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National Occupational Analysis

Truck and Transport Mechanic

2015

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National Occupational Analysis

TRUCK AND TRANSPORT MECHANIC

2015

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FOREWORD

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this National Occupational Analysis (NOA) as the national standard for the occupation of Truck and Transport Mechanic.

Background

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to cooperate with provincial and territorial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. Employment and Social Development Canada (ESDC) sponsors a program, under the guidance of the CCDA, to develop a series of NOAs.

The NOAs have the following objectives:

- to describe and group the tasks performed by skilled workers;
- to identify which tasks are performed in every province and territory;
- to develop instruments for use in the preparation of Interprovincial Red Seal Examinations and curricula for training leading to the certification of skilled workers;
- to facilitate the mobility of apprentices and skilled workers in Canada; and,
- to supply employers, employees, associations, industries, training institutions and governments with analyses of occupations.

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This analysis was prepared by the Labour Market Integration Directorate of ESDC. The coordinating, facilitating and processing of this analysis were undertaken by employees of the NOA development team of the Trades and Apprenticeship Division. The host jurisdiction of British Columbia also participated in the development of this NOA.

Comments or questions about National Occupational Analyses may be forwarded to:

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TABLE OF CONTENTS

APPENDICES

To facilitate understanding of the occupation, the work performed by tradespersons is divided into the following categories:

Blocks	the largest division within the analysis that is comprised of a distinct set of trade activities
Tasks	distinct actions that describe the activities within a block
Sub-Tasks	distinct actions that describe the activities within a task
Key Competencies	activities that a person should be able to do in order to be called 'competent' in the trade

The analysis also provides the following information:

Trends	changes identified that impact or will impact the trade including work practices, technological advances, and new materials and equipment
Related Components	a list of products, items, materials and other elements relevant to the block
Tools and Equipment	categories of tools and equipment used to perform all tasks in the block; these tools and equipment are listed in Appendix A
Context	information to clarify the intent and meaning of tasks
Required Knowledge	the elements of knowledge that an individual must acquire to adequately perform a task

The appendices located at the end of the analysis are described as follows:

Appendix A — Tools and Equipment	a non-exhaustive list of tools and equipment used in this trade
Appendix B — Glossary	definitions or explanations of selected technical terms used in the analysis
Appendix C — Acronyms	a list of acronyms used in the analysis with their full name
Appendix D — Block and Task Weighting	the block and task percentages submitted by each jurisdiction, and the national averages of these percentages; these national averages determine the number of questions for each block and task in the Interprovincial exam
Appendix E — Pie Chart	a graph which depicts the national percentages of exam questions assigned to blocks
Appendix F — Task Profile Chart	a chart which outlines graphically the blocks, tasks and sub-tasks of this analysis

DEVELOPMENT AND VALIDATION OF ANALYSIS

Development of Analysis

A draft analysis is developed by a committee of industry experts in the field led by a team of facilitators from ESDC. This draft analysis breaks down all the tasks performed in the occupation and describes the knowledge and abilities required for a tradesperson to demonstrate competence in the trade.

Draft Review

The NOA development team then forwards a copy of the analysis and its translation to provincial and territorial authorities for a review of its content and structure. Their recommendations are assessed and incorporated into the analysis.

Validation and Weighting

The analysis is sent to all provinces and territories for validation and weighting. Participating jurisdictions consult with industry to validate and weight the document, examining the blocks, tasks and sub-tasks of the analysis as follows:

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

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

This method for the validation of the NOA also identifies common core sub-tasks across Canada for the occupation. If at least 70% of the responding jurisdictions perform a sub-task, it shall be considered common core. Interprovincial Red Seal Examinations are based on the common core sub-tasks identified through this validation process.

Definitions for Validation and Weighting

YES	sub-task performed by qualified workers in the occupation in a specific jurisdiction
NO	sub-task not performed by qualified workers in the occupation in a specific jurisdiction
NV	analysis Not Validated by a province/territory
ND	trade Not Designated in a province/territory
NOT COMMON CORE (NCC)	sub-task, task or block performed by less than 70% of responding jurisdictions; these will not be tested by the Interprovincial Red Seal Examination for the trade
NATIONAL AVERAGE %	average percentage of questions assigned to each block and task in Interprovincial Red Seal Examination for the trade

Provincial/Territorial Abbreviations

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

ANALYSIS

Safe working procedures and conditions, accident prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and work environments can be created by controlling the variables and behaviours that may contribute to accidents or injury.

It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe and accident-free work environment.

It is imperative to apply and be familiar with the Occupational Health and Safety (OH&S) Acts and Workplace Hazardous Materials Information System (WHMIS) regulations. As well, it is essential to determine workplace hazards and take measures to protect oneself, co-workers, the public and the environment.

Safety education is an integral part of training in all jurisdictions. As safety is an imperative part of all trades, it is assumed and therefore it is not included as a qualifier of any activities. However, the technical safety tasks and sub-tasks specific to the trade are included in this analysis.

SCOPE OF THE TRUCK AND TRANSPORT MECHANIC TRADE

"Truck and Transport Mechanic" is this trade's official Red Seal occupational title approved by the CCDA. This analysis covers tasks performed by truck and transport mechanics whose occupational title has been identified by some provinces and territories of Canada under the following names:

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
Commercial Transport Vehicle Mechanic										✓			
Heavy Equipment Technician - Truck and Transport Mechanic									✓				
Truck and Coach Technician						✓							
Truck and Transport Mechanic	✓	✓	✓		✓		✓	✓					
Truck and Transport Service Technician				✓									
Truck and Transport Technician												✓	

Truck and transport mechanics inspect, repair and maintain commercial trucks, emergency vehicles, buses and road transport vehicles. In some jurisdictions, they may also work on commercial trailers and recreation vehicles. Truck and transport mechanics work on the structural, mechanical, electrical and electronic vehicle systems and components such as engines, cab, chassis and frames, brakes, steering, suspension, drive train, heating, ventilation and air conditioning (HVAC), emissions, fuel systems and hydraulic systems. In addition, truck and transport mechanics perform preventative maintenance and diagnosis of vehicles.

Truck and transport mechanics use specialized tools including hand tools, test meters, hoisting and lifting equipment, staging equipment, welding and cutting equipment, hydraulic equipment, safety equipment, recycle and recovery equipment, and complex electronics and computer diagnostic test equipment.

Truck and transport mechanics are employed in the agricultural, construction, mining, forestry, petrochemical and transportation sectors. They may be employed in small repair shops, motor vehicle dealers, fleet maintenance companies, public transportation companies, government highway departments, railways and construction companies.

Work environments for truck and transport mechanics differ from one job to another. The truck and transport mechanic frequently works in awkward positions, and must often climb, stoop, crouch and kneel. They also must handle heavy parts and tools. Truck and transport mechanics are sometimes required to work in adverse weather conditions.

There is some risk of injury involved in working with heavy equipment and power tools. Common occupational hazards are exposure to chemicals and harmful materials, repetitive motion, noise and sharp edges.

Key attributes for individuals entering this trade are mechanical aptitude, manual dexterity, good hand-eye coordination and strength. They must also have a good understanding of computerized machinery, good problem-solving and analytical skills, and the ability to read and understand service manuals. Good communication skills and patience are also important. Other assets include good vision, hearing and sense of smell to diagnose problems.

This analysis recognizes similarities or overlaps with the work of automotive service technicians, agricultural equipment technicians, heavy duty equipment technicians, recreation vehicle service technicians and transport trailer technicians.

With experience, truck and transport mechanics act as mentors and trainers to apprentices in the trade. They may also advance to supervisory, service manager and training positions.

OCCUPATIONAL OBSERVATIONS

The increased use of more complex electronic systems in the industry is an ongoing trend. The advent of computer control modules and multiplexing has pushed the industry heavily towards computer diagnostics. The technician must have a greater understanding of software and electronics to complete diagnostics as most logic based systems are now module controlled.

In order to increase fuel efficiency, vehicles are being produced with lighter components and more streamlined designs. The industry is also introducing after-market components to improve fuel economy.

There is concern regarding diesel engine emissions produced. The ongoing changes to regulations and emission standards will have an impact on the way diesel engines are constructed and maintained. Different issues and vehicle faults may arise because of the new designs of these engines and components.

Alternative fuel and power sources such as liquid natural gas (LNG) and compressed natural gas (CNG) and electric drive systems are being used more frequently in the truck and transport industry to lower emissions. There is an increase in hybrid drive systems with higher voltage generators. Truck and transport mechanics' service procedures must change due to the nature of the liquid gas and the hybrid vehicles.

To make the roads safer, there is an increase use of avoidance protection systems such as adaptive cruise, roll-over protection and anti-sway protection. Truck and transport mechanics must be able to diagnose, disable and repair these systems.

ESSENTIAL SKILLS SUMMARY

Essential skills are needed for work, learning and life. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Through extensive research, the Government of Canada and other national and international agencies have identified and validated nine essential skills. These skills are used in nearly every occupation and throughout daily life in different ways.

A series of CCDA-endorsed tools have been developed to support apprentices in their training and to be better prepared for a career in the trades. The tools can be used independently or with the assistance of a tradesperson, trainer, employer, teacher or mentor to:

- understand how essential skills are used in the trades;
- learn about individual essential skills strengths and areas for improvement; and
- improve essential skills and increase success in an apprenticeship program.

Tools are available online or for order at: http://www.edsc.gc.ca/eng/jobs/les/tools/index.shtml.

The application of these skills may be described throughout this document within the competency statements which support each subtask of the trade. The following are summaries of the requirements in each of the essential skills, taken from the essential skills profile. A link to the complete essential skills profile can be found at www.red-seal.ca.

Reading
Truck and transport mechanics read a variety of paper-based and electronic documents for troubleshooting and servicing, including manufacturers' instructions, technical service bulletins and operating procedures. They read and interpret government regulations that specify vehicle inspection procedures and roadworthiness requirements of trucks and transports. They locate information on labels such as part numbers and serial numbers.

Document Use
Truck and transport mechanics interpret technical drawings and flowcharts to understand and troubleshoot systems. They study graphed data generated by diagnostic equipment to locate information such as duration, speed and revolutions per minute. Truck and transport mechanics also complete a variety of forms including truck inspection forms.

Writing
Truck and transport mechanics write remarks on the complaint/issue, the cause of a problem and the work completed to correct a problem. They may leave reminder notes for co-workers on other shifts including warnings about defective equipment. Truck and transport mechanics complete pre-job safety checklists. They may also write reports for insurance claims or to report workplace accidents.

Numeracy
Truck and transport mechanics analyze and compare a variety of measurements such as energy, dimension, speed, horsepower, temperature and torque to specifications. They calculate the effect that modifications have on vehicle performance. They may use some measurements to determine approximate service life of components.

Oral Communication
Truck and transport mechanics exchange technical repair and troubleshooting information with apprentices, co-workers and manufacturers. They speak with service managers about topics such as work assignments, repair procedures and the condition of tools and equipment. They may speak with customers to respond to questions, gather information about a problem to be fixed or explain the results of inspections and repairs.

Thinking Skills
Truck and transport mechanics evaluate the severity of vehicle defects, assess the conditions of parts and decide what repairs or replacements are to be done. They decide on the most efficient course and sequence of actions to complete a job and ensure the vehicle is safe for operation. An understanding of systems is important in completing the work. Truck and transport mechanics coordinate their work with co-workers if needed.

Working with Others
Truck and transport mechanics may work independently or with others. They are part of a team which includes other mechanics, service managers and parts and warehouse personnel.

Digital Technology
Truck and transport mechanics use diagnostic equipment such as scan tools and analyzers to determine the operational condition of components. They use computer equipment to complete repairs, download data from on-board computers and monitor systems. They may use databases to retrieve repair information and technical drawings or to input information about repairs. Truck and transport mechanics use the Internet to access online manuals, technical service bulletins and recall notices. They also use computers for daily tasks which may include e-mail, file management and using fleet management software.

Continuous Learning
Truck and transport mechanics are continuously learning to keep up with the changes in the industry. They may participate in training seminars to learn about new equipment and how to troubleshoot and perform repairs effectively.

BLOCK A COMMON OCCUPATIONAL SKILLS

Trends

The truck and transport mechanic trade is seeing an increase in the need for more advanced computer skills, as there is more electronic communication, equipment and documentation. Health, safety and environmental considerations are also gaining importance, with improved equipment and regulations. New specialized tools, lubricants and fasteners are becoming more common, as are non-serviceable components such as sealed bearings, joints and drive shafts.

Related Components

All components apply.

Tools and Equipment

See Appendix A.

Task 1 Performs safety-related functions

Context

Truck and transport mechanics maintain a safe work environment to ensure safety of equipment and personnel. They must wear personal protective equipment (PPE) and use safety equipment when performing certain tasks.

Required Knowledge

K 1	types and operation of fire extinguishing equipment
K 2	emergency phone numbers
K 3	industry-related safety acts and regulations
K 4	disposal and recycling procedures
K 5	types of PPE such as respiratory, hearing, eye and body protection
K 6	PPE and safety equipment operations
K 7	workplace safety and health regulations such as fall protection and WHMIS
K 8	company policies and procedures such as evacuation routes, location of safety equipment and safety training
K 9	potential hazards such as ceiling heights, overhead wires and uneven surfaces

Sub-task

A-1.01 Maintains safe work environment.

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

Key Competencies

A-1.01.01	perform visual inspection of vehicles and surrounding work area to identify potential hazards such as air lines, light cords and broken equipment, and fluids and gases under high pressure in hydraulic, pneumatic and air conditioning systems
A-1.01.02	handle and store hazardous materials according to Material Safety Data Sheets (MSDS), and workplace and jurisdictional policies
A-1.01.03	perform general housekeeping duties such as sweeping, discarding defective components and keeping area clear of obstacles
A-1.01.04	utilize ventilation equipment to contain and extract fumes, smoke and dust
A-1.01.05	recognize safe lifting locations or points according to manufacturers' specifications

Sub-task

A-1.02 Uses personal protective equipment (PPE) and safety equipment.

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

Key Competencies

A-1.02.01	store PPE and safety equipment according to company policy and manufacturers' recommendations
A-1.02.02	recognize worn, damaged or defective PPE and safety equipment
A-1.02.03	ensure proper fit of PPE and safety equipment
A-1.02.04	identify location of safety stations, first aid kits and fire extinguishing equipment
A-1.02.05	select PPE according to work conditions and requirements such as wearing coveralls, footwear, gloves, and eye and hearing protection

Task 2 Uses and maintains tools and equipment.

Context Truck and transport mechanics maintain tools and equipment to ensure longevity and safe operation of tooling. They use these tools and equipment to carry out all activities of the trade.

Required Knowledge

K 1	types of hand tools such as wrenches, punches and hammers
K 2	tools and equipment operating procedures
K 3	imperial system and metric system
K 4	types of power tools such as impact guns, drills and grinders
K 5	basic repairs of power tools
K 6	manufacturers' maintenance specifications such as lubrication and calibration schedules
K 7	jurisdictional regulations in regards to shop equipment maintenance and welding procedures
K 8	measuring devices such as micrometers, calipers and tape measures
K 9	testing devices such as pressure gauges, flowmeters and temperature gauges
K 10	diagnostic tools such as computers and handheld diagnostic tools
K 11	types of shop equipment such as pullers, presses, axle stands and blocking
K 12	limitations of hoisting and lifting equipment
K 13	load limitations of shop equipment and supporting devices
K 14	types of hoisting and lifting equipment such as jacks, chain hoists and vehicle hoists
K 15	types of welding equipment such as oxy-acetylene welding (OAW), metal inert gas (MIG) gas metal arc welding (GMAW) and shielded metal arc welding (SMAW)
K 16	welding materials such as electrodes, wires and shielding gases
K 17	welding principles and considerations
K 18	basic welding procedures
K 19	types of cutting equipment such as OAW and plasma
K 20	cutting principles and considerations
K 21	basic cutting procedures

Sub-task

A-2.01 Maintains hand, power, measuring, testing and diagnostic tools.

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

Key Competencies

A-2.01.01	store hand, power, measuring, testing and diagnostic tools
A-2.01.02	clean hand, power, measuring, testing and diagnostic tools
A-2.01.03	recognize worn, damaged or defective hand, power, measuring, testing and diagnostic tools, and tag, repair or remove from service
A-2.01.04	lubricate power tools according to manufacturers' specifications
A-2.01.05	calibrate measuring tools according to manufacturers' specifications

Sub-task

A-2.02 Maintains shop equipment.

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

Key Competencies

A-2.02.01	recognize and interpret tags on shop equipment identifying load limits
A-2.02.02	visually inspect shop equipment to recognize worn, damaged or defective equipment, and remove from service
A-2.02.03	store shop equipment
A-2.02.04	maintain solvent washers and biological parts washers
A-2.02.05	recognize potential hazards such as ceiling heights, overhead wires and uneven surfaces
A-2.02.06	ensure certification dates are current, according to jurisdictional regulations
A-2.02.07	lubricate and clean shop equipment according to manufacturers' specifications

Sub-task

A-2.03 Uses hoisting and lifting equipment.

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

Key Competencies

A-2.03.01	inspect hoisting and lifting equipment for wear, damage, leaks and defects
A-2.03.02	repair or replace worn, damaged and defective components on hoisting and lifting equipment
A-2.03.03	store hoisting and lifting equipment
A-2.03.04	position and connect hoisting and lifting equipment
A-2.03.05	operate hoisting and lifting equipment
A-2.03.06	secure hoisting and lifting to prevent movement
A-2.03.07	select hoisting and lifting equipment according to equipment limitations and job requirements

Sub-task

A-2.04 Uses welding and cutting equipment.

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

Key Competencies

A-2.04.01	clean welding and cutting tips according to manufacturers' guidelines
A-2.04.02	transport welding and cutting equipment according to jurisdictional regulations such as Transportation of Dangerous Goods (TDG)
A-2.04.03	recognize and remove worn, damaged or defective cutting and welding equipment from service
A-2.04.04	determine when repair task should be completed by a certified welder
A-2.04.05	determine equipment and material selection according to materials being worked on, such as aluminum or steel
A-2.04.06	set up welding and cutting equipment such as adjusting voltages and regulators for task being performed
A-2.04.07	prepare vehicle for welding according to manufacturers' recommendations to prevent damage to vehicle and electronic components

A-2.04.08	prepare work area for welding such as removing combustibles and placing flash curtains
A-2.04.09	perform basic welding and cutting procedures

Task 3 Performs routine trade activities.

Context Truck and transport mechanics reference different sources of documentation to diagnose, service and repair systems. Truck and transport mechanics must have knowledge of materials and hardware such as fasteners, bearings, bushings and lubricants, and their application.

Required Knowledge

K 1	various types of lubricants such as synthetic, semi-synthetic and non-synthetic, and application
K 2	types of coolants and additives, and range of protection
K 3	limitation of mixing types of fluids, lubricants and coolants
K 4	disposal and recycling of fluids, lubricants and coolants
K 5	types of fasteners, sealing devices, adhesives and gaskets
K 6	chemical reaction of sealants
K 7	torque specification of fasteners
K 8	taps, dies and thread repair kits
K 9	types of hoses, tubing and fittings such as plastic, rubber, neoprene and steel
K 10	jurisdictional/industry regulations such as regulations for hoses, tubing and fittings
K 11	types of bearings
K 12	types of bushings
K 13	types of seals such as static and dynamic
K 14	the application of bearings, bushings and seals
K 15	types of shaft repairs such as installing wear sleeves and re-machining of the shaft
K 16	types of filters such as wash-out and pre-cleaners
K 17	application of filters such as air, fuel and oil
K 18	disposal and recycling of filters
K 19	use of reference material to locate serviceable items such as screens, filters, breathers and lubrication points

K 20	preventative maintenance schedules
K 21	company policies and procedures such as work orders and checklists
K 22	repair procedures
K 23	types of documents and reference tools materials such as service manuals, MSDS and check lists
K 24	documentation and reference material formats (paper and electronic)

Sub-task

A-3.01 Uses documentation and reference materials.

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

Key Competencies

A-3.01.01	locate information on vehicle such as vehicle identification numbers (VIN) and component serial numbers
A-3.01.02	locate and reference most recent original equipment manufacturer (OEM) manuals, service bulletins and support documentation (paper or electronic) for diagnostic, servicing and repair procedures
A-3.01.03	interpret shop service and parts manuals, troubleshooting trees, schematics, technical drawings and regulations
A-3.01.04	complete service records, motor vehicle inspections and warranty forms according to manufacturers' requirements and jurisdictional regulations
A-3.01.05	create parts lists according to repair required
A-3.01.06	match replacement part to original part

Sub-task

A-3.02 Maintains fluids, lubricants and coolants.

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

Key Competencies

A-3.02.01	verify fluid levels such as engine, transmission, differentials and hydraulic using tools and equipment such as dip sticks and sight glass to ensure fluid is within operating range
A-3.02.02	select types and grades of fluids and lubricants according to manufacturers' specifications
A-3.02.03	select types of coolants and additives according to manufacturers' specifications
A-3.02.04	verify coolant has been mixed properly using tools and equipment such as refractometers and test strips
A-3.02.05	store fluids, lubricants and coolants according to regulations
A-3.02.06	take fluid samples according to instructions
A-3.02.07	interpret fluid sample results to indicate issues such as contamination, abnormal wear or signs of premature failure

Sub-task

A-3.03 Services hoses, tubing and fittings.

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

Key Competencies

A-3.03.01	relieve pressure from air and fluid systems before disconnecting hoses, tubing and fittings
A-3.03.02	identify and replace hoses and tubing according to the application such as size and pressure limits
A-3.03.03	identify and replace fittings and clamping devices according to the application such as thread and fitting size compatibility
A-3.03.04	construct hose/tube assemblies using tools and equipment such as crimping tools and tube flaring tools

Sub-task

A-3.04 Services filters.

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

Key Competencies

A-3.04.01	relieve system pressure before removing filters
A-3.04.02	remove filters using appropriate tool for the application
A-3.04.03	identify performance issues and symptoms related to plugged filters to determine if replacement of filter is required
A-3.04.04	select and install filters according to manufacturers' specifications
A-3.04.05	dispose of filters according to jurisdictional regulations

Sub-task

A-3.05 Services bearings, bushings and seals.

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

Key Competencies

A-3.05.01	inspect bearings and bushings for defects such as pitting, scoring, discolouration and excessive wear
A-3.05.02	inspect seals and sealing surfaces for damage
A-3.05.03	lubricate and install bearings and bushings to the allowable tolerances according to application
A-3.05.04	install seals according to manufacturers' specifications
A-3.05.05	adjust bearing according to manufacturers' specifications

Sub-task

A-3.06 Uses fasteners, sealing devices, adhesives and gaskets.

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

Key Competencies

A-3.06.01	select and install fasteners for the application according to type, grade, thread pitch and size
A-3.06.02	select and apply sealing devices such as weather-stripping and window channel, aerobic and anaerobic sealants, gaskets, and adhesives for the application
A-3.06.03	verify quality product selected such as OEM item
A-3.06.04	remove broken fasteners while minimizing damage to threads
A-3.06.05	repair threads using tools such as taps, dies, chasers and thread inserts
A-3.06.06	remove sealants, gaskets and adhesives while minimizing damage to sealing surface
A-3.06.07	fabricate gaskets for application

BLOCK B ENGINE AND SUPPORTING SYSTEMS

Trends

Due to federal mandates on reducing emissions, engine and supporting systems are becoming more sophisticated and complex. For example, alternate fuel systems such as liquid natural gas and hybrid drive are becoming more prevalent.
Electronically controlled engines and supporting systems are more commonly used throughout the industry. Therefore, truck and transport mechanics need better computer skills and electronic diagnostic abilities. They service, diagnose and repair various types of systems with increasing complexity and quickly changing technology.

Related Components (including, but not limited to)

Base engine: pistons, piston rings, wrist pins, connecting rods, flywheels, vibration dampers/harmonic balancers, timing gears, crankshaft, camshafts, valve/injector trains, rocker assemblies, engine cylinder block, wet liner/sleeve, dry sleeve, cylinder head, intake manifold, exhaust manifold, oil pans/sumps.

Engine management system: Electronic control modules (ECMs), sensors, solenoids, harnesses, actuators, connectors, potentiometers, vehicle electronic control units (VECUs).

Cooling system: radiator, radiator cap, coolant pumps, temperature gauge, thermostats, cooling fans, fan shroud, fan belt and pulleys, hoses.

Lubrication system: sump/oil pan, dipstick, oil pumps, pressure regulating valves, filters, filter bypass valves, oil coolers, relief valves, bypass valves.

Fuel delivery system: injectors, tanks, check valves, lines, injection pumps, lift pumps.

Intake/exhaust system: air cleaners, charge air coolers (CACs), turbo chargers, exhaust manifold, exhaust piping, intake piping, mufflers, hoses, emergency shutdown devices.

Starting aids: pre-heaters, ether injectors, auxiliary heaters, glow plugs.

Emission system: catalytic converters, exhaust gas recirculation systems (EGR), particulate filters, after treatment regeneration devices (ARDs), diesel exhaust fluid (DEF) systems, selective catalyst reduction (SCR) systems, diesel particulate filter (DPF) systems, crankcase ventilation systems and evaporative emission systems.

Tools and Equipment

See Appendix A.

Task 4 Services, diagnoses and repairs base engine.

Context

The engine produces power through engine speed and torque to enable movement of the vehicle. Truck and transport mechanics must diagnose and service the base engine and its components to ensure proper engine function and reduce down time.

Servicing includes the adjustment of components as well as their routine maintenance. Diagnosing is required to locate failures in order to effectively perform repairs on the engine, which may include replacement or rebuilding of components.

Required Knowledge

K 1	base engine operating principles
K 2	base engine components such as blocks, crankshafts, camshafts, cylinder heads, pistons and bushings
K 3	cylinder head components such as valves, seats, springs and rockers
K 4	troubleshooting trees and techniques
K 5	specialty tools such as manometers, dynamometers, piston ring compressors, dial indicators and torque wrenches, and their applications and operation
K 6	certification requirements for road testing
K 7	related symptoms of component failures such as abnormal vibration and noise
K 8	oil sampling procedures
K 9	inspection and testing procedures
K 10	removal, replacement and repair procedures
K 11	common causes and related symptoms of base engine failures such as oil contamination, overheating, over revving and operator misuse
K 12	hazards associated with base engine such as sharp edges, weight and size
K 13	safe work practices related to base engine hazards and associated jurisdictional safety regulations

Sub-task

B-4.01 Services base engine.

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

Key Competencies

B-4.01.01	collect oil sample according to sample kit instructions
B-4.01.02	visually inspect oil sample for residual contaminants and send sample for analysis according to employer practices and customer request
B-4.01.03	visually inspect upper cylinder head for worn, damaged or defective components such as chipped or worn cam lobes, broken valve springs and damaged rocker arms
B-4.01.04	adjust clearance of valve train components according to manufacturers' specifications
B-4.01.05	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

B-4.02 Diagnoses base engine.

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

Key Competencies

B-4.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
B-4.02.02	perform sensory inspections such as feeling for vibrations, listening for abnormal sounds and smelling for burning oil to confirm complaint and establish a preliminary diagnosis
B-4.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
B-4.02.04	perform specialized testing procedures such as testing for excessive crankcase pressure to assess components for wear, damage or defects using tools and equipment such as manometers
B-4.02.05	interpret oil sample analysis results to determine specific component wear

B-4.02.06	compare test results to manufacturers' specifications or expected values to verify diagnosis
B-4.02.07	perform failure analysis to determine root cause of failure
B-4.02.08	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

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Sub-task

B-4.03 Repairs base engine.

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

Key Competencies

B-4.03.01	remove and replace worn, damaged or faulty components such as worn bearings, worn piston rings, and scored or cavitated liners
B-4.03.02	perform updates according to manufacturers' specifications
B-4.03.03	rebuild cylinder head by cleaning, replacing worn parts such as valves, seats and springs according to manufacturers' specifications
B-4.03.04	rebuild base engine by cleaning, replacing worn or damaged components such as scored or loose liners, cracked block and broken crankshaft
B-4.03.05	repair base engine using methods such as replacing parts causing the failure, grinding valves, shimming cylinder liners and using oversized bearings, according to manufacturers' specifications
B-4.03.06	perform adjustment procedures such as adjusting valve train clearances to ensure proper operation of component/equipment
B-4.03.07	verify repairs using methods such as road testing and dynamometer testing
B-4.03.08	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 5 Services, diagnoses and repairs lubrication systems.

Context

The lubrication system regulates the flow of oil throughout the engine and its components to the liquid-to-liquid cooler to transfer heat from the oil to the cooling system. It also flushes contaminants away from engine components through the oil filter. Its main purpose is to protect internal engine components by creating a thin film of oil between metal surfaces.

Truck and transport mechanics must service and troubleshoot the lubrication system to ensure proper protection of the engine and its components.

Servicing includes the replacement of consumables as well as the routine maintenance of the system. Diagnosing is required to determine root cause of failures in order to effectively perform repairs on lubrication system.

Required Knowledge

K 1	lubrication system operating principles
K 2	lubrication system components such as oil pumps, filters and coolers
K 3	inspection and testing procedures
K 4	troubleshooting trees and techniques
K 5	specialty tools such as pressure gauges and infrared/direct contact thermometers
K 6	related effect of component failure such as engine knock, excessive engine temperature and loss of oil pressure
K 7	removal, replacement and repair procedures
K 8	hazards of working with lubrication systems such as high temperatures and skin irritation
K 9	specialized tools such as pressure, temperature and feeler gauges
K 10	lubrication flow schematics
K 11	lubrication system consumables such oil and filters

Sub-task

B-5.01 Services lubrication system.

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

Key Competencies

B-5.01.01	clean lubrication system components using lint-free rags and solvents
B-5.01.02	perform sensory inspections such as looking for leaks, smelling for burnt oil and checking magnetic drain plug for contamination
B-5.01.03	measure oil pressure, temperature and level to determine if they meet manufacturers' specifications
B-5.01.04	remove and replace consumables such as oil filter and oil according manufacturers' maintenance schedule and specifications
B-5.01.05	recycle and/or dispose of consumables according to jurisdictional regulations
B-5.01.06	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

B-5.02 Diagnoses lubrication system.

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

Key Competencies

B-5.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
B-5.02.02	perform sensory inspections such as listening for engine knock, smelling for burnt oil and looking for leaks to confirm complaint and establish a preliminary diagnosis
B-5.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
B-5.02.04	perform specialized testing procedures such as oil pressure and temperature, pump cavitation and aeration (pseudo cavitation)
B-5.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis

B-5.02.06	perform failure analysis to determine root cause of failure
B-5.02.07	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

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Sub-task

B-5.03 Repairs lubrication system.

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

Key Competencies

B-5.03.01	remove and replace worn, damaged or faulty components such as defective pumps, faulty oil thermostats and broken or plugged piston cooling nozzles
B-5.03.02	verify repair by using methods such as checking oil pressure and temperature while running engine at operating condition
B-5.03.03	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 6 Services, diagnoses and repairs intake and exhaust systems.

Context

The engine intake and exhaust systems supply cool filtered air to the engine and releases exhaust gases to the atmosphere after combustion. Emissions control systems are often an integral part of both intake and exhaust systems.

Truck and transport mechanics must service, diagnose and repair the intake and exhaust systems to ensure proper operation and performance of the engine.

Servicing includes the replacement of consumables and components as well as their routine maintenance. Diagnosing is required to determine root cause of failures in order to effectively perform repairs on intake and exhaust systems.

Required Knowledge

K 1	intake and exhaust systems operating principles
K 2	intake system components and consumables such as CACs, turbochargers, piping, gaskets and filters
K 3	starting aids such as pre-heaters and ether injection
K 4	exhaust system components such as manifolds, piping and mufflers
K 5	types and arrangement of turbochargers such as variable geometry turbochargers (VGTs) and compound turbochargers
K 6	specialized tests such as boost test, exhaust leakage test, VGT actuator test, and intake and CAC pressure test
K 7	specialized tools such as manufacturers' software, intake CAC pressure test kits and manometers
K 8	recycling and disposal methods, and jurisdictional requirements
K 9	troubleshooting trees and techniques
K 10	intake system contamination such as dust, oil and antifreeze
K 11	inspection and testing procedures
K 12	common causes and related symptoms of component failures such as black exhaust smoke, poor engine performance and no start
K 13	hazards associated with intake and exhaust systems such as running engine in confined spaces, extreme heat from exhaust components and dangers surrounding air inlets
K 14	emergency shutdown devices such as air dams (cable and switch operated)
K 15	safe work practices related to fuel delivery system hazards and associated jurisdictional regulations

Sub-task

B-6.01 Services intake and exhaust systems.

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

Key Competencies

B-6.01.01	clean intake components
B-6.01.02	perform sensory inspections of intake and exhaust systems to identify worn, damaged or defective components such as looking for soot deposits indicating leaks, listening for air escaping and looking for incorrect fit or installation of piping
B-6.01.03	remove and replace consumables according to manufacturers' specifications and maintenance schedule
B-6.01.04	recycle and/or dispose of consumables according to jurisdictional regulations
B-6.01.05	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

B-6.02 Diagnoses intake and exhaust systems.

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

Key Competencies

B-6.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
B-6.02.02	perform sensory inspections to confirm complaint and establish a preliminary diagnosis
B-6.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
B-6.02.04	perform specialized testing procedures on exhaust system such as turbocharger actuator test and CAC pressure drop test to assess components for wear, damage or defects
B-6.02.05	perform specialized testing procedures on exhaust system such as back pressure exhaust test to assess components for wear, damage or defects

B-6.02.06	compare test results to manufacturers' specifications or expected values to verify diagnosis
B-6.02.07	perform failure analysis to determine root cause of failure
B-6.02.08	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

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Sub-task

B-6.03 Repairs intake and exhaust systems.

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

Key Competencies

B-6.03.01	remove and replace worn, damaged or faulty components such as cracked intake manifold or CAC, corroded piping and damaged turbocharger seals
B-6.03.02	remove and replace worn, damaged or faulty starting aid components
B-6.03.03	use welding and cutting equipment to repair piping, remove broken fasteners, and cut and weld intake and exhaust piping
B-6.03.04	perform adjustment procedures such as calibrating turbocharger actuator to ensure proper operation of component/equipment
B-6.03.05	verify repairs using methods such as pressure testing intake system and performing sensory observations of exhaust system
B-6.03.06	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 7 Services, diagnoses and repairs engine management system.

Context

Engine management systems receive analog/digital inputs and distribute analog/digital outputs to many components throughout the vehicle to optimize vehicle performance.

Truck and transport mechanics must service and diagnose the engine management system to ensure proper operation of multiple components of the vehicle.

Servicing includes the replacement of components as well as software updates. Diagnosing is required to determine root cause of failures in order to effectively perform repairs on engine management systems.

Required Knowledge

K 1	engine management system operating principles
K 2	characteristics of manufacturer specific management systems
K 3	engine management system components such as harnesses, ECMs, VECUs, switches, sensors and actuators
K 4	servicing procedures for engine management systems
K 5	effect of static electricity and external voltage induction on delicate electronic components
K 6	hazards when servicing engine management systems such as high voltage outputs
K 7	troubleshooting trees and techniques
K 8	specialized tools such as computers, multimeters and break-out harnesses
K 9	types of specialized connectors and harnesses such as sensor connections, injector harnesses and ECM connectors
K 10	common causes and related symptoms of failures such as poor connections, chaffed or corroded harnesses and poor repair practices causing poor performance and fault codes
K 11	safe work practices related to engine management system hazards and jurisdictional safety regulations
K 12	removal, replacement and repair procedures
K 13	inspection and testing procedures
K 14	specialized tests such as computer-based testing based on manufacturers' recommendations
K 15	wiring schematics

Sub-task

B-7.01 Services engine management system.

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

Key Competencies

B-7.01.01	adjust ECM parameters such as shutdowns, cruise controls and fan controls
B-7.01.02	perform engine management system software updates
B-7.01.03	download engine management system logged data

Sub-task

B-7.02 Diagnoses engine management system.

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

Key Competencies

B-7.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
B-7.02.02	perform sensory inspections to confirm complaint and establish a preliminary diagnosis
B-7.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
B-7.02.04	perform specialized testing procedures such as fault code retrieval, resistance test, voltage drop test and commanded actuator test using tools and equipment such as computers, multimeters, pin-out equipment and break-out harnesses
B-7.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis
B-7.02.06	perform failure analysis to determine root cause of failure
B-7.02.07	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

B-7.03 Repairs engine management system.

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

Key Competencies

B-7.03.01	remove and replace damaged or faulty components such as faulty ECMs, chaffed harnesses and open/shorted sensors or actuators
B-7.03.02	perform updates according to manufacturers' specifications
B-7.03.03	repair components such as harnesses and connections by soldering, splicing and crimping, according to manufacturers' specifications
B-7.03.04	calibrate engine management components such as injectors, turbochargers and speed control sensors
B-7.03.05	verify repair by using methods such as verifying that fault codes remain inactive and performing operational tests
B-7.03.06	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 8 Services, diagnoses and repairs fuel delivery system.

Context

The fuel delivery system supplies clean fuel to the engine at regulated pressure and volume.

Truck and transport mechanics must service, diagnose and repair the fuel delivery system to ensure proper engine operation and minimize downtime.

Required Knowledge

K 1	fuel system operating principles
K 2	types of fuel delivery systems such as mechanical and electronic
K 3	fuel delivery system components such as pumps, injectors, tanks, check valves, fuel regulating valves and lines
K 4	fuel delivery system consumables such as fuels, filters and fuel-water separators
K 5	controls such as ECMs and electronic controls
K 6	types of fuels such as winter and summer fuels, natural gas, propane, diesel and biodiesel

K 7	types of fuel additives and their purpose such as cetane boost and antigel/antiwax
K 8	troubleshooting trees and techniques
K 9	specialty tools such as pressure gauges, vacuum gauges, fitting adaptors and injector removal/installation tools
K 10	common causes and related symptoms of component failures such as exhaust smoke, rough running engine, poor engine performance and no start
K 11	hazards associated with fuel delivery systems such as stored high pressure, irritant, flammability and noxious fumes
K 12	safe work practices related to fuel delivery system hazards and associated jurisdictional regulations
K 13	removal, replacement and repair procedures
K 14	inspection and testing procedures
K 15	fuel sampling procedures
K 16	specialized tests such as pressure test, pressure decay test, injector leakage test and pump inlet restriction test
K 17	recycling and disposal methods and jurisdictional requirements
K 18	fuel flow schematics

Sub-task

B-8.01 Services fuel delivery system.

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

Key Competencies

B-8.01.01	clean fuel delivery system components using lint-free rags and solvents
B-8.01.02	perform sensory inspections such as smelling or looking for fuel leaks, looking for excessive exhaust smoke and listening for engine miss
B-8.01.03	remove and replace consumables according manufacturers' maintenance schedule and specifications
B-8.01.04	recycle and/or dispose of consumables according to jurisdictional regulations
B-8.01.05	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

B-8.02 Diagnoses fuel delivery system.

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

Key Competencies

B-8.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
B-8.02.02	perform sensory inspections such as smelling and looking for leaks, listening for poor engine performance and looking for excessive exhaust smoke to confirm complaint and establish a preliminary diagnosis
B-8.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
B-8.02.04	perform specialized testing procedures to assess components for wear, damage or defects using manufacturer's recommended tools and equipment, and following jurisdictional safety guidelines
B-8.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis
B-8.02.06	perform failure analysis to determine root cause of failure
B-8.02.07	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking
B-8.02.08	interpret fuel system flow schematics

Sub-task

B-8.03 Repairs fuel delivery system.

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

Key Competencies

B-8.03.01	remove and replace worn, damaged or faulty components such as leaking injectors, worn pumps and plugged lines
B-8.03.02	perform updates according to manufacturers' specifications
B-8.03.03	perform measurements such as injector height, fuel pressure and pump inlet restriction to determine if they meet manufacturers' specifications

B-8.03.04	repair fuel delivery system by replacing or cleaning parts causing the failure and adjusting ECM parameters, according to manufacturers' specifications
B-8.03.05	perform adjustment procedures such as setting injector height and setting pump timing according to manufacturers' specifications, to ensure proper operation of component/equipment
B-8.03.06	verify repair using methods such as running equipment at operating condition and performing manufacturers' test procedures
B-8.03.07	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 9 Services, diagnoses and repairs emission systems for diesel engines.

Context

Engine emission systems work in conjunction with other engine systems to reduce nitric oxide and nitrogen dioxide (NO_x gases) and other harmful by-products of combustion to meet jurisdictional environmental requirements.

Truck and transport mechanics must service and diagnose the emissions system to ensure proper operation and performance of the engine, and to ensure emissions levels meet requirements.

Servicing includes the replacement of consumables and components as well as their routine maintenance. Diagnosing is required to determine root cause of failures in order to effectively perform repairs on emissions systems.

Required Knowledge

K 1	emission system operating principles
K 2	types of emission systems such as EGR, SCR, DPF, DEF and crankcase ventilation systems
K 3	emission system components and consumables such as oxidation catalysts, particulate filters, DEF, dosing nozzles, and EGR valves and coolers
K 4	controls such as ECMs, and electronic and manual switches
K 5	servicing procedures for emission systems
K 6	effects of fuel additives
K 7	troubleshooting trees and techniques
K 8	specialty tools such as manufacturers' software and temperature measurement devices

K 9	common causes and related symptoms of component failures such as soot build-up, excessive heat in the EGR, high urea concentration and contamination in DEF
K 10	hazards associated with emission systems such as skin and eye irritation, and high temperature
K 11	safe work practices related to emission system hazards and associated jurisdictional regulations
K 12	removal, replacement and repair procedures
K 13	inspection and testing procedures
K 14	specialized tests such as computer-based testing based on manufacturers' recommendations
K 15	recycling and disposal methods and jurisdictional requirements
K 16	wiring schematics

Sub-task

B-9.01 Services emission systems for diesel engines.

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

Key Competencies

B-9.01.01	clean emission system components such as DPF and fluid dosing nozzles
B-9.01.02	perform sensory inspections of emission systems such looking for leaks, observing DEF levels and looking for accumulation of urea crystals
B-9.01.03	perform software updates according to manufacturers' recommendations
B-9.01.04	remove and replace consumables and components according to manufacturers' specifications and maintenance schedule
B-9.01.05	recycle and/or dispose of consumables and components according to jurisdictional regulations
B-9.01.06	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

B-9.02 Diagnoses emission systems for diesel engines.

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

Key Competencies

B-9.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
B-9.02.02	perform sensory inspections to confirm complaints and establish a preliminary diagnosis
B-9.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
B-9.02.04	perform specialized testing procedures such as computer-based testing to assess components for wear, damage or defects
B-9.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis
B-9.02.06	perform failure analysis to determine root cause of failure
B-9.02.07	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

B-9.03 Repairs emission systems for diesel engines.

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

Key Competencies

B-9.03.01	release stored energy using any means necessary without releasing fluid from system
B-9.03.02	remove and replace worn, damaged or faulty components such DPF, EGR, cooler and piping, and leaking dosing nozzles
B-9.03.03	perform computer-based updates according to manufacturers' recommendations
B-9.03.04	reprogram parameters after repair according to manufacturers' recommendations

B-9.03.05	verify repair by using methods such as operating vehicle, parked regeneration and monitoring operation
B-9.03.06	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 10 Services, diagnoses and repairs engine retarder systems.

Context

Engine retarder systems are an optional component used to assist the primary braking system to slow the vehicle and to prolong primary brake life.

These systems receive inputs from the vehicle and operator to determine appropriate timing to manage compression within the engine by controlling exhaust flow or valve position.

Truck and transport mechanics must diagnose and service/repair engine retarder systems to ensure proper function and reduce down time.

Required Knowledge

K 1	engine retarder system operating principles
K 2	function of electronic controls used with engine retarder systems
K 3	types of engine retarder systems such as compression and exhaust
K 4	engine retarder system components such as ECMs, solenoids, valves and switches
K 5	inspection and testing procedures
K 6	troubleshooting trees and techniques
K 7	specialty tools such as computer-based manufacturers' software, pressure testing equipment and multimeter
K 8	specialized tests such as oil pressure tests, solenoid tests and electrical resistance tests
K 9	hazards of working with engine retarder systems such as high temperatures and skin irritation
K 10	safe work practices related to engine retarder system hazards and jurisdictional safety regulations
K 11	related effect of component failure such as engine knock, excessive engine temperature and loss of oil pressure
K 12	common faults associated with engine retarder systems such as intermittent operation and weak performance

K 13	removal, replacement and repair procedures
K 14	wiring schematics

Sub-task

B-10.01 Services and repairs engine retarder systems.

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

Key Competencies

B-10.01.01	remove and replace worn, damaged or faulty components such as open/shorted solenoids, damaged O-rings and stuck exhaust valves
B-10.01.02	perform ECM software updates according to manufacturers' specifications
B-10.01.03	repair components such as damaged harnesses, exhaust valves and slave pistons according to manufacturers' specifications
B-10.01.04	perform adjustment procedures such as valve clearances and parameters for operator preferences to ensure proper operation of component/equipment
B-10.01.05	verify repair using methods such as road testing and function testing
B-10.01.06	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

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Sub-task

B-10.02 Diagnoses engine retarder systems.

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

Key Competencies

B-10.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
B-10.02.02	perform sensory inspections to confirm complaint and establish a preliminary diagnosis
B-10.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure

B-10.02.04	perform specialized testing procedures such as pressure tests, electrical resistance tests and commanded operational tests to assess components for wear, damage or defects
B-10.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis
B-10.02.06	perform failure analysis to determine root cause of failure
B-10.02.07	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Task 11 Services, diagnoses and repairs cooling system.

Context

The cooling system regulates the circulation of coolant throughout the engine and other components to the air-to-liquid cooler to transfer heat from the engine to the atmosphere as well as the HVAC system.

Truck and transport mechanics must service and diagnose the cooling system to ensure proper operating temperature of the engine and function of the HVAC system.

Servicing includes the replacement of consumables and components as well as their routine maintenance. Diagnosing is required to determine root cause of failures in order to effectively perform repairs on cooling systems.

Required Knowledge

K 1	cooling system operating principles
K 2	cooling system components such as radiator caps, fans and belts
K 3	coolant system consumables such as coolant filters and coolants
K 4	types of coolants (conventional, extended life) and coolant additives
K 5	coolant properties such as pH and freezing point
K 6	sulphate and chloride levels in coolant
K 7	purpose and operation of radiator cap
K 8	common causes and related symptoms of component failures
K 9	hazards associated with cooling systems such as pressure, steam and extreme heat
K 10	safe work practices related to cooling system hazards and jurisdictional safety regulations
K 11	specialized tests such as pressure test, supplemental coolant additives (SCA) test and dye test

K 12	specialized tools such as belt tension gauges, refractometers and vacuum fill and degassing kits
K 13	recycling and disposal methods, and jurisdictional requirements
K 14	auxiliary heaters and heating components
K 15	troubleshooting trees and techniques

Sub-task

B-11.01 Services cooling system.

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

Key Competencies

B-11.01.01	flush cooling system according to manufacturers' specifications and maintenance schedule
B-11.01.02	visually inspect cooling system to identify problems such as improper speed of fan hub, cracked or missing fan blades, plugged radiators, damaged hoses, contamination in coolant, low coolant level and white exhaust
B-11.01.03	adjust belt tension to manufacturers' specifications
B-11.01.04	measure coolant pH, sulphate and chloride levels to determine if they meet manufacturers' specifications based on type of coolant
B-11.01.05	test freezing point of coolant using refractometers, test strips and hydrometers
B-11.01.06	release stored energy such as heat and pressure by allowing system to cool
B-11.01.07	remove and replace consumables such as coolant filter and coolant according to manufacturers' maintenance schedule and specifications
B-11.01.08	recycle and/or dispose of consumables according to jurisdictional regulations
B-11.01.09	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

B-11.02 Diagnoses cooling system.

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

Key Competencies

B-11.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
B-11.02.02	perform sensory inspections such as looking for leaks, cracked hoses, smelling for coolant, feeling hoses for pliability and integrity, to confirm complaint and establish a preliminary diagnosis
B-11.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
B-11.02.04	perform specialized testing procedures to assess system function such as correct operation of thermostat, water pump and fan hub using manufacturer's recommended tools and equipment, and following jurisdictional safety guidelines
B-11.02.05	pressure test radiator cap to rated pressure according to manufacturers' specifications to ensure its proper operation
B-11.02.06	compare test results to manufacturers' specifications or expected values to verify diagnosis
B-11.02.07	perform failure analysis to determine root cause of failure
B-11.02.08	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

B-11.03 Repairs cooling system.

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

Key Competencies

B-11.03.01	remove and replace worn, damaged or faulty components such as defective thermostats, worn pumps and degraded hoses
B-11.03.02	rebuild components such as fan hubs by replacing parts according to manufacturers' rebuild procedures
B-11.03.03	adjust belt tension to ensure proper operation of fan and water pump

B-11.03.04	verify repair by using methods such as road testing and pressure testing
B-11.03.05	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Trends	There is an increasing use of disc brakes due to ease of service and improved materials and design. There are also new safety technology controls such as roll over stability control, vehicle on board radar (VORAD) and collision warning systems that are being introduced in the industry.
Related Components (including, but not limited to)	**Air systems:** air dryer, air starters, compressors, relay valves, air tanks, relief valves, check valves, air lines, governors, pressure switches, gauges, drain valves (automatic or manual), quick release valves, low pressure indicator, dash control valves, trailer supply lines, glad hands. **Brake systems:** brake chambers, slack adjusters (automatic and manual), rotors, calipers, S-cams, springs, pins, bushings, rollers, master cylinders, brake cylinders, hydraulic power boosters, pressure differential valves, metering valves, proportioning valves, foot valves, brake proportioning valves, trailer application valves, relay valves, quick release valves, ratio valves, inversion valves, bobtail proportioning valves, spring brake control valves, tractor protection valves, check valves, stop lamp switches, air pressure gauges, clevis pins, power assisted systems, brake drums, brake shoes, brake spiders, ECUs, sensors.
Tools and Equipment	See Appendix A.

Task 12 Services, diagnoses and repairs air systems.

Context

Truck and transport mechanics must service, diagnose and repair air systems to ensure proper function and reduce down time.

Air systems provide compressed air to control and operate vehicle systems and components such as braking, fan hubs and ride height, and accessories such as seats, wipers and fifth-wheel slide cylinders.

Required Knowledge

K 1	air system design and function
K 2	air system components such as compressors, governors, valves and low air warning systems
K 3	common faults such as ruptured and chafed hoses, sticking valves, faulty compressor and system not building air pressure
K 4	air system specifications
K 5	schematics and troubleshooting trees
K 6	specialty air system tools such as air pressure gauges and their applications and operation
K 7	jurisdictional requirements for road testing
K 8	hazards of servicing air systems

Sub-task

C-12.01 Services air systems.

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

Key Competencies

C-12.01.01	perform sensory inspections of air systems to identify worn, damaged or defective components such as air lines, air dryers, governors, compressors, brake chambers (pots) and air tanks
C-12.01.02	measure air pressures to determine if they meet manufacturers' specifications and jurisdictional requirements
C-12.01.03	release stored energy such as air pressure by opening air valves and fanning down brakes
C-12.01.04	remove and replace air dryer filters according manufacturers' specifications and employer maintenance schedule

C-12.01.05	recycle and/or dispose of consumable air dryer filters and brake chambers according to jurisdictional regulations
C-12.01.06	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking
C-12.01.07	adjust governing air pressures to meet manufacturers' specifications

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Sub-task

C-12.02 Diagnoses air systems.

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

Key Competencies

C-12.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
C-12.02.02	perform audible and visual inspections of components such brake chambers, air lines, tanks, valves, air gauges and air dryers to confirm complaint and establish a preliminary diagnosis
C-12.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
C-12.02.04	perform specialized testing procedures such as pressure tests, timed tests and leakdown to assess components for wear, damage or defects by using diagnostic tools such as soap and water, gauges and hand tools
C-12.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis
C-12.02.06	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

C-12.03 Repairs air systems.

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

Key Competencies

C-12.03.01	remove and replace worn, damaged or faulty components such as air lines, relay valves, brake chambers, modulating valves, governors, compressors and air dryer filters
C-12.03.02	rebuild components such as air compressors, brake chambers, air dryers and purge valves by replacing worn parts, according to manufacturers' specifications
C-12.03.03	repair components such as air starters, compressors, air dryers and driver warning systems by replacing parts causing the failure, according to manufacturers' specifications
C-12.03.04	perform adjustment procedures such as air governors and ride height valves (leveling valves) to ensure proper operation of air system
C-12.03.05	verify repair by using methods such as road testing, load testing and sensory observations
C-12.03.06	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 13 Services, diagnoses and repairs brake systems.

Context

Truck and transport mechanics must service, diagnose and repair brake systems to ensure proper function and reduce down time.

Brake systems slow or stop the vehicle in a safe and controlled manner by using air, hydraulics or cable in conjunction with electronic controls.

Required Knowledge

K 1	types of brake systems such as air, hydraulic and emergency (parking) brake
K 2	operating principles of anti-lock braking system (ABS), roll stability protection and traction control
K 3	components of air brakes such as brake chambers, slack adjusters (automatic and manual), rotors, S-cams, pins and bushings

K 4	hydraulic brake components such as master cylinders, wheel cylinders and brake proportioning valves
K 5	emergency (parking) brake components such as drums and shoes
K 6	ABS components such as wiring, ECMs, modulating valves and sensors
K 7	types of brake shoes, pads and linings
K 8	brake system operation
K 9	common faults such as broken brake chamber springs, leaking diaphragms and loose calipers
K 10	traction control and braking systems
K 11	warning systems
K 12	troubleshooting trees and schematics
K 13	jurisdictional requirements for road testing and road worthiness
K 14	hazards associated with brake systems

Sub-task

C-13.01 Services brake systems.

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

Key Competencies

C-13.01.01	clean brake system components such as ABS components, drums, shoes, pads, rotors, cams and slack adjustors
C-13.01.02	perform sensory inspections of brake components to identify leaks or worn, damaged or defective components such master cylinders, ABS modules, worn shoes and drums, broken springs, slack adjustors and cams
C-13.01.03	measure brake system components such as slack adjustors, brake lining and rotors for brake stroke measurements, drum wear and thicknesses to determine if they meet manufacturers' specifications and jurisdictional requirements
C-13.01.04	check fluid levels in master cylinders to determine if they meet manufacturers' specifications
C-13.01.05	release stored energy in components such as brake chamber springs
C-13.01.06	remove and replace consumable components such as brake linings and fluids according manufacturers' specifications
C-13.01.07	recycle and/or dispose of consumable components according to jurisdictional regulations

C-13.01.08	adjust brakes and lubricate components according to manufacturers' specifications
C-13.01.09	recalibrate sensors for ABS according to manufacturers' specifications
C-13.01.10	bleed hydraulic brakes according to manufacturers' specifications
C-13.01.11	identify types of power assisted hydraulic brakes
C-13.01.12	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

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Sub-task

C-13.02 Diagnoses brake systems.

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

Key Competencies

C-13.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
C-13.02.02	perform sensory inspections such as braking performance, ABS lights, oil and air leaks to confirm complaint and establish a preliminary diagnosis
C-13.02.03	measure brake system components such as slack adjustors, brake lining and rotors for brake stroke measurements, drum wear and thicknesses
C-13.02.04	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
C-13.02.05	perform specialized testing procedures such as leakdown test, performance test and road test to assess components for wear, damage or defects using ABS and hydraulic diagnostic equipment
C-13.02.06	interpret schematics and compare test results to manufacturers' specifications or expected values to verify diagnosis
C-13.02.07	perform failure analysis to determine root cause of failure
C-13.02.08	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

C-13.03 Repairs brake systems.

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

Key Competencies

C-13.03.01	remove and replace worn, damaged or faulty brake components such as slack adjusters, brake chambers, cables, wheel cylinders and master cylinders
C-13.03.02	rebuild and repair components such as master cylinders, calipers, air lines, hydraulic lines and ABS components according to manufacturers' specifications
C-13.03.03	perform adjustment procedures by adjusting components such as brakes, ABS sensors and parking brakes to ensure proper operation and according to manufacturers' specifications
C-13.03.04	verify repair by using methods such as road testing, load testing and sensory observations
C-13.03.05	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Trends

There is an increase in the use of ECMs and multiplex wiring to control components throughout the vehicle. There is a trend towards more wireless communication systems and the use of global positioning systems (GPS) for on road vehicle monitoring and data collection. Increasingly, electronic systems are being used to control vehicle stability and for collision avoidance. The use of high voltage systems is becoming more common throughout the industry with the advancement of hybrid and electric propulsion systems due to the increased demand for environmentally sustainable solutions.

Related Components (including, but not limited to)

Electrical: batteries, starters, alternators, internal and external regulators, cables, wiring, relays, sensors, switches, solenoids, lights, fuses, breakers, rotary beacons, auxiliary heaters, block heaters, seat heaters, fusible links, ignition coils, pick-up coils, coil packs, high intensity discharge (HID) lights.

Electronic: light emitting diodes (LEDs), modules, actuators, circuit boards, multi-function controls, wiring, connectors, data links, communication plugs, terminating resistors, ECMs, sensors.

Tools and Equipment

See Appendix A.

Task 14 Services, diagnoses and repairs batteries.

Context

Truck and transport mechanics need to know how batteries are constructed to understand their applications and limitations. Safety is an important consideration when working with batteries.

Required Knowledge

K 1	types of batteries such as sealed, vented, absorbed glass mat (AGM) and gel cell
K 2	common faults such as low voltage, cracked casing and corroded terminals
K 3	battery ratings such as cranking amps (CA), cold cranking amps (CCA), reserve capacity (RC) and amp-hour rating
K 4	battery maintenance schedule
K 5	hazards related to working with, handling and disposing of batteries and the appropriate safety precautions

K 6	battery construction and how batteries work
K 7	battery testing equipment such as battery testers and hydrometers
K 8	boosting procedures

Sub-task

D-14.01 Performs servicing and repair of batteries.

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

Key Competencies

D-14.01.01	clean battery components such as terminals and connections
D-14.01.02	perform visual inspection of battery to identify defects such as corroded and loose terminals, missing caps or casing damage
D-14.01.03	load test to confirm battery maintains proper charge
D-14.01.04	measure specific gravity of each cell using a hydrometer
D-14.01.05	compare test results to manufacturers' specifications or expected values
D-14.01.06	replace faulty or damaged battery
D-14.01.07	adjust electrolyte levels if applicable
D-14.01.08	recharge battery according to manufacturers' specifications
D-14.01.09	disconnect and connect batteries in proper sequence
D-14.01.10	apply anti-corrosion compounds to terminals and connections
D-14.01.11	recycle and/or dispose of battery according to jurisdictional regulations

Sub-task

D-14.02 Diagnoses batteries.

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

Key Competencies

D-14.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
D-14.02.02	perform visual inspection of battery to identify defects such as corroded and loose terminals, missing caps or casing damage
D-14.02.03	load test to assess battery condition and capacity
D-14.02.04	measure specific gravity to assess the condition of each cell for lack of clarity due to sulfating and for correct electrolyte value
D-14.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis
D-14.02.06	perform failure analysis to determine root cause of failure such as an amperage draw

Task 15 Services, diagnoses and repairs charging systems.

Context Truck and transport mechanics must have a good understanding of the different vehicle charging systems, their operation and components.

Required Knowledge

K 1	types of charging circuits such as 12-volt, 24-volt, and externally or internally regulated systems
K 2	charging system components such as alternators, internal and external regulators, diodes, wiring and relays
K 3	types of alternators such as air/oil cooled, belt driven and gear driven
K 4	ratings of alternators
K 5	alternator components, operation and symptoms indicating faulty components
K 6	equipment and methods for rebuilding and testing alternators and regulators
K7	basic principles of electricity and circuit components

Sub-task

D-15.01 Services charging systems.

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

Key Competencies

D-15.01.01	clean terminals and connections of charging system components
D-15.01.02	perform sensory inspections to identify worn, damaged or defective components such as belts, wiring and cooling fins
D-15.01.03	adjust voltage regulator and belt tension to OEM specifications

Sub-task

D-15.02 Diagnoses charging systems.

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

Key Competencies

D-15.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
D-15.02.02	perform sensory inspections to identify worn, damaged or defective components such belts, wiring and cooling fins to confirm complaint and establish a preliminary diagnosis
D-15.02.03	check alternator charging rate
D-15.02.04	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer which may include specialized testing procedures such as full fielding the alternator
D-15.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis
D-15.02.06	perform failure analysis to determine root cause of failure

Sub-task

D-15.03 Repairs charging systems.

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

Key Competencies

D-15.03.01	remove and replace worn, damaged or faulty components such as belts, pulleys, alternators and regulators
D-15.03.02	adjust belt tension to OEM specifications
D-15.03.03	construct or repair cables by crimping and soldering connectors and terminals
D-15.03.04	rebuild components such as alternators by replacing brushes and bearings, and testing armatures, stators, diodes and regulators according to manufacturers' specifications
D-15.03.05	verify repair by using methods such as full fielding or bench testing

Task 16 Services, diagnoses and repairs spark ignition systems.

Context Spark ignition systems are being reintroduced into the truck and transport industry through alternate fuel sources that reduce greenhouse gas emissions. Although there have been some changes due to technological advances, the basic principles are still applicable today.

Required Knowledge

K 1	electrical fundamentals
K 2	engine operating principles such as firing order, ignition timing and combustion cycle
K 3	spark ignition components such as distributor, spark plugs, modules, ignition coils, rotor, pick up coils, distributor cap and coil packs
K 4	conditions requiring servicing such as intermittent problems, no start, hard starting and misfiring
K 5	common faults such as faulty wiring, low voltage, faulty modules and poor grounds

Sub-task

D-16.01 Performs servicing and repair of spark ignition systems.

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

Key Competencies

D-16.01.01	replace components such as spark plugs, coils, high tension wires and distributor caps
D-16.01.02	repair components such as loose and corroded connections
D-16.01.03	adjust spark plug gap
D-16.01.04	perform visual inspection to identify defects such as damaged wires and coil terminals
D-16.01.05	measure coil resistance to determine if it meets manufacturers' specifications

Sub-task

D-16.02 Diagnoses spark ignition systems.

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

Key Competencies

D-16.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
D-16.02.02	perform visual inspection to identify defects such as damaged wires and coil terminals
D-16.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
D-16.02.04	measure resistance in primary and secondary circuits to verify they fall within manufacturers' specifications
D-16.02.05	test high tension leads to verify they fall within manufacturers' specifications
D-16.02.06	compare test results to manufacturers' specifications or expected values to verify diagnosis

Task 17 Services, diagnoses and repairs starting systems.

Context Truck and transport mechanics must have a good understanding of starting systems, their operation and components.

Required Knowledge

K 1	types of starting systems such as 12-volt and 24-volt
K 2	starting system components such as starter, cables, relays, switches and solenoids
K 3	starting system schematics
K 4	starter rebuilding procedures
K 5	starting system conditions requiring diagnosing such as no cranking, slow cranking and intermittent operation
K 6	common faults such as dead battery, frayed cables and high resistance in cables and connections
K 7	starter draw and voltage drop test procedures
K 8	awareness of safety interlock devices designed to prevent starting of the vehicle in an unsafe condition
K 9	basic principles of electricity and circuit components

Sub-task

D-17.01 Performs servicing and repairs of starting systems.

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

Key Competencies

D-17.01.01	perform visual inspections of starter mounting and identify loose, worn or corroded cables
D-17.01.02	clean components such as connections and terminals
D-17.01.03	remove and replace starter
D-17.01.04	replace components such as solenoid, relays, cables, connections and ignition switches

D-17.01.05	rebuild starter by replacing solenoid, brushes, bushings and starter drives, testing armatures and field windings, and setting starter drive air gap according to manufacturers' specifications
D-17.01.06	verify repair by using methods such as bench and starter draw testing to confirm repair

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Sub-task

D-17.02 Diagnoses starting systems.

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

Key Competencies

D-17.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
D-17.02.02	perform visual inspections of starter system components to identify loose, worn or corroded cables
D-17.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
D-17.02.04	perform specialized testing procedures such as starter draw and voltage drop tests
D-17.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis
D-17.02.06	perform failure analysis to determine root cause of failure

Task 18 Services, diagnoses and repairs electrical components and accessories.

Context Truck and transport mechanics must be able to service, diagnose and repair electrical system faults using multimeters and specialized tools in order to return the vehicle to service. They must have a good understanding of the basic principles of electricity and circuitry.

Required Knowledge

K 1	electrical components such as lights, switches, wiring, relays, fuses and breakers
K 2	electrical accessories such as driving lights, rotary beacons, block heaters, auxiliary power units and seat heaters
K 3	common faults such as blown fuses, broken wires and corroded connections
K 4	stored energy sources such as capacitors
K 5	wiring schematic interpretation
K 6	basic principles of electricity and circuit components
K 7	identification of high voltage electrical systems

Sub-task

D-18.01 Performs servicing and repair of electrical components and accessories.

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

Key Competencies

D-18.01.01	clean components such as corroded terminals, sockets and junction boxes
D-18.01.02	perform visual inspections to identify worn, damaged or defective components and connections
D-18.01.03	identify high voltage electrical systems such as hybrid drive systems requiring specialized training and safety precautions
D-18.01.04	interpret wiring schematics to understand system operation
D-18.01.05	replace components such as light bulbs, fuses, harnesses and plug-in connectors
D-18.01.06	repair components such as faulty wiring, corroded terminals and sockets
D-18.01.07	identify and tighten loose connections

D-18.01.08	apply anti-corrosion compound
D-18.01.09	select and match components such as wires, resistors, fuses, relays and switches to electrical load
D-18.01.10	install or replace electrical accessories
D-18.01.11	recycle and/or dispose of consumable components such as light ballast and fluorescent lighting according to jurisdictional regulations

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Sub-task

D-18.02 Diagnoses electrical components and accessories.

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

Key Competencies

D-18.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
D-18.02.02	perform visual inspections to identify worn, damaged or defective components and connections
D-18.02.03	identify high voltage electrical systems such as hybrid drive systems requiring specialized training and safety precautions
D-18.02.04	perform diagnostic procedure by following troubleshooting tree or wiring schematics supplied by manufacturer to determine failure
D-18.02.05	perform specialized testing procedures such as measuring voltage, amperage and resistance values in electrical circuits
D-18.02.06	compare test results to manufacturers' specifications or expected values to verify diagnosis
D-18.02.07	perform failure analysis on accessories to determine root cause of failure
D-18.02.08	record test results and inspection findings according to manufacturers' requirements if required for warranty purposes

Task 19 Services, diagnoses and repairs vehicle management systems and electronic components.

Context Technological advancement throughout the industry has resulted in more complex vehicle management and electronic systems. Truck and transport mechanics must have a good understanding of the integration between vehicle management systems and other electronic components in a multiplex wiring system.

Required Knowledge

K 1	common failures such as faulty wiring, communication problems, low voltage, failed modules and poor grounds
K 2	basic principles and handling procedures for electronic components such as avoiding static electricity, moisture and other contaminants
K 3	types of electronic systems such as daytime running lights (DRLs), ABS/traction control, vehicle stability control, driver communication, cruise control, satellite systems and supplemental restraint systems (SRSs)
K 4	electronic system components such as actuators, sensors, circuit boards, multi-function controls, wiring and connectors
K 5	conditions requiring repair or replacement of components such as intermittent operation and component failure
K 6	common failures such as faulty modules, blown fuses and poor connections
K 7	wiring schematics
K 8	multiplex systems
K 9	communication protocols
K 10	vehicle management components such as data links, communication plugs, connectors and terminating resistors
K 11	conditions requiring servicing such as gauges not sweeping and failure of lighting circuits
K 12	repair procedures such as soldering, heat shrinking, terminal installation and insulation protection
K 13	wiring types such as twisted pairs
K 14	tools and repair procedures required for various OEM connectors

Sub-task

D-19.01 Services vehicle management systems and electronic components.

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

Key Competencies

D-19.01.01	perform visual inspection to identify component securement, loose and faulty wiring, and other signs of damage such as overheating and exposure to moisture and contaminants
D-19.01.02	check for fault codes on vehicle management and electronic systems
D-19.01.03	remove power supply and release stored energy by disconnecting power sources and allowing capacitors to discharge in SRS modules

Sub-task

D-19.02 Diagnoses vehicle management systems and electronic components.

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

Key Competencies

D-19.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
D-19.02.02	perform visual inspection to identify loose and faulty wiring, and other signs of damage such as overheating and exposure to moisture or other contaminants
D-19.02.03	check and interpret fault codes using OEM reference material
D-19.02.04	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure which may include the use of specialized equipment such as scan tools, multimeters or OEM supplied diagnostic tools
D-19.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis
D-19.02.06	perform failure analysis to determine root cause of failure
D-19.02.07	record test results and inspection findings according to manufacturers' requirements for warranty purposes

Sub-task

D-19.03 Repairs vehicle management systems and electronic components.

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

Key Competencies

D-19.03.01	check and perform software updates following manufacturers' recommended procedures
D-19.03.02	remove power supply and release stored energy by disconnecting power sources and allowing capacitors to discharge in SRS modules
D-19.03.03	replace components such as ECMs, connectors, switches and solenoids
D-19.03.04	repair components such as wiring, connectors and terminals according to manufacturers' specifications
D-19.03.05	adjust components such as actuators, switches and sensors
D-19.03.06	reprogram ECM to accommodate accessories and modifications such as the addition of auxiliary lighting systems
D-19.03.07	verify repair under normal operating conditions to ensure it is within manufacturers' specifications
D-19.03.08	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Trends	More drive train components are now electronically-controlled requiring truck and transport mechanics to have more specialized training and the ability to use diagnostic software. Components are being designed to handle higher torque loads and ratings. The use of synthetic oils has resulted in extended service intervals and component life. There is an increased use in hybrid drive systems as the industry continues to move toward environmentally sustainable practices.
Related Components (including, but not limited to)	**Clutches:** discs, center plates, release springs, bearings, pressure plates. **Transmissions:** seals, gaskets, gears, bearings, breathers, filters, oil pumps, splined shafts, connectors, torque converters, coolers, valve bodies, clutch packs, wiring, solenoids, ECMs, shift bar housings, shift lever, knob, air lines, cylinders, gauges, sensors. **Driveline systems:** driveshaft, u-joint, yokes, slip-joints, seals, steady bearings, support brackets, grease fittings. **Differentials:** seals, breathers, axles, gaskets, hubs, gears, planetaries, bearings, shift forks, filters, coolers, power dividers, locking devices, sensors, wiring. **Transfer cases**: shifter, differential, clutches, gears, gaskets, seals, bearing, breathers, spline shafts, sensors.
Tools and Equipment	See Appendix A.

Task 20 Services, diagnoses and repairs clutches.

Context

The clutch transfers energy and provides a means of disconnect from the engine to the transmission.

Truck and transport mechanics must diagnose, service and repair the clutch to increase longevity and optimal performance of the vehicle.

Servicing includes lubrication and adjustment of components as well as routine maintenance.

Required Knowledge

K 1	types of clutches such as pull, push, self-adjusting and manual adjusting
K 2	clutch components such as discs, center plate, release springs and release bearings
K 3	clutch controls such as cable, linkage and hydraulic
K 4	clutch operation and adjustment
K 5	clutch operation components such as hydraulic-assisted, air-assisted and electronically controlled
K 6	conditions that indicate that clutch needs servicing such as hard shifting, loss of pedal free play and excessive pedal free play
K 7	clutch faults such as shock loads, worn parts, seized release bearings and broken clutch springs

Sub-task

E-20.01 Services clutches.

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

Key Competencies

E-20.01.01	lubricate cross shafts, linkages and release bearings
E-20.01.02	adjust clutch and linkages to obtain manufacturer's tolerance between release bearing and clutch brake
E-20.01.03	inspect master and slave cylinders for leaks and damage
E-20.01.04	inspect and adjust cables, linkages and clutch brakes to ensure efficient operation

Sub-task

E-20.02 Diagnoses clutches.

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

Key Competencies

E-20.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
E-20.02.02	perform sensory inspections such as pedal feel and observing burnt clutch material, and worn or broken components to confirm complaint and establish a preliminary diagnosis
E-20.02.03	inspect master and slave cylinder for leaks and damage
E-20.02.04	use diagnostic tools such as feeler gauges, spring gauges and other measuring devices
E-20.02.05	compare results to manufacturers' specifications or expected values to verify diagnosis
E-20.02.06	perform failure analysis to determine root cause of failure

Sub-task

E-20.03 Repairs clutches.

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

Key Competencies

E-20.03.01	remove and replace worn, damaged or faulty components such as linkages, cross shafts, bushings, clutch brakes, clutch and pressure plate
E-20.03.02	ensure flywheels reconditioned according to manufacturers' specifications
E-20.03.03	ensure proper alignment of discs and pressure plates
E-20.03.04	adjust clutch and linkages to obtain manufacturer's tolerance between release bearing and clutch brake
E-20.03.05	bleed air from master and slave cylinders
E-20.03.06	verify repair using methods such as road testing and sensory observations
E-20.03.07	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 21 Services, diagnoses and repairs manual transmissions and transfer cases.

Context

The transmission of a vehicle transfers power from the engine through the drive shaft to the wheels to enable movement of the vehicle. The transmission allows for selection of gear ratios needed for various loads and speed conditions. The transfer case allows transmission power to be directed to components such as additional axles and/or accessories.

Truck and transport mechanics diagnose, service and repair transmission and transfer cases minimizing down time of the vehicle and ensuring the safety of the vehicle, driver and public. Servicing includes routine maintenance.

Required Knowledge

K 1	types of manual transmissions such as 10-, 13-, 15- and 18-speed, double countershaft and triple countershaft
K 2	manual transmission components such as seals, gaskets, gears and bearings
K 3	auxiliary shift components such as slave cylinder, air lines, regulators and shift knobs
K 4	types of transfer case and transfer case shift controls such as air, electrical and mechanical
K 5	common component faults such as missing teeth in gears, lack of lubrication and worn synchronizers

Sub-task

E-21.01 Services manual transmissions and transfer cases.

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

Key Competencies

E-21.01.01	clean components such as breathers and transmission cases for inspection
E-21.01.02	remove and replace oil according manufacturers' specifications and employer maintenance schedule

E-21.01.03 inspect slave cylinders, range valves, air lines and seals for leakage

E-21.01.04 record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

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Sub-task

E-21.02 Diagnoses manual transmissions and transfer cases.

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

Key Competencies

E-21.02.01 obtain details of symptoms associated with complaint to establish a starting point for diagnostics

E-21.02.02 perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to confirm complaint

E-21.02.03 compare test results to manufacturers' specifications or expected values in order to assess components for wear, damage or defects

E-21.02.04 perform failure analysis to determine root cause of failure

E-21.02.05 record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

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Sub-task

E-21.03 Repairs manual transmissions and transfer cases.

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

Key Competencies

E-21.03.01 remove and replace worn, damaged or faulty components such as slave cylinders, range valves, lines, cases, seals, gears and synchronizers

E-21.03.02 rebuild components such as transmissions and transfer cases by replacing worn or broken parts according to manufacturers' specifications

E-21.03.03 repair or replace components such as synchronizers, bearings, main shafts, and counter shafts according to manufacturers' specifications

E-21.03.04 time gears and adjust bearing pre-loads to ensure proper operation of component/equipment

E-21.03.05	install power take-offs (PTOs) and ensure gear backlash is adjusted according to manufacturers' specifications
E-21.03.06	verify repair using methods such as road testing or sensory observations
E-21.03.07	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 22 Services, diagnoses and repairs automatic transmissions.

Context Truck and transport mechanics must have a good understanding of automatic transmission operation and components in order to service, diagnose and repair, ensure proper function and reduce downtime.

Required Knowledge

K 1	automatic transmission components such as torque converters, valve bodies, pumps, solenoids and clutches
K 2	failures of components such as gears, bearings and clutch packs
K 3	hybrid transmissions
K 4	types and locations of coolers
K 5	servicing procedures for components such as clutch packs, bearings, seals, torque converters, bands, one-way clutches, servos and planetaries
K 6	diagnostic codes, troubleshooting trees and schematics
K 7	pressure loss, solenoid and valve failures
K 8	testing procedures for automatic transmissions such as stall testing and pressure readings

Sub-task

E-22.01 Services automatic transmissions.

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

Key Competencies

E-22.01.01	perform sensory inspections of components to identify leaks
E-22.01.02	check and perform software updates following manufacturers' recommended procedures

E-22.01.03 remove and replace consumable components such as oil and filters according manufacturers' specifications and employer maintenance schedule

E-22.01.04 recycle and/or dispose of consumable components according to jurisdictional regulations

---

Sub-task

E-22.02 Diagnoses automatic transmissions.

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

Key Competencies

E-22.02.01 obtain details of symptoms associated with complaint to establish a starting point for diagnostics

E-22.02.02 check for external leaks and oil condition

E-22.02.03 perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure

E-22.02.04 perform road test to assess components for wear, damage or defects using diagnostic tools such as pressure gauges, computers or other specialized equipment provided by the manufacturer

E-22.02.05 interpret fault codes and test results to ensure operation is within manufacturers' specifications

E-22.02.06 record test results and inspection findings according to manufacturers' requirements for warranty

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Sub-task

E-22.03 Repairs automatic transmissions.

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

Key Competencies

E-22.03.01 remove and replace worn, damaged or faulty components such as solenoids, valves, sensors, hoses, lines and wiring harnesses

E-22.03.02 confirm most current version of software is installed in the ECM

E-22.03.03 rebuild transmission to manufacturers' specifications

E-22.03.04	repair transmission by replacing internal components (torque converters, pumps and valve bodies) and external components (oil coolers) according to manufacturers' specifications
E-22.03.05	ensure road test is performed to verify repair operates to manufacturers' specifications
E-22.03.06	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 23 Services, diagnoses and repairs automated transmission.

Context The automated transmission is a standard transmission shifted automatically using computer controlled actuators and may have a clutch pedal and electronic gear selector.

Required Knowledge

K 1	manual transmissions and failures that can occur with them
K 2	automated transmission components such as wiring, solenoids, sensors, actuators, force motors and ECMs, and their operation
K 3	data links and communication with engine ECM
K 4	automated transmission diagnostic equipment and procedures as outlined by the manufacturer
K 5	basic principles of electricity and circuit components
K 6	basic principles of schematic interpretation

Sub-task

E-23.01 Services automated transmissions.

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

Key Competencies

E-23.01.01	perform sensory inspections of components to identify leaks, breaks and excessive wear
E-23.01.02	check and perform software updates following manufacturers' recommended procedures

E-23.01.03 replace oil according manufacturers' specifications and maintenance schedule

E-23.01.04 recycle and/or dispose of consumable components according to jurisdictional regulations

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Sub-task

E-23.02 Diagnoses automated transmissions.

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

Key Competencies

E-23.02.01 obtain details of symptoms associated with complaint to establish a starting point for diagnostics

E-23.02.02 perform sensory inspections such as checking for leaks and completing a road test to confirm complaint and establish a preliminary diagnosis

E-23.02.03 perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure

E-23.02.04 ensure specialized tests are performed using diagnostic tools including computers or other specialized equipment provided by the manufacturer

E-23.02.05 compare test results to manufacturers' specifications or expected values to verify diagnosis

E-23.02.06 interpret and record test results according to manufacturers' requirements for warranty, and for future reference and tracking

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Sub-task

E-23.03 Repairs automated transmissions.

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

Key Competencies

E-23.03.01 remove and replace worn, damaged or faulty components such as valves, sensors, hoses, lines, actuators, ECMs, gaskets and wiring harnesses

E-23.03.02 confirm most current version of software is installed in the ECM

E-23.03.03 rebuild transmission to manufacturers' specifications

E-23.03.04	repair components such as wiring harnesses and connectors
E-23.03.05	ensure road test is completed to verify repair operates to manufacturers' specifications
E-23.03.06	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 24 Services, diagnoses and repairs driveline systems.

Context The driveline provides a mechanical linkage between the transmission and the differential. A truck and transport mechanic must understand the influence of driveline length, angles and correct phasing on the driveline system.

Required Knowledge

K 1	methods of installing and phasing of driveline systems
K 2	yoke and u-joint installation and removal
K 3	conditions requiring repair such as vibration, noise and other reported problems
K 4	wear limits, driveline angles and support bearings according to manufacturers' specifications
K 5	serviceable and non-serviceable driveline systems
K 6	correct orientation of drive shaft
K 7	function of driveline savers
K 8	PTOs

Sub-task

E-24.01 Services driveline systems.

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

Key Competencies

E-24.01.01	perform sensory inspections of yokes, u-joints, mounting hardware and steady bearings to identify worn, damaged, loose or defective components
E-24.01.02	lubricate serviceable u-joints and slip-joints

Sub-task

E-24.02 Diagnoses driveline systems.

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

Key Competencies

E-24.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
E-24.02.02	inspect u-joints, slip-joints and steady bearings to establish a preliminary diagnosis
E-24.02.03	check driveshaft for correct phasing and orientation
E-24.02.04	perform specialized testing procedures to determine cause of complaint or failure using diagnostic equipment such as vibration analyzer, angle gauges and computers
E-24.02.05	confirm proper driveline alignment by checking ride height and driveline angles
E-24.02.06	compare test results to manufacturers' specifications or expected values to verify diagnosis

Sub-task

E-24.03 Repairs driveline systems.

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

Key Competencies

E-24.03.01	remove and replace worn, damaged or faulty components such as u-joints, steady bearings and slip joints
E-24.03.02	perform adjustment procedures such as phasing, balancing and driveline angle adjustment to ensure proper operation
E-24.03.03	lubricate u-joints and slip joints according to manufacturers' specifications
E-24.03.04	verify repair by ensuring a road test is performed

Task 25 Services, diagnoses and repairs differentials.

Context The differential assembly transfers power from the engine and transmission to the wheels. Truck and transport mechanics must be able to service, diagnose and repair complaints related to differential assembly.

Required Knowledge

K 1	types of differentials such as locking, two-speed, limited slip and outboard planetary drive
K 2	weight ratings and gear ratios
K 3	methods of securing hubs to spindles such as pre-set and conventional bearing types
K 4	differential components such as seals, axles, gaskets, hubs, gears and bearings
K 5	differential lock activating methods such as air and electric
K 6	conditions that indicate differential needs servicing such as noise and interaxle differential lock not working
K 7	common faults such as missing teeth in crown and pinion gears, broken shift fork in power dividers, lack of lubrication and broken axles
K 8	types of lubrication

Sub-task

E-25.01 Services differentials.

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

Key Competencies

E-25.01.01	clean components such as breathers and vents
E-25.01.02	check oil level and visually inspect oil condition during scheduled maintenance
E-25.01.03	replace oil and filters according to manufacturers' specifications
E-25.01.04	inspect seals and gaskets for leaks
E-25.01.05	service bearings and planetary gear sets according to manufacturers' specifications
E-25.01.06	recycle and/or dispose of oil and filter according to jurisdictional regulations

Sub-task

E-25.02 Diagnoses differentials.

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

Key Competencies

E-25.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
E-25.02.02	check oil level and condition
E-25.02.03	inspect components such as fork, bearings, crown and pinion gears for incorrect backlash, wear or incorrect pre-load
E-25.02.04	ensure road test is performed to confirm complaint
E-25.02.05	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure

Sub-task

E-25.03 Repairs differentials.

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

Key Competencies

E-25.03.01	remove and replace worn, damaged or faulty components such as seals, gaskets, bearings and outboard planetary gear sets
E-25.03.02	clean components such as vents, housings, gasket surfaces, gears and hubs to remove debris and contaminants
E-25.03.03	repair components such as housings and spindle threads
E-25.03.04	perform overhaul procedures such as setting and adjusting preload and backlash, and checking and adjusting crown and pinion gear tooth pattern
E-25.03.05	verify repair using methods such as marking paste, dial indicators and weight scale
E-25.03.06	adjust wheel bearings according to manufacturers' specifications
E-25.03.07	refill housing using lubricant according to manufacturers' specifications
E-25.03.08	ensure road test is performed to confirm repairs
E-25.03.09	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 26 Services, diagnoses and repairs drive train retarders.

Context Drive train retarders are an optional component used to assist and extend the life of the primary braking system. They can be separate or combined with another component of the drive train system.

Required Knowledge

K 1	types of retarder systems such as driveline and transmission
K 2	specialized diagnostic equipment such as multimeters, diagnostic software and pressure gauges
K 3	automatic transmissions and retarder components
K 4	components such as generators, solenoids, pressure switches, potentiometers, valves, actuators and wiring harnesses

K 5	common faults such as pressure loss, corroded wiring, weak performance and intermittent operation
K 6	troubleshooting trees and wiring schematics

Sub-task

E-26.01 **Services drive train retarders.**

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

Key Competencies

E-26.01.01	check for fluid leaks, secure component mountings, and damaged or corroded wiring
E-26.01.02	update software
E-26.01.03	replace oil and filter according to manufacturers' specifications and maintenance schedule
E-26.01.04	recycle and/or dispose of consumable components according to jurisdictional regulations

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Sub-task

E-26.02 **Diagnoses drive train retarders.**

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

Key Competencies

E-26.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
E-26.02.02	check for external leaks and loose, broken, damaged or corroded wiring
E-26.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
E-26.02.04	ensure road test is performed to assess components for wear, damage or defects using diagnostic tools such as pressure gauges, computers, multimeters or other specialized equipment provided by the manufacturer

E-26.02.05	interpret fault codes and test results to ensure operation is within manufacturers' specifications
E-26.02.06	record test results and inspection findings according to manufacturers' requirements for warranty

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Sub-task

E-26.03 **Repairs drive train retarders.**

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

Key Competencies

E-26.03.01	remove and replace worn, damaged or faulty components such as solenoids, valves, sensors, pressure switches, potentiometers, lines, wiring and connectors
E-26.03.02	confirm most current version of software is installed in the ECM
E-26.03.03	rebuild transmission to manufacturers' specifications
E-26.03.04	repair driveline retarder components to manufacturers' specifications
E-26.03.05	remove and replace internal transmission components such as torque converters, pumps, clutch pack assemblies and valve bodies according to manufacturers' specifications
E-26.03.06	ensure road test is performed to verify repairs meet manufacturers' specifications
E-26.03.07	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

BLOCK F STEERING, CHASSIS/FRAMES, SUSPENSION, WHEELS, HUBS AND TIRES

Trends	Spoked hubs are less common, being replaced with hub pilot systems. There is also a trend towards a tighter turning radius. There is an increase in load capacities, resulting in the need for wider tires and additional axles to meet road standards. Super single tires are being introduced in the industry. They are lighter and have a larger foot print than the dual wheels.
Related Components (including, but not limited to)	**Steering system components:** steering boxes, steering wheel, steering knuckles, steering column, pitman arms, tie rods, king pins, connecting rods, drag links, power steering components. **Chassis/frame components:** frame rails, cross members, mounts, hangers, gussets, monocoque chassis. **Suspension components:** axles (drive, steering, auxiliary), springs, bushings, air springs, levelling valves, leaf springs, spring overloads, stoppers, spring hangers, shackles, saddles, shocks, torsion bars, walking beam, u-bolts. **Hitches and couplers:** jaw, locks, handles, ball and stud, sliders, rails, saddles, pintles, safety chains, pads, forks. **Tires, wheels and hubs:** belts, tread, tubes, sidewall, seals, rims, spacers (corrosion control, wheel spacers), wedges, valve stems, studs, nuts, super singles, tandem, cup and cone bearings.
Tools and Equipment	See Appendix A.

Task 27 Services, diagnoses and repairs steering system.

Context Truck and transport mechanics diagnose and service steering systems and components in order to ensure the safe and correct operation of the vehicle.

Steering systems are designed to allow the driver to control the direction of the vehicle by turning the front wheels.

Required Knowledge

K 1	operating principles of steering systems
K 2	types of steering systems such as integral, linkage, and rack and pinion
K 3	steering system components such as steering boxes, pitman arms, tie rods, king pins, drag links and power steering components
K 4	master and slave steering systems
K 5	common faults such as tire wear, bent tie rods and worn drag link
K 6	steering geometry and alignment such as caster, camber, toe-in and toe-out
K 7	chassis/frame components such as frame rails, cross members, mounts, hangers and gussets
K 8	monocoque chassis design
K 9	chassis/frame fastening systems
K 10	common chassis/frame faults such as bending, cracking, corrosion and missing fasteners
K 11	types of suspensions such as air ride, spring, solid block and combination
K 12	suspension components such as spring hangers, shackles, saddles, shocks, torsion bars, walking beam and u-bolts
K 13	axle applications such as steering, drive and auxiliary
K 14	common suspension faults such as broken springs, air springs, u-bolts, leaking shocks and worn bushings
K 15	types of hitches and couplers such as pintle hitch, fifth-wheel hitch and ball hitch
K 16	hitch and coupler applications
K 17	common faults such as out-of-adjustment and twisted, bent and worn components
K 18	types of tires such as radial and bias
K 19	tire load ranges, pressures, profiles and sizes
K 20	steering and drive tires
K 21	types of wheels such as aluminum and steel
K 22	types of hubs such as spoked, hub pilot and stud pilot

K 23	tire components such as belts, tread, tubes and sidewall
K 24	wheel components such as rims, spacers, wedges and valve stems
K 25	hub components such as studs, nuts and spacers
K 26	common faults such as cracked rims, holes in tires, broken studs and worn locks

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Sub-task

F-27.01 **Services steering system.**

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

Key Competencies

F-27.01.01	perform sensory inspections of steering system to identify worn, damaged or defective components such king pins, drag links, steering boxes, pitman arms and hydraulic cylinders
F-27.01.02	measure steering system components such as king pins, drag links and tie rods for end play to determine if they meet manufacturers' specifications and jurisdictional requirements
F-27.01.03	remove and replace consumable components such as oils and filters according manufacturers' specifications and employer maintenance schedule to minimize breakdowns
F-27.01.04	recycle and/or dispose of consumable components according to jurisdictional regulations
F-27.01.05	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking
F-27.01.06	lubricate components such as tie rods, king pins and u-joints according to manufacturers' recommendations

Sub-task

F-27.02 Diagnoses steering system.

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

Key Competencies

F-27.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
F-27.02.02	perform sensory inspections such as looking for leaks, feeling for vibrations during road testing and visually inspecting tire for incorrect wear pattern to confirm complaint and establish a preliminary diagnosis
F-27.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
F-27.02.04	perform specialized testing procedures such as performance, pressure and volume tests to assess components for wear, damage or defects using tools and equipment such as pressure gauges, dial indicators and prybars
F-27.02.05	compare test results to manufacturers' specifications or expected pressure values to verify diagnosis
F-27.02.06	perform failure analysis to determine root cause of failure
F-27.02.07	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking
F-27.02.08	interpret tire wear patterns

Sub-task

F-27.03 Repairs steering systems.

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

Key Competencies

F-27.03.01	remove and replace worn, damaged or faulty components such as king pins, drag links, steering boxes, pitman arms and hydraulic cylinders
F-27.03.02	rebuild components such as power steering box and hydraulic cylinders by replacing seals, o-rings and internal components of steering box, according to manufacturers' specifications
F-27.03.03	repair or replace components such as steering boxes, pumps, hoses, lines, seals, u-joints and reservoirs according to manufacturers' specifications

F-27.03.04	perform adjustment procedures such as poppet valves, pitman arms and worm gear to ensure proper operation of component/equipment
F-27.03.05	verify repair by using methods such as road testing, front end alignments, load testing and sensory observations
F-27.03.06	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 28 Services, diagnoses and repairs chassis/frames.

Context The purpose of the chassis/frame is to fasten all the vehicle components. Truck and transport mechanics service, diagnose and repair chassis/frame to ensure vehicle integrity.

Required Knowledge

K 1	frame straightening procedures
K 2	types of suspension such as air ride, spring, solid block and combination
K 3	OEM specifications such as wear limits and load capacity
K 4	jurisdictional requirements
K 5	chassis/frame components such as frame rails, cross members, mounts, hangers and gussets
K 6	chassis/frame fastening systems
K 7	monocoque chassis design

Sub-task

F-28.01 Services chassis/frames.

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

Key Competencies

F-28.01.01	clean frame rails, cross-members and gussets
F-28.01.02	perform sensory inspections of frame rails, cross-members and gussets for loose mounting hardware, cracks and distortions such as corrosion
F-28.01.03	measure frame rails to determine if the frame meets manufacturers' specifications

Sub-task

F-28.02 Diagnoses chassis/frames.

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

Key Competencies

F-28.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
F-28.02.02	perform sensory inspections such as looking for cracked or damaged frames, corrosion, and missing or loose hardware to establish a preliminary diagnosis
F-28.02.03	perform failure analysis using diagnostic equipment such as laser alignment tools, calipers and straight edges to determine root cause of failure
F-28.02.04	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

F-28.03 Repairs chassis/frames.

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

Key Competencies

F-28.03.01	remove and replace worn, damaged or faulty components such as cross-members, gussets and mounting hardware
F-28.03.02	repair and replace components such as cross-members, gussets and frame rail by welding and plating according to manufacturers' specifications
F-28.03.03	verify repair using tools such as laser alignments, calipers and straight edges
F-28.03.04	modify chassis/frame such as adding inserts, drilling frames and adjusting length
F-28.03.05	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 29 Services, diagnoses and repairs suspension.

Context Truck and transport mechanics service, diagnose and repair suspensions to ensure smooth driving conditions. Suspensions distribute load throughout the frame and withstand road hazards by absorbing energy.

Required Knowledge

K 1	types of suspension such as air ride, spring, solid block and combination
K 2	suspension components such as spring hangers, shackles, saddles, shock absorbers, torsion bars, walking beams and u-bolts
K 3	manufacturers' specifications such as wear limits and load capacity
K 4	related effect of component failure such as defective springs, ride height valves, blown air bags, chaffed air lines, defective rubber blocks and worn bushings

Sub-task

F-29.01 Services suspension.

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

Key Competencies

F-29.01.01	clean suspension components
F-29.01.02	perform sensory inspections of suspension to identify worn, damaged or defective components such bolster springs, I- beams, torque rods, ride height valves and air bags
F-29.01.03	measure suspension components such as frame for ride height and bushings for excessive play to determine if they meet manufacturers' specifications
F-29.01.04	release stored energy by draining the air tank and spring tension
F-29.01.05	adjust ride height valve according to manufacturers' specifications
F-29.01.06	lubricate suspension components
F-29.01.07	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

F-29.02 Diagnoses suspension.

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

Key Competencies

F-29.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
F-29.02.02	perform sensory inspections of suspension to identify worn, damaged or defective components such as bolster springs, I beams, torque rods, ride height valves and air bags to confirm complaint and establish a preliminary diagnosis
F-29.02.03	perform testing procedures to assess components for wear, damage or defects using tools and equipment such as tape measures, soapy water and dial indicators

F-29.02.04	compare test results to manufacturers' specifications or expected values to verify diagnosis
F-29.02.05	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

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Sub-task

F-29.03 Repairs suspension.

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

Key Competencies

F-29.03.01	remove and replace worn, damaged or faulty components such as springs, spring guides, bushings and torque rods
F-29.03.02	repair components such as air lines, air springs and leaf spring assemblies according to manufacturers' specifications
F-29.03.03	perform adjustment procedures such as setting ride height valves to ensure proper operation of component/equipment
F-29.03.04	verify repair by using methods such as road testing, load testing and sensory observations
F-29.03.05	use welding and cutting equipment to repair axle stops, shackle assemblies and hanger assemblies
F-29.03.06	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 30 Services, diagnoses and repairs hitches and couplers.

Context Truck and transport mechanics service, diagnose and repair hitches and couplers to ensure that trailers stay coupled to the lead vehicle in a safe manner.

Required Knowledge

K 1	types of hitches and couplers such as pintle hitch, fifth-wheel hitch and ball hitch
K 2	hitch and coupler applications
K 3	common faults such as out-of-adjustment and twisted, bent and worn components
K 4	wear limits and load capacities of hitches and coupler components

Sub-task

F-30.01 Services hitches and couplers.

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

Key Competencies

F-30.01.01	clean 5th wheel, slide rails and pintle components
F-30.01.02	perform sensory inspections of 5th wheel and pintles to identify worn, damaged or defective components such bushings, jaws, slide rail locks and clevis pin
F-30.01.03	measure hitch and coupler components such as 5th wheel plate, side rail locks, bushings, pins and jaws for play to determine if they meet manufacturers' specifications
F-30.01.04	adjust 5th wheel jaws and side rail locks to meet manufacturers' specifications
F-30.01.05	lubricate components
F-30.01.06	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

F-30.02 Diagnoses hitches and couplers.

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

Key Competencies

F-30.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
F-30.02.02	perform sensory inspections of 5th wheel and pintles to identify worn, damaged or defective components such bushings, jaws, slide rail locks and clevis pin to confirm complaint and establish a preliminary diagnosis
F-30.02.03	perform specialized testing procedures such as testing for play to assess components for wear, damage or defects using tools and equipment such as king pin tool
F-30.02.04	test hitch and coupler operation
F-30.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis
F-30.02.06	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

F-30.03 Repairs hitches and couplers.

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

Key Competencies

F-30.03.01	remove and replace worn, damaged or faulty components such as jaws, 5th wheels, springs and pins
F-30.03.02	repair and rebuild 5th wheel components such as jaws, pins, springs and bushings by using rebuild kits, according to manufacturers' specifications
F-30.03.03	adjust 5th wheel to ensure proper operation of component/equipment
F-30.03.04	verify repair by using methods such as coupling and uncoupling

F-30.03.05	lubricate components
F-30.03.06	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 31 Services, diagnoses and repairs tires, wheels and hubs.

Context Truck and transport mechanics service, diagnose and repair tires, wheels and hubs to ensure that the truck will be rolling properly on the road.

Required Knowledge

K 1	tire load ranges, pressures, profiles and sizes
K 2	steering and drive tires
K 3	types of wheels such as aluminum and steel
K 4	types of hubs such as spoked, hub pilot, and stud pilot
K 5	tire components such as belts, tread, tubes and sidewall
K 6	wheel components such as rims, spacers, wedges and valve stems
K 7	hub components such as studs, nuts and spacers
K 8	common faults such as cracked rims, holes in tires, broken studs, worn locks, and worn spacers
K 9	torque values
K 10	wheel balancing
K 11	hazards associated with tire inflation
K 12	hazards associated with removal of tires such as spoke wheels and wedges

Sub-task

F-31.01 Services tires, wheels and hubs.

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

Key Competencies

F-31.01.01	perform sensory inspections of tires, wheels and hubs to identify worn, damaged or defective components such oil leaks from the hubs, air leaks from tires and cracked rims
F-31.01.02	measure tire components such as tread depth for wear and air pressure for air leaks, to determine if they meet manufacturers' specifications
F-31.01.03	measure hub components such as bearing end play to determine if they meet manufacturers' specifications and jurisdictional requirements
F-31.01.04	torque nuts to ensure fasteners meet manufacturers' specifications
F-31.01.05	release stored energy by draining air from tires
F-31.01.06	remove and replace consumable components such as oils in hubs according manufacturers' specifications
F-31.01.07	recycle and/or dispose of consumable components according to jurisdictional regulations
F-31.01.08	adjust tire pressure according to manufacturers' specifications
F-31.01.09	torque tire according to manufacturers' specifications
F-31.01.10	recognize hazards associated with removal of tires such as spoke wheels and wedges
F-31.01.11	identify mismatched tires by casing and tread depth
F-31.01.12	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

F-31.02 Diagnoses tires, wheels and hubs.

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

Key Competencies

F-31.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
F-31.02.02	perform sensory inspections of tires, wheels and hubs to identify worn, damaged or defective components such oil leaks from hubs, air leaks from tires and cracked rims to confirm complaint and establish a preliminary diagnosis
F-31.02.03	perform diagnostic procedure by following troubleshooting tree supplied by manufacturer to determine failure
F-31.02.04	measure components for wear, damage or defects using diagnostic equipment such as dial indicators, torque wrenches, air gauges, tire pressure/heat warning devices and tread depth gauges
F-31.02.05	compare test results to manufacturers' specifications or expected values to verify diagnosis
F-31.02.06	perform failure analysis to determine root cause of failure
F-31.02.07	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

F-31.03 Repairs tires, wheels and hubs.

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

Key Competencies

F-31.03.01	remove and replace worn, damaged or faulty components such as tires, rims, bearings and studs
F-31.03.02	rebuild components such as hub assemblies by replacing bearings and races according to manufacturers' specifications
F-31.03.03	repair components such as tires and hub assemblies by replacing seals, bearings, races, patches and plugs, according to manufacturers' specifications
F-31.03.04	perform procedures such as bearing adjustment to ensure proper operation of component/equipment
F-31.03.05	adjust air pressure and run-out and torque on spoke wheels according to manufacturers' specifications
F-31.03.06	verify repair by using methods such as wheel alignment, road testing and checking for end play, according to manufacturers' specifications
F-31.03.07	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Trends	Cabs are becoming more electronically controlled requiring truck and transport mechanics to have a strong understanding of electronic systems to diagnose common problems. Cameras and other video components are becoming more common.
Related Components (including, but not limited to)	**Interior components:** pedals (fuel, brake and clutch), air ride seats, seat belts, side windows, door handles, visors, panels, SRSs, wheelchair accessories, bunk accessories, dashboard components. **Exterior components:** windshields, wipers, mirrors, door handles, steps, wind deflectors, engine bonnet/hood cables, lock-down straps, mouldings, fenders, mounts, air ride system, headlight assemblies, marker lights, horns.
Tools and Equipment	See Appendix A.

Task 32 Services, diagnoses and repairs interior cab components.

Context	The vehicle is made up of interior components surrounding the occupant. Diagnostics, service and repair of components as well as routine maintenance is a necessity.

Required Knowledge

K 1	interior components such as pedals, air ride seats, seat belts, wheelchair accessories, SRSs (air bags), pneumatics, air-powered accessories and side windows
K 2	safety precautions related to the release of stored energy by disconnecting power sources and allowing capacitors to discharge in SRS modules
K 3	manufacturers' specifications on interior component operations
K 4	common faults such as sticking pedals, air leak on seat and malfunctioning window controls
K 5	accessories such as bunks, cabinetry and safety netting

Sub-task

G-32.01 Services interior cab components.

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

Key Competencies

G-32.01.01	clean, adjust and lubricate components such as brake, throttle and clutch pedal pivot points, bed lifts, SRS (airbags) and seat tracks
G-32.01.02	perform sensory inspections of interior components such as seats, seat belts, safety equipment, gauges, warning devices and driver controls including lighting, horns and switches to identify worn, damaged or defective components

Sub-task

G-32.02 Diagnoses interior cab components.

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

Key Competencies

G-32.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnosis
G-32.02.02	perform sensory inspections of interior components such as seats, seat belts, safety equipment, gauges, warning devices and driver controls including lighting, horns and switches to identify worn, damaged or defective components
G-32.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure

Sub-task

G-32.03 Repairs interior cab components.

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

Key Competencies

G-32.03.01	repair or replace components such as door panels, seat belts, seats, window regulators, motors, switches and dash valves
G-32.03.02	adjust components such as brake and clutch switches
G-32.03.03	verify repair under normal operating conditions to ensure it is within manufacturers' specifications
G-32.03.04	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 33 Services, diagnoses and repairs exterior cab components.

Context The vehicle is made up of exterior components surrounding the occupant. Diagnostics, service and repair of components as well as routine maintenance is a necessity.

Required Knowledge

K 1	exterior components such as windshields, wipers, mirrors, door handles, steps, wind deflectors, engine hood cables, lock-down straps, mouldings and fenders
K 2	manufacturers' specifications on exterior component operations

Sub-task

G-33.01 Services exterior cab components.

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

Key Competencies

G-33.01.01	perform sensory inspections of exterior to identify worn, damaged or defective components such as cracks in the frame and loose fasteners and fairings
G-33.01.02	remove and replace consumable components such as lights, wipers and washer fluid according to manufacturers' specifications
G-33.01.03	recycle and/or dispose of consumable components according to jurisdictional regulations
G-33.01.04	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

G-33.02 Diagnoses exterior cab components.

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

Key Competencies

G-33.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnosis
G-33.02.02	perform sensory inspections of exterior to identify worn, damaged or defective components such as cracks in the cab frame and loose fasteners and fairings
G-33.02.03	inspect cab mounts and cab suspension for proper operation, and worn and damaged bushings, leaking shocks, and leaking or damaged valves
G-33.02.04	measure and adjust cab ride height to manufacturers' specifications or expected values to verify diagnosis
G-33.02.05	perform failure analysis to determine root cause of failure
G-33.02.06	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

G-33.03 Repairs exterior cab components.

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

Key Competencies

G-33.03.01	perform door, hood and cab adjustments to ensure proper operation of component/equipment
G-33.03.02	replace or repair worn, damaged or faulty components such as windshields, mirrors, lights, hood, hood cables, moldings, fenders and cab mounts
G-33.03.03	use welding and cutting equipment to repair components
G-33.03.04	verify repair to ensure it is within manufacturers' specifications
G-33.03.05	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Trends	To increase fuel economy accessories are being added such as air foils and skirting to improve aerodynamics. Trailers have more lift axles to reduce fuel usage and tire wear when travelling empty. In some jurisdictions, regulations are allowing more weight on the road which means long combination vehicles (LCVs) can be pulled by trucks.
Related Components (including, but not limited to)	**Trailer components:** doors, handles, cross members, refrigeration panels, wind deflectors, tail gates, body panels, flooring, roof, wall studs, kick plate, axle, suspension, wheels, legs, feet, gearing, handle, cross tubes, brackets, bracing, fasteners, bogie rails, heating/cooling systems. **Trailer accessories:** canvas air chute, curtains, bulkheads, air foils, converter dolly.
Tools and Equipment	See Appendix A.

Task 34 Services, diagnoses and repairs trailer components and accessories.

Context Truck and transport mechanics must be able to service, diagnose and repair trailer components.

Required Knowledge

K 1	trailer body components such as doors, handles, cross members, refrigeration panels, body panels, flooring, roof, wall studs, electronic lift axles, kick plate, legs, feet, gearing, handle, cross tubes, brackets and bracing
K 2	trailer body accessories such as canvas air chute and bogie rails
K 3	common faults such as seized gear boxes, stripped gears, broken handles, bent legs and pads, and bent and broken cross tubes
K 4	capacity of landing gear components
K 5	required signage, lighting and reflective material for safety
K 6	jurisdictional regulations on reflective material, lighting and signage

Sub-task

H-34.01 Services trailer components and accessories.

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

Key Competencies

H-34.01.01	clean, lubricate and test movement of trailer components and accessories such as bogie rails, doors and hinges, landing gear and interior of trailer
H-34.01.02	perform visual inspections to identify worn, damaged or defective components such as king pins, doors, bogie rails, cross members, canvas air chute, body panels, flooring, roof, wall studs, lift axles, kick plates and landing gear components including legs, feet, gearing, handles, cross tubes, brackets and bracing
H-34.01.03	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

H-34.02 Diagnoses trailer components and accessories.

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

Key Competencies

H-34.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
H-34.02.02	perform visual inspections to identify worn, damaged or defective components such as king pins, doors, bogie rails, cross members, canvas air chutes, body panels, flooring, roof, wall studs, lift axles, kick plate and landing gear components including legs, feet, gearing, handles, cross tubes, brackets and bracing
H-34.02.03	determine faults such as wear, corrosion, overloading, loose fasteners and lack of lubrication
H-34.02.04	perform failure analysis to determine root cause of failure
H-34.02.05	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

H-34.03 Repairs trailer components and accessories.

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

Key Competencies

H-34.03.01	replace or repair components and accessories such as king pins, doors, bogie rails, cross members, canvas air chute, body panels, flooring, roof, wall studs, lift axles, kick plate and landing gear components such as legs, feet, gearing, handles, cross tubes, brackets and bracing
H-34.03.02	perform adjustments to components such as locks and doors
H-34.03.03	rebuild components such as floors, walls, cross members, scuff rails and gear box according to manufacturers' specifications
H-34.03.04	verify repair to ensure it is within manufacturers' specifications
H-34.03.05	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Task 35 Services, diagnoses and repairs heating and refrigeration systems.

Context Truck and transport mechanics service, diagnose and repair fuel, charging and starting systems as part of trailer heating and refrigeration systems. Special training or licenses are required to work on refrigeration, propane heating and high voltage systems.

Required Knowledge

K 1	high voltage systems such as genset/hybrid systems and required training to service
K 2	jurisdictional regulations and licensing requirements
K 3	types of heating/cooling units
K 4	fuel systems such as diesel, propane and natural gas
K 5	components of heating/cooling units such as batteries, wires, fuel tanks starters, alternators, compressors and fuel tanks
K 6	mounting structures, fasteners and reinforcements

K 7	operation of heating/cooling units
K 8	fluid levels such as antifreeze, motor oil and fuel
K 9	manufacturers' specifications
K 10	hazards associated with heating/cooling units and fuel systems
K 11	diagnostic tools and equipment such as multimeters, load testers and chargers
K 12	diagnostic procedures
K 13	power supply such as electric, diesel, propane and natural gas
K 14	removal and installation procedures of components and accessories such as air flow chutes, bulkheads and dividers

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Sub-task

H-35.01 Services heating and refrigeration systems.

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

Key Competencies

H-35.01.01	perform visual inspections to identify worn, damaged or defective components
H-35.01.02	lubricate cleaned electrical connections using dielectric grease
H-35.01.03	clean electrical connections on starters, alternators and batteries using electrical contact cleaner and terminal brushes
H-35.01.04	adjust belt tension with belt tension gauge according to manufacturers' specifications
H-35.01.05	perform preventative maintenance checks such as battery load test and checking for water in tank
H-35.01.06	drain water from tank and add stabilizer or conditioner according to seasonal requirements
H-35.01.07	secure fuel lines using fasteners such as insulated clamps and separators to prevent chafing or kinking of lines
H-35.01.08	remove and replace consumable components such as oil, fuel, coolant and related filters according manufacturers' specifications

H-35.01.09	recycle and/or dispose of consumable components according to jurisdictional regulations
H-35.01.10	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

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Sub-task

H-35.02 Diagnoses heating and refrigeration systems.

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

Key Competencies

H-35.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnostics
H-35.02.02	inspect starting and charging systems for worn, damaged or defective components such as corroded electric connectors and broken or loose belts
H-35.02.03	load test battery for proper CCA and operating condition (state of charge)
H-35.02.04	test starting and charging system for appropriate voltage and amperage draw using a multimeter and/or ammeter
H-35.02.05	interpret diagnostic results to determine next steps such as repairing and replacing starting and charging system components
H-35.02.06	perform sensory inspection of fuel lines to detect problems such as loose fittings, and chafed or kinked lines in order to detect leaks
H-35.02.07	check operation of fuel delivery system components on heating units such as fuel pumps and gas regulators
H-35.02.08	inspect fuel tank condition such as tank expiry date and physical damage
H-35.02.09	inspect fuel system mounting hardware for wear and damage such as loose or worn tank straps, cracked mounting brackets and broken fasteners
H-35.02.10	interpret diagnostic results to determine next steps such as repairing and replacing fuel system components
H-35.02.11	compare test results to manufacturers' specifications or expected values to verify diagnosis
H-35.02.12	perform failure analysis to determine root cause of failure
H-35.02.13	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

H-35.03 Repair heating and refrigeration systems.

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

Key Competencies

H-35.03.01	replace defective components such as chafed or kinked fuel lines, starters, alternators, pulleys, idler pulleys, belts and batteries
H-35.03.02	remove and reinstall fuel tanks and brackets
H-35.03.03	prime fuel system after repair or replacement of components
H-35.03.04	operate and adjust refrigeration and heating unit temperature controls depending on load requirements
H-35.03.05	adjust belt tension with belt tension gauge according to manufacturers' specifications
H-35.03.06	verify repair to ensure it is within manufacturers' specifications
H-35.03.07	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

Trends

Climate control systems have become more complex. Because of environmental concerns, regulations governing the use of refrigerants have become stricter and more consistently enforced. Product tracking has become a common industry practice. More HVAC systems are ECM controlled.

Related Components (including, but not limited to)

Heating and ventilation system: ductwork, motors, blowers, pumps, resistors, controls, modules, heater cores, hoses, fittings.

Air conditioning system: evaporator, condenser, compressor, receiver dryer, expansion valves, sensors, controls, hoses, fittings, orifice tubes, accumulators, switches.

Tools and Equipment

See Appendix A.

Task 36 Services, diagnoses and repairs heating and ventilation systems.

Context

Truck and transport mechanics service, diagnose and repair heating and ventilation systems for the comfort of the driver.

Required Knowledge

K 1	heating system components such as blowers, pumps, resistors, controls and modules
K 2	heater operating principles such as coolant flow and heat exchange
K 3	common heating system faults such as burnt resistors, worn motors and malfunctioning heat controls
K 4	ductwork components and routing
K 5	hazards of materials
K 6	basic principles of electricity and circuit components

Sub-task

I-36.01 Services heating and ventilation systems.

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

Key Competencies

I-36.01.01	clean heating and ventilation system components such as filters and heater cores
I-36.01.02	perform sensory inspections of heating and ventilation system to identify worn, damaged or defective components such bent or plugged fins, burnt heater controls and leaking flow valve
I-36.01.03	measure heating and ventilation system components such as for air temperature and flow to determine if they meet manufacturers' specifications
I-36.01.04	remove and replace consumable components such as coolant according manufacturers' specifications
I-36.01.05	recycle and/or dispose of coolant according to jurisdictional regulations
I-36.01.06	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

I-36.02 Diagnoses heating and ventilation systems.

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

Key Competencies

I-36.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnosis
I-36.02.02	perform sensory inspections such as temperature, coolant leaks and air flow to confirm complaint and establish a preliminary diagnosis
I-36.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
I-36.02.04	perform testing procedures such as bringing vehicle to operating temperature to assess components for wear, damage or defects such as thermostat failure
I-36.02.05	test system and component operation to isolate problem

I-36.02.06	perform failure analysis to determine root cause of failure
I-36.02.07	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

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Sub-task

I-36.03 Repairs heating and ventilation systems.

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

Key Competencies

I-36.03.01	remove and replace worn, damaged or faulty components such as thermostats, blowers, flow valves and heater cores
I-36.03.02	rebuild components such as heater cores, radiators and heater boxes by replacing parts according to manufacturers' specifications
I-36.03.03	repair components such as flow valves by replacing the cable, heater core by soldering components and heater motors by fixing the wiring, according to manufacturers' specifications
I-36.03.04	clean and replace filters
I-36.03.05	adjust cables on flow valves and doors on heater boxes to ensure proper operation of component/equipment
I-36.03.06	verify repair by using methods such as road testing and sensory observations
I-36.03.07	document that repairs and verifications have been performed for warranty, liability, future reference and tracking
I-36.03.08	disassemble and reassemble dashboard and firewall components for access

Task 37 Services, diagnoses and repairs air conditioning systems.

Context Truck and transport mechanics service, diagnose and repair air conditioning systems for the comfort of the driver.

Required Knowledge

K 1	heating system components such as blowers, pumps, resistors, controls and modules
K 2	ductwork components and routing
K 3	regulations and standards related to air conditioning material handling such as reclaiming, recycling and disposing of material
K 4	air conditioning system components such as evaporator, condenser, compressor, receiver dryer, expansion valves, sensors and controls
K 5	air conditioning operating principles and theory (compression and expansion)
K 6	types of refrigerant oils and refrigerants such as R134A
K 7	hazards of materials such as refrigerant, and hot and cold temperatures
K 8	air conditioning electrical components
K 9	properties, sizes and functions of high/low line side

Sub-task

I-37.01 Services air conditioning systems.

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

Key Competencies

I-37.01.01	clean air conditioning system components such as condenser and evaporator cores
I-37.01.02	perform sensory inspections of air conditioning systems to identify worn, damaged or defective components such chaffed lines, defective expansion valves, plugged condensers and damaged evaporators
I-37.01.03	measure temperature and air flow of air conditioning system to determine if it meets manufacturers' specifications
I-37.01.04	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

I-37.02 Diagnoses air conditioning systems.

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

Key Competencies

I-37.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnosis
I-37.02.02	perform sensory inspections of air conditioning systems to identify worn, damaged or defective components such as chaffed lines, defective expansion valves, plugged condensers and damaged evaporators to confirm complaint and establish a preliminary diagnosis
I-37.02.03	perform diagnostic procedure by following troubleshooting tree or schematic supplied by manufacturer to determine failure
I-37.02.04	pressure test for high/low pressure to assess components for wear, damage or defects using tools and equipment such as air conditioning recovery machines
I-37.02.05	perform electrical testing to isolate problem
I-37.02.06	run system to isolate problem
I-37.02.07	compare test results to manufacturers' specifications or expected values to verify diagnosis
I-37.02.08	perform failure analysis to determine root cause of failure
I-37.02.09	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

I-37.03 Repairs air conditioning systems.

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

Key Competencies

I-37.03.01	remove and replace worn, damaged or faulty components such as expansion valves, evaporators, belt, condensers and sensors
I-37.03.02	remove and replace consumables such as freon according manufacturers' specifications and employer maintenance schedule to minimize breakdowns
I-37.03.03	adjust freon pressures to ensure proper operation of component/equipment
I-37.03.04	recycle freon according to jurisdictional regulations using equipment such as air conditioning recovery system
I-37.03.05	verify repair by running air conditioning system
I-37.03.06	document that repairs and verifications have been performed for warranty, liability, future reference and tracking
I-37.03.07	use welding equipment to braze or solder lines
I-37.03.08	disassemble and reassemble dashboard and firewall components for access, according to manufacturers' specifications
I-37.03.09	evacuate, clean and recharge system refrigerant according to manufacturer's specifications

Trends

Hydraulic systems are getting more advanced with the introduction of more electronics. Areas such as the oil industry, road maintenance and waste management are increasing their use of hydraulics in almost all applications because of convenience and simpler design.

Although these systems have not been traditionally recognized as part of the truck and transport mechanic's scope of work, they are now commonly used with after-market accessories. Therefore, servicing, diagnosing and repairing these systems are becoming a more common practice for truck and transport mechanics.

Related Components (including, but not limited to)

Cylinders, motors, reservoirs, accumulators, controls, valves (relief, flow control, splitter), hoses, sensors, gauges, pumps (vane, piston, gear).

Tools and Equipment

See Appendix A.

Task 38 Services, diagnoses and repairs hydraulic components.

Context

Hydraulic systems pump confined fluid to transfer energy smoothly from one component to another. Advantages of using hydraulics include smooth and quiet operation, and adjustability of speed and force to prevent damage, which allows for a versatile and adaptable system.

Truck and transport mechanics must service, diagnose and repair hydraulic systems to ensure proper function and reduce down time.

Required Knowledge

K 1	theory and operating principles of hydraulics
K 2	primary hydraulic components such as prime mover, pump, reservoir, relief valve, control valves, hoses/fittings and actuators
K 3	assembly procedures for hoses/fittings according manufacturers' specifications and correct application
K 4	pressure limits of hoses, tubing and fittings
K 5	types of prime movers such as PTO and drop box (transfer case)

K 6	types of positive (piston, vane, gear) and non-positive (centrifugal) displacement pumps
K 7	types of hydraulic oils based on viscosity index rating
K 8	types of accessories such as cement mixers, dump boxes, snow removal equipment, lift gates, arial lifts and mobile cranes
K 9	importance of cleanliness
K 10	hazards associated with hydraulics such as stored high pressure, skin and eye irritation, flammability and high heat
K 11	safe work practices related to hydraulics and associated jurisdictional safety regulations
K 12	types of failures such as intermittent, catastrophic and degradation
K 13	common causes of failures such as contamination, improper operation, improperly designed components and poor maintenance practices
K 14	common faults such as stuck valves, chafed or broken hoses and leaking seals
K 15	troubleshooting techniques
K 16	specialty tools such as pressure gauges, vacuum gauges, fittings, flow meters and temperature gauges
K 17	specialized tests such as pressure test, flow test and leakage test
K 18	removal, replacement and repair procedures
K 19	inspection and testing procedures
K 20	oil sampling procedures
K 21	recycling and disposal methods, and jurisdictional requirements
K 22	hydraulic schematics

Sub-task

J-38.01 Services hydraulic components.

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

Key Competencies

J-38.01.01	clean hydraulic components such as inlet screen and reservoir
J-38.01.02	perform sensory inspections of hydraulic components to identify worn, damaged or defective components such chaffed hoses, leaking gaskets, seals or hoses, low hydraulic oil levels and abnormal sounds
J-38.01.03	release stored energy such as high pressure in a controlled manner without releasing fluid from the system

J-38.01.04	remove and replace consumables such as filters and oil according manufacturers' specifications
J-38.01.05	recycle and/or dispose of consumables according to jurisdictional regulations
J-38.01.06	record service information and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

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Sub-task

J-38.02 Diagnoses hydraulic components.

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

Key Competencies

J-38.02.01	obtain details of symptoms associated with complaint to establish a starting point for diagnosis
J-38.02.02	release stored energy such as high pressure in a controlled manner without releasing fluid from the system
J-38.02.03	perform sensory inspections to confirm complaint and establish a preliminary diagnosis
J-38.02.04	perform diagnostic procedure by following schematics supplied by manufacturer to determine failure
J-38.02.05	perform specialized testing procedures such as pressure, flow and vacuum to assess components for wear, damage or defects using tools and equipment such as pressure gauges, flowmeters, temperature gauges and vacuum gauges
J-38.02.06	compare test results to manufacturers' specifications or expected values to verify diagnosis
J-38.02.07	perform failure analysis to determine root cause of failure
J-38.02.08	record test results and inspection findings according to manufacturers' requirements for warranty, and for future reference and tracking

Sub-task

J-38.03 Repairs hydraulic components.

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

Key Competencies

J-38.03.01	release stored energy such as high pressure in a controlled manner without releasing fluid from the system
J-38.03.02	remove and replace worn, damaged or faulty components such as damaged hoses, worn pumps, worn or damaged actuators, improperly vented reservoir, and worn damaged or faulty valves
J-38.03.03	rebuild components such as actuators, pumps and valves, according to manufacturers' specifications
J-38.03.04	repair components such as actuators, pumps and valves, by replacing parts causing the failure, according to manufacturers' specifications
J-38.03.05	perform adjustments such as setting pressure and flow to ensure proper operation of component/equipment
J-38.03.06	verify repair using methods such as operational tests, verifying pressures and flow according to manufacturers' recommendations
J-38.03.07	document that repairs and verifications have been performed for warranty, liability, future reference and tracking

APPENDICES

APPENDIX A TOOLS AND EQUIPMENT

Hand Tools/Outils à main

air blow gun
bushing drivers
clamps
cutting equipment (side cutter, tube cutter, wire cutter, scissors, shears, razor knives)
emery papercloth
feeler gauges
files
filter wrenches
flashlight
hacksaw
hammers
magnets
magnifying glass
mirrors
pick set
pipe wrench
pliers
pry bars
pullers
punches and chisels
saws
scribes
scrapers
screwdrivers
slide hammer
sockets and ratchets
terminal tool set
torque multiplier
torque wrench
vice
wire brush
wrenches

Power Tools/Outils mécaniques

air cutoff tools
air hammers
air ratchets
air wrenches
drills
drill press
impact gun
grinding wheels
lighting devices (trouble lights, flood lights)
sanders
parts washers
pressure washer
power saw
presses
vacuum cleaner

Measuring, Testing and Diagnostic Equipment

antifreeze tester
back pressure tester
black light
boost gauge
brake drum gauge
braking force test equipment
opacity meter
plumb bob
refractometer
pressure gauges
test light
spark plug tester

calipers
circuit tester
compression gauges
computerized diagnostic equipment (computer, handheld)
continuity tester
dial indicators
dynamometer
electronic blowby tester
feeler gauge
hydrometer
inductive pickup (amp clamp)
laser alignment tools
liner height protrusion gauge
micrometer
multimeter
squares
straight edges
tape measure
telescopic gauge
temperature gauge (infrared, mechanical and electrical)
timing light
tire gauge
torque wrench
trammel gauge
tread depth gauge
vacuum gauge
vernier calipers
video camera on a cable/flexible arm camera
water manometer

Welding and Cutting Equipment

MIG welding equipment
oxyacetylene equipment
plasma cutter
propane torch
soldering gun
stick welding equipment
TIG welding equipment

Hoisting, Lifting and Staging Equipment

axle lifts
blocking
cranes (overhead, mobile)
fork lifts
hoists
jacks
ladders
scaffolding
stands
steps
stools

Personal Protective Equipment and Safety Equipment

aprons
carbon monoxide sensors
coveralls/fire rated
dust masks
emergency shower
exhaust ventilation
guard rails
hard hats
hearing protection
high voltage protection (insulated gloves, jacket and tools)
masks
respirators

eye wash station
face shields
fall protection system
fire blanket
fire extinguisher
first aid kit
gloves (chemical, welding, latex, nitrile, heavy duty)
goggles
safety boots
safety glasses
vehicle lock-out systems (tags and locks)
welding curtain
welding helmets
welding personal protective gear
wheel chocks

APPENDIX B GLOSSARY

accessories	components for the vehicle which enhance the operation or extend longevity; for example: greasing systems, radio, air conditioning and extra lights. Although some accessories are non-essential to the vehicle operation, they are sometimes required in extreme operating environments.
auxiliary braking systems	secondary braking systems which slow or hold the vehicle by unconventional means such as: - retarding the engine with compression brakes or exhaust brakes; - utilizing a fluid coupler; or - creating resistance on the driveline.
base engine	assembled block and head including internal components and gear trains.
diagnose	tasks involved in inspecting, testing and determining faults in vehicle systems and components.
drive train	mechanical portion that transfers power from the flywheel to the tires.
driveline (drive shaft)	drive connection between a power source and a driven component.
electronic control module (ECM)	module which controls functions of a vehicle; some common ECMs are EPUs (electronic processing units), ECUs (electronic control units), VECUs (vehicle electronic control units)
electrical systems	starting, charging, lighting and accessory circuits without computer control modules.
electronic systems	electrical systems operated via computerized electronic control modules and related sensors and wiring.
hydrodynamic system	hydraulic system with low pressure and high volume; torque converters and fluid couplers are based on this system.
hydrostatic system	hydraulic system which uses high pressure and low volume to transmit power through tubes or hoses to auxiliary systems.
landing gear	components which are used to support the weight of the trailer when disconnected from the vehicle.
power take-off (PTO)	device that couples and uncouples a power source to transfer power to auxiliary systems.

sensory inspection	diagnosing or inspecting using sight, sound, smell and feel.
repair	activities which include replacement, rebuild, or repairing of truck and transport vehicles and components
service	activities which include adjustment, lubricating and general maintenance of truck and transport vehicles and components.
spark ignition system	system which controls a small amount of electrical power to create and transmit, through a step-up transformer, a high voltage to a sparking device which in turn begins ignition.
suspension	components which absorb road surface irregularities to smooth vehicle ride; it is designed to permit controlled wheel movement over irregular surfaces; basic types include spring, air and rubber block

APPENDIX C ACRONYMS

ABS	anti-lock braking system
AGM	absorbed glass mat
ARD	after treatment regeneration device
CA	cranking amps
CAC	charge air cooler
CCA	cold cranking amps
CNG	compressed natural gas
DEF	diesel exhaust fluid
DPF	diesel particulate filter
DRL	daytime running lights
ECM	electronic control module
EGR	exhaust gas recirculation
GMAW	MIG gas metal arc welding
GPS	global positioning systems
HID	high intensity discharge lights
HVAC	heating, ventilation and air conditioning
LCV	long combination vehicle
LED	light emitting diode
LNG	liquid natural gas
MIG	metal inert gas
MSDS	Material Safety Data Sheets
NO_x	nitric oxide and nitrogen dioxide

OAW	oxy-acetylene welding
OEM	original equipment manufacturer
OH&S	Occupational Health and Safety
PPE	personal protective equipment
PTO	power take-off
RC	reserve capacity
SCA	supplemental coolant additives
SCR	selective catalytic reduction
SMAW	shielded metal arc welding
SRS	supplemental restraint system
TDG	Transportation of Dangerous Goods
VECU	vehicle electronic control unit
VGT	variable geometry turbocharger
VIN	vehicle identification number
VORAD	vehicle on board radar
WHMIS	Workplace Hazardous Materials Information System

APPENDIX D BLOCK AND TASK WEIGHTING

BLOCK A COMMON OCCUPATIONAL SKILLS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	4	5	5	6	ND	5	5	8	7	5	NV	5	ND	6%

Task 1 Performs safety-related functions.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	35	10	25	36	ND	20	34	33	35	10	NV	50	ND	29%

Task 2 Uses and maintains tools and equipment.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	30	30	40	29	ND	30	33	43	30	30	NV	25	ND	32%

Task 3 Performs routine trade activities.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	35	60	35	35	ND	50	33	24	35	60	NV	25	ND	39%

BLOCK B ENGINE AND SUPPORTING SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	20	19	16	16	ND	18	18	13	15	25	NV	15	ND	17%

Task 4 Services, diagnoses and repairs base engines.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	5	15	11	ND	20	18	13	15	16	NV	5	ND	14%

Task 5 Services, diagnoses and repairs lubrication systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	7	15	10	9	ND	5	5	12	10	12	NV	5	ND	9%

Task 6 Services, diagnoses and repairs intake and exhaust systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	10	15	10	7	ND	10	8	11	10	12	NV	15	ND	11%

Task 7 Services, diagnoses and repairs engine management systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	15	15	17	ND	20	17	17	20	12	NV	25	ND	17%

Task 8 Services, diagnoses and repairs fuel delivery systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	13	15	10	14	ND	15	16	13	15	12	NV	15	ND	14%

Task 9 Services, diagnoses and repairs emission systems for diesel engines.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	15	20	20	ND	15	20	17	20	12	NV	20	ND	18%

Task 10 Services, diagnoses and repairs engine retarder systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	5	5	10	9	ND	5	8	7	5	12	NV	5	ND	7%

Task 11 Services, diagnoses and repairs cooling systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	5	15	10	13	ND	10	8	10	5	12	NV	10	ND	10%

BLOCK C AIR SYSTEMS AND BRAKES

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	15	18	15	14	ND	17	15	13	15	10	NV	10	ND	14%

Task 12 Services, diagnoses and repairs air systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	40	50	50	46	ND	30	55	50	50	50	NV	60	ND	48%

Task 13 Services, diagnoses and repairs brake systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	60	50	50	54	ND	70	45	50	50	50	NV	40	ND	52%

BLOCK D ELECTRICAL AND ELECTRONIC SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	18	15	16	14	ND	15	20	13	15	20	NV	25	ND	17%

Task 14 Services, diagnoses and repairs batteries.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	8	10	10	15	ND	10	10	11	5	20	NV	5	ND	10%

Task 15 Services, diagnoses and repairs charging systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	20	15	19	ND	15	12	18	10	15	NV	15	ND	16%

Task 16 Services, diagnoses and repairs spark ignition systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	7	10	10	9	ND	5	6	7	5	10	NV	5	ND	8%

Task 17 Services, diagnoses and repairs starting systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	20	15	19	ND	15	12	20	10	15	NV	15	ND	16%

Task 18 Services, diagnoses and repairs electrical components and accessories.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	20	25	16	ND	25	30	22	35	20	NV	20	ND	23%

Task 19 Services, diagnoses and repairs electronic components, accessories and vehicle management systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	25	20	25	22	ND	30	30	22	35	20	NV	40	ND	27%

BLOCK E DRIVE TRAIN

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	15	10	13	10	ND	11	11	13	10	14	NV	10	ND	12%

Task 20 Services, diagnoses and repairs clutches.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	10	15	20	20	ND	10	10	21	10	16	NV	10	ND	14%

Task 21 Services, diagnoses and repairs manual transmission and transfer cases.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	15	10	19	ND	25	20	21	20	14	NV	20	ND	18%

Task 22 Services, diagnoses and repairs automatic transmissions.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	15	15	10	17	ND	20	20	16	20	14	NV	25	ND	17%

Task 23 Services, diagnoses and repairs automated transmissions.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	15	15	10	19	ND	25	25	16	20	14	NV	15	ND	18%

Task 24 Services, diagnoses and repairs driveline systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	10	15	20	12	ND	5	5	8	12	14	NV	10	ND	11%

Task 25 Services, diagnoses and repairs differentials.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	15	20	13	ND	10	15	13	13	14	NV	15	ND	15%

Task 26 Services, diagnoses and repairs drive train retarders.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	10	10	10	0	ND	5	5	5	5	14	NV	5	ND	7%

BLOCK F STEERING, CHASSIS/FRAMES, SUSPENSION, WHEELS, HUBS AND TIRES

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	15	18	10	15	ND	16	12	13	15	15	NV	15	ND	14%

Task 27 Services, diagnoses and repairs steering systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	30	20	25	22	ND	30	40	26	25	20	NV	30	ND	27%

Task 28 Services, diagnoses and repairs chassis/frames.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	15	20	15	12	ND	10	5	16	15	20	NV	20	ND	15%

Task 29 Services, diagnoses and repairs suspension.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	25	20	25	27	ND	10	20	20	25	20	NV	25	ND	21%

Task 30 Services, diagnoses and repairs hitches and couplers.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	15	20	15	17	ND	10	15	17	20	20	NV	10	ND	16%

Task 31 Services, diagnoses and repairs tires, wheels and hubs.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	15	20	20	22	ND	40	20	21	15	20	NV	15	ND	21%

BLOCK G CAB

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	4	2	5	6	ND	4	4	7	5	2	NV	5	ND	4%

Task 32 Services, diagnoses and repairs interior cab components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	65	50	50	56	ND	70	60	60	65	50	NV	50	ND	58%

Task 33 Services, diagnoses and repairs exterior cab components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	35	50	50	44	ND	30	40	40	35	50	NV	50	ND	42%

BLOCK H TRAILERS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	3	5	5	6	ND	4	3	8	5	2	NV	5	ND	5%

Task 34 Services, diagnoses and repairs trailer components and accessories.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	60	70	50	59	ND	75	40	50	70	100	NV	70	ND	64%

Task 35 Services, diagnoses and repairs heating refrigeration systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	40	30	50	41	ND	25	60	50	30	0	NV	30	ND	36%

BLOCK I CLIMATE CONTROL

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	4	4	8	7	ND	5	7	6	8	5	NV	5	ND	6%

Task 36 Services, diagnoses and repairs heating ventilation systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	40	50	50	43	ND	40	40	35	40	50	NV	40	ND	43%

Task 37 Services, diagnoses and repairs air conditioning systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	60	50	50	57	ND	60	60	65	60	50	NV	60	ND	57%

BLOCK J HYDRAULIC SYSTEMS

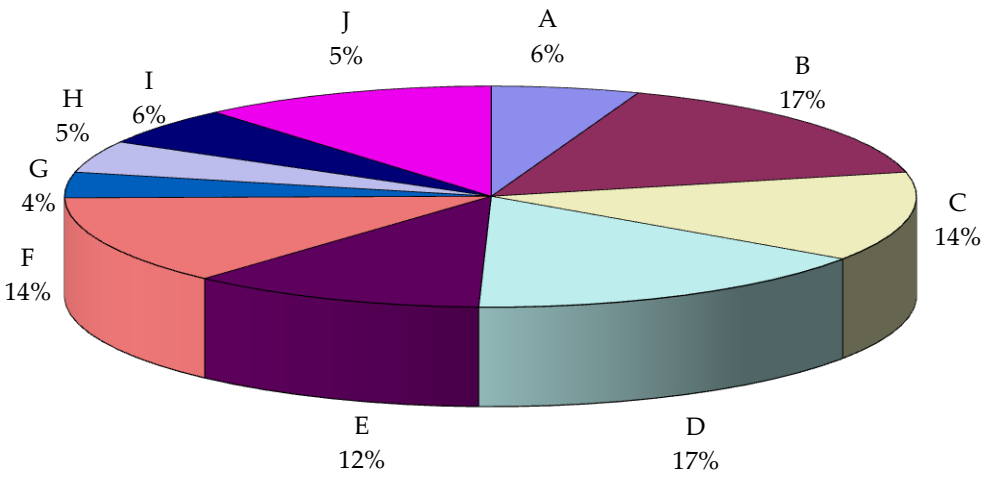
	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	2	4	7	6	ND	5	5	6	5	2	NV	5	ND	5%

Task 38 Services, diagnoses and repairs hydraulic components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	100	100	100	100	ND	100	100	100	100	100	NV	100	ND	100%

APPENDIX E

PIE CHART*



TITLES OF BLOCKS

BLOCK A	Common Occupational Skills	BLOCK F	Steering, Chassis/Frames, Suspension, Wheels, Hubs And Tires
BLOCK B	Engine and Supporting Systems	BLOCK G	Cab
BLOCK C	Air Systems and Brakes	BLOCK H	Trailers
BLOCK D	Electrical and Electronic Systems	BLOCK I	Climate Control
BLOCK E	Drive Train	BLOCK J	Hydraulic Systems

*Average percentage of the total number of questions on an interprovincial examination, assigned to assess each block of the analysis, as derived from the collective input from workers within the occupation from all areas of Canada. Interprovincial examinations typically have from 100 to 150 multiple-choice questions.

APPENDIX F

TASK PROFILE CHART — Truck and Transport Mechanic

BLOCKS	TASKS	SUB-TASKS				
A – COMMON OCCUPATIONAL SKILLS	1. Performs safety-related functions.	1.01 Maintains safe work environment.	1.02 Uses personal protective equipment (PPE) and safety equipment.			
	2. Uses and maintains tools and equipment.	2.01 Maintains hand, power, measuring, testing, and diagnostic tools.	2.02 Maintains shop equipment.	2.03 Uses hoisting and lifting equipment.	2.04 Uses welding and cutting equipment.	
	3. Performs routine trade activities.	3.01 Uses documentation and reference materials.	3.02 Maintains fluids, lubricants, and coolants.	3.03 Services hoses, tubing, and fittings.	3.04 Services filters.	3.05 Services bearings, bushing and seals.
		3.06 Uses fasteners, sealing devices, adhesives and gaskets.				
B - ENGINE AND SUPPORTING SYSTEMS	4. Services, diagnoses and repairs base engine.	4.01 Services base engine.	4.02 Diagnoses base engine.	4.03 Repairs base engine.		
	5. Services, diagnoses and repairs lubrication system.	5.01 Services lubrication systems.	5.02 Diagnoses lubrication systems.	5.03 Repairs lubrication systems.		
	6. Services, diagnoses and repairs intake and exhaust systems.	6.01 Services intake and exhaust systems.	6.02 Diagnoses intake and exhaust systems.	6.03 Repairs intake and exhaust systems.		

BLOCKS	TASKS	SUB-TASKS		
	7. Services, diagnoses and repairs engine management system.	7.01 Services engine management system.	7.02 Diagnoses engine management system.	7.03 Repairs engine management system.
	8. Services, diagnoses and repairs fuel delivery system.	8.01 Services fuel delivery system.	8.02 Diagnoses fuel delivery system.	8.03 Repairs fuel delivery system.
	9. Services, diagnoses and repairs emission systems for diesel engines.	9.01 Services emission systems for diesel engines.	9.02 Diagnoses emission systems for diesel engines.	9.03 Repairs emission systems for diesel engines.
	10. Services, diagnoses and repairs engine retarder systems.	10.01 Services and repairs engine retarder systems.	10.02 Diagnoses engine retarder systems.	
	11. Services, diagnoses, and repairs cooling system.	11.01 Services cooling system.	11.02 Diagnoses cooling system.	11.03 Repairs cooling system.
C - AIR SYSTEMS AND BRAKES	12. Services, diagnoses and repairs air systems.	12.01 Services air systems.	12.02 Diagnoses air systems.	12.03 Repairs air systems.
	13. Services, diagnoses and repairs brake systems.	13.01 Services brake systems.	13.02 Diagnoses brake systems.	13.03 Repairs brake systems.
D - ELECTRICAL AND ELECTRONIC SYSTEMS	14. Services, diagnoses and repairs batteries.	14.01 Performs servicing and repair of batteries.	14.02 Diagnoses batteries.	

BLOCKS	TASKS	SUB-TASKS		
	15. Services, diagnoses and repairs charging systems.	15.01 Services charging systems.	15.02 Diagnoses charging systems.	15.03 Repairs charging systems.
	16. Services, diagnoses and repairs spark ignition systems.	16.01 Performs servicing and repair of spark ignition systems.	16.02 Diagnose spark ignition systems.	
	17. Services, diagnoses and repairs starting systems.	17.01 Performs servicing and repairs of starting systems.	17.02 Diagnoses starting systems.	
	18. Services, diagnoses and repairs electrical components and accessories.	18.01 Performs servicing and repair of electrical components and accessories.	18.02 Diagnoses electrical components and accessories.	
	19. Services, diagnoses and repairs vehicle management systems and electronic components.	19.01 Services vehicle management systems and electronic components.	19.02 Diagnoses vehicle management systems and electronic components.	19.03 Repairs vehicle management systems and electronic components.
E - DRIVE TRAIN	20. Services, diagnoses and repairs clutches.	20.01 Services clutches.	20.02 Diagnoses clutches.	20.03 Repairs clutches.
	21. Services, diagnoses and repairs manual transmission and transfer cases.	21.01 Services manual transmission and transfer cases.	21.02 Diagnoses manual transmission and transfer cases.	21.03 Repairs manual transmission and transfer cases.

BLOCKS	TASKS	SUB-TASKS		
	22. Services, diagnoses and repairs automatic transmissions.	22.01 Services automatic transmissions.	22.02 Diagnoses automatic transmissions.	22.03 Repairs automatic transmissions.
	23. Services, diagnoses and repairs automated transmissions.	23.01 Services automated transmissions.	23.02 Diagnoses automated transmissions.	23.03 Repairs automated transmissions.
	24. Services, diagnoses and repairs driveline systems.	24.01 Services driveline systems.	24.02 Diagnoses driveline systems.	24.03 Repairs driveline systems.
	25. Services, diagnoses and repairs differentials.	25.01 Services differentials.	25.02 Diagnoses differentials.	25.03 Repairs differentials.
	26. Services, diagnoses and repairs drive train retarders.	26.01 Services drive train retarders.	26.02 Diagnoses drive train retarders.	26.03 Repairs drive train retarders.
F - STEERING, CHASSIS/FRAMES, SUSPENSION, WHEELS, HUBS AND TIRES	27. Services, diagnose, and repairs steering systems.	27.01 Services steering systems.	27.02 Diagnoses steering systems.	27.03 Repairs steering systems.
	28. Services, diagnoses and repairs chassis/frames.	28.01 Services, chassis/frames.	28.02 Diagnoses chassis/frames.	28.03 Repairs chassis/frames.
	29. Services, diagnoses and repairs suspension.	29.01 Services suspension.	29.02 Diagnoses suspension.	29.03 Repairs suspension.

BLOCKS	TASKS	SUB-TASKS		
	30. Services, diagnoses and repairs hitches and couplers.	30.01 Services hitches and couplers.	30.02 Diagnoses hitches and couplers.	30.03 Repairs hitches and couplers.
	31. Services, diagnoses and repairs tires, wheels and hubs.	31.01 Services tires wheels and hubs.	31.02 Diagnoses tires, wheels and hubs.	31.03 Repairs tires, wheels and hubs.
G – CAB	32. Services, diagnoses and repairs interior cab components.	32.01 Services interior cab components.	32.02 Diagnoses interior cab components.	32.03 Repairs interior cab components.
	33. Services, diagnoses and repairs exterior cab components.	33.01 Services exterior cab components.	33.02 Diagnoses exterior cab components.	33.03 Repairs exterior cab components.
H - TRAILERS	34. Services, diagnoses and repairs trailer components and accessories.	34.01 Services trailer components and accessories.	34.02 Diagnoses trailer components and accessories.	34.03 Repairs trailer components and accessories.
	35. Services, diagnoses and repairs heating refrigeration systems.	35.01 Services heating and refrigeration systems.	35.02 Diagnoses heating and refrigeration systems.	35.03 Repairs heating and refrigeration systems.
I - CLIMATE CONTROL	36. Services, diagnoses and repairs heating ventilation systems.	36.01 Services heating and ventilation systems.	36.02 Diagnoses heating and ventilation systems.	36.03 Repairs, heating and ventilation systems.
	37. Services, diagnoses and repairs air conditioning systems.	37.01 Services air conditioning systems.	37.02 Diagnoses air conditioning systems.	37.03 Repairs air conditioning systems.

BLOCKS	TASKS	SUB-TASKS		
J - HYDRAULIC SYSTEMS	38. Services, diagnoses and repairs hydraulic components.	38.01 Services hydraulic components.	38.02 Diagnoses hydraulic components.	38.03 Repairs hydraulic components.