes	Learning Objectives
E-18.02.01L	demonstrate knowledge of refrigerators and ice makers, their components characteristics and applications	identify terminology associated with refrigerators and ice makers
		identify types of refrigerators and ice makers , and describe their characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		identify refrigerator and ice maker components , and describe their characteristics, applications and operation
E-18.02.02L	demonstrate knowledge of procedures to repair refrigerators and ice makers	identify tools and testing equipment used to repair refrigerators and ice makers, and describe their procedures for use
		describe procedures to repair refrigerators and ice makers
		describe sequence of operations to perform repairs
		describe procedures to perform tests

E-18.02.03L	demonstrate knowledge of certification requirements to repair refrigerators and ice makers	identify certification requirements to repair refrigerators and ice makers
E-18.02.04L	demonstrate knowledge of regulatory requirements to repair refrigerators and ice makers	identify codes, standards and regulations to repair refrigerators and ice makers

Range of Variables

refrigerator and ice maker components include: thermostats, circuit boards, high limit switches, gas valves, electrodes, water valves, timer switches, thermocouples, burner assemblies, elements

types of refrigerators and ice makers include: compressor, absorption

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas, water

cooling unit components include: boiler, condenser, evaporator, absorber

tools and testing equipment include: manometers, multimeters, thermometers, hand tools

tests include: working pressure, leak, AC, DC, temperature, water flow

E-18.03 Installs refrigerators and ice makers

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

Performance Criteria		Evidence of Attainment
E-18.03.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-18.03.02P	identify and lay out location of installation	location of installation is identified and laid out according to manufacturers' specifications, codes and jurisdictional regulations
E-18.03.03P	cut out opening	opening is cut out according to manufacturers' specifications
E-18.03.04P	reinforce structure	structure is reinforced to support refrigerators and ice makers according to manufacturers' specifications
E-18.03.05P	insert, secure and seal refrigerators and ice makers	refrigerators and ice makers are inserted, secured and sealed according to manufacturers' specifications, codes and jurisdictional regulations
E-18.03.06P	connect supply systems	supply systems are connected to refrigerators and ice makers according to manufacturers' specifications, codes and jurisdictional regulations

E-18.03.07P	install venting	venting is installed to refrigerators and ice makers according to manufacturers' specifications, codes and jurisdictional regulations
E-18.03.08P	perform tests	tests are performed according to requirements
E-18.03.09P	verify operation	operation is verified according to manufacturers' specifications by cycling refrigerators and ice makers
E-18.03.10P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

tools and testing equipment include: manometers, multimeters, thermometers, hand tools

supply systems include: AC, DC, LP gas, water

tests include: working pressure, leak, LP gas, AC, DC, temperature, water flow

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

Knowledge		
	Learning Outcomes	Learning Objectives
E-18.03.01L	demonstrate knowledge of refrigerators and ice makers, their components characteristics and applications	identify terminology associated with refrigerators and ice makers
		identify types of refrigerators and ice makers , and describe their characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		identify refrigerator and ice maker components , and describe their characteristics, applications and operation
		identify cooling unit components , and describe their characteristics and applications
E-18.03.02L	demonstrate knowledge of procedures to repair refrigerators and ice makers	identify tools and testing equipment used to repair refrigerators and ice makers, and describe their procedures for use
		describe procedures to repair refrigerators and ice makers
		describe sequence of operations to perform repairs

		describe procedures to perform tests
E-18.03.03L	demonstrate knowledge of certification requirements to repair refrigerators and ice makers	identify certification requirements to repair refrigerators and ice makers
E-18.03.04L	demonstrate knowledge of regulatory requirements to repair refrigerators and ice makers	identify codes, standards and regulations to repair refrigerators and ice makers

Range of Variables

refrigerator and ice maker components include: thermostats, circuit boards, high limit switches, gas valves, electrodes, water valves, timer switches, thermocouples, burner assemblies, elements

types of refrigerators and ice makers include: compressor, absorption

system requirements include: venting, structure, wiring, sizing

supply systems include: AC, DC, LP gas, water

cooling unit components include: boiler, condenser, evaporator, absorber

tools and testing equipment include: manometers, multimeters, thermometers, hand tools

tests include: working pressure, leak, LP gas, AC, DC, temperature, water flow

Task E-19 Services air conditioners and heat pumps

Task Descriptor

Recreation vehicle service technicians service air conditioners and heat pumps to ensure product performance. Regular maintenance of air conditioners and heat pumps is required. Recreation vehicle service technicians repair air conditioners and heat pumps to restore products to working condition. New air conditioners and heat pumps may be installed to replace, retrofit or as new installs requested by customers.

E-19.01 Maintains air conditioners and heat pumps

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-19.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-19.01.02P	test operation of air conditioners and heat pump systems	operation of air conditioners and heat pump systems is tested according to requirements using tools and testing equipment

E-19.01.03P	turn off and disconnect supply systems	supply systems are turned off and disconnected according to manufacturers' specifications, codes and jurisdictional regulations
E-19.01.04P	clean cooling coils, and condenser and evaporator fins	cooling coils, and condenser and evaporator fins are cleaned of debris and foreign objects
E-19.01.05P	clean return air filters	return air filters are cleaned to ensure adequate air flow
E-19.01.06P	reconnect and turn on supply systems	supply systems are reconnected and turned on according to manufacturers' specifications, codes and jurisdictional regulations
E-19.01.07P	identify worn and damaged components	worn and damaged components are identified to recommend replacement or repair
E-19.01.08P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

tools and testing equipment include: multimeter, thermometer, anemometer, hand tools

supply systems include: AC, DC

components include: capacitors, motors, relays, control units, condenser, compressor, evaporator, fans

Knowledge

	Learning Outcomes	Learning Objectives
E-19.01.01L	demonstrate knowledge of air conditioners and heat pumps, their components , characteristics and applications	identify terminology associated with air conditioners and heat pumps
		identify types of air conditioning systems , and describe their characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
		identify components , and describe their characteristics, applications and operation
		describe system and product operation

E-19.01.02L	demonstrate knowledge of procedures to maintain air conditioners and heat pumps	identify tools and testing equipment used to maintain air conditioners and heat pumps, and describe their procedures for use
		describe procedures to maintain air conditioners and heat pumps
		describe sequence of operations to perform maintenance

Range of Variables

components include: capacitors, motors, relays, control units, condenser, compressor, evaporator, fans

types of air conditioning systems include: basement, roof, window

system requirements include: venting, structure, wiring, sizing, clearances

supply systems include: AC, DC

tools and testing equipment include: multimeter, thermometer, anemometer, hand tools

E-19.02 Repairs air conditioners and heat pumps

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-19.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-19.02.02P	disconnect supply systems and discharge capacitors	supply systems are disconnected and capacitors discharged according to manufacturers' specifications, codes and jurisdictional regulations
E-19.02.03P	add and modify venting and ducting	venting and ducting is added and modified to ensure adequate air flow according to manufacturers' specifications
E-19.02.04P	replace air conditioners and heat pumps, and their components	air conditioners and heat pumps, and their components are replaced according to manufacturers' specifications
E-19.02.05P	verify repair of air conditioners and heat pumps	repair is verified by testing air conditioners and heat pump operation using tools and testing equipment
E-19.02.06P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

supply systems include: AC, DC

components include: capacitors, motors, relays, control units, condenser, compressor, evaporator, fans

tools and testing equipment includes: multimeter, thermometer, anemometer, hand tools

Knowledge		
	Learning Outcomes	Learning Objectives
E-19.02.01L	demonstrate knowledge of air conditioners and heat pumps, their components , characteristics and applications	identify terminology associated with air conditioners and heat pumps
		identify types of air conditioning systems , and describe their characteristics and applications
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
E-19.02.02L	demonstrate knowledge of procedures to repair air conditioners and heat pumps	identify components , and describe their characteristics, applications and operation
		identify tools and testing equipment used to repair air conditioners and heat pumps, and describe their procedures for use
		describe procedures to repair air conditioners and heat pumps
		describe sequence of operations to perform repairs

Range of Variables

components include: capacitors, motors, relays, control units, condenser, compressor, evaporator, fans

types of air conditioning systems include: basement, roof, window

system requirements include: venting, structure, wiring, sizing, clearances

supply systems include: AC, DC

tools and testing equipment include: multimeter, thermometer, anemometer, hand tools

E-19.03 Installs air conditioners and heat pumps

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-19.03.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-19.03.02P	identify and lay out location of installation	location of installation is identified and laid out according to manufacturers' specifications, codes and jurisdictional regulations
E-19.03.03P	cut out opening	opening is cut out according to manufacturers' specifications
E-19.03.04P	reinforce structure	structure is reinforced to support air conditioners and heat pumps according to manufacturers' specifications
E-19.03.05P	insert, secure and seal air conditioners and heat pumps	air conditioners and heat pumps are inserted, secured and sealed according to manufacturers' specifications
E-19.03.06P	connect supply systems	supply systems are connected to air conditioners and heat pumps according to manufacturers' specifications, codes and jurisdictional regulations
E-19.03.07P	install venting and ducting	venting and ducting are installed to air conditioners and heat pumps according to manufacturers' specifications
E-19.03.08P	install and wire thermostats	thermostats are installed and wired according to manufacturers' specifications
E-19.03.09P	verify operation	operation is verified according to manufacturers' specifications by cycling air conditioners and heat pumps using tools and testing equipment
E-19.03.10P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

supply systems include: AC, DC

tools and testing equipment includes: multimeter, thermometer, anemometer, hand tools

Knowledge

	Learning Outcomes	Learning Objectives
E-19.03.01L	demonstrate knowledge of air conditioners and heat pumps, their components , characteristics and applications	identify terminology associated with air conditioners and heat pumps
		identify types of air conditioning systems , and describe their characteristics and applications
		identify components , and describe their characteristics, applications and operation
		identify system requirements , and describe their characteristics and applications
		identify supply systems , and describe their characteristics and applications
E-19.03.02L	demonstrate knowledge of procedures to install air conditioners and heat pumps	identify tools and testing equipment used to install air conditioners and heat pumps, and describe their procedures for use
		describe procedures to install air conditioners and heat pumps
		describe sequence of operations to perform installations

Range of Variables

air conditioner and heat pump components include: capacitors, motors, relays, control units, condenser, compressor, evaporator, fans, thermostat

types of air conditioning systems include: basement, roof, window

system requirements include: venting, structure, wiring, sizing, clearance

supply systems include: AC, DC

tools and testing equipment include: multimeter, thermometer, anemometer, hand tools

Task E-20 Services consumer products

Task Descriptor

Recreation vehicle service technicians service consumer products to ensure product performance. They repair consumer products to restore them to working condition. Consumer products are defined as accessories, add-ons and options including entertainment, safety, convenience and navigation products. Some consumer products cannot be repaired and are only replaced. New consumer products are also installed at the customers' request.

E-20.01 Replaces consumer products

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-20.01.01P	select consumer products	consumer products are selected according to work order
E-20.01.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
E-20.01.03P	verify supply systems	supply systems are verified for product operation
E-20.01.04P	replace components	components are replaced according to manufacturers' specifications
E-20.01.05P	modify interior and exterior components	interior and exterior components are modified according to consumer product manufacturers' specifications
E-20.01.06P	exchange and secure product	product is exchanged and secured according to manufacturers' specifications
E-20.01.07P	verify operation	operation of consumer product is verified according to manufacturers' specifications
E-20.01.08P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

consumer products include: entertainment, safety, convenience, navigation

tools and testing equipment include: hand tools, power tools, multimeters

supply systems include: AC, DC, LP gas, water

components include: fuses, breakers, mounting hardware, batteries

Knowledge

	Learning Outcomes	Learning Objectives
E-20.01.01L	demonstrate knowledge of consumer products , their characteristics, applications and operation	identify terminology associated with consumer products
		identify consumer products , and describe their characteristics, applications and operation
		identify supply systems , and describe their characteristics and applications
		identify system requirements , and describe their characteristics and applications
E-20.01.02L	demonstrate knowledge of procedures to repair consumer products	identify tools and testing equipment used to repair consumer products , and describe their procedures for use
		describe procedures to repair consumer products
		describe sequence of operations to perform repairs
E-20.01.03L	demonstrate knowledge of training and certification requirements to repair consumer products	identify training and certification requirements to repair consumer products
E-20.01.04L	demonstrate knowledge of regulatory requirements to repair consumer products	identify codes, standards and regulations to repair consumer products

Range of Variables

consumer products include: entertainment, safety, convenience, navigation

supply systems include: AC, DC, LP gas, water

system requirements include: venting, structure, wiring, sizing

tools and testing equipment include: hand tools, power tools, multimeters

E-20.02 Installs consumer products

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
E-20.02.01P	select consumer products	consumer products are selected according to work order
E-20.02.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task

E-20.02.03P	identify and lay out location of installation	location of installation is identified and laid out according to manufacturers' specifications, codes and jurisdictional regulations
E-20.02.04P	cut out opening	opening is cut out according to manufacturers' specifications
E-20.02.05P	insert, secure and seal consumer products	consumer products are inserted, secured and sealed according to manufacturers' specifications, codes and jurisdictional regulations
E-20.02.06P	connect consumer products	consumer products are connected by installing components in RV according to manufacturers' specifications, codes and jurisdictional regulations
E-20.02.07P	perform tests	tests are performed according to requirements
E-20.02.08P	verify operation of consumer products	operation of consumer products is verified according to manufacturers' specifications
E-20.02.09P	document work	work is documented according to company policies, procedures and jurisdictional regulations

Range of Variables

consumer products include: entertainment, safety, convenience, navigation

tools and testing equipment include: hand tools, power tools, multimeters, polarity tester

components include: ducting, venting, electrical, gas, mounting hardware, plumbing

tests include: working pressure, leak, operation

requirements include: component placement, customer needs, codes, manufacturers' specifications, jurisdictional regulations

Knowledge

	Learning Outcomes	Learning Objectives
E-20.02.01L	demonstrate knowledge of consumer products	identify terminology associated with consumer products identify types of consumer products , and describe their characteristics and applications
E-20.02.02L	demonstrate knowledge of procedures to install consumer products	identify tools and testing equipment used to install consumer products , and describe their procedures for use describe procedures to install consumer products describe procedures to perform tests

E-20.02.03L	demonstrate knowledge of training and certification to install consumer products	identify training and certification to install consumer products
E-20.02.04L	demonstrate knowledge of regulatory requirements to install consumer products	identify codes, standards and regulations to install consumer products

Range of Variables

consumer products include: entertainment, safety, convenience, navigation

tools and testing equipment include: hand tools, power tools, multimeters, polarity tester

tests include: working pressure, leak, operation

Major Work Activity F

Interior and exterior components

Task F-21 Diagnoses interior and exterior components

Task Descriptor

Recreation vehicle service technicians identify service requirements, and diagnose structural and cosmetic damages, including wear of interior and exterior components to determine the type of service required.

F-21.01 Diagnoses interior components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
F-21.01.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
F-21.01.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
F-21.01.03P	inspect interior components	interior components are visually inspected to identify faults
F-21.01.04P	determine cause of fault	cause of fault is determined according to inspections
F-21.01.05P	access damaged area	damaged area is accessed by removing items to facilitate in-depth inspection
F-21.01.06P	determine servicing required	servicing required is determined according to tests and inspections

Range of Variables

tools and testing equipment include: moisture meters, hand tools, power tools

interior components include: walls, ceiling, flooring, soft goods, cabinetry

faults include: cracks, torn upholstery, wood rot, gouges, other damage

cause of fault includes: leaks, binding, environmental conditions, moisture damage, delamination and misuse, physical damage

items include: windows, doors, mouldings, underbelly, lights

servicing includes: adjustment or replacement of defective components

Knowledge		
	Learning Outcomes	Learning Objectives
F-21.01.01L	demonstrate knowledge of interior components , their characteristics and applications	identify terminology associated with interior components
		identify interior component materials, and describe their characteristics and applications
		describe RV construction
		describe potential faults to material
F-21.01.02L	demonstrate knowledge of procedures to diagnose interior components	identify tools and testing equipment used to diagnose interior components , and describe their procedures for use
		identify inspection sequence and describe inspection procedures
		describe procedures to diagnose interior components
F-21.01.03L	demonstrate knowledge of training and certification requirements to diagnose interior components	identify training and certification requirements to diagnose interior components
F-21.01.04L	demonstrate knowledge of regulatory requirements to diagnose interior components	identify codes , standards and jurisdictional regulations to diagnose interior components

Range of Variables

tools and testing equipment include: moisture meters, hand tools, power tools

faults include: cracks, torn upholstery, wood rot, gouges, other damage

interior components include: walls, ceiling, flooring, soft goods, cabinetry

codes include: CEC, CSA

F-21.02 Diagnoses exterior components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
F-21.02.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
F-21.02.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
F-21.02.03P	inspect exterior components	exterior components are visually inspected to identify damages
F-21.02.04P	determine cause of fault	cause of fault is determined according to inspection
F-21.02.05P	access damaged area	damaged area is accessed by removing items to facilitate in-depth inspection
F-21.02.06P	perform moisture and leak test	moisture and leak test is performed to detect point of entry of water
F-21.02.07P	determine servicing required	servicing required is determined according to tests and inspections

Range of Variables

tools and testing equipment include: moisture meters, hand tools, power tools, access equipment, leak test machine, fall protection system, caulking gun

exterior components include: sidewalls, roof, sub floor structures, sealants, doors, mouldings, windows

damages include: electrolysis, delamination, misalignment, wood rot

cause of fault includes: sealant failure, ultraviolet (UV) damage, impact

items include: windows, doors, mouldings, underbelly, lights

servicing includes: adjustment or replacement of damaged or defective components

Knowledge

	Learning Outcomes	Learning Objectives
F-21.02.01L	demonstrate knowledge of exterior components , their characteristics and applications	identify terminology associated with exterior components
		identify exterior component materials, and describe their characteristics and applications
		describe RV construction
		identify potential faults to material

F-21.02.02L	demonstrate knowledge of procedures to diagnose exterior components	identify tools and testing equipment used to diagnose exterior components , and describe their procedures for use
		identify inspection sequence and describe inspection procedures
		describe sealant inspection techniques
		describe procedures to diagnose exterior components
F-21.02.03L	demonstrate knowledge of training and certification requirements to diagnose exterior components	identify training and certification requirements to diagnose exterior components
F-21.02.04L	demonstrate knowledge of regulatory requirements to diagnose exterior components	identify codes , standards and jurisdictional regulations to diagnose exterior components

Range of Variables

exterior components include: sidewalls, roof, sub floor structures, sealants, doors, mouldings, windows
tools and testing equipment include: moisture meters, hand tools, power tools, access equipment, leak test machine, fall protection system, caulking gun
codes include: CEC, CSA

Task F-22 Services interior components

Task Descriptor

Recreation vehicle service technicians maintain, repair and install interior components to ensure customer safety and satisfaction regarding cosmetic appearance, functionality and comfort of the RV.

F-22.01 Maintains interior components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
F-22.01.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
F-22.01.02P	adjust hardware, door, trims and upholstery	hardware, door, trims and upholstery are adjusted according to cosmetic appearance and functionality

F-22.01.03P	lubricate hinges, door slides and locks	hinges, door slides and locks are lubricated using lubrication products according to job task
F-22.01.05P	clean interior components	interior components are cleaned using cleaning products according to cosmetic appearance and functionality
F-22.01.06P	identify worn and damaged interior components	worn and damaged interior components are identified to recommend replacement or repair

Range of Variables

tools and equipment include: hand tools, power tools, nailers, staplers, caulking guns, cleaning equipment

lubrication products include: silicone based lubricants, white lithium grease

interior components include: cabinetry, flooring, soft goods, wall and ceiling paneling

cleaning products include: polish, wax, shampoo, coloured filler putty

Knowledge		
	Learning Outcomes	Learning Objectives
F-22.01.01L	demonstrate knowledge of interior components , their characteristics and applications	identify terminology associated with interior components
		identify interior components , and describe their characteristics and applications
		identify materials of soft goods , and describe their characteristics and applications
		identify materials, and describe construction of walls, ceiling and flooring
		identify types of fasteners and adhesives, and describe their characteristics and applications
		identify building materials , and describe their characteristics and applications
		identify construction methods , and describe their characteristics and applications
F-22.01.02L	demonstrate knowledge of procedures used to maintain interior components	identify tools and equipment used to maintain interior components , and describe their procedures for use
		describe procedures to remove and install interior components

F-22.01.03L	demonstrate knowledge of training and certification requirements to maintain interior components	identify training and certification requirements to maintain interior components
F-22.01.04L	demonstrate knowledge of regulatory requirements to maintain interior components	identify codes , standards and jurisdictional regulations to maintain interior components

Range of Variables

interior components include: cabinetry, flooring, soft goods, wall and ceiling paneling

materials of soft goods include: fabric, foams, leather, vinyl, screening

building materials include: fibreglass, plastics, composites, wood, aluminum

construction methods include: stapling, bonding, nailing

tools and equipment include: hand tools, power tools, nailers, staplers, caulking guns, cleaning equipment

codes include: CEC, CSA

F-22.02 Repairs interior components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
F-22.02.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
F-22.02.02P	move, relocate and re-secure interior components	interior components are moved, relocated and re-secured according to job task
F-22.02.03P	prepare repair area	repair area is prepared by measuring, laying out and cutting work surface using techniques
F-22.02.04P	replace soft goods	soft goods are replaced according to job task
F-22.02.05P	repair wood, plastic, fabric and vinyl surfaces	wood, plastic, fabric and vinyl surfaces are repaired according to job task
F-22.02.06P	replace interior components	interior components are replaced according to job task

Range of Variables

tools and equipment include: hand tools, power tools, nailers, staplers, caulking gun

interior components include: window coverings, lighting, light fixtures, paneling, cabinets, counter tops, flooring, soft goods, doors, hardware, trim, mouldings

work surface includes: paneling, flooring

techniques include: sanding, filling, nailing, stapling, applying adhesive

soft goods include: upholstery, valances, blinds, curtains, furniture, snaps, buttons

Knowledge		
Learning Outcomes	Learning Objectives	
F-22.02.01L	demonstrate knowledge of interior components , their characteristics and applications	identify terminology associated with interior components
		identify interior components , and describe their characteristics and applications
		identify materials of soft goods , and describe their characteristics and applications
		identify materials, and describe construction of walls, ceiling, and flooring
		identify types of fasteners and adhesives, and describe their characteristics and applications
		describe routing of electrical circuits, venting, LP gas lines and plumbing
		identify building materials , and describe their characteristics and applications
		identify construction methods , and describe their characteristics and applications
F-22.02.02L	demonstrate knowledge of procedures used to repair interior components	identify tools and equipment used to repair interior components , and describe their procedures for use
		describe procedures to remove and install interior components
F-22.02.03L	demonstrate knowledge of training and certification requirements to repair interior components	identify training and certification requirements to repair interior components
F-22.02.04L	demonstrate knowledge of regulatory requirements to repair interior components	identify codes , standards and jurisdictional regulations to repair interior components

Range of Variables

interior components include: window coverings, lighting, light fixtures, paneling, cabinets, counter tops, flooring, soft goods, doors, hardware, trim, mouldings

soft goods include: upholstery, valances, blinds, curtains, furniture, snaps, buttons

materials of soft goods include: fabric, foams, leather, vinyl, screening

building materials include: fibreglass, plastics, composites

construction methods include: nailing, stapling, bonding

tools and equipment include: hand tools, power tools, nailers, staplers, caulking gun

components include: structure, furniture, wall trim, paneling, cabinets, appliances

codes include: CEC, CSA

F-22.03 Installs interior components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
F-22.03.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
F-22.03.02P	move, relocate and re-secure interior components and soft goods	interior components and soft goods are moved, relocated and re-secured according to job task
F-22.03.03P	measure, lay out and cut wall panels, ceiling panels and flooring	wall panels, ceiling panels and flooring are measured, laid out and cut according job task
F-22.03.04P	position, level and secure interior components and soft goods	interior components and soft goods are positioned, levelled and secured according to job task
F-22.03.05P	complete finishing appearances	finishing appearances are completed after installation by applying stain varnishes, coloured filler putty, tapes, trims and batten mouldings

Range of Variables

tools and equipment include: measuring and layout tools, hand tools, power tools, nailers, staplers, caulking gun

interior components include: window coverings, lighting, light fixtures, paneling, cabinets, counter tops, flooring, soft goods, doors, hardware, trim, mouldings

soft goods include: upholstery, valances, blinds, curtains, furniture, snaps, buttons

Knowledge

Learning Outcomes	Learning Objectives
F-22.03.01L	demonstrate knowledge of interior components , their characteristics and applications
	identify terminology associated with interior components
	identify interior components , and describe their characteristics and applications
	identify materials of soft goods , and describe their characteristics and applications
	identify materials, and describe construction of walls, ceiling and flooring
	identify types of fasteners and adhesives, and describe their characteristics and applications
	describe routing of electrical circuits, venting, LP gas lines and plumbing
	identify building materials , and describe their characteristics and applications
	identify construction methods , and describe their characteristics and applications
F-22.03.02L	demonstrate knowledge of procedures used to install interior components
	identify tools and equipment used to install interior components , and describe their procedures for use
	describe procedures to remove and install interior components
F-22.03.03L	demonstrate knowledge of training and certification requirements to install interior components
	identify training and certification requirements to install interior components
F-22.03.04L	demonstrate knowledge of regulatory requirements to install interior components
	identify codes , standards and jurisdictional regulations to install interior components

Range of Variables

interior components include: window coverings, lighting, light fixtures, paneling, cabinets, counter tops, flooring, soft goods, doors, hardware, trim, mouldings

soft goods include: upholstery, valances, blinds, curtains, furniture, snaps, buttons

materials of soft goods include: fabric, foams, leather, vinyl, screening

building materials include: fibreglass, plastics, composites, wood, aluminum

construction methods include: nailing, stapling, bonding

tools and equipment include: measuring and layout tools, hand tools, power tools, nailers, staplers, caulking gun

codes include: CEC, CSA

Task F-23 Services exterior components

Task Descriptor

Recreation vehicle service technicians service exterior components to provide a weather resistant, safe and structurally sound vehicle to the customer. They also perform repairs to maintain cosmetic appearance, operation and security of the RV.

F-23.01 Maintains exterior components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
F-23.01.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
F-23.01.02P	clean exterior components	exterior components are cleaned by removing contaminants
F-23.01.03P	lubricate exterior components	exterior components are lubricated according to job task and manufacturers' specifications
F-23.01.04P	adjust hardware	hardware is adjusted according to job task
F-23.01.05P	verify operation of exterior components	operation of exterior components is verified
F-23.01.06P	apply products	products are applied according to job task to prevent deterioration
F-23.01.07P	identify worn and damaged exterior components	worn and damaged exterior components are identified to recommend replacement or repair

Range of Variables

tools and equipment include: hand tools, power tools, cleaning equipment, caulking gun, heat gun, rivet gun

exterior components include: siding and roofing materials, steps, locks, hinges, vents, lights, rivets, decals, slide outs, mouldings, hatches, outlets, wheel wells, rock guards, underbelly, fibre-reinforced plastic (FRP) panels, exterior consumer products

hardware includes: door latches, locks, hinges

products include: roofing material cleaners and conditioners, sealants, waxes, exterior cleaners, UV protectants, lubricants

Knowledge

Learning Outcomes	Learning Objectives
F-23.01.01L	demonstrate knowledge of exterior components , their characteristics and applications
	identify terminology associated with exterior components
	identify RV construction materials and products , and describe their characteristics and applications
	identify adhesives and sealants, and describe their characteristics and applications
	identify exterior components , and describe their characteristics and applications
F-23.01.02L	demonstrate knowledge of procedures used to maintain exterior components
	identify tools and equipment used to maintain exterior components , and describe their procedures for use
	describe procedures to maintain exterior components
	describe procedures to use products to maintain exterior components
F-23.01.03L	demonstrate knowledge of training and certification requirements to maintain exterior components
	identify training and certification requirements to maintain exterior components
F-23.01.04L	demonstrate knowledge of regulatory requirements to maintain exterior components
	identify standards, jurisdictional regulations and manufacturers' specifications to maintain exterior components

Range of Variables

exterior components include: siding and roofing materials, steps, locks, hinges, vents, lights, rivets, decals, slide outs, mouldings, hatches, outlets, wheel wells, rock guards, underbelly, FRP panels, exterior consumer products

RV construction materials and products include: ethylene-propylene diene monomer (EPDM), thermoplastic poly olefin (TPO) coated aluminium, wood, vinyl, fibreglass, ABS plastic, FRP

tools and equipment include: hand tools, power tools, cleaning equipment, caulking gun, heat gun, rivet gun

products include: roofing material cleaners and conditioners, sealants, waxes, exterior cleaners, UV protectants, lubricants

F-23.02 Repairs exterior components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
F-23.02.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
F-23.02.02P	access damaged area	damaged area is accessed by removing exterior components
F-23.02.03P	replace joists, studs, rafters, ducting and insulation	joists, studs, rafters, ducting and insulation are replaced according to job task
F-23.02.04P	repair damaged area	damaged area is repaired using techniques
F-23.02.05P	replace exterior components	exterior components are replaced according to job task

Range of Variables

tools and equipment include: measuring and layout tools, cutting tools, hand tools, power tools, caulking gun, heat gun, rivet gun

exterior components include: ladders, windows, siding, doors, steps, slide outs, vents, mouldings, hatches, outlets, wheel wells, rock guards, FRP panels, exterior consumer products

techniques include: reapplying sealants, adding structural reinforcements, refinishing FRP panel, replacing siding, replacing roofing, removing and replacing exterior consumer products

Knowledge

	Learning Outcomes	Learning Objectives
F-23.02.01L	demonstrate knowledge of exterior components , their characteristics and applications	identify terminology associated with exterior components
		identify RV construction materials and products , and describe their characteristics and applications
		identify adhesives and sealants, and describe their characteristics and applications
		identify exterior components , and describe their characteristics and applications
F-23.02.02L	demonstrate knowledge of procedures used to repair exterior components	identify tools and equipment used to repair exterior components , and describe their procedures for use

		describe procedures to repair exterior components
		describe procedures to repair and replace roofing, walls and underbelly
F-23.02.03L	demonstrate knowledge of training and certification requirements to repair exterior components	identify training and certification requirements to repair exterior components
F-23.02.04L	demonstrate knowledge of regulatory requirements to repair exterior components	identify codes , standards and jurisdictional regulations to repair exterior components

Range of Variables

exterior components include: ladders, windows, siding, doors, steps, slide outs, vents, mouldings, hatches, outlets, wheel wells, rock guards, FRP panels, exterior consumer products

RV construction materials and products include: EPDM, TPO coated aluminium, wood, vinyl, fibreglass, ABS plastic, FRP

tools and equipment include: measuring and layout tools, cutting tools, hand tools, power tools, caulking gun, heat gun, rivet gun

codes include: CEC, CSA

F-23.03 Installs exterior components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
F-23.03.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
F-23.03.02P	measure, lay out and cut material	material is measured, laid out and cut to prepare for installation of exterior components
F-23.03.03P	remove and relocate existing components	existing components are removed and relocated to aid in installation of new exterior components
F-23.03.04P	position, level and secure exterior components	exterior components are positioned, levelled and secured using fasteners
F-23.03.05P	apply sealants and finishing products	sealants and finishing products are applied according to job task and manufacturers' specifications
F-23.03.06P	install decals	decals are installed to enhance cosmetic appearance

Range of Variables

tools and equipment include: measuring and layout tools, cutting tools, hand tools, power tools, caulking gun, heat gun, rivet gun

exterior components include: ladders, windows, siding, doors, steps, slide outs, vents, mouldings, hatches, outlets, wheel wells, rock guards, FRP panels, exterior consumer products

fasteners include: adhesives, sealants, screws, rivets, staples, nuts, bolts

sealants and finishing products include: paints, silicones, putty, roof sealants

Knowledge		
	Learning Outcomes	Learning Objectives
F-23.03.01L	demonstrate knowledge of exterior components , their characteristics and applications	identify terminology associated with exterior components
		identify RV construction materials and products , and describe their characteristics and applications
		identify adhesives and sealants, and describe their characteristics and applications
		identify exterior components , and describe their characteristics and applications
F-23.03.02L	demonstrate knowledge of procedures used to install exterior components	identify tools and equipment used to install exterior components , and describe their procedures for use
		describe procedures to install exterior components
		describe procedures for construction and installation of exterior components
		describe procedures for modification and fabrication of RV structure
F-23.03.03L	demonstrate knowledge of training and certification requirements to install exterior components	identify training and certification requirements to install exterior components
F-23.03.04L	demonstrate knowledge of regulatory requirements to install exterior components	identify codes , standards and jurisdictional regulations to install exterior components

Range of Variables

exterior components include: ladders, windows, siding, doors, steps, slide outs, vents, mouldings, hatches, outlets, wheel wells, rock guards, FRP panels, exterior consumer products

RV construction materials and products include: rubber, TPO aluminium, wood, vinyl, fibreglass, galvanized metal, ABS plastic, FRP

tools and equipment include: measuring and layout tools, cutting tools, hand tools, power tools, caulking gun, heat gun, rivet gun

codes include: CEC, CSA

Major Work Activity G

Frames and mechanical components

Task G-24 Diagnoses frames and mechanical components

Task Descriptor

Diagnosis of frame and mechanical component problems ensures that servicing is completed to correct problems to ensure a safe and reliable repair. In some jurisdictions, the work performed on frames by recreation vehicle service technicians is limited by liability and environmental restrictions.

G-24.01 Diagnoses frames

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	no	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-24.01.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
G-24.01.02P	select and use tools and equipment	tools and equipment are selected and used according to job task
G-24.01.03P	inspect frame	frame is visually inspected for faults
G-24.01.04P	measure frame for alignment	frame is measured for alignment according to manufacturers' specifications
G-24.01.05P	determine cause of fault	cause of fault is determined according to tests, inspections and manufacturers' specifications
G-24.01.06P	determine servicing required	servicing required is determined according to tests, inspections and manufacturers' specifications
G-24.01.07P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: measuring devices, calipers, marking devices, plumb bob, levels, hand tools, power tools, shop tools

faults include: peeling undercoat, corrosion, cracks, bends, broken bolts, broken welds

cause of fault includes: poor maintenance, accidents, rough road conditions, overloading, environmental conditions

servicing includes: cleaning, preparing, painting, changing couplers, changing bumpers, alignment procedures, pin boxes, king pin

Knowledge		
	Learning Outcomes	Learning Objectives
G-24.01.01L	demonstrate knowledge of frames, their characteristics and applications	identify terminology associated with frames
		identify causes of rust and corrosion
		identify types of fasteners, and describe their characteristics and applications
		identify paints, primers and undercoating materials, and describe their characteristics and applications
		identify frame types , and describe their characteristics and applications
		identify frame styles, and describe their characteristics and applications
		identify types, sizes and weight capacities of hitch couplers
		identify rear bumper types and attachments, and describe their characteristics and applications
G-24.01.02L	demonstrate knowledge of procedures to diagnose frames	identify frame material , and describe their characteristics and applications
		identify tools and equipment used to diagnose frames, and describe their procedures for use
		describe procedures to diagnose frames

Range of Variables

frame types include: I beam, tubular, C channels

frame material includes: ferrous, non-ferrous

tools and equipment include: measuring devices, calipers, marking devices, plumb bob, levels, hand tools, power tools, shop tools

G-24.02 Diagnoses running gear

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-24.02.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
G-24.02.02P	select and use tools and equipment	tools and equipment are selected and used according to job task
G-24.02.03P	interpret tire tread wear	tire tread wear is interpreted according to visual inspection and manufacturers' specifications
G-24.02.04P	identify worn, loose or broken running gear components	worn, loose or broken running gear components are identified
G-24.02.05P	test brake systems	brake systems are tested to ensure functionality
G-24.02.06P	check for brake problems	brake problems are checked for proper operation
G-24.02.07P	locate and isolate electrical problems between trailer and tow vehicle	electrical problems between trailer and tow vehicle are located and isolated by testing voltage drop and amp draw using multimeters
G-24.02.08P	inspect hydraulic brakes	hydraulic brakes are visually inspected for leaks and pinched lines
G-24.02.09P	determine cause of fault	cause of fault is determined according to tests, inspections and manufacturers' specifications
G-24.02.10P	determine servicing required	servicing required is determined according to tests, inspections and manufacturers' specifications
G-24.02.11P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: hand tools, power tools, multimeters, calipers, measuring tools, depth gauge, shop tools

tire tread wear includes: cupping, feathering, outer and inner wear

components include: axles, bushings, bearings, hangers, equalizers, shocks, springs, bolts, shackles, brake assemblies, wheels, tires

brake systems include: electric, hydraulic, electric over hydraulic

brake problems include: scored brake drums, seized parts, delaminated linings, defective magnets, broken springs, out of adjustment, defective wiring

cause of fault includes: poor maintenance, defective parts, wear, corrosion

servicing includes: replacing seals, servicing bearings, replacing bushings, replacing springs, replacing hardware, servicing brakes, replacing axles

Knowledge		
	Learning Outcomes	Learning Objectives
G-24.02.01L	demonstrate knowledge of running gear, their components , characteristics and applications	identify terminology associated with running gear
		identify components , and describe their characteristics and applications
		identify tire types, pressures and load ranges
		identify torque specifications
		describe signs of wheel damage, bearing wear and overheating
		identify axle and spring capacities
		identify wheel alignment specifications and describe their characteristics
		identify types of axle suspension , and describe their characteristics and applications
		describe trailer brake wiring circuits
		identify location and describe function of break-away switches
G-24.02.02L	demonstrate knowledge of procedures to diagnose running gear	identify brake systems , and describe their characteristics and applications
		identify tools and equipment used to diagnose running gear, and describe their procedures for use
		describe procedures to diagnose running gear

Range of Variables

components include: axles, bushings, hangers, equalizers, shocks, springs, bolts, shackles, brake assemblies, wheels, tires

wheel alignment specifications include: camber, caster, toe

types of axle suspension include: steel spring, torsion, air ride

brake systems include: electric, hydraulic, electric over hydraulic

tools and equipment include: hand tools, power tools, multimeters, calipers, measuring tools, depth gauge

G-24.03 Diagnoses levelling systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-24.03.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
G-24.03.02P	select and use tools and equipment	tools and equipment are selected and used according to job task
G-24.03.03P	access and inspect levelling system components	levelling system components are accessed and visually inspected
G-24.03.04P	check hydraulic fluid	hydraulic fluid is checked for fluid level and contaminants
G-24.03.05P	test levelling system	levelling system is tested according to operating instructions
G-24.03.06P	check electrical source	electrical source is checked for specified DC voltage and amperage
G-24.03.07P	inspect wiring connections, gauge and routing	wiring connections, gauge and routing are inspected according to manufacturers' specifications
G-24.03.08P	determine cause of fault	cause of fault is determined according to tests, inspections and manufacturers' specifications
G-24.03.09P	determine servicing required	servicing required is determined according to tests, inspections and manufacturers' specifications
G-24.03.10P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: hand tools, power tools, multimeters, load testers, levels, hydraulic pressure gauges

levelling system components include: switches, seals, fittings, cylinders, hoses, hydraulic pumps, electric solenoids, hydraulic and electric jacks, controls and sensors

cause of fault includes: poor maintenance, defective parts, operator misuse, corrosion

servicing includes: replacing jacks, replacing fittings and hoses, servicing electrical components

Knowledge		
	Learning Outcomes	Learning Objectives
G-24.03.01L	demonstrate knowledge of levelling systems, their components , characteristics and applications	identify terminology associated with levelling system operation
		describe levelling system operation
		identify hydraulic, mechanical and electrical/electronic systems, and describe their characteristics and applications
		identify components , and describe their characteristics and applications
		describe sequence of operation
G-24.03.02L	demonstrate knowledge of procedures to diagnose levelling systems	identify DC systems, and describe their characteristics and applications
		identify tools and equipment used to diagnose levelling systems, and describe their procedures for use
		describe procedures to diagnose levelling systems

Range of Variables

components include: switches, seals, fittings, cylinders, hoses, hydraulic pumps, electric solenoids, hydraulic and electric jacks, controls and sensors

tools and equipment include: hand tools, power tools, multimeters, load testers, levels, hydraulic pressure gauges

G-24.04 Diagnoses slide-out systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-24.04.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
G-24.04.02P	select and use tools and equipment	tools and equipment are selected and used according to job task
G-24.04.03P	check electrical source	electrical source is checked for specified DC voltage and amperage
G-24.04.04P	inspect wiring connections, gauge and routing	wiring connections, gauge and routing are inspected according to manufacturers' specifications
G-24.04.05P	test electrical/electronic components	electrical/electronic components are tested for operation
G-24.04.06P	check mechanical components	mechanical components are checked for lubrication and wear
G-24.04.07P	check hydraulic components	hydraulic components are checked for leaks using methods
G-24.04.08P	inspect hydraulic fluid	hydraulic fluid is visually inspected for fluid level and contaminants
G-24.04.09P	check seals and sweeps for faults	seals and sweeps are checked for faults
G-24.04.10P	determine cause of fault	cause of fault is determined according to tests, inspections and manufacturers' specifications
G-24.04.11P	determine servicing required	servicing required is determined according to tests, inspections and manufacturers' specifications
G-24.04.12P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multimeters, load testers, hand tools, power tools, shop tools, measuring and alignment devices

electrical/electronic components include: solenoids, relays, control boards, motors, switches, wiring, connectors

mechanical components include: cables, gears, pulleys, tubes and rollers, sweeps, seals

hydraulic components include: hoses, fittings, cylinders, reservoirs, pumps

methods include: performing visual inspection, using hydraulic pressure gauges

faults include: fit, cracks, corrosion, tears, adhesion, damaged mechanical and electrical components, faulty alignment

cause of fault includes: poor maintenance, defective parts, operator misuse, poor alignment, corrosion, damaged sweeps and seals

servicing includes: replacing cylinders, cables, motors, wiring, switches and winches, repairing fittings and hoses, gears, rollers, lubrication

Knowledge		
	Learning Outcomes	Learning Objectives
G-24.04.01L	demonstrate knowledge of slide-out systems, their characteristics and applications	identify terminology associated with slide-out systems
		identify types of slide-out systems , and describe their characteristics and applications
		identify electrical/electronic components , and describe their characteristics and applications
		identify mechanical components , and describe their characteristics and applications
		identify hydraulic components , and describe their characteristics and applications
G-24.04.02L	demonstrate knowledge of procedures to diagnose slide-out systems	describe operation of slide-out systems
		identify tools and equipment used to diagnose slide-out systems, and describe their procedures for use
		describe procedures to diagnose slide-out systems

Range of Variables

electrical/electronic components include: solenoids, relays, control boards, motors, switches, wiring, connectors

mechanical components include: cables, gears, pulleys, tubes and rollers, sweeps, seals

hydraulic components include: hoses, fittings, cylinders, reservoirs, pumps

types of slide-out systems include: hydraulic, through-frame, in-wall, cable, manual

tools and equipment include: multimeters, load testers, hand tools, power tools, shop tools, measuring and alignment devices

G-24.05 Diagnoses lifting systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-24.05.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
G-24.05.02P	select and use tools and equipment	tools and equipment are selected and used according to job task
G-24.05.03P	check electrical source	electrical source is checked for specified DC voltage and amperage
G-24.05.04P	inspect wiring connections, gauge and routing	wiring connections, gauge and routing are inspected according to manufacturers' specifications
G-24.05.05P	test electrical/electronic components	electrical/electronic components are tested for operation
G-24.05.06P	check mechanical components	mechanical components are checked for lubrication and wear
G-24.05.07P	check seals and sweeps	seals and sweeps are checked for faults
G-24.05.08P	determine cause of fault	cause of fault is determined
G-24.05.09P	determine servicing required	servicing required is determined according to tests, inspections and manufacturers' specifications
G-24.05.10P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multimeters, load testers, hand tools, power tools, shop tools, measuring and alignment devices

electrical/electronic components include: solenoids, relays, control boards, remote controls, motors, switches, wiring, connectors

mechanical components include: winches, gears, cranks, cables, guide tubes, spring assemblies, rollers, bearings

faults include: fit, cracks, tears, adhesion, alignment

cause of fault includes: poor maintenance, defective parts, operator misuse, poor alignment

servicing includes: replacing cylinders, cables, cranks, motors and winches, repairing fittings and hoses

Knowledge		
	Learning Outcomes	Learning Objectives
G-24.05.01L	demonstrate knowledge of lifting systems, their characteristics and applications	identify terminology associated with lifting systems
		identify lifting systems, and describe their characteristics and applications
		identify electrical/electronic components , and describe their characteristics and applications
		identify mechanical components , and describe their characteristics and applications
G-24.05.02L	demonstrate knowledge of procedures to diagnose lifting systems	describe operation of lifting systems
		identify tools and equipment used to diagnose lifting systems, and describe their procedures for use
		describe procedures to diagnose lifting systems

Range of Variables

electrical/electronic components include: solenoids, relays, control boards, remote controls, motors, switches, wiring, connectors

mechanical components include: winches, gears, cranks, cables, guide tubes, spring assemblies, rollers, bearings

tools and equipment include: multimeters, load testers, hand tools, power tools, shop tools, measuring and alignment devices

Task G-25 Services frames

Task Descriptor

Frames are serviced to ensure the safe and reliable operation of recreation vehicles. The frame of a RV carries the load of all components and maintains the integrity of the entire unit. Servicing must be performed within exact tolerances to maintain the performance qualities of the RV. In some jurisdictions, the work performed on frames by recreation vehicle service technicians is limited by liability and environmental restrictions.

G-25.01 Maintains frames

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	no	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-25.01.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
G-25.01.02P	inspect undercoating	undercoating is visually inspected for faults
G-25.01.03P	sand, prep, paint, undercoat frame	frame is sanded, prepped, painted and undercoated according to manufacturers' specifications
G-25.01.04P	inspect frame for damages	frame is inspected for damages
G-25.01.05P	inspect mounting points for frame components	mounting points for frame components are visually inspected according to manufacturers' specifications
G-25.01.06P	clean, adjust and lubricate components	components are cleaned, adjusted and lubricated
G-25.01.07P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: hand tools, power tools, pneumatic tools, shop tools

faults include: chipping, peeling, rust

damages include: rust, cracks, frame to axle misalignment, improper gauge

mounting points include: floor to frame, slide-out mechanism, hangers, outriggers, brackets

components include: steps, couplers, bumpers, pin box, frame rails

Knowledge

Learning Outcomes	Learning Objectives
G-25.01.01L demonstrate knowledge of frames, their components , characteristics and applications	identify terminology associated with frames
	identify causes of rust and corrosion
	identify types of fasteners, and describe their characteristics and applications
	identify paints, primers and undercoating materials, and describe their characteristics and applications
	identify frame types , and describe their components , characteristics and applications
	identify frame styles, and describe their characteristics and applications
	identify types, sizes and weight capacities of hitch couplers
	identify bumper types and attachments, and describe their characteristics and applications
G-25.01.02L demonstrate knowledge of procedures to maintain frames	identify frame materials , and describe their characteristics and applications
	identify tools and equipment used to maintain frames, and describe their procedures for use
	describe procedures to maintain frames

Range of Variables

components include: steps, couplers, bumpers, pin box, frame rails

frame types include: I beam, tubular, C channels

frame materials include: ferrous, non-ferrous

tools and equipment include: hand tools, power tools, pneumatic tools, shop tools

G-25.02 Repairs frames

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	no	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-25.02.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
G-25.02.02P	sand, prep, paint and undercoat frame	frame is sanded, prepped, painted and undercoated according to manufacturers' specifications
G-25.02.03P	remove and reattach bolt on frame components	bolt on frame components are removed and reattached according to manufacturers' specifications
G-25.02.04P	lubricate frame components	frame components are lubricated according to manufacturers' specifications
G-25.02.05P	adjust frame components	frame components are adjusted according to manufacturers' specifications
G-25.02.06P	clean frame components	frame components are cleaned according to manufacturers' specifications
G-25.02.07P	verify frame components repair	frame components repair is verified according to manufacturers' specifications
G-25.02.08P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: grinders, welders, presses, jacks, hammers, measuring tools, drills, socket wrenches

components include: outriggers, couplers, jacks, floor mounts, steps, bumpers, pin box

Knowledge

	Learning Outcomes	Learning Objectives
G-25.02.01L	demonstrate knowledge of frames, their components , characteristics and applications	identify terminology associated with frames
		identify causes of rust and corrosion
		identify types of fasteners, and describe their characteristics and applications
		identify paints, primers and undercoating materials, and describe their characteristics and applications

		identify frame types , and describe their components , characteristics and applications
		identify frame styles, and describe their characteristics and applications
		identify types, sizes and weight capacities of hitch couplers
		identify bumper types and attachments, and describe their characteristics and applications
		identify frame materials , and describe their characteristics and applications
G-25.02.02L	demonstrate knowledge of procedures to repair frames and their components	identify tools and equipment used to repair frames and their components , and describe their procedures for use
		describe procedures to repair frames and their components

Range of Variables

components include: outriggers, couplers, jacks, floor mounts, steps, bumpers, pin box

frame types include: I beam, tubular, C channels

frame materials include: ferrous, non-ferrous

tools and equipment include: grinders, welders, presses, jacks, hammers, measuring tools, drills, socket wrenches

Task G-26 Services running gear

Task Descriptor

Running gear is made up of brake systems, suspension and axles. The servicing of running gear is important for safe operation, especially while the RV is in transit.

G-26.01 Maintains running gear

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

Performance Criteria		Evidence of Attainment
G-26.01.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
G-26.01.02P	check tires and wheels	tires and wheels are checked for faults
G-26.01.03P	adjust brakes	brakes are adjusted according to manufacturers' specifications
G-26.01.04P	test brakes	brakes are tested using ammeters to verify current load of magnets according to manufacturers' specifications
G-26.01.05P	bleed and flush hydraulic trailer brakes	hydraulic trailer brakes are bled and flushed to remove air in system or contaminants
G-26.01.06P	clean and lubricate moving parts on brake assemblies	moving parts on brake assemblies are cleaned and lubricated according to manufacturers' specifications
G-26.01.07P	inspect running gear components for wear	running gear components are inspected for wear according to manufacturers' specifications
G-26.01.08P	clean and repack bearings, and replace grease seals	bearings are cleaned, and repacked, and grease seals are replaced
G-26.01.09P	measure brakes for excessive wear	brakes are measured for excessive wear using measuring tools
G-26.01.10P	inspect bushings for movement	bushings are inspected for movement
G-26.01.11P	lubricate bushings	bushings are lubricated according to bushing type and manufacturers' specifications
G-26.01.12P	torque wheel nuts	wheel nuts are torqued according to manufacturers' specifications

G-26.01.13P	torque suspension bolts	suspension bolts are torqued according to manufacturers' specifications
G-26.01.14P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: multimeters, hand tools, power tools, measuring tools, pneumatic tools

faults include: wear, corrosion, low pressure, rim damage, wheel nuts, overheating, contamination

components include: axles, bushings, hangers, equalizers, shocks, springs, bolts, shackles, brake assemblies, wheels, tires, bearings

wear includes: rust spots, chipping, burnt spots, metal stretching, cracks, spindle damage, worn bearings

brakes include: drums, shoes, rotors, pads

measuring tools include: micrometers, calipers

suspension bolts include: shackle bolts and nuts, U-bolts and nuts

Knowledge		
	Learning Outcomes	Learning Objectives
G-26.01.01L	demonstrate knowledge of running gear, their components , characteristics and applications	identify terminology associated with running gear
		identify components , and describe their characteristics and applications
		identify tire types, pressures and load ranges
		identify torque specifications
		describe signs of wheel damage, bearing wear and overheating
		identify axle and spring capacities
		identify wheel alignment specifications and describe their characteristics
		identify types of axle suspension , and describe their characteristics and applications
		describe trailer brake wiring circuits
		identify location and describe function of break-away switches
		identify brake systems , and describe their characteristics and applications
G-26.01.02L	demonstrate knowledge of procedures to maintain running gear	identify tools and equipment used to maintain running gear, and describe their procedures for use

describe procedures and service schedules to maintain running gear

describe procedures to check for tire pressure, wear and alignment

Range of Variables

components include: axles, bushings, hangers, equalizers, shocks, springs, bolts, shackles, brake assemblies, wheels, tires, bearings

wheel alignment specifications include: camber, caster, toe

types of axle suspension include: steel spring, torsion, air ride

brake systems include: electric, hydraulic, electric over hydraulic

tools and equipment include: multimeters, hand tools, power tools, measuring tools, pneumatic tools

G-26.02 Repairs running gear

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-26.02.01P	select and use tools and equipment	tools and equipment are selected and used according to job task
G-26.02.02P	repair or replace tires	tires are repaired or replaced according to manufacturers' specifications
G-26.02.03P	replace damaged brake parts	damaged brake parts are replaced according to manufacturers' specifications
G-26.02.04P	bleed and flush hydraulic trailer brakes	hydraulic trailer brakes are bled and flushed to remove air and contaminants from system
G-26.02.05P	clean and lubricate brake components	brake components are cleaned and lubricated
G-26.02.06P	service bearings	bearings are serviced according to manufacturers' specifications
G-26.02.07P	replace and lubricate bushings	bushings are replaced and lubricated according to bushing type
G-26.02.08P	adjust brakes	brakes are adjusted according to manufacturers' specifications
G-26.02.09P	replace springs	springs are replaced

G-26.02.10P	verify running gear repair	running gear repair is verified by checking alignment, torques, air pressure and operation
G-26.02.11P	document work	work is documented according to company policies and procedures

Range of Variables

tools and equipment include: power tools, impact guns, wrenches, sockets, pliers, spring tools, measuring tools, torque wrenches, pressure gauges, hammers, jacks, shop tools

Knowledge		
	Learning Outcomes	Learning Objectives
G-26.02.01L	demonstrate knowledge of running gear, their components , characteristics and applications	identify terminology associated with running gear
		identify components , and describe their characteristics and applications
		identify tire types, pressures and load ranges
		identify torque specifications
		describe signs of wheel damage, bearing wear and overheating
		identify axle and spring capacities
		identify wheel alignment specifications and describe their characteristics
		identify types of axle suspension , and describe their characteristics and applications
		describe trailer brake wiring circuits
		identify location and describe function of break-away switches
		identify brake systems , and describe their characteristics and applications
		identify DC electrical circuits, and describe their characteristics and applications
		describe use of connectors according to faults
		identify axle capacities and attached components, and describe their characteristics and applications
		identify types of lubricants, and describe their characteristics and applications
		describe bearing wear

		identify bolt patterns on hubs, and describe their characteristics and applications
G-26.02.02L	demonstrate knowledge of procedures to repair running gear	identify tools and equipment used to repair running gear, and describe their procedures for use
		describe procedures to repair running gear
		identify compatibility of replacement parts
		describe torque requirements of components

Range of Variables

components include: axles and saddles, bushings, hangers, equalizers, shocks, springs, bolts, shackles, brake assemblies, wheels, tires

wheel alignment specifications include: camber, caster, toe

types of axle suspension include: steel spring, torsion, air ride

brake systems include: electric, hydraulic, electric over hydraulic

faults include: moisture, vibration, corrosion

tools and equipment include: power tools, impact guns, wrenches, sockets, pliers, spring tools, measuring tools, torque wrenches, pressure gauges, hammers, jacks

Task G-27 Services levelling systems

Task Descriptor

Levelling systems are used to level the RV or coach when parked and powered electrically, hydraulically or manually. The system is serviced to ensure correct functioning for customer use and comfort.

G-27.01 Maintains levelling systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-27.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
G-27.01.02P	lubricate levelling system components	levelling system components are lubricated according to manufacturers' specifications

G-27.01.03P	check and fill hydraulic fluids	hydraulic fluids are checked for debris and contaminants , and filled
G-27.01.04P	verify levelling system operation	levelling system operation is verified
G-27.01.05P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: multimeters, load testers, levels, hydraulic pressure gauges, ammeter, shop tools

components include: switches, seals, fittings, cylinders, hoses, hydraulic pumps, electric solenoids, hydraulic and electric jacks, controls and sensors

debris and contaminants include: dirt, water, salt, air

Knowledge		
	Learning Outcomes	Learning Objectives
G-27.01.01L	demonstrate knowledge of levelling systems , their components , characteristics and applications	identify terminology associated with levelling system operation
		describe levelling system operation
		identify hydraulic, mechanical and electrical/electronic systems, and describe their characteristics and applications
		identify levelling systems and describe their components , characteristics and applications
G-27.01.02L	demonstrate knowledge of procedures to maintain levelling systems	identify DC systems, and describe their characteristics and applications
		identify tools and testing equipment used to maintain levelling systems, and describe their procedures for use
		describe procedures to maintain levelling systems

Range of Variables

levelling systems include: manual, electrical, hydraulic

components include: switches, seals, fittings, cylinders, hoses, hydraulic pumps, electric solenoids, hydraulic and electric jacks, controls and sensors

tools and testing equipment include: multimeters, load testers, levels, hydraulic pressure gauges, ammeter, shop tools

G-27.02 Repairs levelling systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-27.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
G-27.02.02P	replace or repair electrical wiring and connections	electrical wiring and connections are replaced or repaired
G-27.02.03P	drain and flush hydraulic fluid reservoirs	hydraulic fluid reservoirs are drained and flushed
G-27.02.04P	fill hydraulic fluid	hydraulic fluid is filled according to manufacturers' specifications
G-27.02.05P	bleed hydraulic lines	hydraulic lines are bled to remove air
G-27.02.06P	replace and repair levelling system components	levelling system components are replaced and repaired according to manufacturers' specifications
G-27.02.07P	calibrate automatic levelling controls	automatic levelling controls are calibrated according to manufacturers' specifications
G-27.02.08P	repair hydraulic system leaks	hydraulic system leaks are repaired by replacing seals, hoses, fittings or cylinders
G-27.02.09P	verify repair of levelling system	repair is verified by testing levelling system operation
G-27.02.10P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment: include: multimeters, hand tools, power tools, levels, ammeter, shop tools

repairs include: soldering, crimping

components include: switches, seals, fittings, cylinders, hoses, hydraulic pumps, electric solenoids, hydraulic and electric jacks, controls and sensors

Knowledge

	Learning Outcomes	Learning Objectives
G-27.02.01L	demonstrate knowledge of levelling systems, their components , characteristics and applications	identify terminology associated with levelling system operation
		describe levelling system operation
		identify hydraulic, mechanical and electrical/electronic systems, and describe their characteristics and applications

		identify levelling systems, and describe their components , characteristics and applications
		identify DC systems, and describe their characteristics and applications
G-27.02.02L	demonstrate knowledge of procedures to repair levelling systems	identify tools and testing equipment used to repair levelling systems, and describe their procedures for use
		describe procedures to repair levelling systems

Range of Variables

components include: switches, seals, fittings, cylinders, hoses, hydraulic pumps, electric solenoids, hydraulic and electric jacks, controls and sensors

tools and testing equipment: include: multimeters, hand tools, power tools, levels, ammeter, shop tools

G-27.03 Installs levelling systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-27.03.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
G-27.03.02P	ensure levelling system is compatible with vehicle	levelling system is compatible with vehicle according to manufacturers' specifications
G-27.03.03P	prepare location for levelling system components	location for levelling system components is prepared by moving other RV components or building or installing mounts
G-27.03.04P	position and secure levelling system components	levelling system components are positioned and secured according to manufacturers' specifications
G-27.03.05P	route and connect electrical wiring and hydraulic hoses	electrical wiring and hydraulic hoses are routed and connected considering factors and according to manufacturers' installation instructions
G-27.03.06P	verify levelling system operation	levelling system operation is verified
G-27.03.07P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: hand tools, power tools, pneumatic tools, levels, multimeters, shop tools

components include: switches, seals, fittings, cylinders, hoses, hydraulic pumps, electric solenoids, hydraulic and electric jacks, controls and sensors

factors include: pinch points, heat, secure mounting, wiring, hose routing

Knowledge		
	Learning Outcomes	Learning Objectives
G-27.03.01L	demonstrate knowledge of levelling systems, their characteristics and applications	identify terminology associated with levelling system operation
		describe levelling system operation
		identify hydraulic, mechanical and electrical/electronic systems, and describe their characteristics and applications
		identify levelling system components , and describe their characteristics and applications
G-27.03.02L	demonstrate knowledge of procedures to install levelling systems and components	identify DC systems, and describe their characteristics and applications
		identify tools and testing equipment used to install levelling systems and components , and describe their procedures for use
		describe procedures to install levelling systems and components
		identify system tolerances , and describe their characteristics and applications
		identify proposed location for levelling system components

Range of Variables

components include: switches, seals, fittings, cylinders, hoses, hydraulic pumps, electric solenoids, hydraulic and electric jacks, controls and sensors

tools and testing equipment include: hand tools, power tools, pneumatic tools, levels, multimeters, shop tools

system tolerances include: ground clearances, weight capacities, jack range of travel

Task G-28 Services slide-out systems

Task Descriptor

Slide-out systems are designed to give the customer more space inside their RV. Because most RVs have slide-out systems, it is important for RV service technicians to be knowledgeable in maintaining and repairing the different types and their operation.

G-28.01 Maintains slide-out systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-28.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
G-28.01.02P	check electrical source	electrical source is checked for specified DC voltage and amperage
G-28.01.03P	inspect wiring connections, gauge and routing	wiring connections, gauge and routing are inspected for functionality
G-28.01.04P	verify slide-out system operation	slide-out system operation is verified for alignment, gap, full extension and retraction
G-28.01.05P	lubricate mechanical components	mechanical components are lubricated according to manufacturers' specifications
G-28.01.06P	check hydraulic system components	hydraulic system components are checked for leaks using methods
G-28.01.07P	check, fill and inspect hydraulic fluid level	hydraulic fluid level is checked, filled and visually inspected for debris and contaminants
G-28.01.08P	check, clean and condition seals and sweeps	seals and sweeps are checked for faults , cleaned and conditioned
G-28.01.09P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: multimeters, load tester, hand tools, power tools

mechanical components include: cables, gears, pulleys, tubes and rollers

hydraulic system components include: hoses, fittings, cylinders, reservoirs, pumps

methods include: visual inspection, hydraulic pressure gauges

debris and contaminants include: dirt, water, air

faults include: fit, cracks, tears, adhesion, corrosion, impacts, wear

Knowledge

	Learning Outcomes	Learning Objectives
G-28.01.01L	demonstrate knowledge of slide-out systems, their characteristics and applications	identify terminology associated with slide-out systems
		identify types of slide-out systems , and describe their characteristics and applications
		identify electrical/electronic components , and describe their characteristics and applications
		identify mechanical components , and describe their characteristics and applications
		identify hydraulic components , and describe their characteristics and applications
		describe operation of slide-out systems
G-28.01.02L	demonstrate knowledge of procedures to maintain slide-out systems	identify tools and testing equipment used to maintain slide-out systems, and describe their procedures for use
		describe procedures and service schedules to maintain slide-out systems
		describe procedures for checking power supply

Range of Variables

types of slide-out systems include: hydraulic, through-frame, in-wall, cable, manual

electrical/electronic components include: solenoids, relays, control boards, motors, switches, wiring, sensors, connectors

mechanical components include: cables, gears, pulleys, tubes and rollers

hydraulic components include: hoses, fittings, cylinders, reservoirs, pumps

tools and testing equipment include: multimeters, load tester, hand tools, power tools

G-28.02 Repairs slide-out systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-28.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
G-28.02.02P	replace and repair electrical wiring and connections	electrical wiring and connections are replaced and repaired
G-28.02.03P	re-align slide-out system	slide-out system is re-aligned to installation tolerances
G-28.02.04P	lubricate mechanical components	mechanical components are lubricated according to manufacturers' specifications
G-28.02.05P	fill hydraulic fluid	hydraulic fluid is filled according to manufacturers' specifications
G-28.02.06P	drain and flush hydraulic fluid reservoirs	hydraulic fluid reservoirs are drained and flushed to remove contaminants
G-28.02.07P	repair hydraulic system leaks	hydraulic system leaks are repaired by replacing seals, hoses, fittings and cylinders
G-28.02.08P	bleed hydraulic lines	hydraulic lines are bled to remove air
G-28.02.09P	route and crimp cables	cables are routed and crimped according to slide-out system tolerances
G-28.02.10P	replace electrical/electronic, mechanical, and hydraulic components	electrical/electronic, mechanical, and hydraulic components are replaced according to manufacturers' specifications
G-28.02.11P	remove and replace slide-out system	slide-out system is removed and replaced according to manufacturers' specifications
G-28.02.12P	verify repair of slide-out system	repair is verified by testing slide-out system operation
G-28.02.13P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: multimeters, hand tools, power tools, lifting tables, shop tools

repairs include: soldering, crimping, cleaning

mechanical components include: cables, gears, pulleys, tubes and rollers

electrical/electronic components include: solenoids, relays, control boards, motors, switches, wiring, sensors, connectors

hydraulic components include: hoses, fittings, cylinders, reservoirs, pumps

slide-out systems include: hydraulic, through-frame, in-wall, cable, manual

Knowledge

	Learning Outcomes	Learning Objectives
G-28.02.01L	demonstrate knowledge of <i>slide-out systems</i> , their characteristics and applications	identify terminology associated with <i>slide-out systems</i>
		identify <i>slide-out systems</i> , and describe their characteristics and applications
		identify <i>electrical/electronic components</i> , and describe their characteristics and applications
		identify <i>mechanical components</i> , and describe their characteristics and applications
		identify <i>hydraulic components</i> , and describe their characteristics and applications
		describe operation of <i>slide-out systems</i>
G-28.02.02L	demonstrate knowledge of procedures to repair <i>slide-out systems</i>	identify <i>tools and testing equipment</i> used to repair <i>slide-out systems</i> , and describe their procedures for use
		describe procedures to repair <i>slide-out systems</i>

Range of Variables

slide-out systems include: hydraulic, through-frame, in-wall, cable, manual

electrical/electronic components include: solenoids, relays, control boards, motors, switches, wiring, sensors, connectors

mechanical components include: cables, gears, pulleys, tubes and rollers

hydraulic components include: hoses, fittings, cylinders, reservoirs, pumps

tools and testing equipment include: multimeters, hand tools, power tools, lifting tables, shop tools

Task G-29 Services lifting systems

Task Descriptor

Lifting systems are designed to give the customer more space inside specific styles of RVs. Some examples are lifting/lowering the roof of the RV or lifting/lowering beds or platforms. It is important for RV service technicians to be knowledgeable about servicing the different types and their operation.

G-29.01 Maintains lifting systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

Performance Criteria		Evidence of Attainment
G-29.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
G-29.01.02P	check electrical source	electrical source is checked for specified DC voltage and amperage
G-29.01.03P	inspect wiring connections, gauge and routing	wiring connections, gauge and routing are inspected for functionality
G-29.01.04P	verify lifting system operation	lifting system operation is verified for alignment, full extension and retraction
G-29.01.05P	lubricate mechanical components	mechanical components are lubricated according to manufacturers' specifications
G-29.01.06P	check, clean and condition seals and sweeps	seals and sweeps are checked for faults , cleaned and conditioned
G-29.01.07P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: multimeters, load tester, hand tools, power tools, shop tools

mechanical components include: cables, gears, pulleys, spring assemblies, tubes and rollers

faults include: fit, cracks, tears, adhesion, corrosion, impacts, wear

Knowledge

Learning Outcomes		Learning Objectives
G-29.01.01L	demonstrate knowledge of lifting systems, their characteristics and applications	identify terminology associated with lifting systems
		identify lifting systems, and describe their characteristics and applications

		identify electrical/electronic components , and describe their characteristics and applications
		identify mechanical components , and describe their characteristics and applications
		describe operation of lifting systems
G-29.01.02L	demonstrate knowledge of procedures to maintain lifting systems	identify tools and testing equipment used to maintain lifting systems, and describe their procedures for use
		describe procedures and service schedules to maintain lifting systems

Range of Variables

electrical/electronic components include: solenoids, relays, control boards, motors, switches, wiring, sensors, connectors

mechanical components include: cables, gears, pulleys, spring assemblies, tubes and rollers

tools and testing equipment include: multimeters, load tester, hand tools, power tools, shop tools

G-29.02 Repairs lifting systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
G-29.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
G-29.02.02P	replace and repair electrical wiring and connections	electrical wiring and connections are replaced and repaired
G-29.02.03P	re-align lifting system	lifting system is re-aligned according to manufacturers' specifications
G-29.02.04P	lubricate mechanical components	mechanical components are lubricated according to manufacturers' specifications
G-29.02.05P	route and crimp cables	cables are routed and crimped according to lifting system tolerances
G-29.02.06P	replace electrical/electronic and mechanical components	electrical/electronic and mechanical components are replaced according to manufacturers' specifications
G-29.02.07P	verify repair of lifting system	repair is verified by testing lifting system operation
G-29.02.08P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: multimeters, hand tools, power tools

repairs include: soldering, crimping

mechanical components include: winches, gears, cranks, cables, guide tubes, spring assemblies

electrical/electronic components include: solenoids, relays, control boards, motors, switches, wiring, sensors, connectors

Knowledge		
	Learning Outcomes	Learning Objectives
G-29.02.01L	demonstrate knowledge of lifting systems, their characteristics and applications	identify terminology associated with lifting systems
		identify lifting systems, and describe their characteristics and applications
		identify electrical/electronic components , and describe their characteristics and applications
		identify mechanical components , and describe their characteristics and applications
		describe operation of lifting systems
G-29.02.02L	demonstrate knowledge of procedures to repair lifting system	identify tools and testing equipment used to repair lifting systems, and describe their procedures for use
		describe procedures to repair lifting systems

Range of Variables

electrical/electronic components include: solenoids, relays, control boards, motors, switches, wiring, sensors, connectors

mechanical components include: winches, gears, cranks, cables, guide tubes, spring assemblies

tools and testing equipment include: multimeters, hand tools, power tools

Major Work Activity H

Towing systems

Task H-30 Diagnoses towing systems

Task Descriptor

Recreation vehicle service technicians need to recognize and diagnose towing system problems to prepare a repair plan. Towing systems are made up of the tow vehicle and towed vehicle, and include the hitching, wiring and brake systems.

H-30.01 Diagnoses tow vehicle systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
H-30.01.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
H-30.01.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
H-30.01.03P	inspect tow vehicle systems	tow vehicle systems are inspected for operational faults
H-30.01.04P	identify tow vehicle requirements	tow vehicle requirements are identified to ensure vehicle is approved for towing
H-30.01.05P	inspect tow vehicle system components	tow vehicle system components are visually inspected for damage
H-30.01.06P	perform electrical tests to isolate issues	electrical tests are performed to isolate issues between tow and towed vehicle
H-30.01.07P	determine cause of fault	cause of fault is determined by inspections and testing
H-30.01.08P	determine servicing required	servicing required is determined according to manufacturers' specifications, tests and inspections
H-30.01.09P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: test lights, multimeters, specialty diagnostic tools

tow vehicle systems include: hitching, braking, lighting

operational faults include: improper setup, damage, malfunctions

tow vehicle requirements include: hitch classes, towing capacities, weight ratings

components include: fifth wheel hitch, hitch pin, hitch receiver, weight distribution system, tie downs, brake controllers, electrical components (wiring, fuses, relays, diodes), sway control

damage includes: wear, corrosion, fatigue, loose fasteners

cause of fault includes: shorts, corroded connectors, worn hitching components

servicing includes: replacing connectors, torque specifications, lubrication, replacing hitches, replacing brake controls

Knowledge		
	Learning Outcomes	Learning Objectives
H-30.01.01L	demonstrate knowledge of tow vehicle systems and their components , characteristics and applications	identify terminology associated with tow vehicle systems and their components
		identify tow vehicle systems and their components , and describe their characteristics and applications
		identify tow vehicle requirements , and describe their characteristics and applications
		describe types of brake systems and their operation
		identify diodes and electrical circuits, and describe their characteristics and applications
H-30.01.02L	demonstrate knowledge of procedures to diagnose tow vehicle systems	identify tools and testing equipment used to diagnose tow vehicle systems , and describe their procedures for use
		describe procedures to diagnose tow vehicle systems
H-30.01.03L	demonstrate knowledge of regulatory requirements to diagnose tow vehicle systems	identify regulations related to tow vehicle systems

Range of Variables

components include: fifth wheel hitch, weight distribution system, tie downs, brake controllers, electrical components (wiring, fuses, relays, diodes), sway control

tow vehicle requirements include: hitch classes, towing capacities, weight ratings

types of brake systems include: hydraulic, electric, surge

tools and testing equipment include: test lights, multimeters, specialty diagnostic tools

damage includes: wear, corrosion, fatigue, loose fasteners

tow vehicle systems include: hitching, braking, lighting

regulations include: axle weight limitations, towing capacities

H-30.02 Diagnoses towed vehicle systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
H-30.02.01P	confirm customer concern	customer concern is confirmed on work order to isolate source of problem and determine required diagnostic actions
H-30.02.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
H-30.02.03P	inspect towed vehicle systems	towed vehicle systems are inspected for operational faults
H-30.02.04P	identify towed vehicle capabilities	towed vehicle capabilities are identified
H-30.02.05P	inspect towed vehicle system components	towed vehicle system components are visually inspected for damage and operation
H-30.02.06P	perform electrical tests to isolate issues	electrical tests are performed to isolate issues between tow and towed vehicle
H-30.02.07P	determine cause of fault	cause of fault is determined
H-30.02.08P	determine servicing required	servicing required is determined according to manufacturers' specifications, tests and inspections
H-30.02.09P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: test lights, multimeters, 12-volt power source, specialty diagnostic tools, hand tools, power tools

towed vehicle systems include: hitching, braking, lighting

operational faults include: improper setup, corrosion, damage, malfunctions

towed vehicle capabilities include: axle capacities, weight ratings, auxiliary braking, safety break-away switches

components include: tow bars, couplers, pin boxes, base plates, auxiliary brake systems, wiring, safety cables

damage includes: wear, fatigue, loose fasteners, corrosion

cause of fault includes: shorts, corrosion, wear

servicing includes: replacing connectors, replacing hitches, replacing braking system components

Knowledge

	Learning Outcomes	Learning Objectives
H-30.02.01L	demonstrate knowledge of towed vehicle systems and their components , characteristics and applications	identify terminology associated with towed vehicle systems and their components
		identify towed vehicle systems and their components , and describe their characteristics and applications
		identify diodes and electrical circuits, and describe their characteristics and applications
		identify towed vehicle capabilities
H-30.02.02L	demonstrate knowledge of procedures to diagnose towed vehicle systems	identify tools and testing equipment used to diagnose towed vehicle systems , and describe their procedures for use
		describe procedures to diagnose towed vehicle systems
H-30.02.03L	demonstrate knowledge of regulatory requirements to diagnose towed vehicle systems	identify regulations related to towed vehicle systems

Range of Variables

towed vehicle systems include: hitching, braking, lighting

components include: tow bars, couplers, pin boxes, base plates, auxiliary brake systems, wiring, safety cables

towed vehicle capabilities include: axle capacities, weight ratings, auxiliary braking, safety break-away switches

tools and testing equipment include: test lights, multimeters, 12-volt power source, specialty diagnostic tools, hand tools, power tools

regulations include: axle weight limitations, towing capacities

Task H-31 Services tow vehicle systems

Task Descriptor

Recreation vehicle service technicians install towing systems to provide customers with the comfort and convenience of using their existing vehicle to increase their versatility. It is critical that technicians properly maintain these systems in order to ensure safety and worry-free travelling.

H-31.01 Maintains tow vehicle systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	no	yes	yes	yes	no	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
H-31.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
H-31.01.02P	inspect tow vehicle system components for wear, corrosion and lack of lubrication	tow vehicle system components are visually inspected for wear, corrosion and lack of lubrication
H-31.01.03P	lubricate hitching components	hitching components are lubricated according to manufacturers' specifications
H-31.01.04P	protect electrical components	electrical components are protected using dielectric grease and corrosion protection
H-31.01.05P	check and adjust bolt torque	bolt torque is checked and adjusted according to manufacturers' specifications
H-31.01.06P	verify operation of electrical system	operation of electrical system is verified using diagnostic equipment and visual inspection
H-31.01.07P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: hitch lubrication tools, torque wrenches, diagnostic

components include: weight distributing hitches, fifth wheel hitches, air ride hitches, sway control systems, brake control systems, receiver

Knowledge

	Learning Outcomes	Learning Objectives
H-31.01.01L	demonstrate knowledge of tow vehicle systems and their components , characteristics and applications	identify terminology associated with tow vehicle systems and their components
		identify tow vehicle systems and their components , and describe their characteristics and applications
		identify hitch weights, clearances and towing limitations
		describe lubrication requirements of components
H-31.01.02L	demonstrate knowledge of procedures to maintain tow vehicle systems	identify tools and testing equipment used to maintain tow vehicle systems , and describe their procedures for use
		describe procedures to maintain tow vehicle systems

Range of Variables

tow vehicle systems include: hitching, braking, lighting

components include: weight distributing hitches, fifth wheel hitches, air ride hitches, sway control systems, brake control systems, receiver

tools and testing equipment include: hitch lubrication tools, torque wrenches, diagnostic

H-31.02 Repairs tow vehicle systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	no	yes	yes	yes	no	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
H-31.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
H-31.02.02P	access repair area	repair area is accessed by removing exterior body parts and raising tow vehicle
H-31.02.03P	repair and replace tow vehicle system components	tow vehicle system components are repaired and replaced according to manufacturers' specifications
H-31.02.04P	verify tow vehicle system operation and setup	tow vehicle system operation and setup is verified
H-31.02.05P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: pneumatic tools, measuring tools, hand tools, power tools, multimeters, diagnostic

components include: weight distributing hitches, fifth wheel hitches, air ride hitches, sway control systems, brake control systems, receiver

tow vehicle systems include: hitching, braking, lighting

Knowledge		
	Learning Outcomes	Learning Objectives
H-31.02.01L	demonstrate knowledge of tow vehicle systems and their components , characteristics and applications	identify terminology associated with tow vehicle systems and their components
		identify tow vehicle systems and their components , and describe their characteristics and applications
		identify hitch weights, clearances and towing limitations
H-31.02.02L	demonstrate knowledge of procedures to repair tow vehicle systems	identify tools and testing equipment used to repair tow vehicle systems , and describe their procedures for use
		describe procedures to repair tow vehicle systems and their components

Range of Variables

tow vehicle systems include: hitching, braking, lighting

components include: weight distributing hitches, fifth wheel hitches, air ride hitches, sway control systems, brake control systems, receiver

tools and testing equipment include: pneumatic tools, measuring tools, hand tools, power tools, multimeters, diagnostic

H-31.03 Installs tow vehicle systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	no	yes	yes	yes	no	yes	ND	NV	ND

Skills		
	Performance Criteria	Evidence of Attainment
H-31.03.01P	determine installation strategy	installation strategy is determined by calculating load and material requirements
H-31.03.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
H-31.03.03P	access installation area	installation area is accessed by removing exterior body parts and raising tow vehicle

H-31.03.04P	install tow vehicle system components	tow vehicle system components are installed according to manufacturers' specifications
H-31.03.05P	verify tow vehicle system operation and setup	tow vehicle system operation and setup is verified
H-31.03.06P	document work	work is documented according to company policies and procedures

Range of Variables

installation strategy includes: component selection and placement, customer needs

tools and testing equipment include: pneumatic tools, measuring tools, hand tools, power tools

components include: weight distributing hitches, fifth wheel hitches, air ride hitches, sway control systems, brake control systems, receiver

tow vehicle systems include: hitching, braking, lighting

Knowledge		
	Learning Outcomes	Learning Objectives
H-31.03.01L	demonstrate knowledge of tow vehicle systems and their components , characteristics and applications	identify terminology associated with tow vehicle systems and their components
		identify tow vehicle systems and their components , and describe their characteristics and applications
		identify tow vehicle requirements , and describe their characteristics and applications
		describe limitations of tow vehicle components
H-31.03.02L	demonstrate knowledge of procedures to install tow vehicle systems	identify tools and testing equipment used to install tow vehicle systems , and describe their procedures for use
		describe procedures to install tow vehicle systems
		describe installation and removal procedures of tow vehicle system components
		describe hook-up and unhooking procedures

Range of Variables

tow vehicle systems include: hitching, braking, lighting

components include: weight distributing hitches, fifth wheel hitches, air ride hitches, sway control systems, brake control systems, receiver

tow vehicle requirements include: hitch classes, towing capacities, weight ratings

tools and testing equipment include: pneumatic tools, measuring tools, hand tools, power tools

Task H-32 Services towed vehicle systems

Task Descriptor

Recreation vehicle service technicians install towing systems to provide customers with the comfort and convenience of using their existing vehicle to increase their versatility. It is critical that technicians properly maintain these systems in order to ensure safety and worry-free travelling.

H-32.01 Maintains towed vehicle systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
H-32.01.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
H-32.01.02P	inspect towed vehicle system components	towed vehicle system components are visually inspected for wear, corrosion and lack of lubrication
H-32.01.03P	lubricate hitching components	hitching components are lubricated according to manufacturers' specifications
H-32.01.04P	protect electrical components	electrical components are protected using dielectric grease and corrosion protection
H-32.01.05P	verify operation of towed vehicle systems	operation of towed vehicle systems is verified by performing inspection according to manufacturers' specifications
H-32.01.06P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: test lights, multimeters, 12-volt power source, specialty diagnostic tools, hand tools, power tools

components include: spacers, cables, fasteners, tow bars, auxiliary braking system, base plates, lubrication systems

towed vehicle systems include: hitching, braking, lighting, lubrication pump

Knowledge

	Learning Outcomes	Learning Objectives
H-32.01.01L	demonstrate knowledge of towed vehicle systems and their components , characteristics and applications	identify terminology associated with towed vehicle systems and their components
		identify towed vehicle systems and their components , and describe their characteristics and applications
		identify towed vehicle requirements , and describe their characteristics and applications
		describe limitations of tow bars, axles and safety cables
H-32.01.02L	demonstrate knowledge of procedures to maintain towed vehicle systems	identify tools and testing equipment used to maintain towed vehicle systems , and describe their procedures for use
		describe procedures to maintain towed vehicle systems

Range of Variables

towed vehicle systems include: hitching, braking, lighting, lubrication pump

components include: spacers, cables, fasteners, tow bars, auxiliary braking system, base plates, lubrication systems

towed vehicle requirements include: auxiliary braking, weight restriction, safety break-away switches

tools and testing equipment include: test lights, multimeters, 12-volt power source, specialty diagnostic tools, hand tools, power tools

H-32.02 Repairs towed vehicle systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

	Performance Criteria	Evidence of Attainment
H-32.02.01P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
H-32.02.02P	repair and replace towed vehicle system components	towed vehicle system components are repaired and replaced according to manufacturers' specifications
H-32.02.03P	verify towed vehicle system operation and setup	towed vehicle system operation and setup are verified
H-32.02.04P	document work	work is documented according to company policies and procedures

Range of Variables

tools and testing equipment include: test lights, multimeters, 12-volt power source, specialty diagnostic tools, hand tools, power tools

components include: spacers, cables, fasteners, tow bars, auxiliary braking system, base plates, lubrication systems

towed vehicle systems include: hitching, braking, lighting, lubrication pump

Knowledge		
Learning Outcomes	Learning Objectives	
H-32.02.01L	demonstrate knowledge of towed vehicle systems and their components , characteristics and applications	identify terminology associated with towed vehicle systems and their components
		identify towed vehicle systems and their components , and describe their characteristics and applications
		identify towed vehicle requirements , and describe their characteristics and applications
		describe limitations of towed vehicle system components
H-32.02.02L	demonstrate knowledge of procedures to repair towed vehicle systems	identify compatibility of replacement parts
		identify tools and testing equipment used to repair towed vehicle systems , and describe their procedures for use
		describe procedures to repair towed vehicle systems
		describe procedures to repair and replace towed vehicle system components
		describe hook-up and unhooking procedures

Range of Variables

towed vehicle systems include: hitching, braking, lighting, lubrication pump

components include: spacers, cables, fasteners, tow bars, auxiliary braking system, base plates, lubrication systems

towed vehicle requirements include: auxiliary braking, weight restriction, safety break-away switches

tools and testing equipment include: test lights, multimeters, 12-volt power source, specialty diagnostic tools, hand tools, power tools

H-32.03 Installs towed vehicle systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	NV	NV	yes	yes	yes	yes	yes	yes	ND	NV	ND

Skills

Performance Criteria		Evidence of Attainment
H-32.03.01P	determine installation strategy	installation strategy is determined by calculating load and material requirements
H-32.03.02P	select and use tools and testing equipment	tools and testing equipment are selected and used according to job task
H-32.03.03P	install towed vehicle system components	towed vehicle system components are installed according to manufacturers' specifications
H-32.03.04P	verify towed vehicle system operation and setup	towed vehicle system operation and setup are verified
H-32.03.05P	document work	work is documented according to company policies and procedures

Range of Variables

installation strategy includes: component selection and placement, customer needs

load includes: length, height, width, weight

tools and testing equipment include: pneumatic tools, measuring tools, hand tools, power tools

components include: spacers, cables, fasteners, tow bars, auxiliary braking system, base plates, lubrication systems

towed vehicle systems include: hitching, braking, lighting, lubrication pump

Knowledge

Learning Outcomes		Learning Objectives
H-32.03.01L	demonstrate knowledge of towed vehicle systems and their components , characteristics and applications	identify terminology associated with towed vehicle systems and their components
		identify towed vehicle systems and their components , and describe their characteristics and applications
		identify towed vehicle requirements , and describe their characteristics and applications
		describe limitations of towed vehicle system components
H-32.03.02L	demonstrate knowledge of procedures to install towed vehicle systems	identify tools and testing equipment used to install towed vehicle systems , and describe their procedures for use

describe procedures to install **towed vehicle systems**

describe hook-up and unhooking procedures

Range of Variables

towed vehicle systems include: hitching, braking, lighting, lubrication pump

components include: spacers, cables, fasteners, tow bars, auxiliary braking system, base plates, lubrication systems

towed vehicle requirements include: auxiliary braking, weight restriction, safety break-away switches

tools and testing equipment include: pneumatic tools, measuring tools, hand tools, power tools

Appendix A

Acronyms

ABS	acrylonitrile butadiene styrene
AC	alternating current
AGM	absorbed glass matt
BTU	British thermal unit
CEC	Canadian Electrical Code
CO	carbon monoxide
CSA	Canadian Standards Association
DC	direct current
ECO	energy cut off
EPDM	ethylene-propylene diene monomer
FRP	fibre-reinforced plastic
GFCI	ground fault circuit interrupter
LP	liquefied petroleum
NTSB	National Transportation Safety Board
OEM	original equipment manufacturer
OH&S	Occupational Health and Safety
PDI	pre-delivery inspections
PPE	personal protective equipment
PVC	polyvinyl chloride
RV	recreation vehicle
SDS	safety data sheet
TDG	Transportation of Dangerous Goods
TPO	thermoplastic poly olefin
UV	ultraviolet
WHMIS	Workplace Hazardous Materials Information System

Appendix B

Tools and Equipment / Outils et équipement

Hand Tools/Outils à main

air inflators	pompes à air
anchor spring tools	outils pour ressort d'ancrage
awls	poinçons
basin wrenches	clés à robinet
battery carrying straps	sangles de transport de batterie
bearing packers	graisseurs de roulement
bearing pullers	extracteurs de roulement
brake adjustment tools	outils de réglage des freins
brake spring pliers	pincés à ressorts de frein
brushes	brosses
butane igniters	allumeurs à butane
cable crimpers	sertisseuses de câbles
calculators	calculatrices
carpet stretchers	tendeurs de tapis
caulking guns	pistolets à calfeutrer
centre punches	pointeaux
channel lock pliers	pincés multiprises
clamps	serre-joints
coaxial crimpers	sertisseuses coaxiales
creepers	sommiers roulants
drain buckets and funnels	bacs et entonnoirs de vidange
easy outs	extracteurs de filets
faucet wrenches	clés pour lavabo
files	limes
filter wrenches	clés à filtre
flaring tools	outils à évaser
flashlights	lampes de poche
flue cleaners	nettoyeurs de conduits
glue guns	pistolets à colle
hack saws	scies à métaux
hammers	marteaux
hand drills	perceuses à main
hand saws	scies à main
heat guns	pistolets à air chaud
hole punches	emporte-pièces

hydraulic testers	instruments de contrôle de circuit hydraulique
jumper leads	câbles de démarrage
locking pliers	pincés-étaux
nibblers	grignoteuses
notched trowels	truelles dentelées
nut drivers	tourne-écrous
paint brushes	pinceaux
PEX crimpers	sertisseurs PEX
pipe cutters	coupe-tuyaux
pipe seamers	sertisseuses à tuyau
pipe wrenches	clés à tuyaux
pliers	pincés
pop riveters	riveteuses
propane torches	chalumeaux au propane
pry bars	leviers
putty knives	couteaux à mastic
routers	toupies
rubber mallets	maillets en caoutchouc
screening tools	outils pour moustiquaires
screw drivers	tournevis
scribes	pointes à tracer
snakes	furets
snap fastener tools	outils à boutons-pression
socket sets	jeux de douilles
soldering guns/irons	fers à souder
spin weld drivers	machines à souder par friction
staplers	agrafeuses
straightedges	règles droites
stud finders	détecteurs de montants
thread taps	tarauts
tile cutters	coupe-carreaux
tin snips	cisailles de ferblantier
tire pressure gauges	jauges de pression de gonflage
tire valve stem tools	outils pour tige de valve de pneus
toilet wands	tubes de rallonge
torque wrenches	clés dynamométriques
tread depth gauges	calibres de profondeur des pneus
trowels	truelles
tube benders	cintreuse à tuyau
tube cutters	coupe-tubes
utility knives	couteaux tout usage

valve installer tools
wire brushes
wire crimping tools
wire cutters
wire strippers
wood clamps
wrenches

outils de montage pour valve
brosses métalliques
outils à sertir les fils
coupe-fils
pinces à dénuder
pinces à bois
clés

Measuring and Testing Tools and Equipment/ Instruments de mesure et outils et appareils de test

air flow meters
air speed indicator (anemometers)
alternator testers
ammeters
carbon monoxide detector
carbon-pile battery load testers
circuit board testers
DC test lights
dial indicators
diode testers
hydrometers
laptops and tablets
leak detectors (liquid and electronic)
levels
manometers (dial and U-tube)
measuring tapes
micrometers
moisture meters
multimeter
outlet testers
oven temperature testers

plumb bobs
scales
squares
thermometers
Volt-ohm meters
water pressure gauges
weigh scales

débitmètres
anémomètres
testeurs d'alternateurs
ampèremètres
détecteurs de monoxyde de carbone
appareils de vérification de la charge de la batterie
vérificateurs circuits imprimés
lampes témoins c.c.
comparateurs à cadran
testeurs de diodes
densimètres
ordinateurs portables et tablettes
détecteurs de fuites (liquides et électroniques)
niveaux
manomètres (numériques et en U)
rubans à mesurer
micromètres
humidimètres
multimètres
lampes témoins
appareils de contrôle de la température pour les fours
fils à plomb
balances
équerres
thermomètres
voltmètres
indicateurs de pression d'eau
bascules de pesage

Power Tools / Outils à mécaniques

air chisels	couteaux pneumatiques
air compressors	compresseurs d'air
air nailers	cloueuses pneumatiques
air nozzles	buses d'air
air staplers	agrafeuses pneumatiques
angle grinders	meuleuses d'angles
band saws	scies à ruban
battery chargers	chargeurs de batteries
chop saws	scies à tronçonner
circular saws	scies circulaires
die grinders	meules à rectifier les matrices
drill bits	mèches
drill presses	perceuses à colonne
electric drills	perceuses électriques
electric staplers	agrafeuses électriques
hole saws	scies à cloche
impact wrenches	clés à chocs
jig saws	scies sauteuses
mitre saws	scies à onglets
oxy-fuel torches	torches d'oxycoupage
parts washers	bacs de dégraissage
plastic welder	machines à souder les plastiques
power washers	laveuses à pression
reciprocating saws	scies alternatives
rivet guns	riveteuses pneumatiques
router	toupies
router bits	mèches de toupie
sanders/grinders	meuleuses-rectifieuses
saw blades	lames de scie métallique
screw guns	pistolets agrafeurs pneumatiques
scroll saws	scies à chantourner
table saws	scies d'établis
wet/dry vacuums	aspirateurs pour déchets solides et humides

Lifting and Moving Equipment, Ladders and Scaffolding/Équipement de levage, équipement servant au déplacement, échelles et échafaudages

camper lift jacks	timons rouleurs
camper loaders	chargeurs de caravane sur camionnette
dollies	diabolos
floor jacks	crics rouleurs
fork lifts	chariots élévateurs à fourche
hoists	appareils de levage
jack stands	chandelles
ladders (step ladders, extendable)	échelles (escabeaux, à perche)
scaffolding	échafaudages
scissor lifts	tables élévatrices à ciseaux
tractors/loaders	tracteurs/chargeuses

Personal Protective Equipment and Safety Equipment/Équipement de protection individuelle et équipement de sécurité

coveralls	combinaisons
eye wash station	douches oculaires
face masks	masques protecteurs
face shield	écrans faciaux
fall arrest equipment	dispositifs antichute
fire extinguishers	extincteurs
gloves and sleeves (cut-resistant)	gants et manches résistants aux coupures
goggles	lunettes de protection
guards	dispositifs de sécurité
hearing protection	protecteurs auriculaires
helmet	casques protecteurs
knee pads	protège-genoux
respirators and dust masks	appareils de protection respiratoire et masques antipoussières
safety boots	bottes de sécurité
safety glasses	lunettes de sécurité

Appendix C

Glossary / Glossaire

add-a-room	a structure consisting of three walls that can be attached to an RV awning to create an additional room; they are sometimes available in hard-walled versions called "Florida rooms"	cuisinette pour auvent	structure de trois murs que l'on peut attacher à l'auvent d'un VR pour créer une nouvelle pièce; on les retrouve souvent en version rigide que l'on nomme « pavillons d'été »
anode rod	when used in a water heater, attracts corrosion-causing products in the water; these products attack the anode rod instead of the metal tank itself; the anode rod should be inspected yearly and changed when it is reduced to 1/4 of its original size; the rods are used only in steel water heater tanks	tige d'anode	lorsqu'utilisé dans un chauffe-eau, attire les produits qui causent la corrosion dans l'eau; ces produits s'attaquent à la tige d'anode et non au réservoir en métal; la tige d'anode doit subir une inspection annuelle et doit être remplacée lorsqu'elle atteint le quart de sa taille originale; les tiges sont utilisées dans les chauffe-eau en acier seulement
awning	The fabric or vinyl-shade mounted on an RV	auvent	toile en tissu ou en vinyle attachée au toit d'un VR
ball mount	the portion of the towing assembly which holds the hitch-ball, and the connecting device for the weight-distributing bars on a weight-distributing hitch, and the ball alone on a weight-carrying hitch	support de boule d'attelage	partie de la caravane qui supporte l'attelage, la boule d'attelage et le mécanisme qui joint les barres stabilisatrices à l'attelage répartiteur de masse, et qui joint la boule à une sellette d'attelage
battery	the auxiliary battery installed in RV units to provide 12-volt power. The battery charges through several charging systems including solar, power converter and properly connected tow vehicles	batterie	accumulateur de réserve installé dans un VR pour procurer une alimentation de 12 volts. Il se charge de plusieurs façons, dont par l'entremise d'un système de charge solaire, d'un convertisseur de puissance ou d'un véhicule tracteur correctement connecté
camber	the angle between the vertical axis of a wheel and the vertical axis of the vehicle when viewed from the front or rear; inward tilt is negative, outward tilt is positive	carrossage	l'angle entre l'axe verticale d'une roue et l'axe verticale d'un véhicule, d'une vue de l'avant ou de l'arrière; l'inclinaison vers l'intérieur est dite négative, et l'inclinaison vers l'extérieur est dite positive
class A motorhome	an RV with the living accommodation built on or as an integral part of a self-propelled motor vehicle	autocaravane classe A	VR dont l'habitation est bâtie sur un véhicule automoteur ou qui fait partie intégrale de ce dernier

class B motorhome	also known as a camping van conversion; these RVs are compact units made from a cargo van, customized to include sleeping, eating and bathroom facilities with raised roof to provide additional headroom	autocaravane classe B	se nomme aussi « conversion d'autocaravane »; ces VR sont des unités compactes faites à partir d'une fourgonnette utilitaire; ils comprennent des toilettes, des endroits pour dormir et manger, ainsi qu'un toit élevé pour permettre plus de dégagement à la tête
class C motorhome	an RV with the living accommodation built on a cab and chassis configuration	autocaravane classe C	VR dont l'habitation est bâtie sur le châssis et la cabine d'une camionnette
Class I hitch	trailer hitch with capacity of up to 2,000-lb gross trailer weight and 200-lb hitch weight rating	attelage de classe 1 (classe i)	attelage de caravane pouvant soutenir jusqu'à 2 000 lb de poids brut de la caravane et 200 lb de charge statique maximale
Class II hitch	trailer hitch with weight carrying rating of up to 3,500-lb gross trailer weight and 350-lb hitch weight rating	attelage de classe 2 (classe ii)	attelage de caravane pouvant soutenir jusqu'à 3 500 lb de poids brut de la caravane et 350 lb de charge statique maximale
Class III hitch	trailer hitch with weight carrying rating of up to 5,000-lb gross trailer weight and 500-lb hitch weight rating	attelage de classe 3 (classe iii)	attelage de caravane pouvant soutenir jusqu'à 5 000 lb de poids brut de la caravane et 500 lb de charge statique maximale
Class IV hitch	trailer hitch with weight carrying rating of up to 10,000-lb gross trailer weight and up to 1,000-lb hitch weight rating	attelage de classe 4 (classe iv)	attelage de caravane pouvant soutenir jusqu'à 10 000 lb de poids brut de la caravane et 1 000 lb de charge statique maximale
Class V hitch	any trailer hitch with capacity greater than 10,000-lb gross trailer weight and greater than 1,000-lb hitch weight rating	attelage de classe 5 (classe v)	attelage de caravane pouvant soutenir plus de 10 000 lb de poids brut de la caravane et plus de 1 000 lb de charge statique maximale
container	a certified cylinder or tank used to hold liquid petroleum gas	réservoir	cylindre ou réservoir certifié utilisé pour contenir du gaz de pétrole liquéfié
converter	a component of the electrical system that changes 120-V AC into 12-V DC electrical power	convertisseur	appareil qui change une alimentation à c.a. de 120 volts en une alimentation à c.c. de 12 volts
coupler	the part of the trailer that attaches to the ball of the hitch	coupleur	la partie de la caravane qui se lie à la boule d'attelage
fifth wheel hitch	a hitch mounted over the rear axle of the tow vehicle which couples to a kingpin mounted on the trailer	sellette d'attelage	attelage installé sur l'essieu arrière d'un véhicule tracteur, connecté au pivot d'attelage de la remorque
frame	the part of a vehicle which all other parts attach to; frame usually refers to a non-unibody chassis	cadre	partie du véhicule à laquelle toutes les autres parties sont liées; le cadre réfère habituellement au châssis d'un véhicule non monocoque

gas pressure	the force that the gas exerts on the walls of the container. In a RV low pressure, LP gas system, the pressure must be 11" of water column (6.25 oz per sq. in.)	pression des gaz	la force exercée par les gaz sur les parois du contenant. Dans un système de GPL à basse pression d'un VR, la pression des GPL doit être à 11 pouces de colonne d'eau (6,25 onces par pouce carré)
generator	a piece of equipment powered by gasoline, diesel, or sometimes propane, for generating 120-V AC power	génératrice	appareil électrique alimenté par de la gazoline, du diesel ou parfois du propane, pour produire un courant électrique à c.a. de 120 volts
hitch	a device which attaches directly to a tow vehicle providing the connection between the tow vehicle and the trailer	attelage	mécanisme s'attachant directement à un véhicule tracteur, établissant le lien d'attache entre le véhicule tracteur et la caravane
hitchball	the steel ball attached to the towing vehicle that connects with the travel trailer	boule d'attelage	boule en acier attachée au véhicule tracteur qui se lie à la caravane classique
holding tanks	there are three different holding tanks on most RVs: - fresh water tank (holds fresh water that can be stored for later use), - grey water tank (holds the waste water from the sinks and showers), - black water tank (holds the waste water from the toilet)	réservoirs d'eau	il existe trois différents réservoirs d'eau dans la plupart des VR : • réservoir d'eau potable (contient de l'eau potable, qui peut être stockée pour une utilisation ultérieure) • réservoir d'eau grise (contient les eaux usées des lavabos et des douches) • réservoir d'eau noire (contient les eaux usées de la toilette)
inverter	a component of the electrical system that changes 12-V DC into 120-V AC power	onduleur	appareil qui change une alimentation à c.a. de 120 volts en une alimentation à c.c. de 12 volts
LP gas	liquefied petroleum gas; propane is one formulation and butane is the other; RV appliances may be fueled by LP gas	gaz de pétrole liquéfié (GPL)	le GPL se trouve sous forme de propane ou de butane; il alimente certains appareils électroménagers du VR
lubrication pump	provides lubrication to transmission of towed vehicle to prevent overheating during tow	pompe à huile	fournit une lubrification à la transmission du véhicule remorqué pour prévenir la surchauffe durant le remorquage
regulator	the LP valve controlling the gas flow to all appliances, and maintaining the appropriate pressure in the LP gas system	régulateur	valve de GPL qui contrôle l'émission de gaz dans tous les appareils et qui conserve le bon niveau de pression dans le système de GPL
running gear	a general term referring to the suspension system, axles, brakes, bearings, wheel and tires	train roulant	un terme général qui renvoie au système de suspension, aux trains de roues, aux freins, aux paliers, aux roues et aux pneus

safety chains/cables	a set of chains/cables that are attached to both the trailer frame and the tow vehicle while towing; safety chains/cables are intended to keep the trailer attached to the tow vehicle in the event of a hitch failure, preventing the trailer from completely separating from the tow vehicle	chaînes ou câbles de sécurité	ensemble de chaînes ou de câbles attachés au cadre de châssis de la caravane et au véhicule tracteur lors du remorquage; les chaînes ou les câbles de sécurité ont pour but de garder la caravane attachée au véhicule tracteur au cas où il y aurait un bris dans l'attelage, empêchant la caravane de se détacher complètement du véhicule tracteur
shore power	AC electricity provided by an external plug to an external AC power source	courant de l'alimentation externe	électricité à c.a. qui provient d'une prise de courant externe, vers un bloc d'alimentation externe à c.a sur le VR
slide-out	additional living space that slides out, either by hydraulics, electricity or manually, when the RV is set up	rallonge escamotable	espace additionnel coulissant, à l'aide d'hydraulique, d'électricité ou de façon manuelle, alors que le VR est installé
tow vehicle	the vehicle that pulls an RV	véhicule tracteur	véhicule qui tire un VR
towed vehicle	the term for an RV that is being towed	véhicule tracté	terme servant à désigner un VR qui est tracté
trailer brakes	brakes that are built into the towed vehicle	freins de la caravane	freins qui sont intégrés à la caravane
underbelly	the covered material that encloses the frame and the underside of the floor	sous-châssis	matériau couvert qui recouvre le cadre et le dessous du plancher