

SKILLED**TRADES**^{BC}

PROGRAM OUTLINE

Transport Trailer Technician

Implementation date: April 1, 2024

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TRANSPORT TRAILER TECHNICIAN PROGRAM OUTLINE

APPROVED BY INDUSTRY

MARCH 2023

IMPLEMENTATION DATE

APRIL 1, 2024

THIS BC PROGRAM HAS BEEN HARMONIZED AND IS BASED ON RSOS 2021

**Developed by
SkilledTradesBC
Province of British Columbia**

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Section 1

INTRODUCTION

Transport Trailer Technician

Foreword

Transport Trailer Technicians inspect, diagnose, maintain and repair transport trailers connected to or moved by a power unit. Trailers include flat decks, dry freight vans, refrigerated vans, tankers, converters, boosters, jeeps, pole trailers, steering dollies, dump trailers and any other commercial pull-type units. Transport Trailer Technicians inspect, service and repair parts and components of systems such as suspension and brake systems, mechanical and electrical components, flooring, hydraulic systems, axles, wheel assemblies and coupling units. Mechanics may specialize in sheet metal work, frame repair or replacement, and heating and refrigeration unit repairs.

Transport Trailer Technicians are employed at trailer manufacturers, sales and repair facilities, as well as at construction or industrial sites and fleet repair shops. They may work in a shop or out of a mobile service vehicle.

Due to the size and complexity of the equipment, safety is of prime importance. The student must be conscious of the impact on people, equipment, work area and environment when performing their work. Due to the size and complexity of the equipment, safety is of prime importance. The student must be conscious of the impact on people, equipment, work area and environment when performing their work.

Some important attributes of the Transport Trailer Technician are:

- Reliability
- Analytical skills
- Ability to read and understand service manuals
- Mathematical aptitude

They also demonstrate the ability to:

- Communicate effectively
- Work with little or no supervision
- Contribute to a team approach
- Plan and work sequentially
- Adapt to changing technology
- Problem solve

Key attributes for people entering this trade are mechanical aptitude, manual dexterity, hand-eye coordination, stamina and agility. Communication skills and patience are also important. Other assets are good vision, hearing and sense of smell to diagnose problems. This occupation may require a valid driver's license with air endorsement and/or a forklift operator's certificate.

This revised Program Outline is intended as a guide for instructors, apprentices, and employers of apprentices as well as for the use of industry organizations, regulatory bodies, and provincial and federal governments. It reflects updated standards based on the 2021 Red Seal Occupational Standard (RSOS). It was developed by British Columbia industry and instructor subject matter experts.

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

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

Competencies are to be evaluated through written exams and practical assessments. A passing grade is achieved by getting an overall mark of 70%. See the Assessment Guidelines in Section 4 for more details.

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

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

SAFETY ADVISORY

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

Acknowledgements

Industry and Instructor Subject Matter Experts retained to assist in the development and review of this Program Outline:

- | | | |
|------------------|-----------------|---|
| • L. Achtemichuk | Instructor | British Columbia Institute of Technology (BCIT) |
| • L. Babcock | Industry Expert | Babcock Consulting |
| • G. Barron | Industry Expert | Coast Mountain Bus Company |
| • B. Kozubski | Instructor | Thompson Rivers University (TRU) |
| • D. Noble | Instructor | Okanagan College (OC) |
| • M. Obal | Industry Expert | Oceanside Industrial |

Previous Contributors

Industry and Instructor Subject Matter Experts retained to assist in the development and review of the 2013 Program Outline:

- | | | |
|------------------|-----------------|---|
| • L. Babcock | Chair | Thompson Rivers University (TRU) |
| • B. Holcik | Industry Expert | Finning |
| • B. Haugen | Co-chair | Vancouver Community College (VCC) |
| • P. Mottershead | Instructor | Vancouver Island University (VIU) |
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| • G. Warne | Instructor | British Columbia Institute of Technology (BCIT) |

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Transport Trailer Technician occupation.

How to Use this Document

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

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

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

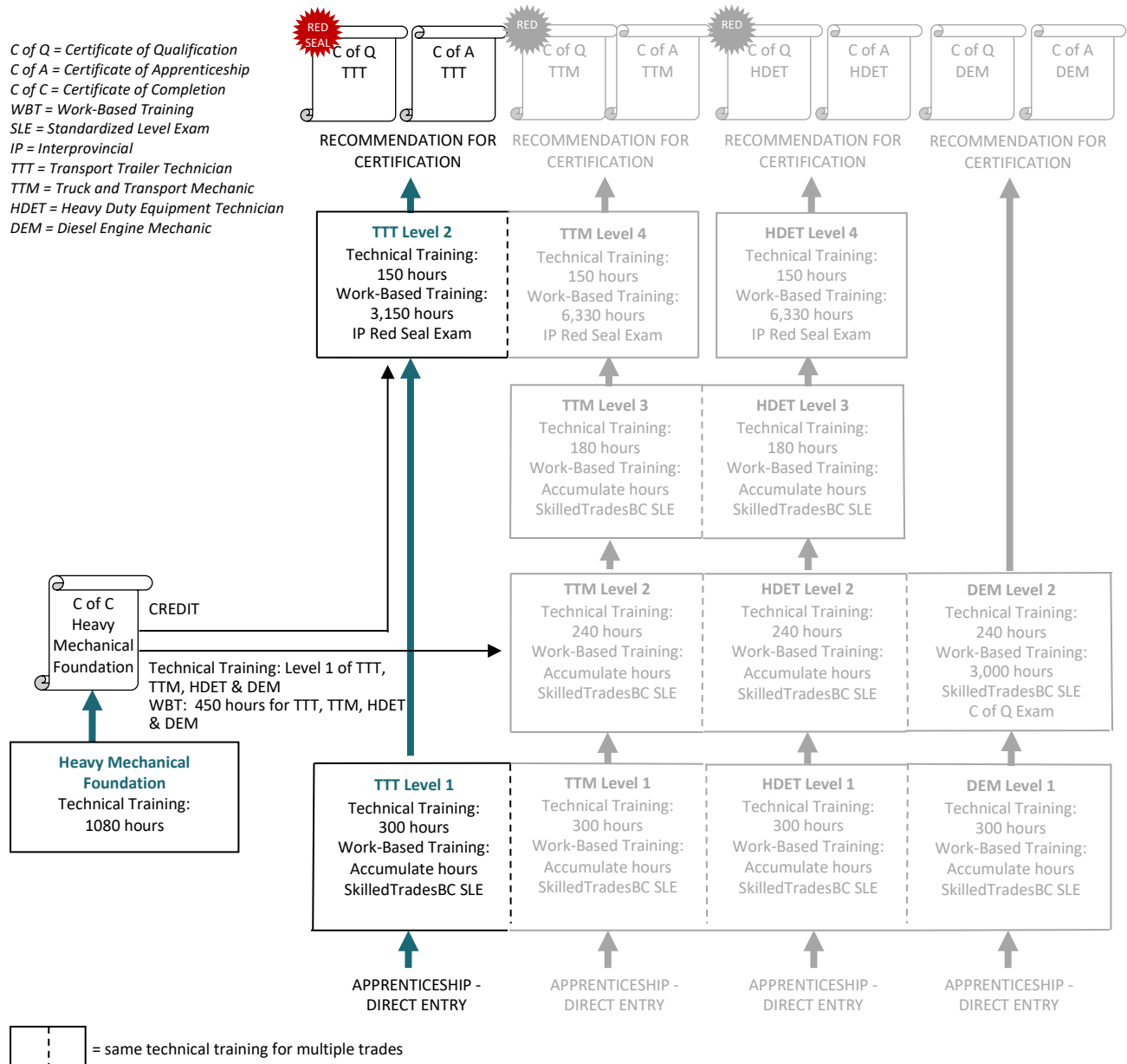
Section 2

PROGRAM OVERVIEW

Transport Trailer Technician

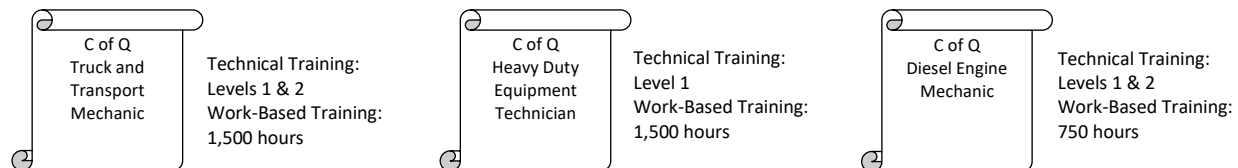
Program Credentialing Model

This graphic provides an overview of the Transport Trailer Technician apprenticeship pathway.



CROSS-PROGRAM CREDITS

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



Occupational Analysis Chart

TRANSPORT TRAILER TECHNICIAN

Occupation Description: “Transport Trailer Technician” means a person who maintains, rebuilds, overhauls, reconditions, and does diagnostic trouble shooting and repair of commercial trailers.

F = Foundation

2-TTT = Level 2 for Transport Trailer Technician only

4-HDET = Level 4 for Heavy Duty Equipment Technician only

4-TTM = Level 4 for Truck and Transport Mechanic only

4 = Level 4 for both Truck and Transport Mechanic and Heavy Duty Equipment Technician

= Competency appears only in Truck and Transport Mechanic and Transport Trailer Technician

= Competency appears only in Heavy Duty Equipment Technician

Grey text = Competency does not appear in this Heavy Mechanical trade

PERFORM OCCUPATIONAL SKILLS A	Use safe work practices <div style="text-align: right;">A1</div>	Implement hybrid and electric vehicle (EV) safety protocols <div style="text-align: right;">A2</div>	Use hand tools, power tools, and shop equipment <div style="text-align: right;">A3</div>	Use fasteners and fittings <div style="text-align: right;">A4</div>	Lift and support loads <div style="text-align: right;">A5</div>	Operate equipment <div style="text-align: right;">A6</div>
	1 F	1 F	1 F	1 F	1 F	1 F
	Use documentation and reference materials <div style="text-align: right;">A7</div>	Service bearings and seals <div style="text-align: right;">A8</div>	Select and maintain lubricants <div style="text-align: right;">A9</div>	Use cutting and welding equipment <div style="text-align: right;">A10</div>	Describe diagnostic procedures <div style="text-align: right;">A11</div>	
	1 F	1 F	1 F	1 F	1 F	
SERVICE, DIAGNOSE, AND REPAIR BRAKES B	Service and repair hydraulic brakes and parking brakes <div style="text-align: right;">B1</div>	Service and repair hydraulic power brakes and ABS systems <div style="text-align: right;">B2</div>	Service and repair air brakes <div style="text-align: right;">B3</div>	Diagnose and repair advanced brake systems <div style="text-align: right;">B4</div>		
	1 F	1 F	1 F	2-TTT	4-TTM	

**Section 2
Program Overview**

**SERVICE, DIAGNOSE,
AND REPAIR
HYDRAULICS**

C

Service hydraulic components

C1

1				F
---	--	--	--	---

Diagnose and repair advanced hydraulic systems

C2

	2-TTT		4	
--	-------	--	---	--

**SERVICE, DIAGNOSE,
AND REPAIR
ELECTRICAL AND
ELECTRONIC SYSTEMS**

D

Describe electricity

D1

1				F
---	--	--	--	---

Use electrical testing instruments

D2

1				F
---	--	--	--	---

Service, diagnose, and repair battery systems

D3

1				F
---	--	--	--	---

Service starting and charging systems

D4

1				F
---	--	--	--	---

Service electrical circuits

D5

1				F
---	--	--	--	---

Diagnose and repair charging systems

D6

	2			
--	---	--	--	--

Diagnose and repair starting systems

D7

	2			
--	---	--	--	--

Diagnose and repair electrical and electronic components and systems

D8

	2			
--	---	--	--	--

Diagnose and repair vehicle and equipment management systems

D9

	2			
--	---	--	--	--

Service, diagnose, and repair electronic ignition systems

D10

	2			
--	---	--	--	--

**SERVICE, DIAGNOSE,
AND REPAIR FRAMES,
STEERING, AND
SUSPENSION**

E

Service, diagnose, and repair tires, wheels, and hubs

E1

1				F
---	--	--	--	---

Service steering systems

E2

1				F
---	--	--	--	---

Service, diagnose, and repair suspension systems

E3

1				F
---	--	--	--	---

Service undercarriage systems

E4

1				
---	--	--	--	--

Service, diagnose, and repair frames

E5

1				F
---	--	--	--	---

Diagnose and repair wheeled equipment steering

E6

			4-HDET	
--	--	--	--------	--

Diagnose and repair track machine steering

E7

			4-HDET	
--	--	--	--------	--

Diagnose and repair undercarriage

E8

			4-HDET	
--	--	--	--------	--

Diagnose and repair truck steering systems

E9

	2-TTT		4-TTM	
--	-------	--	-------	--

Align truck and trailer

E10

	2-TTT		4-TTM	
--	-------	--	-------	--

**SERVICE, DIAGNOSE,
AND REPAIR TRAILERS**

F

Service, diagnose, and repair landing gear and trailer accessories

F1

1				F
---	--	--	--	---

Service, diagnose, and repair coupling systems

F2

1				F
---	--	--	--	---

Service, diagnose, and repair trailer body components

F3

1				F
---	--	--	--	---

Service heating and refrigeration systems

F4

1				F
---	--	--	--	---

Diagnose and repair heating and refrigeration systems

F5

	2-TTT		4-TTM	
--	-------	--	-------	--

**Section 2
Program Overview**

**SERVICE, DIAGNOSE,
AND REPAIR HEATING,
VENTILATION, AND AIR
CONDITIONING**

Describe heating and air conditioning fundamentals

G1

1				F
---	--	--	--	---

Service, diagnose, and repair heating and air conditioning systems

G2

	2-TTT		4	
--	-------	--	---	--

**SERVICE, DIAGNOSE,
AND REPAIR ENGINES
AND SUPPORTING
SYSTEMS**

Describe engine fundamentals

H1

	2			
--	---	--	--	--

Service engine support systems

H2

	2			F
--	---	--	--	---

Diagnose and repair engine support systems

H3

	2			
--	---	--	--	--

Service diesel fuel supply systems

H4

	2			F
--	---	--	--	---

Diagnose and repair diesel fuel supply systems

H5

	2			
--	---	--	--	--

Describe alternative fuel systems

H6

	2			
--	---	--	--	--

Service, diagnose, and repair engines and components

H7

	2			
--	---	--	--	--

Diagnose and repair mechanical fuel injection systems

H8

	2			
--	---	--	--	--

Service, diagnose, and repair electronic diesel fuel systems

H9

	2			
--	---	--	--	--

Service, diagnose, and repair diesel emissions systems

H10

	2			
--	---	--	--	--

Service, diagnose, and repair engine retarder systems

H11

	2			
--	---	--	--	--

**SERVICE, DIAGNOSE,
AND REPAIR
POWERTRAINS**

Describe power transfer systems

I1

		3		
--	--	---	--	--

Service, diagnose, and repair clutches

I2

		3		
--	--	---	--	--

Service, diagnose, and repair manual transmissions

I3

		3		
--	--	---	--	--

Service, diagnose, and repair automated transmissions

I4

		3		
--	--	---	--	--

Service, diagnose, and repair automatic transmissions and torque converters

I5

		3		
--	--	---	--	--

Service, diagnose, and repair power shift transmissions

I6

		3		
--	--	---	--	--

Service, diagnose, and repair drivelines

I7

		3		
--	--	---	--	--

Service, diagnose, and repair drive axles

I8

		3		
--	--	---	--	--

Service, diagnose, and repair final drives

I9

		3		
--	--	---	--	--

Service, diagnose, and repair drivetrain retarders

I10

		3		
--	--	---	--	--

Service, diagnose, and repair winches

I11

		3		
--	--	---	--	--

Service, diagnose, and repair power take-offs and transfer cases

I12

		3		
--	--	---	--	--

**Section 2
Program Overview**

SERVICE, DIAGNOSE, AND REPAIR STRUCTURAL COMPONENTS AND ACCESSORIES J	Describe protective structures	Service, diagnose, and repair cab structures	Service, diagnose, and repair sound suppression systems	Diagnose and repair attachments and accessories	Diagnose and repair pneumatic systems
	J1	J2	J3	J4	J5
	1 F	1 F	4-HDET	4-HDET	4-HDET
SERVICE, DIAGNOSE, AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV) K	Service, diagnose, and repair hybrid vehicles and hybrid equipment	Service, diagnose, and repair electric vehicles (EV)			
	K1	K2			
	2-TTT 4	2-TTT 4			
USE COMMUNICATION AND MENTORING TECHNIQUES L	Use communication techniques	Use mentoring techniques			
	L1	L2			
	1 F	2-TTT 4			

Training Topics and Suggested Time Allocation

TRANSPORT TRAILER TECHNICIAN – LEVEL 1

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line A	PERFORM OCCUPATIONAL SKILLS	18%	55%	45%	100%
A1	Use safe work practices		✓	✓	
A2	Implement hybrid and electric vehicle (EV) safety protocols		✓	✓	
A3	Use hand tools, power tools, and shop equipment		✓	✓	
A4	Use fasteners and fittings		✓	✓	
A5	Lift and support loads		✓	✓	
A6	Operate equipment		✓	✓	
A7	Use documentation and reference materials		✓	✓	
A8	Service bearings and seals		✓	✓	
A9	Select and maintain lubricants		✓	✓	
A10	Use cutting and welding equipment		✓	✓	
A11	Describe diagnostic procedures		✓		
Line B	SERVICE, DIAGNOSE, AND REPAIR BRAKES	17%	40%	60%	100%
B1	Service and repair hydraulic brakes and parking brakes		✓	✓	
B2	Service and repair hydraulic power brakes and ABS systems		✓	✓	
B3	Service and repair air brakes		✓	✓	
Line C	SERVICE, DIAGNOSE, AND REPAIR HYDRAULICS	14%	60%	40%	100%
C1	Service hydraulic components		✓	✓	
Line D	SERVICE, DIAGNOSE, AND REPAIR ELECTRICAL AND ELECTRONIC SYSTEMS	19%	55%	45%	100%
D1	Describe electricity		✓		
D2	Use electrical testing instruments		✓	✓	
D3	Service, diagnose, and repair battery systems		✓	✓	
D4	Service starting and charging systems		✓	✓	
D5	Service electrical circuits		✓	✓	
Line E	SERVICE, DIAGNOSE, AND REPAIR FRAMES, STEERING, AND SUSPENSION	15%	50%	50%	100%
E1	Service, diagnose, and repair tires, wheels, and hubs		✓	✓	
E2	Service steering systems		✓	✓	
E3	Service, diagnose, and repair suspension systems		✓	✓	
E4	Service undercarriage systems		✓	✓	
E5	Service, diagnose, and repair frames		✓	✓	
Line F	SERVICE, DIAGNOSE, AND REPAIR TRAILERS	8%	35%	65%	100%
F1	Service, diagnose, and repair landing gear and trailer accessories		✓	✓	
F2	Service, diagnose, and repair coupling systems		✓	✓	
F3	Service, diagnose, and repair trailer body components		✓	✓	

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
F4	Service heating and refrigeration systems		✓	✓	
Line G	SERVICE, DIAGNOSE, AND REPAIR HEATING, VENTILATION, AND AIR CONDITIONING	4%	100%	0%	100%
G1	Describe heating and air conditioning fundamentals		✓		
Line J	SERVICE, DIAGNOSE, AND REPAIR STRUCTURAL COMPONENTS AND ACCESSORIES	4%	60%	40%	100%
J1	Describe protective structures		✓		
J2	Service, diagnose, and repair cab structures		✓	✓	
Line L	USE COMMUNICATION AND MENTORING TECHNIQUES	1%	50%	50%	100%
L1	Use communication techniques		✓	✓	
Total Percentage for Transport Trailer Technician Level 1		100%			

Training Topics and Suggested Time Allocation

TRANSPORT TRAILER TECHNICIAN – LEVEL 2

		% of Time	% of Time Allocated to:		
			Theory	Practical	Total
Line B	SERVICE, DIAGNOSE, AND REPAIR BRAKES	25%	50%	50%	100%
B4	Diagnose and repair advanced brake systems		✓	✓	
Line C	SERVICE, DIAGNOSE, AND REPAIR HYDRAULICS	20%	40%	60%	100%
C2	Diagnose and repair advanced hydraulic systems		✓	✓	
Line E	SERVICE, DIAGNOSE, AND REPAIR FRAMES, STEERING, AND SUSPENSION	22%	40%	60%	100%
E9	Diagnose and repair truck steering systems		✓	✓	
E10	Align truck and trailer		✓	✓	
Line F	SERVICE, DIAGNOSE, AND REPAIR TRAILERS	10%	50%	50%	100%
F5	Diagnose and repair heating and refrigeration systems		✓	✓	
Line G	SERVICE, DIAGNOSE, AND REPAIR HEATING, VENTILATION, AND AIR CONDITIONING	10%	50%	50%	100%
G2	Service, diagnose, and repair heating and air conditioning systems		✓	✓	
Line K	SERVICE, DIAGNOSE, AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)	10%	60%	40%	100%
K1	Service, diagnose, and repair hybrid vehicles and hybrid equipment		✓	✓	
K2	Service, diagnose, and repair electric vehicles (EV)		✓	✓	
Line L	USE COMMUNICATION AND MENTORING TECHNIQUES	3%	100%	0%	100%
L2	Use mentoring techniques		✓		
Total Percentage for Transport Trailer Technician Level 2		100%			

Section 3
PROGRAM CONTENT
Transport Trailer Technician

Level 1

Transport Trailer Technician

Line (GAC): A PERFORM OCCUPATIONAL SKILLS

Competency: A1 Use safe work practices

Objectives

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

- Apply personal safety measures
- Demonstrate knowledge of jurisdictional safety certifications and requirements
- Perform risk assessment
- Identify and use shop emergency equipment
- Prevent, identify and extinguish various classes of fires

LEARNING TASKS

CONTENT

1. Apply personal safety precautions and procedures

- Personal apparel
 - Clothing
 - Hair and beards
 - Jewellery
- Personal protective equipment (PPE)
 - Maintenaning PPE
- Safety meetings
- Housekeeping
- Ventilation systems
- Respect for others’ safety
- Situational awareness
- Ergonomics

2. Perform applicable lock out procedures

- WorkSafeBC requirements
- Electrical isolation (Night switch)
- Tag
- Key storage
- Equipment and machine lock-out

3. Demonstrate knowledge of jurisdictional safety certifications and requirements

- Compressed gas certifications
- Refrigerant handler certificate
- WorkSafeBC requirements
- Commercial Vehicle Safety Enforcement regulations (CVSE)
- Environmental regulations

4. Perform risk assessment

- Workplace hazards
- Job task hazards
- Environmental hazards

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>5. Locate shop emergency equipment and procedures</p> | <ul style="list-style-type: none"> • Hazard documentation and reporting |
| <p>6. Describe fire safety</p> | <ul style="list-style-type: none"> • Site safety plan <ul style="list-style-type: none"> ○ Emergency shutoffs ○ Fire control systems ○ Eye wash facilities ○ Emergency exits ○ First aid facilities ○ Emergency contact/phone numbers ○ Muster points • Conditions necessary to support a fire • Classes of fires • Symbols and colours |
| <p>7. Apply preventative fire safety precautions when working near, handling or storing flammable liquids or gases, combustible materials, and electrical apparatus</p> | <ul style="list-style-type: none"> • Liquid and compressed fuels • Ventilation • Purging • Lubricants • Combustible materials • Aerosols |
| <p>8. Describe the considerations taken to fight a fire</p> | <ul style="list-style-type: none"> • Warning others and the Fire Department • Evacuation of others • Fire containment • Escape route • Training • Describe the procedure for using a fire extinguisher <ul style="list-style-type: none"> ○ P.A.S.S. |
| <p>9. Describe equipment fire suppression systems</p> | <ul style="list-style-type: none"> • Types • Construction • Operation • Disarming |

Line (GAC): **A PERFORM OCCUPATIONAL SKILLS**
Competency: **A2 Implement hybrid and electric vehicle (EV) safety protocols**

Objectives

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

- Identify hybrid and electric vehicle (EV) safety hazards
- Select and use high voltage PPE, tools, and equipment
- Implement and follow hybrid and EV safety protocols

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>1. Identify hybrid and electric vehicle (EV) safety hazards</p> | <ul style="list-style-type: none"> • Arc flash • Electrocutation • Burns • High voltage sources • Stored energy • Environmental conditions |
| <p>2. Select and use high voltage PPE</p> | <ul style="list-style-type: none"> • Arc flash suits • Insulated gloves • Non-conductive boots • High voltage signage • Insulated safety rescue hook • Lock-out and tag-out devices |
| <p>3. Select and use high voltage tools and equipment</p> | <ul style="list-style-type: none"> • Insulated high voltage tools • Specialized lifting equipment • Specizlied testing equipment |
| <p>4. Implement and follow hybrid and EV safety protocols</p> | <ul style="list-style-type: none"> • High voltage work procedures • Manufacturer procedures • Facility requirements • Knowledge of jurisdictional hybrid / EV safety certifications and requirements |

Line (GAC): **A PERFORM OCCUPATIONAL SKILLS**
Competency: **A3 Use hand tools, power tools, and shop equipment**

Objectives

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

- Select, use, and maintain tools and shop equipment
- Select, use, and maintain safety equipment

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>1. Use protective equipment associated with the use of tools and shop equipment</p> | <ul style="list-style-type: none"> • PPE • Screening • Guarding • Ventilation • Clean up |
| <p>2. Apply lock-out procedures to shop equipment</p> | <ul style="list-style-type: none"> • WorkSafeBC lock-out procedures • Electrical isolation • Tags • Locks |
| <p>3. Select, use, and maintain hand tools</p> | <ul style="list-style-type: none"> • Hand tool safety <ul style="list-style-type: none"> ○ Safety practices ○ Hazards ○ Organizing work area ○ Maintaining hand tools ○ Safe tool handling and storage • Hand tool selection <ul style="list-style-type: none"> ○ Fastener tools ○ Cutting tools ○ Clamping tools ○ Pullers ○ Multipliers • Grease gun |
| <p>4. Select, use, and maintain measuring instruments</p> | <ul style="list-style-type: none"> • Layout tools • Imperial and metric precision measuring and calibration • Micrometer • Veriner • Bore gauges • Dial indicator |

LEARNING TASKS

CONTENT

5. Select, use, and maintain power tools

- Feeler/thickness gauges
- Torque wrenches

6. Select, use, and maintain drill bits

- Pneumatic
 - Lubrication
- Electric
 - Corded
 - Cordless
- Hydraulic

7. Select, use, and maintain shop equipment

- Types
- Sharpening
- Cutting speeds
- Lubricants

- Presses
- Parts cleaning equipment
 - Hot tank
 - Cold solution
 - Hot agitator
 - Solvent tank
 - Pressure washer
 - Steam cleaner
 - Chemical cleaners
- Drill press
- Glass beader
- Sand blaster
- Grinders
- Compressor
- Cut-off saws

Achievement Criteria

Performance	The learner will be able to use hand tools, power tools, and shop equipment.
Conditions	The learner will be given <ul style="list-style-type: none"> • Hand tools, power tools, and shop equipment • Test equipment • Manufacturer’s Specifications • A work place or training environment
Criteria	The learner will be evaluated on <ul style="list-style-type: none"> • Following safe work practices throughout entire task including lock out procedures • Conducting task in a logical manner • Conducting task according to manufacturer’s specifications • Conducting task according to work place requirements <p><i>Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts</i></p>

Line (GAC): **A PERFORM OCCUPATIONAL SKILLS**
Competency: **A4 Use fasteners and fittings**

Objectives

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

- Select and use imperial and metric fasteners
- Select and use pipe, tubing, hose, and fittings

LEARNING TASKS

CONTENT

1. Select and use imperial and metric fasteners

- Thread systems
- Fastener types
 - Installation
- Washers
 - Types
 - Applications
- Locking devices
 - Types
 - Applications

2. Cut and repair internal and external threads

- Taps
- Dies
- Thread repair
- Broken fastener extraction

3. Select, use, and repair tubing, pipe and fittings

- Tubing
 - Types
 - Sizing
 - Applications
- Pipe
 - Types
 - Sizing
- Threads
 - Applications
- Fitting
 - Types
 - Sizing
 - Applications
- Assembly procedures
- Sealants
- Cutting, bending, and flaring

LEARNING TASKS

4. Select and use hose and hose fittings

CONTENT

- Hose
 - Types
 - Sizing
 - Applications
- Assembly
- Hose fittings
 - Types

Line (GAC): A PERFORM OCCUPATIONAL SKILLS

Competency: A5 Lift and support loads

Objectives

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

- Apply the WorkSafeBC Safety Regulations to lifting and blocking applications
- Select, use, and maintain lifting and blocking equipment
- Select, use, and maintain staging and access equipment
- Inspect and service wire rope
- Lift and move loads

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>1. Apply the Occupational Health and Safety Regulations</p> | <ul style="list-style-type: none"> • Refer to regulations <ul style="list-style-type: none"> ○ PPE ○ Clothing ○ Housekeeping ○ Safe lifting and carrying ○ Safe handling with cranes ○ Maintenance and service documentation |
| <p>2. Determine load weight</p> | <ul style="list-style-type: none"> • Manufacturer’s specification • Estimation |
| <p>3. Select, use, and maintain jacks</p> | <ul style="list-style-type: none"> • Types • Capacities |
| <p>4. Select, use, and maintain stands and blocking</p> | <ul style="list-style-type: none"> • Manufacturer’s procedures • Types • Capacities • Bridging |
| <p>5. Select, use, and maintain staging and access equipment</p> | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Aerial work platforms ○ Scissor lifts ○ Scaffolding ○ Mobile steps and ladders ○ Fall arrest systems • Capacities |

LEARNING TASKS

CONTENT

- | | |
|---|--|
| 6. Select, use, and maintain wire slings, chains and lifting straps | <ul style="list-style-type: none"> • Types • Capacities • Rating tags • Rigging and lifting attachments |
| 7. Select, use, and maintain wire rope | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Regular lay ○ Lang lay • Construction • Application • Safe working load • Inspection frequency • Damage and wear • Removal • Repair/replacement • Lubrication • Scheduled maintenance |
| 8. Use visual and sound signals | <ul style="list-style-type: none"> • WorkSafeBC Safety Regulations <ul style="list-style-type: none"> ○ Hand ○ Sound |
| 9. Select, use, and maintain hoisting equipment | <ul style="list-style-type: none"> • Types • Capacities • Operation |
| 10. Lift, hoist, and move loads | <ul style="list-style-type: none"> • Determine safe working load • Lifting and rigging procedures • Jurisdictional regulations and certifications |

Line (GAC): **A PERFORM OCCUPATIONAL SKILLS**
Competency: **A6 Operate equipment**

Objectives

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

- Perform pre-start and walk around inspections
- Start, move, secure, and stop equipment

LEARNING TASKS

CONTENT

- | | |
|---|--|
| 1. Describe pre-start and walk around inspections | <ul style="list-style-type: none"> • Checklist • Operator’s manuals |
| 2. Describe starting aids | <ul style="list-style-type: none"> • Glow plug systems • Intake preheater systems • Starting fluids • Block/circulating heaters • Battery warmers |
| 3. Describe start up procedures | <ul style="list-style-type: none"> • Controls • Cranking • Monitoring • Jump starting |
| 4. Describe emergency shut down procedures | <ul style="list-style-type: none"> • Cut-off <ul style="list-style-type: none"> ○ Fuel ○ Air |
| 5. Start, operate, and shut down selected equipment | <ul style="list-style-type: none"> • Pre-start and walk around • Use of starting aids • Moving • Securing and shutting down • Electrical isolation (Night switch) |

Line (GAC): A PERFORM OCCUPATIONAL SKILLS

Competency: A8 Service bearings and seals

Objectives

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

- Select bearing and seals
- Service bearings and seals

LEARNING TASKS

1. Describe bearings

2. Select and service bearings

3. Describe seals and sealants

4. Select and service seals and sealants

CONTENT

- Purpose
- Types
 - Friction
 - Antifriction
- Terminology
- Applications
- Loads
 - Axial
 - Radial
- Removal
- Clean
- Inspection
 - Pitting
 - Scoring
 - Brinelling
- Lubrication
- Storage
- Installation
 - Heating
 - Cooling
- Adjustments
- Types
 - Static
 - Dynamic
- Applications
- Removal
- Inspection
- Fabrication
- Installation

Line (GAC): A PERFORM OCCUPATIONAL SKILLS

Competency: A9 Select and maintain lubricants

Objectives

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

- Describe lubricants
- Identify lubricants
- Select lubricants
- Perform fluid analysis

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. Describe the theory of lubrication</p> | <ul style="list-style-type: none"> • Friction • Purpose |
| <p>2. Describe the properties of lubricants</p> | <ul style="list-style-type: none"> • Viscosity • Viscosity Index • Additives • Types <ul style="list-style-type: none"> ○ Oils ○ Greases ○ Dry lubricants ○ Synthetics ○ Environmentally Friendly Liquids • Ratings <ul style="list-style-type: none"> ○ American Petroleum Institute (API) ○ Society of Automotive Engineers (SAE) ○ International Organization for Standardization (ISO) ○ Military Standards ○ International Lubricant Standardization Approval Committee |
| <p>3. Describe the use of lubricants</p> | <ul style="list-style-type: none"> • Applications • Oils • Greases • Dry lubricants • Synthetics • Manufacturer’s specifications • Minimum requirements • Warranty issues |

LEARNING TASKS

CONTENT

4. Handle and maintain lubricants

- Storage
- Disposal
- Personal protection

5. Perform fluid analysis

- Procedures
- Safety
- Reports
 - Interpretation of test results
 - Contamination
 - Condition
 - Recommendations

Line (GAC): A PERFORM OCCUPATIONAL SKILLS

Competency: A10 Use cutting and welding equipment

Objectives

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

- Identify metals
- Describe different welding procedures
- Cut, weld, and braze using oxy-acetylene
- Perform shielded metal arc weld
- Weld using wire feed processes
- Solder tubing and sheet metal

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>1. Identify regulations with respect to welding</p> | <ul style="list-style-type: none"> • WorkSafeBC Safety Regulations • Transportation of Dangerous Goods Act (TDG) • Required certifications |
| <p>2. Identify metals</p> | <ul style="list-style-type: none"> • Metals <ul style="list-style-type: none"> ○ Steel ○ Aluminum |
| <p>3. Identify oxy-acetylene components</p> | <ul style="list-style-type: none"> • Safety precautions • Gases • Valves and regulators • Cylinders • Hoses and fittings • Cutting torches and tips • Flashback valves • Check valves |
| <p>4. Use oxy-acetylene equipment</p> | <ul style="list-style-type: none"> • Assembly procedures • Operation procedures • Lighting • Pressures • Adjusting • Shut down procedures • Leak testing • Storage |

LEARNING TASKS	CONTENT
5. Cut mild steel with oxy-acetylene equipment	<ul style="list-style-type: none"> • Set-up • Freehand cuts • Guided cuts • Hole piercing
6. Braze with oxy-acetylene equipment	<ul style="list-style-type: none"> • Brazing set-up • Brazing techniques
7. Describe the shielded metal arc welding (SMAW) process	<ul style="list-style-type: none"> • Process • Applications <ul style="list-style-type: none"> ○ Safety requirements
8. Identify shielded metal arc welding equipment	<ul style="list-style-type: none"> • AC/DC machines • Components • Electrodes <ul style="list-style-type: none"> ○ Classifications ○ Selection ○ Storage and handling • Electrode holder • Ground clamps • Cables • Connectors
9. Weld mild steel with shielded metal arc	<ul style="list-style-type: none"> • Procedures • Weld ground placement • Settings • Positions • Joints • Types of welds
10. Weld mild steel using wire feed processes	<ul style="list-style-type: none"> • Procedures • Settings • Safety • Weld types and positions • Wire type
11. Select and use air-arc and plasma cutting equipment	<ul style="list-style-type: none"> • Purpose • Procedure • Safety • Maintain

Achievement Criteria

Performance The learner will be able to use cutting and welding equipment.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Cutting and welding equipment

Criteria The learner will be evaluated on

- Following safe work practices throughout entire task including lock out procedures
- Conducting task in a logical manner
- Conducting task according to manufacturer’s specifications
- Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): A PERFORM OCCUPATIONAL SKILLS

Competency: A11 Describe diagnostic procedures

Objectives

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

- Describe the importance of following a diagnostic procedure
- Describe diagnostic procedures used for troubleshooting

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. Describe the importance of following a diagnostic process</p> | <ul style="list-style-type: none"> • Cost of improper diagnosis • Unhappy customers • Lost business • Damage to components • Time management • Efficiency |
| <p>2. Describe general diagnostic procedures</p> | <ul style="list-style-type: none"> • Understanding system • Understanding complaint • Communicating with operator • Operational test • Visual inspection • Forming all possible conclusions • Test conclusions • System component isolation |
| <p>3. Describe the importance of following manufacturer’s diagnostic procedures where available</p> | <ul style="list-style-type: none"> • Warranty requirement • Warranty claims • Diagnostic efficiency |
| <p>4. Describe the importance of failure analysis</p> | <ul style="list-style-type: none"> • Repeat failure • Extend life • Cost • Customer satisfaction |

Line (GAC): **B** **SERVICE, DIAGNOSE, AND REPAIR BRAKES**
Competency: **B1** **Service and repair hydraulic brakes and parking brakes**

Objectives

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

- Service hydraulic brake systems
- Diagnose hydraulic brake systems
- Repair hydraulic brake systems

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>1. Describe the principles of braking</p> | <ul style="list-style-type: none"> • Coefficient of friction • Heat <ul style="list-style-type: none"> ○ Absorption ○ Dissipation • Effects of speed and weight • Brake fade |
| <p>2. Describe the foundation brake</p> | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Disk ○ Drum ○ Multidisc • Components <ul style="list-style-type: none"> ○ Calipers ○ Wheel cylinder ○ Lines ○ Shoes/pads • Operation <ul style="list-style-type: none"> ○ Self energizing and non-self energizing ○ Servo/non-servo |
| <p>3. Review hydraulic principles</p> | <ul style="list-style-type: none"> • Pressure • Force • Area |
| <p>4. Describe the hydraulics of a brake system</p> | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Disk ○ Drum ○ Multidisc • Components <ul style="list-style-type: none"> ○ Master cylinder ○ Metering valve |

LEARNING TASKS

CONTENT

5. Select and maintain brake fluids

- Proportioning valve
- Switches
- Operation
- Requirements
- Types
 - DOT 3
 - DOT 4
 - DOT 5
- Characteristics
 - Hygroscopic
 - Boiling point
 - Viscosity
- Identification

6. Describe parking brake systems

- Types
 - Integral
 - Driveline
 - Hydraulic
 - Mechanical
- Components
- Operation

7. Diagnose hydraulic brake systems

- Measurements
- Diagnostic procedures
 - Operational checks
 - Fluid condition/level
- Inspection
- Failure analysis

8. Repair hydraulic brake systems

- Components
 - Hydraulic
 - Mechanical
- Inspection
- Removal
- Repair/replacement
- Installation
- Flushing/bleeding

9. Service parking brake systems

- Inspection
- Removal

LEARNING TASKS

CONTENT

10. Perform preventive maintenance

- Repair/replacement
- Installation

- Inspection
- Operational tests
- Fluid level checks
- Adjustment
- Lubrication

Achievement Criteria

Performance The learner will be able to service and repair hydraulic brakes and parking brakes.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Equipment with hydraulic brakes with park brakes

Criteria The learner will be evaluated on

- Following safe work practices throughout entire task including lock out procedures
- Conducting task in a logical manner
- Conducting task according to manufacturer’s specifications
- Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): **B SERVICE, DIAGNOSE, AND REPAIR BRAKES**
Competency: **B2 Service and repair hydraulic power brakes and ABS systems**

Objectives

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

- Diagnose hydraulic assisted power brake systems
- Repair hydraulic assisted power brake systems
- Describe hydraulic anti-lock braking (ABS) systems
- Diagnose hydraulic anti-lock braking (ABS) systems
- Repair hydraulic anti-lock braking (ABS) systems

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>1. Describe power brake systems</p> | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Vacuum boosters ○ Hydro-boost ○ Hydro-max ○ Hydraulic • Components • Operation |
| <p>2. Diagnose power brake systems</p> | <ul style="list-style-type: none"> • Sensory inspection • Testing <ul style="list-style-type: none"> ○ Operational • Failure analysis |
| <p>3. Repair power brake systems</p> | <ul style="list-style-type: none"> • Inspection • Removal • Repair/replacement/rebuild • Installation • Bleeding • Adjustments and calibrations • Verification of system operation |
| <p>4. Describe hydraulic anti-lock braking systems</p> | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Single channel ○ Multi channel • Components • Operation • Precautions |

LEARNING TASKS

CONTENT

- | | |
|---|---|
| 5. Diagnose hydraulic anti-lock braking systems | <ul style="list-style-type: none"> • Manufacturer’s diagnostic procedures • Road test • Diagnostic codes • Components • Inspection • Testing |
| 6. Repair hydraulic anti-lock braking systems | <ul style="list-style-type: none"> • Inspection • Removal • Repair/replacement/rebuild • Installation • Bleeding • Adjustments and calibrations • Verification of system operation • Diagnostic codes |

Achievement Criteria

Performance The learner will be able to service and repair hydraulic power brakes and ABS systems.

- Conditions The learner will be given
- Tools
 - Test equipment
 - Manufacturer’s Specifications
 - A work place or training environment
 - Equipment with hydraulic ABS and power brakes

- Criteria The learner will be evaluated on
- Followed safe work practices throughout entire task including lock out procedures
 - Conducted in a logical manner
 - Conducted according to manufacturer’s specifications
 - Conducted according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): **B SERVICE, DIAGNOSE, AND REPAIR BRAKES**
Competency: **B3 Service and repair air brakes**

Objectives

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

- Describe the principles of braking
- Describe the principles of pneumatics
- Describe air brake schedules and components
- Service air brake systems
- Repair a wheel brake assembly

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>1. Describe the principles of braking</p> <p>2. Describe the principles of pneumatics</p> <p>3. Describe a basic air brake system</p> <p>4. Describe air over hydraulic braking systems</p> | <ul style="list-style-type: none"> • Coefficient of friction • Heat <ul style="list-style-type: none"> ○ Absorption ○ Dissipation • Effects of speed and weight • Brake fade
 • Characteristics of air • Relationship between force, pressure and area • Effects of heat on air • Time lag • Pneumatic balance
 • Sub systems <ul style="list-style-type: none"> ○ Supply ○ Delivery • Foundation brakes <ul style="list-style-type: none"> ○ Drum ○ Disc • Components <ul style="list-style-type: none"> ○ Compressor ○ Governor ○ Treadle ○ Relay ○ Brake chamber • Operation
 • Components |
|--|---|

LEARNING TASKS

CONTENT

- | | |
|---|--|
| | <ul style="list-style-type: none"> • Operation |
| 5. Describe the basics of air brake schedules | <ul style="list-style-type: none"> • 121 • X • SX • Operation and routine maintenance |
| 6. Repair foundation brake assembly | <ul style="list-style-type: none"> • Inspection • Disassembly • Replacement • Measurement • Assembly • Adjustment |
| 7. Service and inspect air brakes | <ul style="list-style-type: none"> • Tractor and trailer • Caging brakes • Components <ul style="list-style-type: none"> ○ Foundation brakes ○ Reservoirs ○ Lines ○ Disc/Drum ○ Valves • Adjustment • Scheduled maintenance |

Achievement Criteria

Performance The learner will be able to service and repair air brakes.

- Conditions The learner will be given
- Tools
 - Test equipment
 - Manufacturer’s Specifications
 - A work place or training environment
 - Equipment with air disc and drum brakes

- Criteria The learner will be evaluated on
- Following safe work practices throughout entire task including lock out procedures
 - Conducting task in a logical manner
 - Conducting task to manufacturer’s specifications
 - Conducted task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): C **SERVICE, DIAGNOSE, AND REPAIR HYDRAULICS**
Competency: C1 **Service hydraulic components**

Objectives

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

- Describe the principles of hydraulics
- Describe the basic components of a hydraulic system
- Describe the types of hydraulic systems
- Identify hydraulic components
- Select hydraulic fluids for applications
- Select and assemble hydraulic hoses and fittings
- Demonstrate safe work procedures for hydraulic systems service
- Perform scheduled maintenance on hydraulic systems

LEARNING TASKS

CONTENT

- | | |
|--|---|
| 1. Describe the principles of hydraulics | <ul style="list-style-type: none"> • Terminology • Advantages/disadvantages • Fluid characteristics • Pascal’s Law • Calculations • Bernoulli’s Principle |
| 2. Perform calculations | <ul style="list-style-type: none"> • Area • Volume • Force • Pressure • Flow rate • Pascal’s law |
| 3. Describe the basic operation of a hydraulic system and components | <ul style="list-style-type: none"> • Filters • Accumulators • Seals • Fittings • Reservoir <ul style="list-style-type: none"> ○ Vented ○ Pressurized • Pump <ul style="list-style-type: none"> ○ Positive displacement <ul style="list-style-type: none"> ▪ Gear ▪ Vane |

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>4. Describe types of hydraulic systems</p> <p>5. Demonstrate safe work procedures</p> <p>6. Service hydraulic systems</p> <p>7. Interpret basic hydraulic diagrams</p> | <ul style="list-style-type: none"> <ul style="list-style-type: none"> ▪ Piston ○ Ratings <ul style="list-style-type: none"> ▪ Pressure ▪ Flow • Control valves <ul style="list-style-type: none"> ○ Pressure ○ Directional ○ Volume • Actuators <ul style="list-style-type: none"> ○ Cylinder ○ Motor • Connecting lines • Hydraulic fluids
 • Open-centre • Closed-centre • Self-contained • Auxillary-powered
 • Safety blocking equipment and attachments • Relieve pressure • Reservoir venting • Actuator neutralization • Temperature hazards
 • Visual inspection • Leaks • Hose rubs • External damage • Fluid level check • Filter change, fluid change, and fluid analysis • Strainers • Flushing system
 • Types <ul style="list-style-type: none"> ○ Pictorial ○ Schematic • Basic symbols |
|---|---|

LEARNING TASKS

CONTENT

- | | |
|---|---|
| 8. Select hydraulic fluids | <ul style="list-style-type: none"> • Requirements • SAE viscosity ratings • ISO viscosity ratings • API service ratings • Manufacturer’s specifications • Synthetic/Non-synthetic • Component/System compatibility • Eco-friendly |
| 9. Select hydraulic hoses and fittings | <ul style="list-style-type: none"> • Hose construction • Ratings • Compatability • Hose application • Fitting types <ul style="list-style-type: none"> ○ National Pipe Thread (NPT) ○ Joint Industry Conference (JIC) ○ O-ring Boss (ORB) ○ O-ring Face (ORFS) ○ Split flange ○ Society of Automotive Engineers (SAE) ○ Reusable/Permanent |
| 10. Assemble hydraulic hoses and fittings | <ul style="list-style-type: none"> • Permanent • Reusable |

Achievement Criteria

- | | |
|-------------|--|
| Performance | The learner will be able to service hydraulic components. |
| Conditions | The learner will be given <ul style="list-style-type: none"> • Tools • Test equipment • Manufacturer’s Specifications • A work place or training environment • Equipment with mobile hydraulic systems |
| Criteria | The learner will be evaluated on <ul style="list-style-type: none"> • Following safe work practices throughout entire task including lock out procedures • Conducting task in a logical manner • Conducting task according to manufacturer’s specifications • Conducting task according to work place requirements |

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): D SERVICE, DIAGNOSE, AND REPAIR ELECTRICAL AND ELECTRONIC SYSTEMS

Competency: D1 Describe electricity

Objectives

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

- Define electrical terminology
- Explain basic circuit concepts
- Perform circuit calculations
- Describe magnetic theory
- Identify common electrical and electronic components
- Interpret wiring diagrams and symbols

LEARNING TASKS

1. Define electrical terminology

CONTENT

- Electrical quantities and their units and prefixes
- Voltage
- Current
- Resistance
- Power/Watts
- Circuit terminology
- Open circuit
- Closed circuit
- Short circuit
- Continuity
- Ground circuit
- Ground fault
- Series circuit
- Parallel circuit
- Series parallel circuit

2. Explain basic circuit concepts

- Sources of electricity
- Atomic theory
- Current flow
- Electrons
- Protons
- Neutron
- Conductors
- Insulators
- Semiconductors
- Ohm’s Law

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>3. Perform calculations</p> | <ul style="list-style-type: none"> • Watt’s Law • Basic circuit • Series circuits • Parallel circuits • Series parallel circuits • Source • Load • Closed circuit • Electrical relationships |
| <p>4. Describe magnetic theory</p> | <ul style="list-style-type: none"> • Ohm’s Law • Watt’s Law • Series circuits • Parallel circuits • Series parallel circuits
<ul style="list-style-type: none"> • Properties of magnetic lines of force • Terminology • Relationship to electric current • Electromagnetic induction <ul style="list-style-type: none"> ○ Types ○ Requirements • Factors affecting magnitude |
| <p>5. Identify common electrical components</p> | <ul style="list-style-type: none"> • Lamps • Switches • Relays • Solenoids • Resistors <ul style="list-style-type: none"> ○ Fixed ○ Variable • Capacitors • Motors • Alternators • Fuses |
| <p>6. Describe the basic function of common electronic components</p> | <ul style="list-style-type: none"> • Diodes • Transistors |

LEARNING TASKS

7. Interpret basic electrical wiring diagrams

CONTENT

- Types
- Wiring schematic and diagrams
- Symbols
- Abbreviations

Line (GAC): D SERVICE, DIAGNOSE, AND REPAIR ELECTRICAL AND ELECTRONIC SYSTEMS

Competency: D2 Use electrical testing instruments

Objectives

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

- Use electrical measuring devices

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>1. Describe how to use electrical measuring devices</p> | <ul style="list-style-type: none"> • Analog vs. digital • Voltmeters • Ammeters • Ohmmeters • Multimeters (VOM) • Amp clamp • Load tester • Capacitance tester • Continuity testers • Test lights • Safety precautions |
| <p>2. Diagnose electrical circuits</p> | <ul style="list-style-type: none"> • Voltage drops • Shorts • Grounds • Opens • Resistance • Amperage draw |

LEARNING TASKS	CONTENT
	<ul style="list-style-type: none"> • Case • Terminals
3. Describe the chemical action that takes place in a battery during charging and discharging	<ul style="list-style-type: none"> • Charging cycle • Discharging cycle
4. Select batteries	<ul style="list-style-type: none"> • Battery rating methods <ul style="list-style-type: none"> ○ Cold cranking amperes (CCA) ○ Cranking amperes (CA) ○ Reserve capacity ○ Amp hour • Physical dimensions
5. Service batteries	<ul style="list-style-type: none"> • Safety precautions • Inspection • Cleaning • Terminal servicing • Charging • Replacement • Scheduled maintenance • Storage and handling
6. Diagnose batteries	<ul style="list-style-type: none"> • Specific gravity • Open circuit voltage test • Load test • 3 minute fast charge test • Battery Impedance test
7. Repair battery systems	<ul style="list-style-type: none"> • Battery securement • Cable connectors • Battery cable • Isolation devices • Battery enclosure
8. Use booster equipment and chargers	<ul style="list-style-type: none"> • Safety • Voltage • Polarity • Amperage • Battery maintainers

LEARNING TASKS

CONTENT

- Smart chargers
- Boosters
 - Battery
 - Jumper pack

Achievement Criteria

Performance The learner will be able to service, diagnose, and repair battery systems.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Equipment with battery systems

Criteria The learner will be evaluated on

- Following safe work practices throughout entire task including lock out procedures
- Conducting task a logical manner
- Conducting task according to manufacturer’s specifications
- Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): D SERVICE, DIAGNOSE, AND REPAIR ELECTRICAL AND ELECTRONIC SYSTEMS

Competency: D4 Service starting and charging systems

Objectives

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

- Describe starting and charging circuits
- Identify starting and charging circuit components
- Service starting and charging circuits

LEARNING TASKS

1. Describe starting and charging circuits

CONTENT

- Purpose
- Operation
- Connections
- System voltage
- Battery configuration
 - Series
 - Parallel
- Series parallel
- Isolation switches
- Starter motor assembly
- Alternator assembly
- Solenoids and relays
- Magnetic switch
- Thermal switch
- Ignition switch
- Neutral safety switch/clutch pedal switch
- Cables and terminals

2. Identify components of starting circuits

- Battery
- Starter motor assembly
- Solenoids and relays
- Ignition switch
- Neutral safety switch/clutch pedal switch
- Cables and terminals

3. Identify components of charging circuits

- Alternator Types
 - Brushless
 - Brushed

LEARNING TASKS

CONTENT

4. Service starting and charging circuits

- Gear driven
- Belt driven
- Air oil cooled
- Internal/external regulators
- Belts
- Cooling fins
- Pullys
- ECM
- Mounting hardware

- Sensory inspection
- Output voltage/amperage test
- Current draw test
- Voltage drop test
- Belt condition and tension
- Component removal and replacement
- Cleaning components and connections
- Fault codes

Achievement Criteria

Performance The learner will be able to service charging and starting systems.

- Conditions** The learner will be given
- Tools
 - Test equipment
 - Manufacturer’s Specifications
 - A work place or training environment
 - Equipment with functional starting and charging circuit

- Criteria** The learner will be evaluated on
- Following safe work practices throughout entire task including lock out procedures
 - Conducting task in a logical manner
 - Conducting task according to manufacturer’s specifications
 - Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): D SERVICE, DIAGNOSE, AND REPAIR ELECTRICAL AND ELECTRONIC SYSTEMS

Competency: D5 Service electrical circuits

Objectives

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

- Describe electrical circuits and faults
- Service consumable electrical components

LEARNING TASKS

1. Describe electrical circuits

2. Describe sources of circuit faults

3. Service consumable electrical components

CONTENT

- Wiring harness
- Trailer wiring circuits
 - Connectors
 - Junction box
 - Wiring harness
- Circuit identification
- Wire gauge
- Terminals/connectors
 - Crimped
 - Soldered
- Blown fuses
- Fusible link
- Circuit Breaker
- Connection
- Wiring
- Lamps
- Switches
- Motors
- Fuses
- Adjustment
- Calibration
- Anti-corrosion compound

Achievement Criteria

Performance The learner will be able to service electrical circuits.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Equipment with electrical components

Criteria The learner will be evaluated on

- Following safe work practices throughout entire task including lock out procedures
- Conducting task in a logical manner
- Conducting task according to manufacturer’s specifications
- Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): E **SERVICE, DIAGNOSE, AND REPAIR FRAMES, STEERING, AND SUSPENSION**

Competency: E1 **Service, diagnose, and repair tires, wheels, and hubs**

Objectives

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

- Describe tires, rims, wheels, and hubs
- Describe steering geometry
- Describe traction devices
- Service tires, rims, wheels and hubs
- Diagnose tires, rims, wheels and hubs
- Repair tires, wheels, and hubs

LEARNING TASKS

1. Describe tires and rims

2. Diagnose tires and rims

3. Service tires and rims

CONTENT

- Types of tires
 - Radial
 - Bias
- Rating
 - Load range
 - Size
 - Ply
- Types of rims
 - Dayton
 - Hub pilot
 - Stud pilot
 - Multi-piece
- Inflation and monitoring systems

- Sensory inspection
- Tire wear and damage
- Wheel run out
- Air pressure
- Tread depth

- Safety precautions
- Inspection
- Rim cleanout
- Pressure
- Wheel nut torque
- Matching
- Scheduled maintenance

LEARNING TASKS

4. Repair tires and rims

5. Describe wheel hubs

6. Diagnose wheel hubs

7. Service wheel hubs

8. Repair wheel hubs

CONTENT

- Repair/replacement
- Balancing
 - Static
 - Dynamic
- Mounting
 - Runout
- Plug and patch
- Tube

- Types
 - Conventional
 - Planetary
 - Unitized
- Components
 - Bearings
 - Seals
 - Studs
 - Separator rings
- Lubrication

- Sensory inspection
- Testing
 - End play
 - Rolling resistance
 - Leaks

- Sensory inspection
- Lubrication
- Level
- Condition

- Repair/replacement
 - Bearings
 - Seals
 - Hubs
 - Studs
- Adjustment
 - Bearing end play
 - Rolling torque

Achievement Criteria

Performance	The learner will be able to service, diagnose, and repair tires, wheels, and hubs.
Conditions	The learner will be given <ul style="list-style-type: none"> • Tools • Test equipment • Manufacturer’s Specifications • A work place or training environment • Equipment with tires and wheel assemblies
Criteria	The learner will be evaluated on <ul style="list-style-type: none"> • Following safe work practices throughout entire task including lock out procedures • Conducting task in a logical manner • Conducting task according to manufacturer’s specifications • Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): E **SERVICE, DIAGNOSE, AND REPAIR FRAMES, STEERING, AND SUSPENSION**

Competency: E2 **Service steering systems**

Objectives

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

- Describe steering systems
- Service steering systems

LEARNING TASKS

1. Describe basic steering systems fundamentals

CONTENT

- Types
 - Truck power assist
 - Track steering
 - Wheeled equipment steering
- System Components
 - Kingpins
 - Tie-rod ends
 - Drag link
 - Tie rod
 - Spindle
 - Steering arms
 - Steering gear
 - Orbital valves/hand metering unit
 - Cylinder
 - Drive motor
 - Steering pumps/motor
 - Steering column
 - Control valves
 - Clutches

2. Service steering systems

- Sensory inspection
- Removal or replacement
- Installation
- Lubrication
 - Level
 - Condition
 - Filters
 - Grease
- Scheduled maintenance
- Adjustment
 - Drag link
 - Tie rod ends

LEARNING TASKS

CONTENT

- Axle stops
- Steering gear
- Toe
- Track tension
- Calibration

Achievement Criteria

Performance The learner will be able to service steering systems.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Equipment with various steering systems

Criteria The learner will be evaluated on

- Following safe work practices throughout entire task including lock out procedures
- Conducting task in a logical manner
- Conducting task according to manufacturer’s specifications
- Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): E **SERVICE, DIAGNOSE, AND REPAIR FRAMES, STEERING, AND SUSPENSION**

Competency: E3 **Service, diagnose, and repair suspension systems**

Objectives

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

- Describe suspension systems
- Service suspension systems
- Diagnose suspension systems
- Repair suspension systems

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Describe wheeled equipment suspension systems | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Hydro pneumatic ○ Rigid ○ Rubber block ○ Oscillating axle • Components • Operation |
| 2. Service wheeled equipment suspension systems | <ul style="list-style-type: none"> • Sensory inspection • Adjustments <ul style="list-style-type: none"> ○ Pressure ○ Height • Calibration • Lubrication • Scheduled maintenance |
| 3. Diagnose wheeled equipment suspension systems | <ul style="list-style-type: none"> • Sensory inspection • Measuring <ul style="list-style-type: none"> ○ Pressure ○ Height ○ Wear |
| 4. Repair wheeled equipment suspension systems | <ul style="list-style-type: none"> • Repair/replacement/rebuild • Adjustment |
| 5. Describe truck and trailer suspension systems | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Walking beams ○ Leaf springs ○ Air bag |

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>6. Service truck and trailer suspension systems</p> | <ul style="list-style-type: none"> ○ Rubber block ○ Lift axle ● Components <ul style="list-style-type: none"> ○ Air bag ○ Shock absorbers ○ Spring construction ○ Hangers and attachments ○ Air suspension lockout ○ Valves ● Operation |
| <p>7. Diagnose truck and trailer suspension systems</p> | <ul style="list-style-type: none"> ● Sensory inspection ● Adjustments <ul style="list-style-type: none"> ○ Pressure ○ Height ● Calibration ● Lubrication ● Scheduled maintenance |
| <p>8. Repair truck and trailer suspension systems</p> | <ul style="list-style-type: none"> ● Sensory inspection ● Measuring <ul style="list-style-type: none"> ○ Pressure ○ Height ○ Wear ● Repair/replacement/rebuild ● Adjustments ● Lubrication |

Achievement Criteria

Performance The learner will be able to service, diagnose, and repair suspension systems.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Equipment with various suspension systems

Criteria The learner will be evaluated on

- Followed safe work practices throughout entire task including lock out procedures
- Conducted in a logical manner
- Conducted according to manufacturer’s specifications
- Conducted according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): E **SERVICE, DIAGNOSE, AND REPAIR FRAMES, STEERING, AND SUSPENSION**

Competency: E4 **Service undercarriage systems**

Objectives

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

- Describe track machine undercarriages
- Service track machine undercarriages

LEARNING TASKS

1. Describe undercarriages

CONTENT

- Types
 - Steel
 - Rubber
- Components
 - Rollers
 - Sprockets
 - Tracks
 - Idler
 - Boggies
 - Pivot shaft
 - Equalizer bar
- Operation
- Adjustment
- Lubrication
- Inspection
 - Measuring
 - Sensory

2. Service undercarriages

Line (GAC): E **SERVICE, DIAGNOSE, AND REPAIR FRAMES, STEERING, AND SUSPENSION**

Competency: E5 **Service, diagnose, and repair frames**

Objectives

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

- Describe types of frames
- Diagnose frames
- Repair frames

LEARNING TASKS

1. Describe rail and frame types

2. Service frames

3. Diagnose frames

CONTENT

- Types of rails
 - Materials
 - Mild steel
 - High tensile steel
 - Aluminum
 - Strength
 - Resisting bending moment (RBM)
 - Section modulus
 - Yield strength
- Types of frames
 - Channel
 - Rigid
 - Articulated
 - I beam
- Components
 - Cross members
 - Brackets
 - Mounts
 - Hardware
 - Swing Bearing
 - Fasteners
 - Grade
 - Type
- Swing bearing
- Measurement
- Lubrication
- Sensory inspection
- Measuring

LEARNING TASKS

CONTENT

4. Repair Frames

- Projection
 - Laser
 - String
 - Ultrasonic

- Sensory inspection
- Rail replacement
- Rail sectional replacement
 - Welding procedure
 - Brace support
- Repair
 - Crack
 - Bent
 - Twisted
- Adjustments
 - Alignment

Achievement Criteria

Performance The learner will be able to service, diagnose, and repair frames.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Equipment with various frame configurations

Criteria The learner will be evaluated on

- Following safe work practices throughout entire task including lock out procedures
- Conducting task in a logical manner
- Conducting task according to manufacturer’s specifications
- Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC):	F	SERVICE, DIAGNOSE, AND REPAIR TRAILERS
Competency:	F1	Service, diagnose, and repair landing gear and trailer accessories

Objectives

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

- Describe landing gear and trailer accessories
- Service trailer accessories
- Diagnose trailer accessories
- Repair trailer accessories
- Service landing gear
- Diagnose landing gear
- Repair landing gear

LEARNING TASKS

1. Describe landing gear and trailer accessories

CONTENT

- Lift gates
 - Hydraulic
 - Mechanical
- Landing gear
 - Hydraulic
 - Electric
 - Mechanical
- Landing gear components
 - Gears
 - Cross rods
 - Support
- Trailer accessories
 - Tarping systems
 - Ladders
 - Ratchet winch
 - Aerodynamic systems
- Operation
 - Operational checks
 - Lubrication
 - Adjustments
 - Scheduled maintenance

- Inspection
 - Sensory
 - Measurement
 - Operational

2. Service landing gear and trailer accessories

3. Diagnose landing gear and trailer accessories

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 4. Repair landing gear and trailer accessories | <ul style="list-style-type: none"> ○ Pressure/flow ○ Voltage • Lubrication
 • Repair/replacement/rebuild • Adjustments |
|--|--|

Achievement Criteria

Performance The learner will be able to service, diagnose, and repair landing gear and trailer accessories.

- Conditions** The learner will be given
- Tools
 - Test Equipment
 - Manufacturer’s Specifications
 - A work place or training environment
 - Equipment with various landing gear and trailer accessories

- Criteria** The learner will be evaluated on
- Following safe work practices throughout entire task including lock out procedures
 - Conducting task in a logical manner
 - Conducting task according to manufacturer’s specifications
 - Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

LEARNING TASKS

CONTENT

	<ul style="list-style-type: none"> ○ Buffers <ul style="list-style-type: none"> ▪ Pneumatic ▪ Hydraulic ○ Safety chains
3. Service couplers	<ul style="list-style-type: none"> ● Ball ○ Safety chains
4. Diagnose couplers	<ul style="list-style-type: none"> ● Sensory inspection ● Measurement ● Adjustment ● Lubrication
5. Repair couplers	<ul style="list-style-type: none"> ● Sensory inspection ● Testing <ul style="list-style-type: none"> ○ Operational ● Measurement
	<ul style="list-style-type: none"> ● Repair/replacement/rebuild ● Adjustments ● Verification of operation

Achievement Criteria

Performance The learner will be able to service, diagnose, and repair coupling systems.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Equipment with various couplers

Criteria The learner will be evaluated on

- Following safe work practices throughout entire task including lock out procedures
- Conducting task in a logical manner
- Conducting task according to manufacturer’s specifications
- Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC):	F	SERVICE, DIAGNOSE, AND REPAIR TRAILERS
Competency:	F3	Service, diagnose, and repair trailer body components

Objectives

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

- Describe trailer bodies and components
- Service trailer body components
- Diagnose trailer body components
- Repair trailer body components

LEARNING TASKS

1. Describe trailer bodies and components

CONTENT

- Types
 - Dump
 - Logging
 - Van
 - Flat deck
 - Car carrier
 - Tanker
 - Dolly
 - Low bed
- Components
 - Frames
 - Doors
 - Hinged
 - Roll up
 - Bunks
 - Bumpers
 - Sliding bogies
 - Tanks
 - Valves
 - Manifold piping
 - Gauges
 - Transfer pump
 - Reflective tape
 - Box
 - Transfer
 - Dump

2. Service trailer body components

- Sensory inspection
- Measurement
- Operation
- Adjustments

LEARNING TASKS

CONTENT

3. Diagnose trailer body components

- Lubrication
- Sensory inspection
- Measurement
- Operation
- Testing
 - Pressure
 - Valves

4. Repair trailer body components

- Repair/replacement/rebuild
- Operation
- Adjustment
- Lubrication
- Verification of repair

Achievement Criteria

Performance The learner will be able to service, diagnose, and repair trailer body components.

- Conditions The learner will be given
- Tools
 - Test equipment
 - Manufacturer’s Specifications
 - A work place or training environment
 - Equipment with a variety of trailer bodies

- Criteria The learner will be evaluated on
- Following safe work practices throughout entire task including lock out procedures
 - Conducting task in a logical manner
 - Conducting task according to manufacturer’s specifications
 - Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): F **SERVICE, DIAGNOSE, AND REPAIR TRAILERS**
Competency: F4 **Service heating and refrigeration systems**

Objectives

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

- Describe heating and refrigeration systems
- Service heating and refrigeration systems

LEARNING TASKS

1. Describe heating and refrigeration systems

CONTENT

- Trailer mounted
 - Cooling unit
 - Heating unit
 - Combination unit
- Drive types
 - Fuel
 - Electric
 - Hybrid
- Components
 - Valves
 - Heat exchangers
 - Compressor
 - Generator
 - Battery
 - Electronic control module (ECM)
 - Control panel
 - Sensors
 - Switches
 - Motors
- Operational modes
 - Heating
 - Cooling
 - Defrost

2. Service heating and refrigeration systems

- Inspection
 - Sensory
 - Operational
 - Temperature
- Filters
- Lubricants
- Belts

Achievement Criteria

Performance The learner will be able to service heating and refrigeration systems.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Equipment with heating and refrigeration units

Criteria The learner will be evaluated on

- Following safe work practices throughout entire task including lock out procedures
- Conducting task in a logical manner
- Conducting task according to manufacturer’s specifications
- Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): G SERVICE, DIAGNOSE, AND REPAIR HEATING, VENTILATION, AND AIR CONDITIONING

Competency: G1 Describe heating and air conditioning fundamentals

Objectives

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

- Identify heating and air conditioning components
- Describe the construction and operation of heating and air conditioning systems
- Describe the impact of refrigerants on the environment
- Apply legislated procedures when dealing with systems containing refrigerants

LEARNING TASKS

1. Describe principles of heating and air conditioning systems
2. Identify components of heating and air conditioning systems

CONTENT

- Describe the laws of thermodynamics
- Heater core
- Valves
- Controls
- Ducts
- Filters
- Resistor pack
- Door actuator
- Compressor
- Drive systems
- Evaporator
- Fans
- Condenser
- Receiver-drier/accumulator
- Orifice tubes/expansion valves
- Refrigerant
 - Ozone depleting potential
 - Global warming potential
 - Types
- Lubricants
 - Mineral
 - Synthetic
- Controls
- Sensors
- Hoses, piping and connectors
- Seats and gaskets

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>3. Describe the design and operation of heating and air conditioning systems</p> | <ul style="list-style-type: none"> • Heating system • Refrigeration cycle • Compressor • Evaporator • Condenser • Receiver-drier/accumulator • Orifice tubes/expansion valves • Refrigerant • Lubricants • Controls • Sensors |
| <p>4. Describe the impact of refrigerants on the environment</p> | <ul style="list-style-type: none"> • Ozone depletion • Global warming |
| <p>5. Identify legislation dealing with the use and handling of refrigerants</p> | <ul style="list-style-type: none"> • Training requirements • Certification • Jurisdictional regulations |

Line (GAC): J **SERVICE, DIAGNOSE, AND REPAIR STRUCTURAL COMPONENTS AND ACCESSORIES**
Competency: J1 **Describe protective structures**

Objectives

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

- Describe regulations related to protective structures
- Describe inspection procedures of protective structures

LEARNING TASKS

CONTENT

1. Describe structural components

2. Describe inspection procedures

3. Describe operational regulations

- Roll Over Protective Structure (ROPS)
- Falling Objects Protective Structure (FOPS)
- Operator Protective Structure (OPS)

- Damage
 - Cracks
 - Dents
 - Fatigue
 - Alterations
- Certification labeling
- Secondary escape
- Safety equipment

- Components
 - Safety glass
 - Screens

Line (GAC):	J	SERVICE, DIAGNOSE, AND REPAIR STRUCTURAL COMPONENTS AND ACCESSORIES
Competency:	J2	Service, diagnose, and repair cab structures

Objectives

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

- Describe cab, bodies, and components
- Service cab, bodies, and components
- Diagnose cab, bodies, and components
- Repair cab, bodies, and components

LEARNING TASKS

1. Describe cabs, bodies, and components

CONTENT

- Body types
 - Articulating
 - Coach
 - Transit
 - School
 - Monocoque
- Cab types
 - Conventional
 - Cab over
 - Tilting cab
- Cab mounting
 - Fixed
 - Air ride
 - Cushion
- Components
 - Doors
 - Windows
 - Hood
 - Seats
 - Seat belts
 - Supplemental Restraint System (SRS)
 - Accessibility devices
 - Sleepers
 - Emergency system
 - Aerodynamic devices
- Operation
 - Sensory inspection
 - Components

2. Service cabs, bodies, and components

LEARNING TASKS

CONTENT

3. Diagnose cabs, bodies, and components

- Restraint certification
- Adjustment
- Lubrication

- Sensory inspection
- Testing
 - Operational
 - Pressure
 - Leaks
- Adjustment
- Lubrication
- Supplemental Restraint System (SRS)
- Fault codes

4. Repair cabs, bodies, and components

- Sensory inspection
- Repair/replacement/rebuild
- Lubrication
- Adjustment
 - Hood
 - Cab
 - Doors
 - Windows
 - Cab suspension
- Verification of system operation

Achievement Criteria

Performance The learner will be able to service, diagnose, and repair cab structures.

- Conditions The learner will be given
- Tools
 - Test equipment
 - Manufacturer’s specifications
 - A work place or training environment
 - Equipment with cab structures

- Criteria The learner will be evaluated on
- Following safe work practices throughout entire task including lock out procedures
 - Conducting task in a logical manner
 - Conducting task according to manufacturer’s specifications
 - Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): L **USE COMMUNICATION AND MENTORING TECHNIQUES**
Competency: L1 **Use communication techniques**

Objectives

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

- Use communication techniques
- Use digital communication technologies and platforms

LEARNING TASKS

CONTENT

1. Use effective communication skills

- Safety and information meetings
- Verbal and written instructions
- Professionalism
 - Participation
 - Responsibilites
 - Respect
- Harrassment and discrimination
- Constructive feedback

2. Use active listening

- Attention
- Clarification
- Acknowledgement of understanding
- Eye contact
- Engagement
- Open-ended questions

3. Use digital communication technologies and platforms

- Email
- Text messages
- Social media
- Record keeping
 - Apps and platforms
 - Service/work orders
 - Inspection reports

Level 2

Transport Trailer Technician

Line (GAC): **B SERVICE, DIAGNOSE, AND REPAIR BRAKES**
Competency: **B4 Diagnose and repair advanced brake systems**

Objectives

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

- Describe air brake schedules and their components
- Diagnose and repair air brake schedules and their components.
- Diagnose and repair air over hydraulic systems and their components
- Diagnose and repair ABS, traction control, and stability systems

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Describe tractor/trailer and bus air brake schedules and their components
 2. Diagnose tractor/trailer and bus air brake systems and components
 3. Repair tractor/trailer and bus air brake components
 4. Describe other trailer brake systems and their components
 5. Diagnose other trailer brakes and their components | <ul style="list-style-type: none"> • Schedules <ul style="list-style-type: none"> ○ 121 ○ X ○ SX • Systems <ul style="list-style-type: none"> ○ Sub-systems ○ Supply ○ Delivery ○ Foundation brakes ○ Components ○ Operations • Valve operation/function • Inspection • Testing • Foundation brakes • Inspection • Removal • Repair/replacement • Installation • Adjustment • Lubrication • Verification of system operation • Electric • Electronic • Hydraulic/surge • Inspection • Testing • Types <ul style="list-style-type: none"> ○ Electric |
|---|---|

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>6. Repair other trailer brake components</p> <p>7. Describe tractor/trailer and bus air anti-lock, traction control braking, and vehicle stability systems</p> <p>8. Diagnose and repair tractor/trailer and bus air anti-lock, traction control braking, and vehicle stability systems</p> | <ul style="list-style-type: none"> ○ Electronic ○ Hydraulic/surge ● Inspection ● Removal ● Repair/replacement ● Installation ● Adjustments ● Lubrication ● Verification of system operation ● Components ● Operation ● Inspection ● Removal ● Repair/replacement ● Installation ● Adjustments ● Lubrication ● Verification of system operation ● Diagnostic codes |
|--|--|

Achievement Criteria

- | | |
|--|--|
| <p>Performance</p> <p>Conditions</p> <p>Criteria</p> | <p>The learner will be able to diagnose and repair advanced brake systems.</p> <p>The learner will be given</p> <ul style="list-style-type: none"> ● Tools ● Test equipment ● Manufacturer’s Specifications ● A work place or training environment ● Equipment with air brake systems <p>The learner will be evaluated on</p> <ul style="list-style-type: none"> ● Following safe work practices throughout entire task including lock out procedures ● Conducting task in a logical manner ● Conducting task according to manufacturer’s specifications ● Conducting task according to work place requirements |
|--|--|

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): C **SERVICE, DIAGNOSE, AND REPAIR HYDRAULICS**
Competency: C2 **Diagnose and repair advanced hydraulic systems**

Objectives

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

- Diagnose hydraulic systems
- Repair hydraulic systems and components
- Repair electronic hydraulic systems

LEARNING TASKS

1. Describe hydraulic systems and components

2. Diagnose hydraulic systems

3. Repair hydraulic systems and components

CONTENT

- Pumps
 - Pressure compensated
 - Load sensing (HD only)
- Electronic components
 - Solenoids
 - Sensors
 - Electronic Control Module (ECM)
 - Controls
- Actuators
 - Cylinders
 - Motors
- Valves
 - Pressure
 - Flow
 - Directional
- System types
 - Closed loop
 - Open loop
- Safety precautions
- Diagnostic procedures
- Test equipment
 - Pressure gauges
 - Flow meters
 - Temperature sensors
 - Electronic Service Tool (EST)
- Cycle times
- Diagnostic codes
- Manufacturer’s procedures
- Safety precautions
- Components
 - Reservoirs
 - Pumps

LEARNING TASKS

CONTENT

4. Repair electronic hydraulic systems

- Actuators
- Control valves
- Accumulators
- Coolers
- Connecting lines
- Fluids
- Inspection
- Removal/installation
- Repair/replacement/rebuild
- System flushing
- Safety precautions
- Sensors
- Actuators
- Wiring and connectors
- Electronic Control Module (ECM)
- Communication protocols
- Removal/installation
- Repair/replacement
- Verification of systems operation

Achievement Criteria

Performance The learner will be able to diagnose and repair advanced hydraulic systems.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Equipment with mobile hydraulic systems

Criteria The learner will be evaluated on

- Following safe work practices throughout entire task including lock out procedures
- Conducting task in a logical manner
- Conducting task according to manufacturer’s specifications
- Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): E **SERVICE, DIAGNOSE, AND REPAIR FRAMES, STEERING, AND SUSPENSION**

Competency: E9 **Diagnose and repair truck steering systems**

Objectives

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

- Describe the components and operation of steering systems
- Diagnose steering systems
- Repair steering systems

LEARNING TASKS

1. Describe steering systems

CONTENT

- Types
 - Integral
 - Secondary steering assist
- Components
 - Steering gears
 - Valves
 - Pumps
 - Cylinders
 - Kingpins
 - Tie rod ends
 - Drag link
 - Tie rod
 - Steering arms
 - Spindle
 - Electric motor
 - Sensors
- Operation
 - Steering gear
 - Pump
 - Power assist
 - Electric
 - Hydraulic

2. Diagnose steering components

- Inspection
 - Sensory
 - Measurement
 - Operation
 - Lubrication
- Calibration
- Testing
 - Pressure
 - Flow

LEARNING TASKS

CONTENT

3. Repair steering components

- Leakage
- Electrical
- Repair/replacement/rebuild
- Adjustments
- Lubrication
- Calibration
- Verification of system operation

Achievement Criteria

Performance The learner will be able to diagnose and repair steering systems.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Equipment with hydraulic assisted steering

Criteria The learner will be evaluated on

- Following safe work practices throughout entire task including lock out procedures
- Conducting task in a logical manner
- Conducting task according to manufacturer’s specifications
- Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): E **SERVICE, DIAGNOSE, AND REPAIR FRAMES, STEERING, AND SUSPENSION**
Competency: E10 **Align truck and trailer**

Objectives

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

- Describe steering geometry
- Describe types of alignment
- Diagnose alignment problems
- Perform alignment procedures

LEARNING TASKS

1. Describe alignment geometry
2. Describe types of alignment
3. Diagnose alignment problems
4. Perform alignment

CONTENT

- Camber
- Caster
- Toe
- Toe out on turns
- King pin/Steering axis inclination
- Included angle
- Point of intersection
- Thrust line
- Steer axle
- Drive axle
- Trailer axle
- Sensory inspection
- Measurement
- Wandering
- Pulling
- Tire wear
- Pre-alignment checks
- Set-up
- Adjustments

Achievement Criteria

Performance	The learner will be able to align truck and trailer.
Conditions	<p>The learner will be given</p> <ul style="list-style-type: none"> • Tools • Test equipment • Manufacturer’s Specifications • A work place or training environment • Truck and trailer with various axle configurations
Criteria	<p>The learner will be evaluated on</p> <ul style="list-style-type: none"> • Following safe work practices throughout entire task including lock out procedures • Conducting task in a logical manner • Conducting task according to manufacturer’s specifications • Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

Line (GAC): **F SERVICE, DIAGNOSE, AND REPAIR TRAILERS**
Competency: **F5 Diagnose and repair heating and refrigeration systems**

Objectives

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

- Describe heating and refrigeration systems
- Diagnose heating and refrigeration systems
- Repair heating and refrigeration systems

LEARNING TASKS

1. Describe heating and refrigeration systems

2. Diagnose power units

3. Diagnose heating and refrigeration units

4. Repair power units

CONTENT

- Trailer mounted
 - Cooling unit
 - Heating unit
 - Combination unit
- Drive types
 - Fuel
 - Electric
 - Hybrid
- Components
- Operational modes
 - Heating
 - Cooling
 - Defrost
- Inspection
 - Sensory
 - Operational
 - Temperature
- Fuel supply system
- Starting system
- Charging system
- Lubricating system
- Hybrid system
- High voltage battery system
- Inspection
 - Sensory
 - Operational
 - Pressure
 - Temperature
- Fault codes
- Air flow
- Repair/replacement

LEARNING TASKS

5. Repair heating and refrigeration systems

CONTENT

- Engine drive
 - Fuel supply system
 - Belts
 - Cables and connectors
 - Starting system
 - Charging system
- Hybrid drive
 - Electric motor
 - Generator
 - Battery
- Repair/replacement
 - Evaporators
 - Condensers
 - Compressor
 - Filters
 - Valves
 - Sensors

Achievement Criteria

Performance The learner will be able to diagnose and repair heating and refrigeration systems.

Conditions The learner will be given

- Tools
- Test equipment
- Manufacturer’s Specifications
- A work place or training environment
- Equipment with heating and refrigeration units

Criteria The learner will be evaluated on

- Following safe work practices throughout entire task including lock out procedures
- Conducting task in a logical manner
- Conducting task according to manufacturer’s specifications
- Conducting task according to work place requirements

Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts

- Line (GAC):** G **DIAGNOSE, SERVICE, AND REPAIR HEATING, VENTILATION, AND AIR CONDITIONING**
- Competency:** G2 **Service, diagnose, and repair heating and air conditioning systems**

Objectives

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

- Service heating and air conditioning systems
- Diagnose heating and air conditioning systems
- Repair heating and air conditioning systems

LEARNING TASKS

1. Service heating and air conditioning systems
2. Diagnose heating and air conditioning systems
3. Repair heating and air conditioning systems

CONTENT

- Operation testing
- Cabin filter
- Belt tension/condition
- Cleaning heat exchangers
- Diagnostic procedures
 - Pressure
 - Temperature
- Manufacturer’s procedures
- Diagnostic codes
- Components
 - Electrical
 - Mechanical
 - Drive
- Inspection
- Sensory inspection
- Leak detection methods
 - Vacuum
 - Pressure
 - Dye
 - Electronic
- Safety hazards
- Recovery, evacuation, and recharge
- Component removal and replacement
- Adjustments
 - Ducting
 - Doors
 - Clutch
- Pressure/leak testing
- Environmental considerations
- Verification of system operation

Achievement Criteria

Performance	The learner will be able to diagnose and repair heating and air conditioning systems.
Conditions	The learner will be given <ul style="list-style-type: none"> • Tools • Test equipment • Manufacturer’s Specifications • A work place or training environment • Equipment with HVAC systems
Criteria	The learner will be evaluated on <ul style="list-style-type: none"> • Following safe work practices throughout entire task including lock out procedures • Conducting task in a logical manner • Conducting task according to manufacturer’s specifications • Conducting task according to work place requirements <p><i>Throughout the term of the apprenticeship, the learner must conduct the above performance a multiple of times and in a variety of contexts</i></p>

Line (GAC): **K SERVICE, DIAGNOSE, AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)**

Competency: **K1 Service, diagnose, and repair hybrid vehicles and hybrid equipment**

Objectives

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

- Describe hybrid systems
- Service hybrid systems
- Diagnose hybrid systems
- Repair hybrid systems

LEARNING TASKS

1. Describe hybrid systems

2. Service hybrid systems

CONTENT

- Types
 - Series
 - Parallel
 - Combination
 - Extended range
- Operation
 - Drive
 - Regenerative braking
- Safety
 - High voltage
 - High amperage
 - Ground fault protection system
- High voltage Identification
- Components
 - High voltage battery
 - Capacitor
 - Motors/generator
 - Controls
 - Invertor/converters
 - Cables
 - Electronic Control Module (ECM)
 - Sensors
- Accessory drive motors
 - Air conditioning
 - Compressor
 - Cooling fans
 - Hydraulics
 - Power steering
- Sensory inspection
- Lubrication

LEARNING TASKS

3. Diagnose hybrid systems

4. Repair hybrid systems

CONTENT

- Filters
- Wiring
- Lock out procedure
- Cooling system

- Specialized tooling
- Codes
- Test procedures
- Communication protocols

- Specialized tooling
- Components
 - High voltage battery
 - Capacitor
 - Motors/generator
 - Controls
 - Invertor/converters
 - Cables
 - Electronic Control Module (ECM)
 - Sensors
- Accessory drive motors
 - Air conditioning
 - Compressor
 - Cooling fans
 - Hydraulics
 - Power steering

Line (GAC): **K SERVICE, DIAGNOSE, AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)**

Competency: **K2 Service, diagnose, and repair electric vehicles (EV)**

Objectives

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

- Describe electric vehicles (EV)
- Service electric vehicles (EV)
- Diagnose electric vehicles (EV)
- Repair electric vehicles (EV)

LEARNING TASKS

1. Describe an electrical drive system

2. Service electric drive systems

3. Diagnose electric drive systems

CONTENT

- Operation
 - Drive
 - Regenerative braking
- Safety
 - High voltage
 - High amperage
 - Ground fault protection system
- Components
 - High voltage battery
 - Capacitor
 - Motors/generator
 - Controls
 - Invertor/converters
 - Cables
 - Electronic Control Module (ECM)
 - Sensors
- Accessory drive motors
 - Air conditioning
 - Compressor
 - Cooling fans
 - Hydraulics
 - Power steering
- Lubricant
- Cooling system
 - Coolant
 - Cooling fans
- Specialized tooling
- Codes
- Test procedures
- Communication protocols

LEARNING TASKS

4. Repair electric drive systems

CONTENT

- Specialized tooling
- Components
 - High voltage battery
 - Capacitor
 - Motors/generator
 - Controls
 - Invertor/converters
 - Cables
 - Electronic Control Module (ECM)
 - Sensors
- Accessory drive motors
 - Air conditioning
 - Compressor
 - Cooling fans
 - Hydraulics
 - Power steering

Line (GAC): L **USE COMMUNICATION AND MENTORING TECHNIQUES**
Competency: L2 **Use mentoring techniques**

Objectives

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

- Use effective communication and mentorship skills
- Use mentoring techniques

LEARNING TASKS

1. Use effective communication and mentorship skills

2. Use mentoring techniques

CONTENT

- Safety and information meetings
- Verbal and written instructions
- Professionalism
 - Participation
 - Responsibilites
 - Respect
- Harrassment and discrimination
- Learning/teaching strategies
 - Identifying learner needs
 - Assessing skills
 - Demonstrating skills
- Mentorship best practices
 - Patience
 - Empathy
 - Understanding
 - Building trust
 - Encouraging
 - Giving constructive feedback

Section 4

ASSESSMENT GUIDELINES

Assessment Guidelines – Level 1

Level 1 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		TRANSPORT TRAILER TECHNICIAN LEVEL 1	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
A	PERFORM OCCUPATIONAL SKILLS	11%	12%
B	SERVICE, DIAGNOSE, AND REPAIR BRAKES	19%	19%
C	SERVICE, DIAGNOSE, AND REPAIR HYDRAULICS	15%	15%
D	SERVICE, DIAGNOSE, AND REPAIR ELECTRICAL AND ELECTRONIC SYSTEMS	17%	18%
E	SERVICE, DIAGNOSE, AND REPAIR FRAMES, STEERING, AND SUSPENSION	20%	21%
F	SERVICE, DIAGNOSE, AND REPAIR TRAILERS	10%	10%
G	SERVICE, DIAGNOSE, AND REPAIR HEATING, VENTILATION, AND AIR CONDITIONING	3%	0%
J	SERVICE, DIAGNOSE, AND REPAIR STRUCTURAL COMPONENTS AND ACCESSORIES	4%	5%
L	USE COMMUNICATION AND MENTORING TECHNIQUES	1%	0%
	Total	100%	100%
In-school theory/practical subject competency weighting		50%	50%
Final in-school percentage score		IN-SCHOOL %	
In-school Percentage Score Combined theory and practical subject competency multiplied by		80%	
Standardized Level Exam Percentage Score The exam score is multiplied by		20%	
Final Percentage Score		FINAL%	

Assessment Guidelines – Level 2

Level 2 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		TRANSPORT TRAILER TECHNICIAN LEVEL 2	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
B	SERVICE, DIAGNOSE, AND REPAIR BRAKES	25%	26%
C	SERVICE, DIAGNOSE, AND REPAIR HYDRAULICS	23%	23%
E	SERVICE, DIAGNOSE, AND REPAIR FRAMES, STEERING, AND SUSPENSION	20%	21%
F	SERVICE, DIAGNOSE, AND REPAIR TRAILERS	18%	20%
G	SERVICE, DIAGNOSE, AND REPAIR HEATING, VENTILATION, AND AIR CONDITIONING	7%	10%
K	SERVICE, DIAGNOSE, AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)	5%	0%
L	USE COMMUNICATION AND MENTORING TECHNIQUES	2%	0%
	Total	100%	100%
In-school theory/practical subject competency weighting		50%	50%
Final in-school percentage score Apprentices must achieve a minimum 70% as the final in-school percentage score to be eligible to write the Interprovincial Red Seal exam.		IN-SCHOOL %	

All apprentices who complete level 2 of the Transport Trailer Technician program with a FINAL level mark of 70% or greater will write the Interprovincial Red Seal examination as their final assessment.

SkilledTradesBC will enter the apprentices Transport Trailer Technician Interprovincial Red Seal examination mark in SkilledTradesBC DA. A minimum mark of 70% on the examination is required for a pass.

Section 5

TRAINING PROVIDER STANDARDS

Facility Requirements

Classroom Area

- Recommended 2.5 Sq. meters per student
- Projection screen, multimedia projector, whiteboard or similar
- Seating and tables suitable for lecturing
- Compliance with all safety codes

Shop Area

- Recommended 25 Sq. meters per student
- Meet all safety, fire, and environmental codes
- Good lighting
- Appropriate lifting cranes as required to move industry equipment
- Approved ventilation systems

Lab Requirements

Recommended 10 Sq. meters per student
Computer labs on-site

Student Facilities

1 locker per student
Study areas
Computer labs
Food facility
Hand wash facility
Washroom facility

Instructor's Office Space

Recommended 3.5 Sq. Meters

Other

Storage space for classroom and shop props
Parking space for heavy equipment and trucks
Outside machine/truck wash bay

Tools and Equipment

Shop Equipment

Required Safety Equipment

- Aerial work platform
- Apron
- Arc-rated faceshield/helmet
- Arc-rated protective clothing
- Emergency backup lighting
- Eye wash station
- Face shield
- Fall arrest equipment
- Fall prevention equipment
- Fire extinguisher
- Fireproof blanket
- First aid station
- Gas mask
- Gloves
- Goggles
- Hearing protection
- High voltage gloves
- High voltage safety hook
- Ladder
- Leather gloves
- Respirator
- Safety boots
- Safety cage
- Safety glasses
- Safety hat
- Splash suit

Other Required Equipment

- Air compressor
- Axle stand
- Battery charger
- Battery load/starting system tester
- Bearing heater
- Bleeding equipment
- Booster cable
- Bottle/axle jack
- Cable hoist
- Chain hoist
- Component heating or cooling equipment
- Computer, portable diagnostic computer
- Crack detecting equipment
- Cutting and welding torch set
- Cylinder cart and tank
- Diagnostic equipment
- Dolly
- Drill: bench, hand drivers, twist, air

- Engine rotator
- Fast charger
- Floor hoist
- Forklift
- Fuel recovery and storage system
- Grinder: bench, hand, valve
- Honing equipment
- Hydraulic floor jack
- Hydraulic hand jack
- Hydraulic transmission jack
- Leak detection equipment
- Nitrogen charging equipment
- Parts wash station
- Press: arbor, spring, hydraulic, bushing, shop, mechanical
- Pressure washer
- Printer
- Puller: bearing, gear, heavy duty, reamer
- Refrigerant recycling cart
- Retrieval and storage equipment
- Safety equipment
- Scanning tool
- Shop crane
- Sling/cable/chain
- Spreader bar
- Support stand
- Tire guard
- Transmission jack
- Welding equipment

Recommended

- Alignment tool
- Analyzer: gas, infrared, vibration meter
- Black light
- Coolant recycling unit
- Oil recovery and storage tank
- Overhead crane

Student Equipment (supplied by school)

Required

- 1/4, 3/8, and 1/2 inch drive socket sets
- Adjustable wrench
- Bar (pry, aligning, heel)
- Battery post and clamp cleaner, battery
- Battery terminal puller
- Brass drift
- Center punch
- Chisel
- Digital multimeter
- Feeler gauge set
- File

- Hacksaw and blade
- Hammer: impact, rubber, sledge, air, slide, soft blow
- Hex key set, metric and imperial
- High voltage hand tools
- Jumper wire
- Magnetic pick-up tool (telescopic, flex)
- Metric and imperial steel rule
- Micrometer
- Pick (o-ring, seal)
- Pin punch
- Pipe wrench
- Pliers: insulated, snap ring, torque, punch
- Scraper
- Screwdriver
- Tape measure
- Test light
- Tool chest
- Universal joint
- Utility knife
- Wire brush
- Wire crimper and stripper
- Wire cutter, plier cutters, shears
- Wrench set, combination (metric & imperial)
- Wrench set, flare nut (metric & imperial)

Recommended

- Belt tension gauge
- Borescope
- Depth micrometer
- Dial gauge
- Feeler gauge
- Flowmeter
- Hydrometer
- Inside micrometer
- Level
- Pressure gauge
- Pull-type scale
- Pyrometer
- Small hole gauge
- Steel ruler
- Stethoscope
- Straight edge
- Tachometer
- Telescoping gauge
- Temperature gauge
- Test light
- Thermometer
- Timing gauge
- Tire gauge
- Vacuum gauge

Student Equipment (supplied by student)

Required Safety Equipment

- Coveralls
- Safety boots (CSA approved)
- Safety glasses (CSA approved)

Recommended Safety Equipment

- High visabilty coveralls
- Mechanics gloves

Reference Materials

Recommended Resources

- SkilledTradesBC: www.skilledtradesbc.ca
- WorkSafeBC: www.worksafebc.com

Recommended Texts

Level one:

- Fundamentals of Medium/Heavy Duty Commercial Vehicle Systems
Wright, Gus and Owen C. Duffy
Jones and Bartlett Learning
- Fundamentals of Mobile Heavy Equipment
Duffy, Owen C., et al.
Jones and Bartlett Learning

Level two:

- Fundamentals of Medium/Heavy Duty Commercial Vehicle Systems
Wright, Gus, and Owen C. Duffy
Jones and Bartlett Learning
- Fundamentals of Mobile Heavy Equipment
Duffy, Owen C., et al.
Jones and Bartlett Learning

Instructor Requirements

Occupation Qualification

The instructor must possess:

- Heavy Duty Equipment Technician – Certificate of Qualification with Interprovincial Red Seal endorsement; or
- Truck & Transport Mechanic – Certificate of Qualification with Interprovincial Red Seal endorsement; or
- Transport Trailer Technician – Certificate of Qualification with Interprovincial Red Seal endorsement

Work Experience

A minimum of 10 years of experience working in the industry as a journeyperson.

Instructional Experience and Education

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

- Grade 12 or equivalent
- Instructor Diploma

Appendices

**Appendix A
Acronyms**

ABS	Anti-lock braking system
ACR	Amplified Common Rail
AGM	Absorbed Glass Matt
API	American Petroleum Institute
CA	Cranking amperes
CCA	Cold cranking amperes
CEMF	Counter-Electromotive Force
CNG	Compressed natural gas
CVSE	Commercial Vehicle Safety Enforcement Regulations
CVT	Constant Variable Transmission
DEF	Diesel Exhaust Fluid
DO	Diesel Oxygen Catalyst
DPF	Diesel Particulate Filters
ECM	Electronic Control Module
EGR	Exhaust Gas Recirculation
ESDC	Employment and Social Development Canada
SDC	Electronic Service Tool
EST	Electronic Unit Injectors
EUI	Electronic Unit Pump
EUP	Electric Vehicle
FOPS	Falling Objects Protective Structure
GET	Ground Engaging Tools
GPS	Global Positioning System
HEUI	Hydraulic Electronic Unit Injector
HPCR	High Pressure Common Rail
HPI-TP	High Pressure Injector - Time Pressure
ICBC	Insurance Corporation of British Columbia
ISO	International Organization for Standardization
JIC	Joint Industry Conference
LNG	Liquified natural gas
LPG	Liquified petroleum gas
NPT	National Pipe Thread
OPS	Operator Protective Structure
ORS	O-ring Boss
ORFS	O-ring Face
P.A.S.S.	Pull, Aim, Squeeze, Sweep
PPE	Personal Protective Equipment
PTO	Power Takeoff Shaft
RPM	Revolutions per Minute
SAE	Society of Automotive Engineers

Appendices

SCR	Selective Catalytic Reduction
SMAW	Shielded Metal Arc Welding
SRS	Supplemental Restraint System
TDG	Transportation of Dangerous Goods Act
TIR	Total Indicated Runout
VOM	Volt-Ohm Milliammeter
WHMIS	Workplace Hazardous Materials Information System

Appendix B Summary of Achievement Criteria

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

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

The following tables summarize the practical assessments for each level. **For details, please refer to the Achievement Criteria following the competency in the Program Content section.**

TRANSPORT TRAILER TECHNICIAN – LEVEL 1 SUMMARY OF ACHIEVEMENT CRITERIA	
SUBJECT COMPETENCY	ACHIEVEMENT CRITERIA TASK
A3 Use hand tools, power tools, and shop equipment	The learner will be able to use hand tools, power tools, and shop equipment.
A10 Use cutting and welding equipment	The learner will be able to use cutting and welding equipment.
B1 Service and repair hydraulic brakes and parking brakes	The learner will be able to service and repair hydraulic brakes and parking brakes.
B2 Service and repair hydraulic power brakes and ABS systems	The learner will be able to service hydraulic components.
B3 Service and repair air brakes	The learner will be able to service and repair air brakes.
C1 Service hydraulic components	The learner will be able to service hydraulic components.
D3 Service, diagnose, and repair battery systems	The learner will be able to service, diagnose, and repair battery systems.
D4 Service starting and charging systems	The learner will be able to service charging and starting systems.
D5 Service electrical circuits	The learner will be able to service electrical circuits.
E1 Service, diagnose, and repair tires, wheels, and hubs	The learner will be able to service, diagnose, and repair tires, wheels, and hubs.
E2 Service steering systems	The learner will be able to service steering systems.
E3 Service, diagnose, and repair suspension systems	The learner will be able to service, diagnose, and repair suspension systems.
E5 Service, diagnose, and repair frames	The learner will be able to service, diagnose, and repair frames.
F1 Service, diagnose, and repair landing gear and trailer accessories	The learner will be able to service, diagnose, and repair landing gear and trailer accessories.
F2 Service, diagnose, and repair coupling systems	The learner will be able to service, diagnose, and repair coupling systems.
F3 Service, diagnose, and repair trailer body components	The learner will be able to service, diagnose, and repair trailer body components.

F4 Service heating and refrigeration systems	The learner will be able to service heating and refrigeration systems.
J2 Service, diagnose, and repair cab structures	The learner will be able to service, diagnose, and repair cab structures

TRANSPORT TRAILER TECHNICIAN – LEVEL 2 SUMMARY OF ACHIEVEMENT CRITERIA	
SUBJECT COMPETENCY	ACHIEVEMENT CRITERIA TASK
B4 Diagnose and repair advanced brake systems	The learner will be able to diagnose and repair advanced brake systems.
C2 Diagnose and repair advanced hydraulic systems	The learner will be able to diagnose and repair advanced hydraulic systems.
E9 Diagnose and repair truck steering systems	The learner will be able to diagnose and repair steering systems.
E10 Align truck and trailer	The learner will be able to align truck and trailer.
F5 Diagnose and repair heating and refrigeration systems	The learner will be able to diagnose and repair heating and refrigeration systems.
G2 Service, diagnose, and repair heating and air conditioning systems	The learner will be able to diagnose and repair heating and air conditioning systems.