RED SEAL

THE INTERPROVINCIAL STANDARDS RED SEAL PROGRAM

National Occupational Analysis

2012 | Motorcycle Mechanic

Human Resources and Skills Development Canada
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Canada

Occupational Analyses Series

Motorcycle Mechanic

2012

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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 Motorcycle 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. To this end, Human Resources and Skills Development Canada (HRSDC) 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 HRSDC. 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 Prince Edward Island also participated in the development of this NOA.

Comments or questions about NOAs may be forwarded to:

Trades and Apprenticeship Division
Labour Market Integration Directorate
Human Resources and Skills Development Canada
140 Promenade du Portage, Phase IV, 5th Floor
Gatineau, Quebec K1A 0J9
e-mail: redseal-sceaurouge@hrsdc-rhdcc.gc.ca

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APPENDICES

STRUCTURE OF ANALYSIS

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

Blocks	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	list of components, 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	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	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	list of acronyms used in the analysis with their full name
Appendix D — Block and Task Weighting	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	graph which depicts the national percentages of exam questions assigned to blocks
Appendix F — Task Profile Chart	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 HRSDC. 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 a 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 MOTORCYCLE MECHANIC TRADE

"Motorcycle Mechanic" is this trade's official Red Seal occupational title approved by the CCDA. This analysis covers tasks performed by motorcycle 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
Motorcycle Mechanic	✓	✓	✓	✓					✓				
Motorcycle Mechanic (Motorcycle & Power Equipment Technician)										✓			
Motorcycle Technician						✓							

Motorcycle mechanics work on motorcycles and other units such as motor scooters and all-terrain units. They inspect, clean, test, assemble, diagnose, maintain and repair engines, transmissions, drive systems, steering assemblies, braking systems, chassis and suspension, electrical systems, vehicle management systems, fuel systems and exhaust systems. They may specialize in repairing, rebuilding, customizing or servicing these systems or assemblies.

Motorcycle mechanics work with hand, power, pneumatic and measuring tools, shop equipment, and diagnostic and testing tools. Reference material, documentation and computers are also necessary tools in this trade.

Motorcycle mechanics may work in service shops of motorcycle dealerships, manufacturers and retailers or in independent service establishments. They may specialize in specific motorcycle, scooter and all-terrain unit makes or types.

The work environment may include noise, fumes, odours, hazardous compounds, drafts and vibrations; therefore, safety procedures are important. The work often requires considerable standing, bending, crawling, lifting, pulling and reaching.

Some important attributes of motorcycle mechanics are good hand-eye coordination, mechanical aptitude, time management skills, document use, numeracy, logical thinking and decision making skills, excellent communication and the ability to educate themselves as technology advances. They must also be competent to test ride units.

Experienced motorcycle mechanics may advance to supervisory positions, shop foreman, service manager or instructors. Some mechanics may open their own garage or motorcycle specialty shop. With additional training, motorcycle mechanics can transfer their skills and knowledge to related units and equipment such as, but not limited to, snowmobiles, watercraft and outdoor power equipment.

There are more tools available for data analysis and diagnostics such as laser alignment, dynometer and scan analyser. These tools are more efficient in the diagnosis of units. Manufacturers require more specialized tools to service and repair current models.

Linked brake systems and antilock braking systems (ABS) are new technologies that apply predetermined pressures to both front and rear brake with a single lever action. Alarm systems and global positioning systems (GPS) are also new consumer products that motorcycle mechanics are responsible for installing and maintaining.

Materials are lighter, stronger and more durable. Resins, alloys, carbon fibre, ceramics, composite materials and synthetic fluids are also used on a regular basis in this trade.

The increased use of electronic systems has meant that more work processes and tasks are completed using computers. Diagnosing may be carried out more efficiently with the use of electronic diagnostic tools.

There is an increased need for computer literacy, knowledge of applied technologies and good product knowledge among motorcycle mechanics. Applied technologies and sciences have resulted in advancements in many of the systems of units. Motorcycle mechanics must be computer literate in order to access product information that may be available in the form of an electronic document, CD, or on Internet sites. Many motorcycle mechanics regularly attend training sessions, in person and on-line, on new technologies and products, as sponsored by the manufacturer or dealer.

Customers want new technologies and safety enhancements such as air bags and GPS systems. They are more informed about units and the latest technologies available and have higher expectations for service and quality. The ease of use of units has opened the field for more non-traditional motorcycle riders. More customers are requesting personalized, custom built units with new designs.

There is a need for an increased knowledge of work processes. Documentation supporting repairs and work completed is done according to industry standards. For client safety and liability purposes, motorcycle mechanics are documenting customer refusal of required repairs.

The safety of the mechanic is very important as is the safety of the rider. Motorcycle mechanics receive more training and have increased skill levels in the safety features of units. Being environmentally responsible (e.g. recycling materials and components) is also common practice in many work sites. More jurisdictional regulations are being implemented to reduce noise and emissions.

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.

The tools are available online or for order at: www.hrsdc.gc.ca/essentialskills.

The essential skills profile for the motorcycle mechanic trade indicates that the most important essential skills are **document use, numeracy** and **thinking skills**.

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
Motorcycle mechanics use reading skills to understand documents such as work orders, service manuals and service bulletins. They read regulations governing road worthiness, noise and emission standards of motorcycles, scooters and all-terrain units.

Document Use
Documents that motorcycle mechanics work with include work orders, job estimates, inspection checklists, parts requisitions and service manuals. They also consult and study a variety of graphs, charts and technical drawings such as assembly, schematic and cut-away drawings.

Writing
Motorcycle mechanics write brief notes and descriptions. They may write notes to keep records of their observations and recommendations for themselves, others and clients. Many records are input through the computer keyboard but legible writing skills are a definite asset.

Numeracy
Motorcycle mechanics use numeracy skills to compare and calculate serviceability of components, measurements of dimensions, revolutions per minute, speed, horsepower and torque to specifications. They estimate the effects that repairs and modifications will have on engine performance. They may calculate labour time to prepare repair quotes and invoices.

Oral Communication
Motorcycle mechanics use oral communication skills to discuss job details with colleagues, apprentices, suppliers and clients.

Thinking Skills
Problem solving skills are used by motorcycle mechanics to determine customer's requirements and to explain the actions and repair procedures. Motorcycle mechanics use decision making skills to select the order of unit service and to select tools, parts and procedures needed to carry out the tasks. They use critical thinking skills to determine causes of failures, defects and/or deficiencies.

Working with Others
Motorcycle mechanics mostly work independently but coordinate their work with partspersons and suppliers. They may provide advice and assistance to other mechanics. They may also assist in mentoring apprentices.

Computer Use
Motorcycle mechanics use databases to access details of customers' information and specifics of previously completed work. They use communications software such as email to exchange information with suppliers, manufacturers, colleagues and other motorcycle repair shops. They use diagnostic equipment that runs software applications. They also use the Internet to access specifications, technical service bulletins, recall notices and service manuals.

Continuous Learning
Motorcycle mechanics are required to keep up to date with continuing technological advancements and legislation governing safety inspections and emissions. They may attend training to be certified repairers of specific units. They also learn from each other, by talking to colleagues, suppliers, service managers and by reading magazines and repair manuals.

Trends

There are more efficient tools, methods of repair and more sophisticated diagnostic techniques. For example, stand-alone and on-board electronic diagnostic equipment and exhaust gas analysers (EGA) are becoming more commonly used in shops. Workplaces have become safer due to increased worker awareness and stricter safety requirements.

The Internet is increasingly being used as a resource, for example to troubleshoot unique issues and to consult with other trades experts.

Newly developed units incorporate more and more advanced electronic technology such as traction control, antilock braking systems (ABS) and fly-by-wire controls to provide a higher level of riding experience and safety.

Related Components (including but not limited to)

All components apply.

Tools and Equipment

See Appendix A.

Task 1 Performs safety-related functions.

Context

Motorcycle mechanics carry out their duties following required safety procedures and new jurisdictional regulations.

Required Knowledge

K 1	WHMIS and material safety data sheet (MSDS)
K 2	workers' rights and responsibilities
K 3	company safety policies and procedures, including safety training requirements and emergency procedures
K 4	jurisdictional workplace health and safety acts and regulations
K 5	types of personal protective equipment (PPE) such as eye and hearing protection, dust masks, coveralls and gloves
K 6	types of safety equipment such as fire extinguishers, eye wash stations and workplace mats

K 7	location and use of PPE, safety equipment and on-site first aid stations
K 8	disposal and recycling procedures
K 9	short and long term effects of exposure to hazardous products and noisy environments

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Sub-task

A-1.01 Maintains safe work environment.

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

Key Competencies

A-1.01.01	follow safety procedures provided on MSDS such as ensuring proper ventilation and labeling
A-1.01.02	stabilize unit using equipment such as wheel clamps, stands and tie-downs to prevent unit from tipping or falling
A-1.01.03	perform general housekeeping such as keeping workstation tidy and free of tripping, falling and slipping hazards
A-1.01.04	maintain personal and shared tools and equipment to prevent personal injury
A-1.01.05	identify and communicate general safety issues such as broken or unsafe shop equipment
A-1.01.06	operate shop equipment such as forklifts and pallet jacks according to established safety guidelines
A-1.01.07	recycle and dispose of hazardous and non-hazardous waste and materials according to jurisdictional guidelines

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
NV	yes	yes	NV	ND	yes	ND	ND	yes	yes	ND	ND	ND

Key Competencies

A-1.02.01	select and wear applicable PPE such as when handling hazardous products, working in noisy environments, and according to jurisdictional regulations
A-1.02.02	use safety equipment such as fire extinguishers, eye wash stations and first aid kits according to manufacturers' instructions
A-1.02.03	inspect, maintain and store PPE and safety equipment according to established safety practices

Task 2 Performs routine work practices.

Context Motorcycle mechanics perform many tasks on a daily basis which include maintenance, assembly of new units, storage and restoration of units to operating condition after storage. They also conduct safety inspections, verify repairs and provide reports and recommendations to supervisors and clients.

Required Knowledge

K 1	trade-related consumables such as glues, paint, fasteners, sandpaper, electrical supplies and bonding agents
K 2	WHMIS and MSDS
K 3	manufacturers' recommended maintenance schedules and procedures
K 4	manufacturers' recommended storage procedures according to duration of storage
K 5	manufacturers' recommended uncrating and assembly procedures
K 6	jurisdictional safety inspection requirements
K 7	company safety inspection requirements
K 8	types of diagnostic and testing tools such as multimeters, compression gauges, vacuum gauges and computers
K 9	types of shop equipment such as lifts, presses, grinders and drill presses
K 10	types of measuring tools such as micrometers, dial indicators, calipers, telescopic gauges and feeler gauges

K 11	types of cutting and heating tools and equipment such as oxy-acetylene torches, cut-off saws, grinders and heat guns
K 12	materials to be cut or heated
K 13	consumable materials for cutting and heating such as propane, oxygen and acetylene
K 14	cutting and heating tools and equipment operating procedures
K 15	ventilation requirements
K 16	types of power tools such as pneumatic, corded and battery-powered, and their operation procedures
K 17	types of hand tools and their use
K 18	serial numbers and model type of unit being worked on
K 19	storage and handling procedures of flammable materials
K 20	metric and imperial systems of measurement, and conversion

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Sub-task

A-2.01 Uses trade-related consumables.

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

Key Competencies

A-2.01.01	apply trade-related consumables such as glues, sealants and locking agents according to manufacturers' recommendations
A-2.01.02	store and dispose of trade-related consumables according to manufacturers' guidelines

Sub-task

A-2.02 Performs periodic maintenance.

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

Key Competencies

A-2.02.01	check settings such as tire pressure, fluid levels, fastener torques and chain free play according to manufacturers' specifications
A-2.02.02	change fluids such as oils, coolant and brake fluids according to manufacturers' specifications
A-2.02.03	change components such as filters, spark plugs, tires, brake shoes and brake pads according to manufacturers' specifications
A-2.02.04	adjust and lubricate components such as chains, belts, cables and levers

Sub-task

A-2.03 Performs storage procedures.

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

Key Competencies

A-2.03.01	prepare unit for short-term (seasonal) storage by performing procedures such as adding fuel stabilizer, charging the battery and changing the oil
A-2.03.02	prepare unit for long-term storage by performing procedures such as fogging internal components, draining fuel system and removing battery, in addition to required short-term (seasonal) storage procedures
A-2.03.03	apply protective coatings such as metal, paint and vinyl protectants
A-2.03.04	protect unit using fitted cover
A-2.03.05	return unit into service after short-term (seasonal) storage according to manufacturers' specifications
A-2.03.06	return unit into service after long-term storage according to manufacturers' specifications

Sub-task

A-2.04 Prepares new units.

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

Key Competencies

A-2.04.01	uncrate and check unit for shipping damage
A-2.04.02	install and adjust required components according to manufacturers' assembly procedures
A-2.04.03	prepare unit for showroom by detailing, for example removing protective coatings, wiping, washing and drying
A-2.04.04	perform duties on factory Pre-delivery inspection (PDI) checklist such as filling and checking fluids, servicing batteries and checking fastener torque settings
A-2.04.05	install factory approved accessories according to manufacturers' procedures

Sub-task

A-2.05 Conducts safety inspection.

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

Key Competencies

A-2.05.01	perform walk-around visual inspection of unit to identify safety issues such as broken lights and mirrors, tire wear and oil leaks in order to operate safely
A-2.05.02	perform duties on safety inspection checklist such as checking component integrity and function

Sub-task

A-2.06 Maintains tools and equipment.

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

Key Competencies

A-2.06.01	clean, lubricate, organize and store tools such as hand, power, pneumatic, cutting and heating, measuring, shop, and diagnostic and testing tools
A-2.06.02	replace or repair worn, damaged, defective or otherwise unsafe hand tools, power tools and shop equipment
A-2.06.03	calibrate measuring, diagnostic and testing tools

Sub-task

A-2.07 Verifies repairs.

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

Key Competencies

A-2.07.01	perform components bench tests such as crankshaft run-out tests and clearances to confirm component function
A-2.07.02	perform system function tests such as braking, ignition, fuel delivery and charging while unit is secured on hoist
A-2.07.03	assess road test results to confirm that repairs have been completed

Sub-task

A-2.08 Prepares reports and recommendations.

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

Key Competencies

A-2.08.01	document diagnostic findings to assist the service writer or manager in determining service required
A-2.08.02	provide parts list and recommended repairs in writing or verbally to service writer or manager
A-2.08.03	identify and explain to customer causes of failures based on diagnostic findings

Trends	The use of exotic materials such as carbon fibre, titanium, magnesium and ceramics has become common place. There is an increase in the usage of frames to store fuel and oil and to direct air flow into the airbox. There is an increased use of hydro forming frames in manufacturing processes. There is an increase in the use of multi pivot rear drive assembly.
Related Components (including, but not limited to)	**Chassis:** frames (cradle, stamped, trellis, perimeter, backbone), swing arms (single sided, double sided, multi pivot), steering dampers, windshield, engine guards, saddle bags, foot rests, back rests, steering heads (rake, trail, offset), side cars, oil tanks, fairings, fenders, shifters, triple clamps, handle bars. **Suspension:** suspensions (telescopic, girder, leading link), nitrogen, hydraulic and air shocks, air compressors, springs, linkages, damper rods.
Tools and Equipment	See Appendix A.

Task 3 Diagnoses chassis and components.

Context Motorcycle mechanics diagnose chassis components to detect faults such as misalignment, damage and defects. It is important to identify the repair and replacement procedures required for servicing.

Required Knowledge

K 1	types of frames and structures such as cradle, backbone, stamped and perimeter frames
K 2	frame materials such as aluminum and steel
K 3	steering geometry
K 4	manufacturers' service limits
K 5	types of steering such as triple clamp, girder and centre hub
K 6	steering head system components such as bearings, seals and races
K 7	diagnostic procedures
K 8	types of handle bars such as beams, tubular and clip-on

K 9	control system components such as clutch lever, brake lever and twist grip
K 10	control systems such as foot rests, shifters and brake pedals
K 11	frame and chassis components such as bushings, linkages and springs
K 12	ancillary components such as kickstands and engine guards
K 13	accessory components such as saddlebags, footpegs, windshields and back rests

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Sub-task

B-3.01 Diagnoses frame.

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

Key Competencies

B-3.01.01	perform sensory inspection of frame, according to workplace practices, for conditions such as damage, misalignment, and cracked or damaged welds to prevent potential failure and injury
B-3.01.02	evaluate component condition, according to industry tolerances, by measuring frame using tools and equipment such as tape measures, straightedges and parallels to identify trueness and straightness of frame
B-3.01.03	interpret test drive results to identify conditions such as bent fork and misalignment
B-3.01.04	interpret diagnostic results to determine causes of failure such as impact and stress to determine extent of damage
B-3.01.05	identify frame damage requiring replacement according to manufacturers' specifications
B-3.01.06	determine servicing procedures such as repairing or replacing components

Sub-task

B-3.02 Diagnoses steering head.

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

Key Competencies

B-3.02.01	inspect steering head by performing sensory checks such as listening for abnormal noises, feeling for rough movement or looseness and observing any unusual conditions
B-3.02.02	measure bearing pre-load using tools such as pull gauges, torque wrenches and hand tools
B-3.02.03	identify faults such as damaged, notched, loose and worn bearings to determine servicing procedure

Sub-task

B-3.03 Diagnoses handle bars, foot rests and controls.

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

Key Competencies

B-3.03.01	perform sensory inspection to determine damage such as bent and cracked components, broken cables and bent controls
B-3.03.02	measure free play and alignment using tools and equipments such as measuring tapes, straight edges and lasers
B-3.03.03	determine servicing procedures such as straightening components and lubricating cables and pivot points

Sub-task

B-3.04 Diagnoses ancillary and accessory components.

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

Key Competencies

B-3.04.01	perform sensory inspection to detect faults such as excessive play of steering dampers, worn pivots on stands, bent engine guards and ripped saddlebags
B-3.04.02	evaluate component conditions such as leakage, binding, rust, seizure, wear and misalignment
B-3.04.03	inspect steering dampers by turning the steering to detect resistance to movement (drag) using tools such as pull gauges and straight edges
B-3.04.04	inspect windshield to detect faults such as crazing, cracks, and loose and bent mountings
B-3.04.05	identify the cause of failure such as normal wear or physical damage
B-3.04.06	determine servicing procedure such as lubricating pivot points and straightening components

Task 4 Services chassis and components.

Context As a critical component, the frame is generally replaced if damaged. Motorcycle mechanics may repair minor damages to components as required in accordance with workplace standards.

Required Knowledge

K 1	types of frames such as cradle, backbone, stamped and perimeter frames
K 2	frame materials such as aluminum and steel
K 3	steering geometry
K 4	steering head system components such as bearings, pivot shaft, seals and races
K 5	steering head materials such as steel and aluminum
K 6	manufacturers' service limits and procedures
K 7	types and operation of steering dampers such as rotary, friction and hydraulic
K 8	steering damper components such as discs, seals, fluids and valves

K 9	types and operation of control system components such as handle bars, clutch lever, brake levers and throttle
K 10	frame and chassis system components such as bushings, linkages and springs
K 11	ancillary components such as centre/side stands and engine guards
K 12	accessory components such as saddlebags, back rests and windshields

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Sub-task

B-4.01 Services frame.

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

Key Competencies

B-4.01.01	expose the frame by removing the components to gain access to the damaged area
B-4.01.02	perform minor bracket and mount repairs such as straightening and welding according to workplace procedures
B-4.01.03	replace frame when damage exceeds factory specifications
B-4.01.04	remove and replace bearings, races, bushings and seals according to manufacturers' recommendations
B-4.01.05	grease bearings, races, bushings and seals to ensure smooth operation

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Sub-task

B-4.02 Services steering head.

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

Key Competencies

B-4.02.01	disassemble components such as wheels, fenders, forks and fairings to gain access to steering head
B-4.02.02	repair or replace components such as bearings, pivot shaft, races and seals
B-4.02.03	check adjustment of steering head and set to manufacturers' specifications
B-4.02.04	grease bearings, races, bushings and seals to ensure smooth operation

Sub-task

B-4.03 Services handle bars, foot rests and controls.

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

Key Competencies

B-4.03.01	remove and replace handle bars, foot rests and controls if damage exceeds factory specifications
B-4.03.02	repair minor damage by straightening foot rest, mounts and controls
B-4.03.03	adjust, clean and lubricate cables and pivot points according to manufacturers' specifications to ensure smooth operation and minimal wear
B-4.03.04	verify correct operation of controls

Sub-task

B-4.04 Services ancillary and accessory components.

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

Key Competencies

B-4.04.01	remove and replace components such as engine guards, backrests, steering damper, windshields and saddlebags if damage exceeds workplace standards
B-4.04.02	repair, clean, refinish and secure windshield
B-4.04.03	repair components such as steering dampers, fairings where serviceable

Task 5 Diagnoses suspension.

Context Motorcycle mechanics diagnose suspension components to detect faults such as wear, misalignment, damage and defects.

Required Knowledge

K 1	front suspension systems such as telescopic (conventional and cartridge), girder, A-arm and leading link types
K 2	rear suspension shock absorbers such as single, twin and air, gas charged and hydraulic shocks
K 3	suspension system components such as springs, valves, fork-tubes, bushings, seals linkages, bladders and mounts
K 4	steering geometry
K 5	suspension system operation
K 6	diagnostic procedures
K 7	types of swing arm systems such as single sided and double sided
K 8	swing arm geometry

Sub-task

B-5.01 Diagnoses front suspension components.

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

Key Competencies

B-5.01.01	identify type of front suspension to determine diagnostic procedure
B-5.01.02	perform visual inspection to identify conditions such as leaking seals, worn linkage bearings, damaged fork tubes (bent) and unusual wear
B-5.01.03	evaluate component conditions such as bent, seized, leaking and binding using tools and equipment such as straight edges, and pressure and dial gauges
B-5.01.04	interpret test drive results to identify conditions such as bent fork and misalignment
B-5.01.05	interpret diagnostic results to determine causes of failure such as broken or worn bushings, torn or damaged seals, and improper maintenance
B-5.01.06	determine servicing procedure such as replacing fork seals and oil

Sub-task

B-5.02 Diagnoses rear suspension components.

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

Key Competencies

B-5.02.01	identify type of rear suspension to determine diagnostic procedure
B-5.02.02	perform sensory inspection to identify conditions such as worn linkage bearings, damaged springs, leaking seals and unusual wear
B-5.02.03	perform checks and measurements to determine conditions such as misalignment, excessive play and sag using tools and equipment such as tape measure, straight edges, and sag and dial gauges
B-5.02.04	interpret diagnostic results to determine causes of failure such as broken or worn bearings, and improper maintenance
B-5.02.05	determine servicing procedure such as servicing or replacing linkage bearings and bushings, and reconditioning shocks

Sub-task

B-5.03 Diagnoses swing arm.

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

Key Competencies

B-5.03.01	identify type of swing arm to determine diagnostic procedure
B-5.03.02	perform sensory inspection to identify conditions such as worn bearings and bushings, physical damage and missing hardware
B-5.03.03	perform checks and measurements to determine conditions such as misalignment and excessive play
B-5.03.04	interpret diagnostic results to determine causes of failure such as broken or worn bearings, and improper maintenance
B-5.03.05	determine servicing procedure such as servicing or replacing bearings/bushings, axle and chain guard

Task 6 Services suspension system.

Context Motorcycle mechanics service suspension components to resolve issues such as leakage, binding and noise caused by wear, misalignment, damage and defects which results in improved driveability.

Required Knowledge

K 1	front suspension systems such as telescopic (conventional and cartridge), girder, A-arm and leading link types
K 2	rear suspension shock absorbers such as single, twin and air, gas charged and hydraulic shocks
K 3	front suspension system components such as springs, valves, fork-tubes, bushings, seals linkages, bladders, springs and shock mounts
K 4	steering geometry
K 5	suspension system operation
K 6	diagnostic procedures
K 7	manufacturers' service limits and procedures
K 8	swing arm systems such as single sided and double sided
K 9	swing arm geometry

Sub-task

B-6.01 Services front suspension components.

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

Key Competencies

B-6.01.01	remove and replace front suspension and components
B-6.01.02	disassemble, recondition and reassemble components such as bushings, fork springs, seals, fluid and valves
B-6.01.03	adjust pre-load and damping to tailor suspension performance according to manufacturers' specifications

Sub-task

B-6.02 Services rear suspension components.

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

Key Competencies

B-6.02.01	remove and replace rear suspension and components
B-6.02.02	disassemble, recondition and reassemble components such as bushings, shafts, swing arms, linkages and shocks
B-6.02.03	recharge shocks according to manufacturers' specifications
B-6.02.04	align axle in swing arm to manufacturers' specifications

Sub-task

B-6.03 Services swing arm.

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

Key Competencies

B-6.03.01	remove and replace all styles of swing arms and components
B-6.03.02	disassemble, recondition and reassemble components such as bearings, bushings and shafts
B-6.03.03	align axle and swing arm according to manufacturers’ specifications

Trends	There is an increased use of advanced materials (alloys, carbon fibre) and exotic styles of wheels. Tire technology is advancing rapidly and becoming more model specific. Sensors such as speed and pressure sensors are becoming more common on front and rear wheel assemblies.
Related Components (including, but not limited to)	**Wheels:** rims, spokes, spoke nipples, hubs, bearings, spacers, seals, o-rings, axles, dampers, valves (valve stems). **Tires:** tube, tubeless, bias ply, bias belted, radial. **Sensors:** pressure, speed.
Tools and Equipment	See Appendix A.

Task 7 Diagnoses wheels and tires.

Context Motorcycle mechanics diagnose wheels and tires to ensure ride performance, and wheel and tire operation.

Required Knowledge

K 1	types of tires such as bias ply, bias belted, radial, tube and tubeless
K 2	components such as tire, tube and rim band
K 3	tire materials such as rubber compounds, nylon and aramid
K 4	manufacturers' specifications such as speed ratings, load limits and recommended pressures
K 5	diagnostic procedures
K 6	types of spoked wheels such as tube and tubeless
K 7	system components such as hub, rims, rim locks, brake disks, spokes and spoke nipples
K 8	wheel materials such as alloys, aluminum, carbon fibre and steel
K 9	structure of spoked wheels
K 10	manufacturers' service limits and procedures
K 11	inspection procedures
K 12	types of one piece wheels such as cast, forged and unit

K 13	components such as bearings, spacers, speedometer drive, cush drive, speed sensor and pressure sensor
K 14	multi-piece wheel components such as rim halves, o-rings, hubs and valve stems
K 15	stamped steel rims

Sub-task

C-7.01 Diagnoses tires.

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

Key Competencies

C-7.01.01	perform sensory inspection to determine tire conditions such as uneven wear, cracks, delamination, bead sealing, under inflation and broken belts
C-7.01.02	determine causes of failure such as overloading, over/under inflating and heavy torquing/braking
C-7.01.03	perform checks and measurements such as tread depth, tire pressure and balance, according to manufacturers' specifications
C-7.01.04	verify tire conditions such as vibration and out-of-round by performing road test
C-7.01.05	determine servicing procedure such as tire or tube replacement, tire balance and tire repair according to manufacturers' recommendations

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Sub-task

C-7.02 Diagnoses spoked wheels.

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

Key Competencies

C-7.02.01	perform sensory inspection to determine defects such as worn bearings, cracked or deformed rims, damaged hubs, tire valve condition, and missing and broken spokes
C-7.02.02	determine radial and lateral run out, and end play after removing wheel and by using measuring tools and equipment such as dial gauge and truing stand
C-7.02.03	determine causes of failure such as impact, lack of maintenance and stress

C-7.02.04 test drive to validate clients' concerns by evaluating ride quality such as stability and vibration

C-7.02.05 determine servicing procedure such as spoke, rim, bearing, valve and hub replacement or repair

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Sub-task

C-7.03 Diagnoses one piece wheels.

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

Key Competencies

C-7.03.01 perform sensory inspection to determine defects such as worn bearings, cracked, blistered and deformed rims, damaged hub, damaged tire valve, and chipped or cracked paint

C-7.03.02 determine radial and lateral run out, and end play after removing wheel and by using measuring tools and equipment such as dial gauge and truing stand

C-7.03.03 determine causes of failure such as impact, lack of maintenance and stress

C-7.03.04 test drive and evaluate ride for stability and vibration

C-7.03.05 determine servicing procedure such as one piece wheel, bearing and valve replacement or repair

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Sub-task

C-7.04 Diagnoses multi-piece wheels.

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

Key Competencies

C-7.04.01 perform sensory inspection to determine defects such as worn bearings, cracked, blistered and deformed rims, damaged hub, damaged tire valve, and chipped or cracked paint

C-7.04.02 determine radial and lateral run out, and end play after removing wheel and by using measuring tools and equipment such as dial gauge and truing stand

C-7.04.03 verify condition of components such as fasteners, o-rings and seals to determine serviceability

C-7.04.04	interpret diagnostic results to determine causes of failure such as deterioration of o-ring, impact, lack of maintenance and stress
C-7.04.05	test drive and evaluate ride for stability and vibration
C-7.04.06	determine servicing procedure such as rim, bearing, valve, hub and multi-piece wheel components replacement or repair

Task 8 Services wheels and tires.

Context Motorcycle mechanics service wheels and tires to provide proper function of components.

Required Knowledge

K 1	types of tires such as bias ply, bias belted, radial, tube and tubeless
K 2	components such as tire, tube and rim band
K 3	tire materials such as rubber compounds, nylon and aramid
K 4	types of sensors such as pressure and speed sensors
K 5	types and operation of balancing and mounting equipment
K 6	types of gases such as nitrogen and air
K 7	use of pressure gauges and compressors
K 8	manufacturers' service limits and procedures
K 9	manufacturers' recommendations for repairing tires
K 10	types of spoked wheels such as tube and tubeless
K 11	system components such as hubs, rims, rim locks, spokes and spoke nipples
K 12	materials such as aluminum, steel and composites
K 13	structure of spoked wheels
K 14	types of one piece wheels such as cast, forged and units
K 15	components such as bearings, spacers, speedometer drive and cush drive
K 16	multi-piece wheel components such as rim halves, o-rings and valve stems
K 17	stamped steel rims

Sub-task

C-8.01 Services tires.

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

Key Competencies

C-8.01.01	remove and reinstall components such as brakes, and speed and pressure sensors according to manufacturers' specifications
C-8.01.02	remove and replace tires, tube, rim locks, valves and rim band according to manufacturers' procedures
C-8.01.03	repair tires such as plugging and patching according to manufacturers' procedures and recommendations
C-8.01.04	select tire according to manufacturers' specifications such as speed rating, load rating and tire size

Sub-task

C-8.02 Services spoked wheels.

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

Key Competencies

C-8.02.01	remove and reinstall components such as tires, brakes and speed sensors according to manufacturers' specifications to access wheels
C-8.02.02	remove, adjust, and repair or replace components of wheels such as rims, hubs, bearings, spokes to restore tolerance such as lateral, radial run out and offset, according to manufacturers' specifications
C-8.02.03	service components such as bearings and seals according to manufacturers' specifications

Sub-task

C-8.03 Services one piece wheels.

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

Key Competencies

C-8.03.01	remove and reinstall components such as tires, brakes and speed sensors according to manufacturers' specifications to access wheels
C-8.03.02	remove, and repair or replace components of one piece wheels such as bearings, fasteners, valve and sensors to restore tolerance such as lateral and radial run out, and offset, according to manufacturers' specifications
C-8.03.03	service components such as bearings, fasteners and seals according to manufacturers' specifications

Sub-task

C-8.04 Services multi-piece wheels.

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

Key Competencies

C-8.04.01	remove and reinstall components such as tires, brakes and speed sensors, according to manufacturers' specifications, to access wheel
C-8.04.02	remove, and repair or replace components of wheels such as bearings, fasteners, rims, hubs, seals, o-rings, valve and sensors to restore tolerance such as lateral and radial run out, and offset, according to manufacturers' specifications
C-8.04.03	service components such as bearings, fasteners, seals and o-rings, according to manufacturers' specifications
C-8.04.04	perform leakage test following the reassembly of multi-piece wheel to verify rim assembly

Trends	Braking systems have seen design improvements and advances in technology. There are more efficient friction materials and linked braking systems. ABS is becoming more common in units along with the use of traction control. Anti-dive systems are becoming less common.
Related Components (including, but not limited to)	**Hydraulic:** discs, drums, master cylinder, slave cylinder, brake line, fittings, fluids, proportioning valve, splitter, shoes and pads, pressure switches, springs, seals, torque arm. **Mechanical:** discs, drums, shoes and pads, cables and adjusters, levers, cams, spindles, torque arm, backing plate, wheel cylinder, pivot pins, switches, springs, linkages. **Control systems:** anti-dive, ABS, electronic control unit (ECU), sensors, relays, proportioning valve, switches, brake line.
Tools and Equipment	See Appendix A.

Task 9 Diagnoses braking systems.

Context Motorcycle mechanics diagnose braking systems to ensure proper function of braking components.

Required Knowledge

K 1	mechanical and hydraulic system principles of operation
K 2	types of mechanical and hydraulic braking systems
K 3	components such as master cylinder, brake line, caliper (slave cylinder), brake pads, cables, pivots, springs and fluids
K 4	materials such as carbon, ceramics, aramid, metal sinter and organic compounds
K 5	types of brake fluids
K 6	handling procedures with hazardous chemicals and materials
K 7	jurisdictional regulations for disposal of hazardous chemicals and materials
K 8	manufacturers' service limits and procedures
K 9	diagnostic procedures

K 10	types of braking control systems such as ABS, integrated, linked and anti-dive
K 11	components such as sensors, proportioning valves and pumps

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Sub-task

D-9.01 Diagnoses hydraulic braking systems.

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

Key Competencies

D-9.01.01	perform sensory inspection such as feeling the calipers, listening for dragging and squealing, smelling for pad over heating, and visually inspecting brake pads and fluid quality, and leakage
D-9.01.02	perform checks and measurements such as run-out, thickness and diameter using measuring tools such as a dial and feeler gauges, and calipers
D-9.01.03	inspect levers, pivots and cables to ensure freedom of movement
D-9.01.04	interpret diagnostic results to determine causes of failure such as contaminants, use and inactivity
D-9.01.05	determine servicing procedure such as replacement, repair or maintenance of braking system components

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Sub-task

D-9.02 Diagnoses mechanical braking systems.

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

Key Competencies

D-9.02.01	perform sensory inspection such as feeling the calipers, listening for dragging and squealing, smelling for pad over heating, and visually inspecting brake pads, cables, linkages, pivots, drums and shoes
D-9.02.02	perform checks and measurements such as run out, thickness and diameter, and free play using measuring tools such as a dial and feeler gauges, and calipers

D-9.02.03	interpret diagnostic results to determine causes of failure such as contaminants, use and inactivity
D-9.02.04	determine servicing procedure such as replacement, repair or maintenance of braking system components

Sub-task

D-9.03 Diagnoses braking control systems.

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

Key Competencies

D-9.03.01	perform sensory inspection such as feeling the calipers, listening for dragging and squealing, smelling for pad over heating, and visually inspecting brake pads
D-9.03.02	perform checks and measurements such as leakage check, air gap check and system function check
D-9.03.03	interpret diagnostic results to determine causes of mechanical failure such as contamination and corrosion by performing functional checks of braking control system such as linked, ABS and ECUs, and components such as sensors, pumps and valves
D-9.03.04	determine servicing procedure such as replacement, repair or maintenance of braking control systems components

Task 10 Services braking systems.

Context Motorcycle mechanics service braking systems to restore proper function of braking components

Required Knowledge

K 1	handling procedures with hazardous chemicals and materials
K 2	jurisdictional regulations for disposal of hazardous chemicals and materials
K 3	mechanical and hydraulic system principles operation
K 4	mechanical and hydraulic braking system such as disc and drum
K 5	components such as master cylinder, brake line, caliper (slave cylinder) and brake pads

K 6	types of brake fluids
K 7	materials such as carbon, ceramics, aramid, metal sinter and organic compounds
K 8	system operation
K 9	manufacturers' service limits and procedures
K 10	components such as levers, cables, linkages, pivots and springs
K 11	types of braking control systems such as ABS, integrated, linked and anti-dive
K 12	components such as sensors, proportioning valves and pumps

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Sub-task

D-10.01 Services hydraulic braking systems.

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

Key Competencies

D-10.01.01	remove and replace components such as friction materials, rotors, drums and springs according to manufacturers' specifications
D-10.01.02	repair, recondition or replace components such as master and slave cylinder and drums using tools and equipments such as hones, bore gauges and vernier calipers
D-10.01.03	set tolerances to manufacturers' specifications by replacing worn parts such as discs, drums and brake calipers
D-10.01.04	change and bleed hydraulic braking system fluids to eliminate contaminants and air from the system by using tools and equipment such as check valve and vacuum pump

Sub-task

D-10.02 Services mechanical braking systems.

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

Key Competencies

D-10.02.01	remove and replace components such as friction materials, rotors, drums, cables, rods, levers, switches and springs according to manufacturers' specifications
D-10.02.02	replace or repair, and adjust and lubricate components such as cables, cams, seals and rods using tools and equipments such as dial gauges and vernier calipers
D-10.02.03	set tolerances to manufacturers' specifications by replacing worn parts such as shoes, discs and drums

Sub-task

D-10.03 Services braking control systems.

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

Key Competencies

D-10.03.01	remove and replace components such as pumps and valves
D-10.03.02	repair and re-install components such as hose fittings, brake lines and banjo bolts

Trends	There is a trend towards increased fuel efficiency and lower exhaust and noise emissions. There is also a trend towards replacing rather than reconditioning engine components due to lower manufacturing costs and rising reconditioning costs.
Related Components (including, but not limited to)	Cylinder head, valve train, cylinders, piston, crankshaft assembly, counterbalance assembly, engine case, lubrication system, cooling system.
Tools and Equipment	See Appendix A.

Task 11 Diagnoses two-stroke and four-stroke engines.

Context Motorcycle mechanics diagnose problems in two-stroke and four-stroke engines. Four-stroke engines are the most common as they are often quieter, more fuel efficient and more durable. Two-stroke engines are simpler in design and more commonly used in scooters and off road units. They also require a fuel oil mixture and tend to have higher emissions.

Required Knowledge

K 1	types of cylinder heads such as air or liquid cooled, and single or multi-valve
K 2	cylinder head components such as valves, guides, decompressor and seals
K 3	cylinder head operation
K 4	manufacturers' service limits and procedures
K 5	diagnostic procedures
K 6	types of four-stroke valve trains such as single and dual overhead cam and push rod
K 7	four-stroke valve train components such as valves, gears, cams, rockers, chains and belts
K 8	four-stroke valve train operation
K 9	piston components such as wrist pins, circlips and rings
K 10	types of cylinder materials such as cast iron and plated
K 11	types of pistons such as cast and forged

K 12	cylinder and piston operation
K 13	types of crankshaft assemblies such as roller, plain bearing, single and multi-cylinder, forged and pressed
K 14	crankshaft assembly components such as connecting rods, labyrinth seals, flywheels, thrust washers and wrist pin bearings
K 15	crankshaft operation
K 16	types of counterbalance assemblies such as gear or chain driven, and single or multi-counterweights
K 17	counterbalance assembly components such as gears, chains and bearings
K 18	counterbalance operation
K 19	types of engine cases such as single or multi-cylinder and vertical or horizontal split
K 20	engine case components such as bearing bosses, covers, case seals and fasteners
K 21	engine case function
K 22	types of lubrication systems such as pre-mix, intake injection and positive bearing injection, wet sump and dry sump
K 23	lubrication system components such as pumps, oil tanks, filters, oil coolers and lines
K 24	lubrication system operation
K 25	types of cooling systems such as air and liquid-cooled (oil, coolant)
K 26	cooling system components such as pumps, lines, radiators, cooling fins and thermostats
K 27	cooling system operation
K 28	types of two-stroke valve systems such as reed valve, rotary valve and piston port
K 29	two-stroke valve system components such as reeds, rotary valves and power valve actuators
K 30	two-stroke valve system operation

Sub-task

E-11.01 Diagnoses cylinder heads.

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

Key Competencies

E-11.01.01	inspect cylinder head by performing sensory checks such as listening for abnormal noises, feeling for vibrations and observing for wear and damage
E-11.01.02	evaluate two-stroke components, according to manufacturers' specifications, for conditions such as cracking, warpage, leaks, carbon build-up, broken fasteners and failed gaskets using measuring tools such as surface plates, dyes and pressure gauges
E-11.01.03	evaluate four-stroke components, according to manufacturers' specifications, for conditions such as spring pressure, warpage, valve guide and seat wear, and valve sealing using measuring tools such as surface plates, dyes, and pressure and bore gauges
E-11.01.04	interpret diagnostic results to determine causes of abnormal wear or failure of cylinder head such as insufficient lubrication and overheating
E-11.01.05	determine servicing procedure such as resurfacing or replacement

Sub-task

E-11.02 Diagnoses valve systems on two-stroke engine.

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

Key Competencies

E-11.02.01	inspect valve system by performing sensory checks such as listening for abnormal noises, feeling for vibrations and observing for wear and damage
E-11.02.02	disassemble valve system checking for conditions such as wear or breakage of a reed valve or sticking power valve
E-11.02.03	interpret diagnostic results to determine causes of abnormal wear or failure of the valve such as excessive lubricant, insufficient lubricant and over-rev
E-11.02.04	determine servicing procedure such as cleaning or replacement

Sub-task

E-11.03 Diagnoses valve train on four-stroke engine.

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

Key Competencies

E-11.03.01	inspect valve train by performing sensory checks such as listening for abnormal noises, feeling for vibrations and observing for wear and damage
E-11.03.02	check valve train to confirm function such as correct timing, valve lash and cam lobe wear
E-11.03.03	disassemble valve train checking for conditions such as wear or failure of tensioners, valve stems and lifters
E-11.03.04	interpret diagnostic results to determine causes of abnormal wear or failure of valve train such as insufficient lubricant, overheating and over-rev
E-11.03.05	determine servicing procedure such as tensioner or chain replacement

Sub-task

E-11.04 Diagnoses cylinders and pistons.

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

Key Competencies

E-11.04.01	inspect cylinder by performing sensory checks such as looking for excessive smoke from exhaust, listening for abnormal noises, feeling for vibrations and observing for excessive wear and lack of power
E-11.04.02	check piston, piston rings and cylinder using tools such as compression and leak down gauges to verify integrity of the seal
E-11.04.03	disassemble cylinder and piston to measure for piston and cylinder wall clearance and conditions such as ring wear, piston cracking and detonation
E-11.04.04	interpret diagnostic results to determine causes of abnormal wear or failure of piston, cylinder or rings such as insufficient air filtration, insufficient lubricant and overheating
E-11.04.05	determine servicing procedure such as reboring, replating or replacement

Sub-task

E-11.05 Diagnoses crankshaft assembly.

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

Key Competencies

E-11.05.01	inspect crankshaft assembly by performing sensory checks such as, listening for abnormal noises, feeling for vibrations and observing for lack of power
E-11.05.02	check crankshaft assembly using tools such as dial indicators and stethoscopes for conditions such as run-out, twisting or out-of-phase
E-11.05.03	remove crankshaft to check for conditions such as bearing wear, run-out, twisting and out-of-phase using tools such as v-blocks, micrometers, plastigage and dial indicators
E-11.05.04	interpret diagnostic results to determine causes of abnormal wear or failure of crankshaft such as insufficient lubricant, overheating and detonation
E-11.05.05	determine servicing procedure such as re-build or replacement

Sub-task

E-11.06 Diagnoses counterbalance assemblies.

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

Key Competencies

E-11.06.01	inspect counterbalance assemblies by performing sensory checks such as listening for abnormal noises and feeling for vibrations
E-11.06.02	check counterbalance assemblies using tools such as dial indicators and stethoscopes for conditions such as run-out, out-of-time and excessive bearing clearance
E-11.06.03	remove counterbalance assemblies checking for conditions such as bearing wear and run-out using tools such as v-blocks, micrometers, plastigages and dial indicators
E-11.06.04	interpret diagnostic results to determine causes of abnormal wear or failure of counterbalance assemblies such as insufficient lubricant, chain wear and chain tension
E-11.06.05	determine servicing procedure such as balancer re-timing or replacement

Sub-task

E-11.07 Diagnoses engine cases

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

Key Competencies

E-11.07.01	inspect engine cases by performing sensory checks such as listening for abnormal noises, feeling for vibrations and observing any unusual conditions such as oil leaks, cracks and loose hardware
E-11.07.02	check engine cases using tools such as micrometers, pressure gauges and dye to inspect for conditions such as warping, cracking and structural integrity, and excessive bearing clearance
E-11.07.03	perform pressure and vacuum testing on two-stroke engine cases to check crankcase seal integrity using tools such as pressure and vacuum gauges, and sealing plugs
E-11.07.04	interpret diagnostic results to determine causes of failure of engine cases such as insufficient lubricant, overheating and incorrect hardware torque
E-11.07.05	determine servicing procedure such as thread replacement, welding or engine case replacement

Sub-task

E-11.08 Diagnoses lubrication system.

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

Key Competencies

E-11.08.01	inspect lubrication system by performing sensory checks such as listening for abnormal noises, feeling for vibrations and observing any unusual conditions such as oil leaks and incorrect oil type
E-11.08.02	check lubrication system using an oil pressure gauge for conditions such as low, high or no oil pressure
E-11.08.03	visually check integrity of delivery pipes and jets for adequate flow
E-11.08.04	check adjustment of two-stroke oil pump using tools such as feeler gauges, micrometers and measuring containers
E-11.08.05	check oil pump for wear or failure using tools such as micrometers and feeler gauges

E-11.08.06	visually check pump drive for wear or failure such as broken chain, gear or shaft
E-11.08.07	interpret diagnostic results to determine causes of failure such as incorrect oil type, lack of oil and contamination
E-11.08.08	determine servicing procedure such as replacement

Sub-task

E-11.09 Diagnoses cooling system.

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

Key Competencies

E-11.09.01	inspect cooling system by performing sensory checks such as, listening for noises, feeling for excessive or lack of heat, and observing any unusual conditions such as fan not running or coolant leaking
E-11.09.02	check cooling system using tools such as cooling system pressure gauges, infrared thermometer and refractometer for conditions such as improper glycol mix, leaks, damaged radiator or cylinder cooling fins
E-11.09.03	interpret diagnostic results to determine causes of failure of cooling function such as insufficient airflow, incorrect glycol mix, lack of fan movement or failed thermostat
E-11.09.04	determine servicing procedure such as pump or thermostat replacement, coolant service or radiator cleaning

Task 12 Services two-stroke and four-stroke engines.

Context Motorcycle mechanics service components in two-stroke and four-stroke engines. Two-stroke engines have less moving parts and therefore are often less expensive to maintain.

Required Knowledge

K 1	cylinder head components such as valves, guides, decompressor and seals
K 2	cylinder head operation
K 3	manufacturers' service limits and servicing procedures

K 4	types of four-stroke valve trains such as single and dual overhead cam and push rod
K 5	four-stroke valve train components such as valves, gears, cams, rockers, chains and belts
K 6	four-stroke valve train operation
K 7	piston components such as wrist pins, circlips and rings and their orientation
K 8	types of cylinder materials such as cast iron and plated
K 9	cylinder and piston operation
K 10	crankshaft assembly components such as connecting rods, labyrinth seals, flywheels, thrust washers and wrist pin bearings
K 11	crankshaft operation
K 12	counterbalance assembly components such as gears, chains and bearings
K 13	counterbalance operation
K 14	engine case components such as bearing bosses, covers, case seals and fasteners
K 15	engine case function
K 16	lubrication system components such as pumps, oil tanks, filters, oil coolers and lines
K 17	lubrication system operation
K 18	cooling system components such as pumps, lines, seals, radiators, cooling fins and thermostats
K 19	cooling system operation
K 20	two-stroke valve system components such as reeds, rotary valves and power valve actuators
K 21	two-stroke valve system operation

Sub-task

E-12.01 Services cylinder heads.

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

Key Competencies

E-12.01.01	verify mating surface returned from machining using tools and equipment such as surface plate and straight edge
E-12.01.02	recondition components such as valves seats and guides using tools and equipment such as seat cutters, guide reamers and hydraulic presses

E-12.01.03	perform decarbonization using equipment such as ultrasonic and glass bead cleaners
E-12.01.04	set tolerances according to manufacturers' specifications
E-12.01.05	re-fit or replace cylinder head using tools such as torque wrenches and hand tools

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Sub-task

E-12.02 Services valve systems on two-stroke engine.

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

Key Competencies

E-12.02.01	clean valve assembly using equipment such as ultrasonic and glass bead cleaners
E-12.02.02	replace damaged or worn parts using tools such as pullers and hand tools
E-12.02.03	set tolerances according to manufacturers' specifications

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Sub-task

E-12.03 Services valve train on four-stroke engine.

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

Key Competencies

E-12.03.01	clean valve train components using equipment such as ultrasonic and glass bead cleaners
E-12.03.02	recondition components such as rocker arms and valves using tools such as valve grinders or lapping compounds
E-12.03.03	replace valve train components using tools such as spring compressors and torque wrenches
E-12.03.04	set tolerances according to manufacturers' specifications

Sub-task

E-12.04 Services cylinders and pistons.

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

Key Competencies

E-12.04.01	recondition cylinder components using procedures such as honing and chamfering using tools and equipment such as hones and grinding equipment
E-12.04.02	replace and confirm fit of piston, cylinder or rings using tools such as ring compressors, bore gauges and feeler gauges
E-12.04.03	set tolerances according to manufacturers' specifications

Sub-task

E-12.05 Services crankshaft assembly.

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

Key Competencies

E-12.05.01	check reconditioned or replacement crankshaft assembly for defects
E-12.05.02	re-build multi-piece crankshaft
E-12.05.03	replace crankshaft assembly using tools such as pullers, bore gauges, feeler gauges and plastigages
E-12.05.04	set tolerances according to manufacturers' specifications

Sub-task

E-12.06 Services counterbalance assemblies.

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

Key Competencies

E-12.06.01 replace counterbalance shaft and/or bearing using tools such as pullers, bore gauges, feeler gauges and plastigage

E-12.06.02 set tolerances and timing according to manufacturers' specifications

Sub-task

E-12.07 Services engine cases.

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

Key Competencies

E-12.07.01 recondition engine cases using procedures such as refinishing mating surfaces and repairing threads, and using tools such as scrapers, taps and dies, and thread inserts

E-12.07.02 replace engine cases using tools such as pullers and drivers

E-12.07.03 torque hardware such as bolts and plates to manufacturers' procedures and specifications

Sub-task

E-12.08 Services lubrication system.

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

Key Competencies

E-12.08.01	recondition and clean components such as check valves, pipes, jets and oil galleries
E-12.08.02	replace components such as pumps, gears, rotors, bearings and chains using tools such as pullers and torque wrenches
E-12.08.03	set tolerances within manufacturers' specifications

Sub-task

E-12.09 Services cooling system.

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

Key Competencies

E-12.09.01	mix coolant according to manufacturers' specifications
E-12.09.02	flush and refill cooling system using tools and equipment such as coolant recovery systems, funnels and hoses
E-12.09.03	remove airflow obstructions using methods such as cleaning and combing
E-12.09.04	replace components such as radiators, fans or water pumps using tools and equipment such as pullers and drivers
E-12.09.05	recondition components such as damaged fins and crushed ducts

Trends	Improvements in technology and materials have led to an increase in the popularity of automatic transmissions, electronic shifting, electric propulsion systems and fluid drive systems that are being driven by new materials that make power transfer systems lighter, more compact and more suitable for units.
Related Components (including, but not limited to)	Engine sprockets, clutch bearings, clutch plates, clutch baskets, clutch springs, clutch release mechanism, ring gear, chain, chain tensioner, pulleys, sprockets, main shaft, driven/output shaft, pinion gears, wheel gears, shift drum, shift forks, gear shift linkage, seals, bearings, ECU, sheave assemblies (primary and secondary), helix gear, rollers, shims, springs, valve body, torque converter, belts (cog and V), middle drive gears, middle driven gears, drive shaft, universal joint, gear housing, drive plate, drive coupling, driven plates, clutch hub.
Tools and Equipment	See Appendix A.

Task 13 Diagnoses clutches and primary drive.

Context Motorcycle mechanics diagnose clutches and primary drives to determine irregularities in the transfer of power from the engine crankshaft to the transmission or final drive.

Required Knowledge

K 1	primary drive system operation
K 2	types of primary drive systems such as gears, chains, belt and torque converters
K 3	components of primary drive systems such as drive gear, driven gear, chains, tensioners, sliders, drive belts, sprockets, sheaves, pumps and valves
K 4	manufacturers' service limits and procedures
K 5	diagnostic procedures
K 6	types of clutch systems such as manual and automatic
K 7	types of manual clutches such as wet and dry

K 8	types of clutch components such as springs, weights, ramps, pumps, rollers and fibre and metal plates
K 9	types of release mechanisms such as hydraulic, ramp and cable lever
K 10	manual clutch operation
K 11	types of automatic clutches such as centrifugal, fluid and movable sheave
K 12	automatic clutch components such as shoes, drums and springs
K 13	automatic clutch operation
K 14	components of kick start systems such as kick shaft, ratcheting gear and spring
K 15	kick start operation

Sub-task

F-13.01 Diagnoses primary drive gears.

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

Key Competencies

F-13.01.01	perform sensory inspections by listening for unusual noises, feeling for vibrations and looking for contamination in oil
F-13.01.02	inspect gear components to evaluate the conditions of the primary drive gears for cracks, pits and burrs by using tools and equipment such as bore scopes, dial gauges and magnets
F-13.01.03	interpret diagnostic results to identify causes of failure such as inadequate lubrication, excessive play and contributory damage from related component failure
F-13.01.04	determine servicing procedure such as gears and related components replacement

Sub-task

F-13.02 Diagnoses primary drive chains and sprockets.

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

Key Competencies

F-13.02.01	perform sensory inspections by listening for unusual noises, feeling for vibrations and looking for contamination in oil
F-13.02.02	evaluate component conditions such as sprocket wear, chain wear and tensioner defects by checking measurements according to manufacturers' specifications
F-13.02.03	interpret diagnostic results to identify causes of failure such as lack of lubrication, improper tension and lack of maintenance
F-13.02.04	determine servicing procedure such as lubrication, adjustments, and chain, sprocket and tensioner component replacement

Sub-task

F-13.03 Diagnoses primary drive belts and pulleys.

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

Key Competencies

F-13.03.01	perform sensory inspections by listening for unusual noises, feeling for vibrations and looking for damaged belts and pulleys and oil contamination
F-13.03.02	evaluate component conditions such as belt separation and cracking, and worn pulleys by checking measurements according to manufacturers' specifications
F-13.03.03	interpret diagnostic results to identify causes of failure such as improper tension, lack of maintenance, overheating and contributory damage from related component failure
F-13.03.04	determine servicing procedure such as adjustments, maintenance, and belt and pulley replacement

Sub-task

F-13.04 Diagnoses manual clutches.

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

Key Competencies

F-13.04.01	perform sensory inspections by listening for unusual noises, feeling for vibrations, looking for oil contamination and smelling for burnt components
F-13.04.02	assess test drive results for improper clutching operation such as slippage, grabbing and shuddering
F-13.04.03	evaluate component conditions such as breakage and wear by disassembling clutch systems
F-13.04.04	perform checks and measurements such as plate thickness and warpage using tools and equipment such as gauges, surface plates and calipers, according to manufacturers' specifications
F-13.04.05	interpret diagnostic results to determine causes of failure such as clutch maladjustments, lack of maintenance and contributory damage from related component failure
F-13.04.06	determine servicing procedure such as adjustments, maintenance, and replacement of worn and damaged components

Sub-task

F-13.05 Diagnoses automatic clutches.

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

Key Competencies

F-13.05.01	perform sensory inspections by listening for unusual noises, feeling for vibrations, looking for oil contamination and smelling for burnt components
F-13.05.02	assess test drive results for improper clutching operation such as slippage, grabbing and shuddering
F-13.05.03	evaluate component conditions such as broken and worn clutches, pumps and sheaves by disassembling clutch systems
F-13.05.04	perform checks and measurements such as shoe thickness, drum wear and run out using measuring tools and equipment such as dial indicators, pressure gauges and calipers, according to manufacturers' specifications

F-13.05.05	interpret diagnostic results to determine causes of failure such as clutch maladjustments, lack of maintenance and contributory damage from related component failure
F-13.05.06	determine servicing procedure such as adjustments, maintenance, and replacement of worn and damaged components

Sub-task

F-13.06 Diagnoses kick start.

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

Key Competencies

F-13.06.01	visually inspect external kick start components such as shafts, levers and fasteners for abnormalities
F-13.06.02	perform function test on kick start systems for abnormal operations such as binding, slipping and locking
F-13.06.03	check damage or wear to kick start components such as shaft, bushings, gears and decompression components by measuring with tools and equipment such as dial and bore gauges, and calipers
F-13.06.04	interpret diagnostic results to determine causes of failure such as corrosion, wear and inactivity
F-13.06.05	determine servicing procedure such as maintenance, and replacement of worn and damaged components

Task 14 Services clutches and primary drives.

Context Motorcycle mechanics service clutches and primary drives to ensure an efficient and proper transfer of power from the engine crankshaft to the transmission or final drive.

Required Knowledge

K 1	primary drive system operation
K 2	types of primary drive systems such as gears, chains, belts and torque converters

K 3	components of primary drive systems such as drive gears, driven gears, chains, tensioners, sliders, drive belts, sprockets, sheaves, pumps and valves
K 4	manufacturers' service limits and procedures
K 5	diagnostic procedures
K 6	types of clutch systems such as manual and automatic
K 7	types of manual clutches such as wet and dry
K 8	types of clutch components such as springs, weights, ramps, pumps, rollers, and fibre and metal plates
K 9	types of release mechanisms such as hydraulic, ramp and cable lever
K 10	manual clutch operation
K 11	types of automatic clutches such as centrifugal, fluid and movable sheave
K 12	automatic clutch components such as shoes, drums and springs
K 13	automatic clutch operation
K 14	components of kick start systems such as kick shafts, ratcheting gears and springs
K 15	kick start operation

Sub-task

F-14.01 Services primary drive gears.

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

Key Competencies

F-14.01.01	access primary drive gears by removing covers and panels
F-14.01.02	remove and replace components such as drive and driven gears according to manufacturers' specifications

Sub-task

F-14.02 Services primary drive chains and sprockets.

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

Key Competencies

F-14.02.01	access components by removing covers and shields
F-14.02.02	lubricate and adjust chains and sprockets according to manufacturers' specifications
F-14.02.03	remove, and repair or replace components such as chains, tensioners and sprockets according to manufacturers' specifications
F-14.02.04	remove, and repair or replace damaged related components such as o-rings, gaskets and bearings

Sub-task

F-14.03 Services primary drive belts and pulleys.

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

Key Competencies

F-14.03.01	access components by removing covers and shields
F-14.03.02	maintain components according to manufacturers' specifications by setting tolerances
F-14.03.03	Disassemble, and repair or replace components such as ramps, rollers, pulleys and belts
F-14.03.04	adjust alignment of pulleys and belts according to manufacturers' specifications

Sub-task

F-14.04 Services manual clutches.

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

Key Competencies

F-14.04.01	access components by removing covers and shields
F-14.04.02	remove, measure, and reinstall or replace components such as plates, springs and clutch baskets
F-14.04.03	adjust components such as cables, ramps and pistons
F-14.04.04	replace hydraulic fluids and lubricate cables and ramps according to manufacturers' specifications
F-14.04.05	clean system components such as filters, screens, actuators and passages of debris

Sub-task

F-14.05 Services automatic clutches.

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

Key Competencies

F-14.05.01	access components by removing covers and shields
F-14.05.02	remove, measure, and replace or reinstall components such as shoes, drums, sheaves and belts
F-14.05.03	adjust clutch system components such as spacers and weights
F-14.05.04	replace fluids, clean pivots and ramps, and replace filters according to manufacturers' specifications

Sub-task

F-14.06 Services kick start.

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

Key Competencies

F-14.06.01	access components by removing covers and shields
F-14.06.02	remove, measure, and replace or reinstall components such as ratcheting mechanism, shafts, springs, bushings and gears
F-14.06.03	clean, lubricate and adjust shafts, levers, detents and decompression system components according to manufacturers' specifications

Task 15 Diagnoses transmissions.

Context Motorcycle mechanics need to be familiar with the operation of constant mesh, variable ratio belt and automatic transmissions to determine course of repair.

Required Knowledge

K 1	constant mesh transmission components such as shifter mechanisms, gears and shafts
K 2	operation of constant mesh transmissions
K 3	diagnostic procedures
K 4	variable ratio belt transmission components such as v-belt, springs, rollers and sheaves
K 5	variable ratio belt transmission operation
K 6	manufacturers' service limits and procedures
K 7	types of automatic transmissions such as fluid drive and torque converter
K 8	automatic transmission components such as drive pump, driven motor and pistons
K 9	types of fluids used
K 10	operation of automatic transmissions

Sub-task

F-15.01 Diagnoses constant mesh transmissions.

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

Key Competencies

F-15.01.01	perform sensory inspections by listening for unusual noises, feeling for vibrations and looking for leaks
F-15.01.02	access transmission by disassembling components to evaluate their condition such as broken gears, worn bearings, damaged shift forks and drum
F-15.01.03	perform measurements such as shaft end play, gear shimming and fork clearance
F-15.01.04	interpret diagnostic results to determine cause of failure
F-15.01.05	determine servicing procedures such as repairing or replacing components

Sub-task

F-15.02 Diagnoses variable ratio belt transmissions.

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

Key Competencies

F-15.02.01	perform sensory inspections by listening for unusual noises, feeling for vibrations and smelling for burnt rubber
F-15.02.02	access variable ratio belt transmission by disassembling components to evaluate their condition such as worn or binding sheaves and worn belts
F-15.02.03	perform measurements such as belt width and spring free length
F-15.02.04	interpret diagnostic results to determine causes of failure such as lack of maintenance, improper use and fluid leak
F-15.02.05	determine servicing procedures such as repair or replacement of components

Sub-task

F-15.03 Diagnoses automatic transmissions.

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

Key Competencies

F-15.03.01	perform sensory inspections by listening for unusual noises, feeling for vibrations and slipping, smelling for burnt oil and looking for leaks
F-15.03.02	access automatic transmission by disassembling components to evaluate conditions such as burnt plates, pump wear and fluid deterioration
F-15.03.03	perform measurements such as oil pressure and flow, and clutch free-play
F-15.03.04	interpret diagnostic results to determine causes of failure such as broken or worn o-rings, improper use, lack of maintenance and fluid contamination
F-15.03.05	determine servicing procedures such as repair or replacement of components

Task 16 Services transmissions.

Context Motorcycle mechanics replace and service components of constant mesh, variable ratio belt and automatic transmissions.

Required Knowledge

K 1	constant mesh transmission components such as shifter mechanism, gears and shafts
K 2	operation of constant mesh transmissions
K 3	manufacturers' service limits and procedures
K 4	variable ratio belt transmission components such as v-belts, springs, rollers and sheaves
K 5	variable ratio belt transmission operation
K 6	automatic transmission components such as shafts, pumps and fluids

Sub-task

F-16.01 Services constant mesh transmissions.

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

Key Competencies

F-16.01.01	replace damaged components such as circlips, shafts, gears, seals, bearings and shift forks
F-16.01.02	shim shaft to correct gear misalignment
F-16.01.03	reassemble transmission according to manufacturers' specifications

Sub-task

F-16.02 Services variable ratio belt transmissions.

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

Key Competencies

F-16.02.01	replace components such as bushings, springs, sheaves, helix and weight arms
F-16.02.02	deglaze sheave faces
F-16.02.03	perform adjustments such as clutch alignment, clutch calibration and belt deflection
F-16.02.04	reassemble variable ratio belt transmission according to manufacturers' specifications

Sub-task

F-16.03 Services automatic transmissions.

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

Key Competencies

F-16.03.01	replace components such as pump, filters, plates and fluids
F-16.03.02	perform adjustments such as clutch end play and fluid levels
F-16.03.03	reassemble automatic transmissions according to manufacturers' specifications

Task 17 Diagnoses final drive.

Context Final drive encompasses shaft, chain and belt systems. Motorcycle mechanics are required to understand the differences and functions of these systems in order to correctly diagnose problems.

Required Knowledge

K 1	types of roller chains with or without seals
K 2	operation of final drive chains and sprockets
K 3	final drive ratio
K 4	manufacturers' service limits and procedures
K 5	diagnostic procedures
K 6	final drive shaft and gear components such as universal joints, bearings and seals
K 7	operation of final drive shaft and gears
K 8	components such as belts and pulleys
K 9	operation of final drive belts and pulleys
K 10	types of final drive fluids

Sub-task

F-17.01 Diagnoses final drive chains and sprockets.

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

Key Competencies

F-17.01.01	inspect chain and sprockets by performing sensory checks such as listening for abnormal noises, feeling for vibrations and observing for wear or damage
F-17.01.02	evaluate drive components, according to manufacturers' specifications, for conditions such as cracking, wear, stretching, loose or broken fasteners and using tools such as calipers and measuring tapes
F-17.01.03	interpret diagnostic results to determine causes of abnormal wear or failure such as insufficient lubrication, overtightening or lack of maintenance of final drive chains and sprockets
F-17.01.04	determine servicing procedure such as adjustment or replacement of components

Sub-task

F-17.02 Diagnoses final drive shaft and gears.

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

Key Competencies

F-17.02.01	inspect drive shaft and gears by performing sensory checks such as listening for abnormal noises, feeling for vibrations and observing for fluid leaks or damage
F-17.02.02	inspect fluid for contaminants such as metal filings, water or abnormal colour and smell
F-17.02.03	evaluate shaft and gear components, according to manufacturers' specifications, for conditions such as cracking, wear and gear pitting using tools such as micrometers, dial gauges and calipers
F-17.02.04	interpret diagnostic results to determine causes of abnormal wear or failure such as insufficient or incorrect lubricant, seal failure or incorrect backlash
F-17.02.05	determine servicing procedure such as adjustment of backlash or replacement of gears and joints

Sub-task

F-17.03 Diagnoses final drive belts and pulleys.

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

Key Competencies

F-17.03.01	inspect drive belts and pulleys by performing sensory checks such as listening for abnormal noises, feeling for vibrations and observing for wear or damage
F-17.03.02	evaluate drive belt components, according to manufacturers' specifications, for conditions such as cracking, wear, stretching, loose or broken fasteners and using tools such as belt deflection gauges and calipers
F-17.03.03	interpret diagnostic results to determine causes of abnormal wear or failure such as overtightening, debris damage, or lack of maintenance of drive belts and pulleys
F-17.03.04	determine servicing procedure such as adjustment or replacement of components

Task 18 Services final drive.

Context Motorcycle mechanics are required to replace chains, belts and sprockets on a regular basis as it is a common service.

Required Knowledge

K 1	types of roller chains with or without seals
K 2	operation of final drive chains and sprockets
K 3	final drive ratio
K 4	manufacturers' service limits and procedures
K 5	servicing procedures
K 6	final drive shaft and gear components such as universal joints, bearings and seals
K 7	operation of final drive shaft and gears
K 8	components such as belts and pulleys
K 9	operation of final drive belts and pulleys

K 10	types of final drive fluids
K 11	procedure for removal of rear swing arm systems, and when required

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Sub-task

F-18.01 Services final drive chains and sprockets.

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

Key Competencies

F-18.01.01	adjust chain according to manufacturers' tolerance using tools such as vernier calipers and tape measures
F-18.01.02	remove chain using tools such as grinders and chain breaking tools
F-18.01.03	re-install chain using tools such as riveting tools and pliers
F-18.01.04	remove and re-install sprockets using tools such as circlip pliers and torque wrenches
F-18.01.05	align chain and wheel according to manufacturers' specifications using wheel alignment tools

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Sub-task

F-18.02 Services final drive shaft and gears.

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

Key Competencies

F-18.02.01	remove and replace shaft drive fluid using tools such as funnels and measuring containers
F-18.02.02	remove and replace shafts, joints, bearings and seals using tools such as drivers, seal pullers and punches
F-18.02.03	replace and adjust gears to manufacturers' specifications such as backlash or preload using tools such as measuring tools, pullers, and bearing and seal drivers

Sub-task

F-18.03 Services belts and pulleys.

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

Key Competencies

F-18.03.01	adjust belt according to manufacturers' tolerance using tools such as vernier caliper and belt deflection gauges
F-18.03.02	remove and re-install belt using hand tools
F-18.03.03	remove and re-install pulleys using tools such as circlip pliers and torque wrenches
F-18.03.04	align belt and wheel according to manufacturers' specifications using wheel alignment tools

Trends	There is an increase in the complexity of electronic components and their functions in units. There is an increase in the use of integrated anti-theft systems and GPS.
Related Components (including, but not limited to)	Battery, wiring harness, alternator assembly, rectifier/regulator, solenoid, ECU, starter motor, ignition coils, transistor controlled ignition unit (TCI), capacitor discharge ignition unit (CDI), meter assembly, cruise control unit, generator coils, switches, sensors, lights, horns, pickup coils, pulser assembly, fuse box assembly, audio system, GPS, relays, cooling fan, thermal breaker, signal systems, circuit breaker, breaker points, condenser, system interlocks.
Tools and Equipment	See Appendix A.

Task 19 Diagnoses electrical systems.

Context Motorcycle mechanics are required to have advanced knowledge of electrical systems to efficiently diagnose a variety of electrical problems.

Required Knowledge

K 1	types of batteries such as absorbed glass mat (AGM), lead acid and gel cell
K 2	types of charging systems such as alternator and generator
K 3	components of charging systems such as rotors, stators and regulator/rectifiers
K 4	charging system operation
K 5	manufacturers' service limits and procedures
K 6	types of ignition systems such as digital and capacitor discharge ignition (CDI)
K 7	ignition system components such as source, pulse and ignition coils, and CDI units
K 8	ignition system operation
K 9	diagnostic procedures
K 10	starting system components such as solenoids and starter drives/clutches
K 11	starting system operation

K 12	ancillary components such as lights, horns and signal systems
K 13	accessory components such as audio system, cruise control and security systems
K 14	operation of ancillary and accessory components
K 15	manufacturers' specifications such as operating voltage and resistance
K 16	safe handling and disposal of batteries

Sub-task

G-19.01 Diagnoses battery and charging system.

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

Key Competencies

G-19.01.01	inspect battery and charging systems by performing sensory checks such as listening for abnormal noises, smelling for abnormal odours and observing lights
G-19.01.02	access charging system components to evaluate their condition such as melted connectors, burnt windings and battery plate sulphation
G-19.01.03	perform measurements such as resistance, load testing and voltage output using measuring tools such as multimeters and load testers
G-19.01.04	interpret diagnostic results to determine causes of failure
G-19.01.05	determine servicing procedures such as repairing or replacing components

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Sub-task

G-19.02 Diagnoses ancillary and accessory components.

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

Key Competencies

G-19.02.01	perform sensory inspection of ancillary and accessory components such as listening for abnormal noises, smelling for burnt odours and observing loose or broken accessories
G-19.02.02	disassemble components to evaluate conditions such as corrosion, short or open circuit and damaged wiring connectors

G-19.02.03	interpret diagnostic results to determine causes of failure
G-19.02.04	determine servicing procedures such as repairing or replacing components

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Sub-task

G-19.03 Diagnoses wiring harness.

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

Key Competencies

G-19.03.01	perform sensory inspection such as smelling for burnt odours and observing loose or broken connections
G-19.03.02	evaluate harness for problems such as pinched, cut, broken, melted and rubbed through wires
G-19.03.03	check or validate wire continuity or short with a multimeter
G-19.03.04	determine servicing procedures such as repairing or replacing components

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Sub-task

G-19.04 Diagnoses ignition system.

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

Key Competencies

G-19.04.01	perform sensory inspection such as listening for arcing and checking for spark
G-19.04.02	perform checks and measurements such as coil resistance, source and pulse coil output voltage
G-19.04.03	interpret diagnostic results to determine causes of failure
G-19.04.04	determine servicing procedures such as adjusting, repairing or replacing components

Sub-task

G-19.05 Diagnoses starting system.

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

Key Competencies

G-19.05.01	perform sensory inspection such as listening for abnormal sounds, smelling for abnormal odours and observing for loose connections
G-19.05.02	evaluate components such as solenoids, brushes, bearings and starter gears or sprag clutch
G-19.05.03	perform checks and measurements to identify conditions such as worn, burnt, galled and damaged components

Task 20 Services electrical systems.

Context Motorcycle mechanics require advanced knowledge of electrical systems to efficiently service and repair a variety of electrical problems.

Required Knowledge

K 1	types of batteries such as AGM, lithium, lead acid and gel cell
K 2	types of charging systems such as alternator and generator
K 3	components of charging systems such as rotors, stators and regulators/rectifiers
K 4	charging system operation
K 5	manufacturers' service limits and procedures
K 6	battery initialization, charging and maintenance procedures
K 7	types of ignition systems such as digital and CDI
K 8	ignition system components such as source, pulse and ignition coils, and CDI units
K 9	ignition system operation
K 10	starting system components such as solenoids, starter drives/relays and starter motors
K 11	starting system operation
K 12	ancillary components such as lights, horns and signal systems

K 13	accessory components such as audio systems, cruise control and security systems
K 14	operation of ancillary and accessory components
K 15	safe handling and disposal of batteries
K 16	testing procedures such as voltage drop and current draw

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Sub-task

G-20.01 Services battery and charging system.

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

Key Competencies

G-20.01.01	replace components such as brushes, bearings and bushings
G-20.01.02	clean posts, top up electrolyte and charge battery
G-20.01.03	recondition components by following procedures such as dressing armatures, lubricating bushings and cleaning brushes
G-20.01.04	reassemble charging system components

Sub-task

G-20.02 Services ancillary and accessory components.

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

Key Competencies

G-20.02.01	remove and replace components such as horns, lights, signals and audio systems
G-20.02.02	recondition components such as switches, contacts and connectors by cleaning, greasing, insulating and resurfacing
G-20.02.03	adjust components such as horns and lights

Sub-task

G-20.03 Services wiring harness.

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

Key Competencies

G-20.03.01	repair wiring harness by soldering, crimping, splicing and insulating
G-20.03.02	replace components such as wires, connectors, insulators and diodes
G-20.03.03	resolve causes of failure such as pinched, kinked and rubbed through wires by rerouting or insulating the harness

Sub-task

G-20.04 Services ignition system.

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

Key Competencies

G-20.04.01	replace components such as ignition coils, high tension leads, spark plugs and caps
G-20.04.02	perform adjustments such as spark plugs gap, dwell and pulse coil air gap
G-20.04.03	correct causes of failure such as short circuit of wiring, and poor or loose ground, by cleaning and tightening connections
G-20.04.04	clean spark plugs

Sub-task

G-20.05 Services starting system.

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

Key Competencies

G-20.05.01	remove and replace components such as armature, brushes and bearings
G-20.05.02	recondition components by following procedures such as dressing armature, lubricating bushings and cleaning brushes
G-20.05.03	perform measurements such as current draw and resistance using a multimeter
G-20.05.04	resolve cause of failure such as excessive draw, pinion misalignment and contamination due to leaking seals

Trends	The types of vehicle management systems continue to expand. Due to today's tighter emission requirements, there is increased reliance on vehicle management systems to control fuel injection, exhaust and other systems. There is increased reliance of these systems on ECUs, and ECUs have become faster and more powerful as a result. There is also a trend toward the use of traction and drive control systems that increase driver safety.
Related Components (including but not limited to)	ECUs, sensors and relays, air injection system, immobilizers, intake and exhaust variable valves.
Tools and Equipment	Hand tools, computer, manufacturers' specialized tools, exhaust gas analysis kit, electronic scanning meters, fuel pressure tester, injector tester, multimeter.

Task 21 Diagnoses vehicle management systems.

Context Vehicle management systems use ECU to control the integration of many functions in the operation of the unit such as fuel injection, ignition control, anti-theft management, traction control and ABS. Motorcycle mechanics will use special tools such as multimeters, scan tools and computers to diagnose and identify faults within the systems.

Required Knowledge

K 1	types of vehicle management systems such as fuel injection, ignition control, anti-theft management, traction control, shift control and ABS
K 2	interrelationships among vehicle management systems
K 3	types of vehicle management system components such as O_2 sensors, crank position sensors, immobiliser units, wheel speed sensors and ABS brake pressure sensors
K 4	relationship between ECU and emissions system components such as air injection system (AIS) and O_2 sensors
K 5	diagnostic procedures including outputs and inputs

K 6	relationship between fault indicator codes
K 7	operating voltages of system

Sub-task

H-21.01 Reads fault codes.

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

Key Competencies

H-21.01.01	check for engine fault light on
H-21.01.02	check for fault codes according to manufacturers' procedures
H-21.01.03	determine meaning of the fault codes by checking manufacturers' procedures
H-21.01.04	record fault code history to keep track of faults to be repaired
H-21.01.05	clear fault codes according to manufacturers' procedures

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Sub-task

H-21.02 Interprets test results.

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

Key Competencies

H-21.02.01	determine which fault codes to investigate first based on the relationship among fault indicator codes
H-21.02.02	compare fault codes that occur after repair with the fault code history to confirm the repair
H-21.02.03	determine most likely areas of failure based on fault codes

Task 22 Services vehicle management systems.

Context Vehicle management systems use different voltages. As a result, motorcycle mechanics need to ensure that repairs to wiring and connectors are performed with a high degree of skill.

Required Knowledge

K 1	types and operation of vehicle management systems such as fuel injection, ignition control, anti-theft management, shift control, traction control and ABS
K 2	interrelationships among vehicle management systems
K 3	types of vehicle management system components such as O_2 sensors, crank position sensors, immobilizer units, wheel speed sensors and ABS brake pressure sensors
K 4	relationship between ECU and emissions system components such as AIS and O_2 sensors
K 5	manufacturers' diagnostic procedures including outputs and inputs
K 6	relationship between fault indicator codes
K 7	operating voltages of system

Sub-task

H-22.01 Tests system circuitry and components.

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

Key Competencies

H-22.01.01	locate, identify and investigate components indicated by the fault code
H-22.01.02	test sensors and circuitry for correct function such as continuity, voltage drop and resistance using tools such as multimeters and scan tools

Sub-task

H-22.02 Services system circuitry and components.

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

Key Competencies

H-22.02.01	service wiring by crimping, soldering or replacing using tools such as soldering guns, crimping tools and connector release tools
H-22.02.02	grease connectors with dielectric grease
H-22.02.03	insulate repaired wiring using materials such as electrical tape and heat shrink tubing
H-22.02.04	adjust components such as throttle position sensors (TPS) according to manufacturers' specifications using tools such as multimeters and hand tools

Trends

There is a trend towards more advanced, computer controlled, fuel efficient, quieter intake and exhaust systems. More components are non-serviceable which requires more precise diagnostic techniques.

Advancements in fuel technology have brought about a trend towards the use of higher ethanol content fuels, which affects service life and function of components.

Related Components (including, but not limited to)

Fuel tanks and components, air delivery system components, carburetor components, fuel injection system components, exhaust system components, turbocharger components, supercharger components, air injection system components.

Tools and Equipment

See Appendix A.

Task 23 Diagnoses fuel and exhaust systems.

Context

Fuel and exhaust systems are comprised of the fuel tank, air delivery system, carburetor, fuel injector, exhaust system and forced induction system. They introduce fuel and air into the engine to allow for combustion. The primary function of exhaust systems is to direct exhaust and to lower noise and emissions.

Required Knowledge

K 1	types of fuel tanks such as steel, aluminum and composite
K 2	fuel tank components such as petcocks, pumps, valves, sending units and filler caps
K 3	fuel tank operation
K 4	manufacturers' service limits and procedures
K 5	diagnostic procedures
K 6	types of air delivery systems such as forced air induction and conventional air filtration
K 7	air delivery system components such as air filters, air boxes and air sensors
K 8	air delivery system operation
K 9	types of carburetors such as butterfly, constant velocity and mechanical slide

K 10	carburetor components such as floats, needles, seats, venturis and jets
K 11	carburetor operation
K 12	types of fuel injection systems such as sequential and multi-port
K 13	fuel injection system components such as injectors, fuel rails, regulators and throttle bodies
K 14	fuel injection system operation
K 15	types of exhaust systems such as tuned pipe and expansion chamber
K 16	exhaust system components such as mufflers, spark arrestors, header pipes, expansion chambers, variable exhaust valves, catalytic converters and O_2 sensors
K 17	air injection system operation
K 18	exhaust system operation
K 19	types of forced induction systems such as turbochargers, superchargers and forced-air
K 20	forced induction system components such as wastegates, impellers, seals and bushings
K 21	forced induction system operation

Sub-task

I-23.01 Diagnoses fuel tanks and components.

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

Key Competencies

I-23.01.01	perform sensory inspections to detect fuel pump malfunction, fuel leaks and abnormal odours (stale fuel and contaminated fuel)
I-23.01.02	disassemble components to evaluate their condition such as rust in tank, clogged filters and leaks
I-23.01.03	perform checks and measurements on individual components such as pressure, volume, sending unit operation and vacuum operation according to manufacturers' specifications
I-23.01.04	interpret diagnostic results to determine causes of failure
I-23.01.05	determine service procedures such as replacing and reconditioning components

Sub-task

I-23.02 Diagnoses air delivery systems.

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

Key Competencies

I-23.02.01	perform sensory inspection to verify operation of system and to detect problems such as vacuum leaks, pressure leaks, bearing wear, cracks in fittings and incorrect fitting of components
I-23.02.02	disassemble components to evaluate their conditions such as deterioration due to contamination, warped surfaces, restrictions (plugged filters, collapsed hoses) and scored surfaces
I-23.02.03	perform checks and measurements such as vacuum tests, pressure tests, air flow tests, clearances and tolerances according to manufacturers' specifications
I-23.02.04	interpret diagnostic results to determine causes of failure
I-23.02.05	determine service procedures such as replacing, repairing and adjusting components

Sub-task

I-23.03 Diagnoses carburetor systems.

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

Key Competencies

I-23.03.01	perform sensory inspections to verify operation of system and to detect problems such as vacuum leaks, fuel leaks, broken linkages and stuck throttle
I-23.03.02	disassemble components to evaluate their conditions such as plugged jets, deterioration due to contaminated fuel, damaged diaphragms, incorrect assembly and component wear
I-23.03.03	perform checks and measurements such as calibration, synchronization and float height according to manufacturers' specifications
I-23.03.04	interpret diagnostic results to determine causes of failure
I-23.03.05	determine service procedures such as replacing, repairing and adjusting components

Sub-task

I-23.04 Diagnoses fuel injection systems.

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

Key Competencies

I-23.04.01	perform sensory inspections to verify operation of system and to detect problems such as fuel leaks, vacuum leaks and component malfunctions (fuel pumps and injectors)
I-23.04.02	disassemble components to evaluate their condition such as clogged injectors, damaged seals, worn linkages and contaminated fuel
I-23.04.03	perform checks and measurements such as pressure tests, volume tests, injector function tests and spray patterns
I-23.04.04	interpret diagnostic results to determine causes of failure
I-23.04.05	determine service procedures such as replacing, repairing and adjusting components

Sub-task

I-23.05 Diagnoses exhaust system.

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

Key Competencies

I-23.05.01	perform sensory inspections to verify operation of system and to detect problems such as pressure leaks, vacuum leaks, broken studs, cracks and damaged seals (presence of soot)
I-23.05.02	disassemble components to evaluate their condition such as restricted pipe, collapsed internal components, cracked components and worn gaskets
I-23.05.03	perform checks and measurements such as exhaust gas analysis, exhaust control valve check and sound test
I-23.05.04	interpret diagnostic results to determine causes of failure
I-23.05.05	determine service procedures such as replacing, repairing and adjusting components

Task 24 Services fuel and exhaust systems.

Context Motorcycle mechanics service fuel and exhaust systems to provide optimum air/fuel ratio and fuel consumption. Servicing includes replacing non-serviceable components, reconditioning parts and adjusting settings for maximum efficiency.

Required Knowledge

K 1	types of fuel tanks such as steel, aluminum and composite
K 2	fuel tank components such as petcocks, pumps, valves, sending units and filler caps
K 3	fuel tank operation
K 4	manufacturers' service limits and procedures
K 5	types of air delivery systems such as forced air induction and conventional air filtration
K 6	air delivery system components such as air filter, air box and air sensors
K 7	air delivery system operation
K 8	types of carburetors such as butterfly, constant velocity and mechanical slide
K 9	carburetor components such as float, needle, seat, venturi and jets
K 10	carburetor operation
K 11	types of fuel injection systems such as sequential and multi-port
K 12	fuel injection system components such as injectors, fuel rail, regulators and throttle body
K 13	fuel injection system operation
K 14	types of exhaust systems such as two-stroke and four-stroke
K 15	exhaust system components such as muffler, spark arrestor, header pipe, expansion chambers, variable exhaust valves, catalytic converters and O_2 sensors
K 16	air injection system operation
K 17	exhaust system operation
K 18	types of forced induction systems such as turbochargers, superchargers and forced-air
K 19	forced induction system components such as wastegates, impellers, seals and bushings
K 20	forced induction system operation
K 21	cleaning procedures such as chemical, ultrasonic and mechanical

Sub-task

I-24.01 Services fuel tanks and components.

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

Key Competencies

I-24.01.01	replace faulty components such as corroded fuel tanks, seized pumps, plugged filters, damaged seals and clamps, and deteriorated hoses based on extent of damage
I-24.01.02	recondition components such as corroded tanks, leaking petcocks and filler caps
I-24.01.03	adjust settings such as fuel pressure and fuel gauge sender to manufacturers' specifications
I-24.01.04	adjust and replace tank mounting components

Sub-task

I-24.02 Services air delivery system.

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

Key Competencies

I-24.02.01	replace faulty components such as worn bearings, cracked fittings, clogged filters, collapsed hoses, and leaking seals and gaskets
I-24.02.02	recondition components to service by following procedures such as washing reusable air filters, cleaning screens and lapping warped or scored surfaces
I-24.02.03	adjust settings such as wastegate valve pressure and belt tension to manufacturers' specifications

Sub-task

I-24.03 Services carburetor systems.

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

Key Competencies

I-24.03.01	replace faulty components such as inlet fuel valves, floats, jet needles, slides, seals and gaskets
I-24.03.02	clean and recondition components such as carburetor body, slides, jets, jet needles and emulsion tubes depending on extent of deterioration or wear
I-24.03.03	adjust settings to manufacturers' specifications such as fuel levels, air/fuel mixtures, screws, needle clip position and throttle plate synchronization

Sub-task

I-24.04 Services fuel injection systems.

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

Key Competencies

I-24.04.01	replace faulty components such as hoses, seals, filters, injectors and throttle bodies
I-24.04.02	recondition components by following procedures such as cleaning injectors, cleaning idle air control passages, decarbonizing throttle bodies and cleaning filters
I-24.04.03	adjust settings to manufacturers' specifications such as throttle plate synchronization, idle speed and air bypass screws

Sub-task

I-24.05 Services exhaust system.

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

Key Competencies

I-24.05.01	replace faulty components such as mufflers, gaskets, clamps, baffles and exhaust power valves
I-24.05.02	recondition components by following procedures such as decarbonizing valves and baffles, recoating surfaces and repacking baffles
I-24.05.03	adjust settings to manufacturers' specifications such as adjusting cable free play on power valves and adding/removing baffle plates

APPENDICES

APPENDIX A TOOLS AND EQUIPMENT

Hand Tools

Allen wrenches
ball hone
bearing driver
bearing puller
bolt cutter
brass mallet
bushing and seal driver
circlip pliers
combination wrench set
crimping tool
cylinder hone
dead-blow hammer
drill
file
pin/hook wrench
pliers
punch
reamers
rubber mallet
screwdriver
slide hammer
snap ring pliers
socket
spoke wrench
threaded insert repair
tire iron
torx wrench
riveting tool
valve seat cutter
wire brush
wire stripping tool

Cutting/Heating Tools and Equipment

electric arc welding equipment
heat gun
oxyacetylene welding and cutting equipment
propane torch
soldering equipment

Pneumatic and Electric Power Tools

air impact tool
compressed air gun
glass bead blaster
grinder
hydraulic jack
hydraulic press
impact driver
riveting equipment
shock spring compressor
valve spring compressor

Measuring Devices

air pressure gauge
alignment tools
ball gauge
caliper
carburetor float level gauge
coolant tester
cylinder bore gauge
degree wheel
dial indicator
engine tachometer
feeler gauge
graduated cylinder
height gauge
hydrometer

Measuring Devices (cont'd)

inclinometer
inside micrometer
inside/outside calipers
micrometer
multimeter oil pressure gauge
plastigage
pounds pull gauge
protractor (magnetic)
refractometer
sag gauge
steel rule
straightedge
tape measure
telescopic gauge
temperature gauge
tension gauge
thickness gauge
tire pressure gauge
torque wrench
tread depth gauge
vacuum gauge
vernier caliper

Diagnostic and Testing Tools

alignment tools
borescope
coil tester
compression tester
crankcase pressure test equipment
fuel/oil pressure tester
hydrometer
leak-down tester
load tester
multimeter/DVOM
Peak Voltage Adapter
radiator pressure tester
stethoscope
test light
timing light
vacuum gauge
vacuum pump

Shop Tools and Equipment

alignment bars
battery charger
bearing installation tool
bench grinder and wire wheel brush
bleeding equipment
brake cylinder hone
cable luber
chain breaker
computer diagnostic equipment
crank aligning jig
crankcase separator
crank installer
crankshaft puller
cylinder hone
damper rod holder
electronic diagnostic equipment
frame jig
gasket scraper
grinder
guide installation pilot
hand pump
headlight aiming equipment
honing stone
magnetic base
metal lathe
nitrogen recharging unit
piston pin puller
pneumatic or hydraulic lift table
ring compressor
scraper
seal driver
seal installer
seal remover
solvent tank
tire balancing equipment

Shop Tools and Equipment (continued)

tire mounting equipment
truing jack
ultrasonic tank
V-block
valve resurfacing tool
vice
water bath
wheel truing jig

APPENDIX B GLOSSARY

accessory an item added to a complete motorcycle, to enhance the visual or riding enjoyment of the motorcycle such as an audio system or a carrying rack.

ancillary an item fitted to the motorcycle at manufacture to enable or improve the function of the motorcycle.

brake shoe a cast aluminum, half-circular shoe that holds a bonded brake lining material. When brake is applied, shoe forces lining into brake drum.

chain stretch wear of pins and bushings of a roller or hy-vo chain, causing chain to lengthen.

chain drive use of a chain and sprocket to connect gearbox output shaft to rear wheel

chamfer to bevel an edge of an object or to chamfer edges of port openings in a two-stroke cycle cylinder to prevent piston ring breakage.

chassis the base frame and components connected directly to it, excluding those parts which provide power, but may include wheels and suspension to become a "rolling chassis".

crankcase castings that support and contain the crankshaft flywheel assembly, primary drive and gearbox.

cylinder head casting that seals top of cylinder and provides a mounting place for spark plug. In four-stroke cycle engine, cylinder head also incorporates an intake and exhaust ports. Both two- and four-stroke cycle engines also have combustion chamber built into cylinderhead.

damper device which uses oil metered through orifices to control abrupt suspension movement during extension and compression.

damper rod tube secured to bottom of each fork slider to hold slider onto fork leg. Damper rod controls movement of front suspension by metering hydraulic fluid through orifices in rod.

decarbonize to remove carbon build-up on piston, combustion chamber, and other parts.

drive plate drive plate has friction material bonded to its surface. When clutch is engaged, drive plate transfers power to driven plate.

driven plate a clutch plate which is indexed onto clutch inner hub by tabs or splines around its inside diameter. Driven plate is usually a plain plate (no friction material) and drives gearbox input shaft through clutch inner hub

dry sump in this system, oil is gravity fed to supply side of oil pump from a remote oil tank. After oil has been pumped through four-stroke cycle engine, it is returned to oil tank by return side of oil pump.

final drive chains and sprockets or shafts and gears used to connect the gearbox output shaft to rear wheel.

gearbox a series of shafts and gears which varies ratio of engine to rear wheel speed. Motorcycle gearboxes use from two to seven speeds or ratios.

hydraulic brake a braking system using hydraulic fluid, piston, and cylinders to provide extremely high pressure for brake application.

hy-vo chain also known as the silent chain, is a very strong chain made up of toothed plates positioned side by side and held together by pins. Advantage of this type of chain is great strength and quiet operation.

lateral run-out side-to-side movement (wobble) of a wheel rim.

master cylinder components in a braking system that produces hydraulic pressure for system.

mechanical brake a braking system which uses a mechanical advantage by way of levers and cables or rods to apply brakes. A braking system not using hydraulic fluids or hydraulics.

metal sinter describes the complex compounds used in brake and clutch friction materials.

O-ring a ring made of neoprene that is used to provide a positive seal. It usually fits into a groove slightly shallower than O-ring, and mated against a flat surface to provide a seal for oil, fuel, or air.

primary drive use of chain, gear, or belt drive (belts and pulleys) to connect crankshaft to clutch and gearbox into shaft.

push rod in four-stroke cycle engine, push rods provide means of transferring tappet movement to rocker arm, which opens valves.

recondition to rebuild a component or return to within factory specifications

shift drum a drum shaped gearbox component with slots around its outside diameter. It engages with shift mechanism and shift forks. As drum is rotated, drum slots cause shift forks to move sliding gears or dogs causing engagement and disengagement of various gearbox ratios.

shifting fork a flat forked gearbox component which engages with a slot in a sliding gear or dog. Shifting forks slide back and forth on lateral shafts. Rotation of shift drum or cam plate causes shift fork to move its sliding gear or dog to engage with another gear, locking both gears to shaft.

spoked wheel a wheel consisting of a rim, spokes, nipples and hub. Spokes are laced between hub and rim and are attached to rim by nipples. Thirty-six or forty spokes are normally used.

sprocket/pulley a sprocket consists of a wheel with teeth to engage a chain or toothed belt and provide a positive (non-slip) drive. In the case of a belt final drive, often the toothed sprockets are referred to as "pulleys".

stamped frame a frame stamped from pieces of sheet metal which are welded together to provide support for engine and suspension.

stamped wheel a wheel assembly using stamped sheet metal spokes in place of small wire type spokes. A stamped wheel resembles a cast alloy wheel in appearance.

steering damper a device which uses friction or a hydraulic damper to reduce steering oscillation.

steering head forward part of frame providing a mounting place for bearings which locate and support steering spindle and fork assembly.

suspension components which absorb road surface irregularities to smooth motorcycle ride. It is designed to permit controlled wheel movement over irregular surfaces. Basic parts include forks, swing arm and shock absorbers.

swing arm main member of rear suspension that provides a mounting place for rear wheel and one end of shock absorbers.

torque converter a fluid turbine which takes place of clutch in primary drive. Oil is used to transmit power through torque converter depending upon engine rpm

triple clamps a pair of sturdy brackets that provide a mounting place for fork legs and steering spindle. Triple clamps attach forks to frame through spindle, steering head and steering head bearings.

valve train all components which directly influence valve operation (cam, cam chain, cam followers, valves, valve springs, valve collars, and keepers in SOHC engine).

variable exhaust valve the exhaust control valve operates by opening and closing thereby varying the exhaust pressure or back pressure to help scavenge gases more effectively as related to RPM

APPENDIX C ACRONYMS

ABS	antilock braking system
AGM	absorbed glass mat
AIS	air injection system
CDI	capacitor discharge ignition
ECU	electronic control unit
GPS	global positioning system
MSDS	material safety data sheet
PDI	pre-delivery inspection
PPE	personal protective equipment
OH&S	Occupational Health and Safety
TCI	transistor controlled ignition
TPS	throttle position sensors
WHMIS	Workplace Hazardous Material 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
%	NV	5	8	NV	ND	6	ND	ND	9	8	ND	ND	ND	7%

Task 1 Performs safety-related functions.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	60	NV	ND	34	ND	ND	33	20	ND	ND	ND	39%

Task 2 Performs routine work practices.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	40	NV	ND	66	ND	ND	67	80	ND	ND	ND	61%

BLOCK B CHASSIS AND SUSPENSION

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	10	10	NV	ND	14	ND	ND	8	10	ND	ND	ND	10%

Task 3 Diagnoses chassis and components.

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

Task 4 Services chassis and components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	25	25	NV	ND	21	ND	ND	25	25	ND	ND	ND	24%

Task 5 Diagnoses suspension.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	25	25	NV	ND	42	ND	ND	25	20	ND	ND	ND	27%

Task 6 Services suspension system.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	25	25	NV	ND	21	ND	ND	37	40	ND	ND	ND	30%

BLOCK C WHEELS AND TIRES

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

Task 7 Diagnoses wheels and tires.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	50	NV	ND	50	ND	ND	33	50	ND	ND	ND	47%

Task 8 Services wheels and tires.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	50	NV	ND	50	ND	ND	67	50	ND	ND	ND	53%

BLOCK D BRAKES

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

Task 9 Diagnoses braking systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	50	NV	ND	60	ND	ND	33	40	ND	ND	ND	47%

Task 10 Services braking systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	50	NV	ND	40	ND	ND	67	60	ND	ND	ND	53%

BLOCK E ENGINES

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	15	13	NV	ND	12	ND	ND	15	17	ND	ND	ND	14%

Task 11 Diagnoses two-stroke and four-stroke engines.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	55	NV	ND	58	ND	ND	33	40	ND	ND	ND	47%

Task 12 Services two-stroke and four-stroke engines.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	45	NV	ND	42	ND	ND	67	60	ND	ND	ND	53%

BLOCK F POWER TRANSFER

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

Task 13 Diagnoses clutches and primary drive.

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

Task 14 Services clutches and primary drives.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	20	15	NV	ND	8	ND	ND	18	20	ND	ND	ND	16%

Task 15 Diagnoses transmissions.

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

Task 16 Services transmissions.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	16	25	NV	ND	17	ND	ND	18	30	ND	ND	ND	21%

Task 17 Diagnoses final drive.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	16	15	NV	ND	9	ND	ND	9	5	ND	ND	ND	11%

Task 18 Services final drive.

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

BLOCK G ELECTRICAL SYSTEMS

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

Task 19 Diagnoses electrical systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	60	NV	ND	66	ND	ND	67	65	ND	ND	ND	62%

Task 20 Services electrical systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	40	NV	ND	34	ND	ND	33	35	ND	ND	ND	38%

BLOCK H VEHICLE MANAGEMENT SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	18	12	NV	ND	17	ND	ND	12	4	ND	ND	ND	13%

Task 21 Diagnoses vehicle management systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	60	NV	ND	70	ND	ND	61	40	ND	ND	ND	56%

Task 22 Services vehicle management systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	40	NV	ND	30	ND	ND	39	60	ND	ND	ND	44%

BLOCK I FUEL AND EXHAUST SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	NV	10	10	NV	ND	8	ND	ND	14	13	ND	ND	ND	11%

Task 23 Diagnoses fuel and exhaust systems.

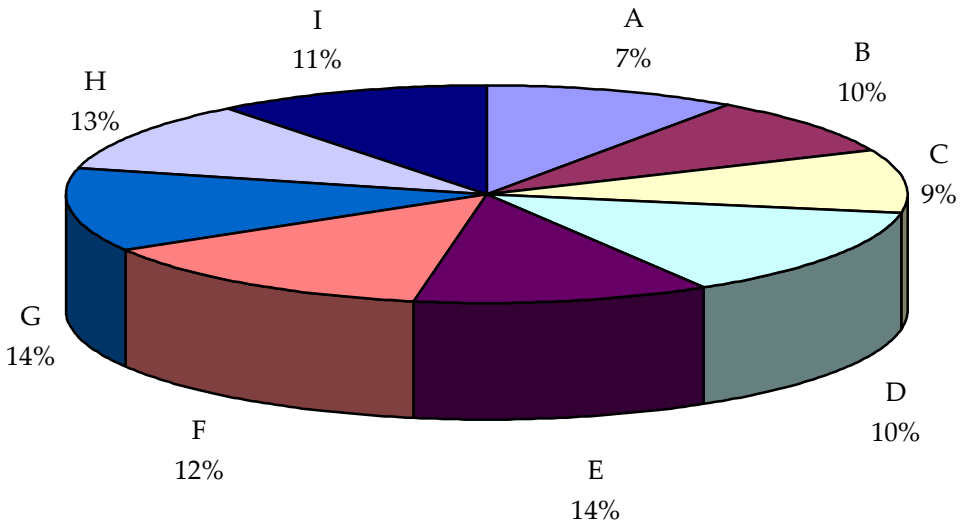
	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	70	NV	ND	62	ND	ND	54	50	ND	ND	ND	57%

Task 24 Services fuel and exhaust systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	NV	50	30	NV	ND	38	ND	ND	46	50	ND	ND	ND	43%

APPENDIX E

PIE CHART*



TITLES OF BLOCKS

BLOCK A	Common Occupational Skills	BLOCK F	Power Transfer
BLOCK B	Chassis and Suspension	BLOCK G	Electrical Systems
BLOCK C	Wheels and Tires	BLOCK H	Vehicle Management Systems
BLOCK D	Brakes	BLOCK I	Fuel and Exhaust Systems
BLOCK E	Engines		

*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 — Motorcycle 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. Performs routine work practices.	2.01 Uses trade-related consumables.	2.02 Performs periodic maintenance.	2.03 Performs storage procedures.	2.04 Prepares new units.	2.05 Conducts safety inspection.
		2.06 Maintains tools and equipment.	2.07 Verifies repairs.	2.08 Prepares reports and recommendations.		
B - CHASSIS AND SUSPENSION	3. Diagnoses chassis and components.	3.01 Diagnoses frame.	3.02 Diagnoses steering head.	3.03 Diagnoses handle bars, foot rests and controls.	3.04 Diagnoses ancillary and accessory components.	
	4. Services chassis and components.	4.01 Services frame.	4.02 Services steering head.	4.03 Services handle bars, foot rests and controls.	4.04 Services ancillary and accessory components.	
	5. Diagnoses suspension.	5.01 Diagnoses front suspension components.	5.02 Diagnoses rear suspension components.	5.03 Diagnoses swing arm.		
	6. Services suspension system.	6.01 Services front suspension components.	6.02 Services rear suspension components.	6.03 Services swing arm.		

BLOCKS	TASKS	SUB-TASKS				
C - WHEELS AND TIRES	7. Diagnoses wheels and tires.	7.01 Diagnoses tires.	7.02 Diagnoses spoked wheels.	7.03 Diagnoses one piece wheels.	7.04 Diagnoses multi-piece wheels.	
	8. Services wheels and tires.	8.01 Services tires.	8.02 Services spoked wheels.	8.03 Services one piece wheels.	8.04 Services multi-piece wheels.	
D - BRAKES	9. Diagnoses braking systems.	9.01 Diagnoses hydraulic braking systems.	9.02 Diagnoses mechanical braking systems.	9.03 Diagnoses braking control systems.		
	10. Services braking systems.	10.01 Services hydraulic braking systems.	10.02 Services mechanical braking systems.	10.03 Services braking control systems.		
E - ENGINES	11. Diagnoses two-stroke and four-stroke engines.	11.01 Diagnoses cylinder heads.	11.02 Diagnoses valve systems on two-stroke engine.	11.03 Diagnoses valve train on four-stroke engine.	11.04 Diagnoses cylinders and pistons.	11.05 Diagnoses crankshaft assembly.
		11.06 Diagnoses counterbalance assemblies.	11.07 Diagnoses engine cases.	11.08 Diagnoses lubrication system.	11.09 Diagnoses cooling system.	
	12. Services two-stroke and four-stroke engines.	12.01 Services cylinder heads.	12.02 Services valve systems on two-stroke engine.	12.03 Services valve train on four-stroke engine.	12.04 Services cylinders and pistons.	12.05 Services crankshaft assembly.
		12.06 Services counterbalance assemblies.	12.07 Services engine cases.	12.08 Services lubrication system.	12.09 Services cooling system.	

BLOCKS	TASKS	SUB-TASKS				
F - POWER TRANSFER	13. Diagnoses clutches and primary drive.	13.01 Diagnoses primary drive gears.	13.02 Diagnoses primary drive chains and sprockets.	13.03 Diagnoses primary drive belts and pulleys.	13.04 Diagnoses manual clutches.	13.05 Diagnoses automatic clutches.
		13.06 Diagnoses kick start.				
	14. Services clutches and primary drives.	14.01 Services primary drive gears.	14.02 Services primary drive chains and sprockets.	14.03 Services primary drive belts and pulleys.	14.04 Services manual clutches.	14.05 Services automatic clutches.
		14.06 Services kick start.				
	15. Diagnoses transmissions.	15.01 Diagnoses constant mesh transmissions.	15.02 Diagnoses variable ratio belt transmissions.	15.03 Diagnoses automatic transmissions.		
	16. Services transmissions.	16.01 Services constant mesh transmissions.	16.02 Services variable ratio belt transmissions.	16.03 Services automatic transmissions.		
	17. Diagnoses final drive.	17.01 Diagnoses final drive chains and sprockets.	17.02 Diagnoses final drive shaft and gears.	17.03 Diagnoses final drive belts and pulleys.		
	18. Services final drive.	18.01 Services final drive chains and sprockets.	18.02 Services final drive shaft and gears.	18.03 Services belts and pulleys.		

BLOCKS	TASKS	SUB-TASKS				
G - ELECTRICAL SYSTEMS	19. Diagnoses electrical systems.	19.01 Diagnoses battery and charging system.	19.02 Diagnoses ancillary and accessory components.	19.03 Diagnoses wiring harness.	19.04 Diagnoses ignition system.	19.05 Diagnoses starting system.
	20. Services electrical systems.	20.01 Services battery and charging system.	20.02 Services ancillary and accessory components.	20.03 Services wiring harness.	20.04 Services ignition system.	20.05 Services starting system.
H - VEHICLE MANAGEMENT SYSTEMS	21. Diagnoses vehicle management systems.	21.01 Reads fault codes.	21.02 Interprets test results.			
	22. Services vehicle management systems.	22.01 Tests system circuitry and components.	22.02 Services system circuitry and components.			
I - FUEL AND EXHAUST SYSTEMS	23. Diagnoses fuel and exhaust systems.	23.01 Diagnoses fuel tanks and components.	23.02 Diagnoses air delivery systems.	23.03 Diagnoses carburetor systems.	23.04 Diagnoses fuel injection systems.	23.05 Diagnoses exhaust system.
	24. Services fuel and exhaust systems.	24.01 Services fuel tanks and components.	24.02 Services air delivery system.	24.03 Services carburetor systems.	24.04 Services fuel injection systems.	24.05 Services exhaust system.