Heavy Duty Equipment Technician

On-the-Job Training Guide

2024

1-877-363-0536
apprenticeship@gov.sk.ca
saskapprenticeship.ca

Saskatchewan Apprenticeship and Trade Certification Commission

Online: www.saskapprenticeship.ca

Recognition:
To promote transparency and consistency, portions of this document has been adapted from the 2014 Heavy Duty Equipment Technician National Occupational Analysis (Employment and Social Development Canada).

A complete version of the Occupational Standard can be found at www.red-seal.ca

STRUCTURE OF THE ON-THE-JOB TRAINING GUIDE

To facilitate understanding of the occupation, this on-the-job training guide contains the following sections:

Task Matrix: a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard detailing the essential skills and the level of training where the content is covered.

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

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

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

On-the-Job and In-school Training Content for the Heavy Duty Equipment Technician Trade: a chart which outlines on-the-job examples for apprentices to achieve relevant work experience to prepare for topics of technical training.

TRAINING REQUIREMENTS FOR THE HEAVY DUTY EQUIPMENT TECHNICIAN TRADE

To graduate from each level of the apprenticeship program, an apprentice must successfully complete the required technical training and compile enough on-the-job experience to total at least 1800 hours each year. Total trade time required is 7200 hours and at least 4 years in the trade.

Journeyperson to apprentice ratio for this trade is: 1:2

The information contained in this on-the-job training guide serves as a guide for employers and apprentices. Apprenticeship training is mutually beneficial to both employer and apprentice. The employer's investment in training apprentices results in skilled and certified workers. The document summarizes the tasks to be covered by the apprentice during their on-the-job portion of apprenticeship training. An apprentice spends approximately 85% of their apprenticeship term training on-the-job.

It is the employer's or journeyperson's responsibility to supervise an apprentice's practical skills development until a satisfactory level of proficiency has been reached.

EMPLOYER TRAINING RESPONSIBILITY

- promote a safety-conscious workplace
- expose the apprentice to all appropriate tools, equipment and shop practices
- provide guided, hands-on practice in pre-delivery and vehicle inspections
- provide guided, hands-on practice servicing and repairing heavy equipment and components
- provide guided, hands-on practice diagnosing and troubleshooting components and system problems
- supervise an apprentice's practical skills development
- provide assistance to develop skills to retrieve technical information from manuals, software, and other media

Employers should make every effort to expose their apprentices to work experience in as many areas of the trade as possible.

In the On-the-Job Training Guide, in-school instruction is listed first; on-the-job suggestions to help employers assist the apprentice to prepare for in-school training are listed next.

The content of the training components is subject to change without notice.

HEAVY DUTY EQUIPMENT TECHNICIAN TASK MATRIX

This chart outlines the blocks, tasks and sub-tasks from the 2014 Heavy Duty Equipment Technician National Occupational Analysis (NOA). Each sub-task details the corresponding essential skill and level of training where the content is covered. *

* Sub Tasks with numbers in the boxes is where the content will be delivered in training.

A – Performs Common Occupational Skills — 8%

A-1 Uses and maintains tools and equipment	**1.01 Maintains tools and equipment** 1	**1.02 Uses hoisting and lifting equipment** 1	**1.03 Operates access equipment** 1	**1.04 Uses personal protective equipment (PPE) and safety equipment** 1	
A-2 Performs general maintenance and inspections	**2.01 Maintains fluids** 1 (2, 3, 4 in context)	**2.02 Services fasteners, sealing devices, adhesives and gaskets** 1 (2, 3, 4 in context)	**2.03 Services hoses, tubing, piping and fittings** 1 (2, 3, 4 in context)	**2.04 Services bearings and seals** 1 (2, 3, 4 in context)	**2.05 Services safety features** 1 (2, 3, 4 in context)
	2.06 Performs scheduled maintenance procedures 1 (2, 3, 4 in context)	**2.07 Identifies operational faults** 1 (2, 3, 4 in context)	**2.08 Performs operational check-out** 1 (2, 3, 4 in context)		
A-3 Organizes work	**3.01 Uses documentation and reference materials** 1 (2, 3, 4 in context)	**3.02 Completes documentation** 1 (2, 3, 4 in context)	**3.03 Communicates with others** 1 (2, 3, 4 in context)	**3.04 Prepares job action plan** 1 (2, 3, 4 in context)	**3.05 Maintains safe work environment** 1 (2, 3, 4 in context)
A-4 Performs routine trade activities	**4.01 Heats materials.** 1	**4.02 Cools materials.** 1	**4.03 Cuts materials.** 1	**4.04 Welds materials.** 1	**4.05 Cleans parts and materials.** 1

B – Engines and Engine Support Systems — 16%

B-5 Diagnoses engines and engine support systems	5.01 Diagnoses base engine 3	5.02 Diagnoses lubrication systems 3	5.03 Diagnoses cooling systems 3	5.04 Diagnoses intake and exhaust systems 3	5.05 Diagnoses fuel systems 3, 4
	5.06 Diagnoses engine control systems 3, 4	5.07 Diagnoses emission control systems 3, 4			
B-6 Repairs engines and engine support systems	6.01 Repairs base engines 3	6.02 Repairs lubrication system 3	6.03 Repairs cooling systems 3	6.04 Repairs intake and exhaust systems 3	6.05 Repairs fuel systems 3, 4
	6.06 Repairs engine control systems 3, 4	6.07 Repairs emission control systems 3, 4			

C – Hydraulic, Hydrostatic and Pneumatic Systems — 19%

C-7 Diagnoses hydraulic, hydrostatic and pneumatic systems	7.01 Diagnoses hydraulic systems 1, 2, 3	7.02 Diagnoses hydrostatic systems 3	7.03 Diagnoses pneumatic systems 1, 3
C-8 Repairs hydraulic, hydrostatic and pneumatic systems	8.01 Repairs hydraulic systems 1, 2, 3	8.02 Repairs hydrostatic systems 3	8.03 Repairs pneumatic systems 1, 3

D – Drivetrain Systems

14%

D-9 Diagnoses drivetrain systems	9.01 Diagnoses clutch systems 2, 3, 4	9.02 Diagnoses torque converters, fluid couplers and retarders 2, 3, 4	9.03 Diagnoses driveline systems 2, 3, 4	9.04 Diagnoses transmission and transfer case systems 2, 3, 4	9.05 Diagnoses axle and differential systems 2, 3, 4
	9.06 Diagnoses final drive systems 2, 3, 4				
D-10 Repairs drivetrain systems	10.01 Repairs clutch systems 2, 3, 4	10.02 Repairs torque converters, fluid couplers and retarders 2, 3, 4	10.03 Repairs driveline systems 2, 3, 4	10.04 Repairs transmission and transfer case systems 2, 3, 4	10.05 Repairs axle and differential system 2, 3, 4
	10.06 Repairs final drive systems 2, 3, 4				

E – Steering, Suspension, Brake Systems, Wheel Assemblies and Undercarriage

14%

E-11 Diagnoses steering, suspension, brake systems, wheel assemblies and undercarriage	11.01 Diagnoses steering systems 1, 2	11.02 Diagnoses suspension systems 1, 2	11.03 Diagnoses brake systems 1, 2	11.04 Diagnoses wheel assemblies 1, 2	11.05 Diagnoses undercarriage systems 1, 2
E-12 Repairs steering, suspension, brake systems, wheel assemblies and undercarriage	12.01 Repairs steering systems 1, 2	12.02 Repairs suspension systems 1, 2	12.03 Repairs brake systems 1, 2	12.04 Repairs wheel assemblies. 1, 2	12.05 Repairs undercarriage systems. 1, 2

F – Electrical and Vehicle Management Systems — 18%

F-13 Diagnoses electrical systems	13.01 Diagnoses starting/charging systems and batteries 1, 3, 4 (2 in context)	13.02 Diagnoses electrical components, motors and accessories 1, 3, 4 (2 in context)		
F-14 Repairs electrical systems	14.01 Repairs starting/charging systems and batteries 1, 3, 4 (2 in context)	14.02 Repairs electrical components, motors and accessories 1, 3,4 (2 in context)		
F-15 Diagnoses electronic vehicle management systems	15.01 Reads diagnostic trouble codes (DTCs) 3, 4	15.02 Monitors parameters 3, 4	15.03 Interprets test results 3, 4	15.04 Tests system circuitry and components 3, 4
F-16 Repairs electronic vehicle management systems	16.01 Updates component software 3, 4	16.02 Repairs components 3, 4		

G – Environmental Control Systems — 6%

G-17 Diagnoses environmental control systems	17.01 Diagnoses heating systems 1, 4	17.02 Diagnoses ventilation and filtration systems 1, 4	17.03 Diagnoses air conditioning systems 1, 4	17.04 Diagnoses sound suppression systems 1, 4
G-18 Repairs environmental control systems	18.01 Repairs heating systems 1, 4	18.02 Repairs ventilation and filtration systems 1, 4	18.03 Repairs air conditioning systems 1, 4	18.04 Repairs sound suppression systems 1, 4

H – Structural Components, Accessories and Attachments — 5%

H-19 Diagnoses structural components, accessories and attachments	**19.01 Diagnoses structural components** 1, 2	**19.02 Diagnoses operator station components** 1, 2	**19.03 Diagnoses attachments and accessories** 1, 2	
H-20 Repairs structural components, accessories and attachments	**20.01 Performs mechanical repairs on structural components** 1, 2	**20.02 Repairs operator station components** 1, 2	**20.03 Repairs attachments and accessories** 1, 2	**20.04 Installs attachments and accessories** 1, 2

TRAINING PROFILE CHART

This Training Profile Chart represents Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) apprenticeship technical training at the topic level.

Level One (Harmonized)	Transcript Code	Hours
Basic Tools	TOOL 145 – Theory	12
	TOOL 146 – Shop	12
Brake Systems	BRAK 111 – Theory	24
	BRAK 112 – Shop	36
Electrical	ELCT 100 – Theory	14
	ELCT 101 – Shop	16
Environmental Control Systems	HVAC 100	6
Hydraulics	HYDR 108 – Theory	24
	HYDR 109 – Shop	36
Steering Systems	STER 100 – Theory	12
	STER 101 – Shop	18
Structural Components and Accessories	MAIN 100 – Theory	12
	MAIN 101 – Shop	18
		240

Level Two (Harmonized)	Transcript Code	Hours
Braking Systems ABS	BRAK 206 – Theory	14
	BRAK 207 – Shop	16
Drivetrain Systems	DRTR 201 – Theory	24
	DRTR 202 – Shop	36
Electrical	ELCT 202 – Theory	12
	ELCT 203 – Shop	18
Hydraulics	HYDR 204 – Theory	30
	HYDR 205 – Shop	30
Steering and Directional Control Systems	STER 202 – Theory	12
	STER 203 – Shop	18
Structural Components	MAIN 200 – Theory	12
	MAIN 201 – Shop	18
		240

Level Three (Harmonized)	Transcript Code	Hours
Alternative Fuels	FUEL 302 – Theory	12
	FUEL 303 – Shop	18
Electrical	ELCT 301 – Theory	14
	ELCT 302 – Shop	16
Engine and Engine Support Systems	ENGN 306 – Theory	55
	ENGN 307 – Shop	65
Powershift Transmissions	TRNM 306 – Theory	26
	TRNM 307 – Shop	34
		240

Level Four (Harmonized)	Transcript Code	Hours
Drivetrains	DRTR 400 – Theory	12
	DRTR 401 – Shop	18
Electrical	ELCT 400 – Theory	40
	ELCT 401 – Shop	50
Environmental Control Systems	HVAC 400 – Theory	12
	HVAC 401 – Shop	18
Fuel Systems	FUEL 404 – Theory	40
	FUEL 405 – Shop	50
		240

ON-THE-JOB AND IN-SCHOOL TRAINING CONTENT FOR THE HEAVY DUTY EQUIPMENT TECHNICIAN TRADE

This chart outlines on-the-job examples for apprentices to achieve relevant work experience to prepare for the topics of technical training. Topics of technical training are provided with the associated learning outcomes.

Level One — 8 weeks — 240 hours

Basic Tools – Theory — 12 hours

- describe safety rules and regulations
- describe the purpose and care of shop and hand tools
- describe various types of fasteners, adhesives and sealing devices

Basic Tools – Shop — 12 hours

- demonstrate safety
- explain legislative regulations
- demonstrate use and care of hand tools and shop equipment

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on the safety rules and regulations*
- *providing instruction on the purpose, use and care of shop and hand tools*
- *describing the various types of fasteners, adhesives and sealing devices*
- *providing opportunities to demonstrate shop safety*
- *explaining legislative regulations*
- *providing opportunities to demonstrate the use and care of hand tools and shop equipment*

Brake Systems – Theory — 24 hours

- describe hydraulic brake system operation
- describe air brake system operation
- describe various types of park brake systems

Brake Systems – Shop — 36 hours

- evaluate hydraulic brake system operation
- evaluate air brake system operation
- evaluate various park brake systems
- conduct final adjustments and performance tests
- repair faults

Electrical – Theory — 14 hours

- apply scientific principles to explain electrical theory and magnetism
- identify electrical circuit types and faults utilizing test equipment
- explain the function and operation of a lead acid battery

Electrical – Shop — 16 hours

- measure electrical values and check circuit operation
- evaluate a lead acid battery
- repair faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on the fundamentals of electrical theory and magnetism*
- *providing instruction on interpreting electrical symbol diagrams*
- *providing instruction on electrical system maintenance and testing procedures*
- *providing instruction on electrical circuit types and faults utilizing test equipment*
- *providing opportunities to measure electrical values and check circuit operation*
- *providing opportunities to* evaluate a lead acid battery
- *providing opportunities to repair faults*

Environmental Control Systems – Theory **6 hours**

- complete the Heating, Refrigeration and Air Conditioning Institute's course on ozone depleting substances

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on Heating, Refrigeration and Air Conditioning (HVAC) safety and systems*

Hydraulics – Theory **24 hours**

- describe the operation of the different types of flow control valves
- describe a power-beyond hydraulic system
- describe open and closed loop hydraulic systems
- describe the operation of a load sensing hydraulic system
- describe various hydrostatic drive systems

Hydraulics – Shop **36 hours**

- evaluate various types of hydraulic systems and flow control valves
- evaluate a power beyond system
- evaluate open and closed loop hydraulic systems
- evaluate a load sensing hydraulic system
- evaluate various hydrostatic drive systems
- repair faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on the fundamentals of a basic hydraulic system and related components*
- *providing instruction on interpreting hydraulic symbol diagrams*
- *providing instruction on hydraulic system maintenance and testing procedures*
- *providing instruction on open and closed center hydraulic systems*
- *providing opportunities to service hydraulic system and various components*
- *providing opportunities to test hydraulic systems using correct tools and procedures*

Steering and Directional Control Systems – Theory **12 hours**

- explain differential directional control in a crawler tractor
- explain hydrostatic directional control in a crawler tractor
- discuss pilot control and orbital steering systems describe maintenance procedure for transmission, transaxle, transfer case, differential and engine

Steering and Directional Control Systems – Shop **18 hours**

- evaluate differential directional control in a crawler tractor
- evaluate hydrostatic directional control in a crawler tractor
- evaluate pilot control and orbital steering systems
- repair faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on basic wheel and frame alignment angles*
- *providing instruction on manual and integral steering system operation*

- *providing instruction on mounting procedures for tires, rims and hubs*
- *providing opportunities to perform a basic wheel alignment*
- *providing opportunities to evaluate manual and integral power steering systems*
- *providing opportunities to perform mounting procedures for tires, rims and hubs*
- *providing opportunities to repair system faults*

Structural Components and Accessories – Theory **12 hours**

- identify hoisting and rigging techniques
- describe the purpose of roll over protection system (ROPS) and operator safety systems
- describe preventative maintenance procedures

Structural Components and Accessories – Shop **18 hours**

- perform hoisting and rigging techniques
- evaluate roll over protection system (ROPS) and operator safety systems
- perform preventative maintenance procedures
- repair defects

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on identifying hoisting and rigging techniques*
- *providing instruction on the purpose of roll over protection system (ROPS) and operator safety systems*
- *providing instruction on preventative maintenance procedures*
- *providing opportunities to perform hoisting and rigging techniques*
- *providing opportunities to evaluate roll over protection system (ROPS) and operator safety systems*
- *providing opportunities to perform preventative maintenance procedures*
- *providing opportunities to repair defects*

Level Two — 8 weeks — 240 hours

Brake Systems ABS – Theory — 14 hours

- describe antilock braking system components
- describe electric braking system components

Brake Systems ABS – Shop — 16 hours

- evaluate antilock braking systems
- evaluate an electric braking system
- repair system faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on antilock braking system components*
- *providing instruction on electric braking system components*
- *providing opportunities to evaluate antilock braking systems*
- *providing opportunities to evaluate an electric braking system*
- *providing opportunities to repair system faults*

Drivetrain Systems – Theory — 24 hours

- identify various seals and bearing types
- discuss various clutch types
- discuss manual transmission operation
- discuss differential operation
- discuss planetary and final drives
- discuss driveline operation

Drivetrain Systems – Shop — 36 hours

- perform the removal and replacement of various seals and bearings
- evaluate various clutch types
- evaluate manual transmission operation
- evaluate differential operation
- evaluate planetary and final drive systems
- evaluate driveline systems
- repair faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on various seals and bearing types*
- *providing instruction on various clutch types electric braking system components*
- *providing instruction on manual transmission operation*
- *providing instruction on differential operation*
- *providing instruction on planetary and final drives*
- *providing instruction on driveline operation*
- *providing opportunities to perform the removal and replacement of various seals and bearings*
- *providing opportunities to evaluate various clutch types*
- *providing opportunities to evaluate manual transmission operation*
- *providing opportunities to evaluate differential operation*
- *providing opportunities to evaluate planetary and final drive systems*
- *providing opportunities to evaluate driveline systems*
- *providing opportunities to repair faults*

Electrical – Theory — 12 hours

- explain the operation of a cranking system and related components
- explain the operation of an alternating current (AC) charging system and related components

Electrical – Shop **18 hours**

- evaluate cranking and charging systems
- repair faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on the operation of a cranking system and related components*
- *providing instruction on the operation of an alternating current (AC) charging system and related components*
- *providing opportunities to evaluate cranking and charging systems*
- *providing opportunities to repair faults*

Hydraulics – Theory **30 hours**

- describe the operation of the different types of flow control valves
- describe a power-beyond hydraulic system
- describe open and closed loop hydraulic systems
- describe the operation of a load sensing hydraulic system
- describe various hydrostatic drive systems

Hydraulics – Shop **30 hours**

- evaluate various types of hydraulic systems and flow control valves
- evaluate a power beyond system
- evaluate open and closed loop hydraulic systems
- evaluate a load sensing hydraulic system
- evaluate various hydrostatic drive systems
- repair faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on the operation of the different types of flow control valves*
- *providing instruction on a power-beyond hydraulic system*
- *providing instruction on open and closed loop hydraulic systems*
- *providing instruction on the operation of a load sensing hydraulic system*
- *providing instruction on various hydrostatic drive systems*
- *providing opportunities to evaluate various types of hydraulic systems and flow control valves*
- *providing opportunities to evaluate a power beyond system*
- *providing opportunities to evaluate open and closed loop hydraulic systems*
- *providing opportunities to a load sensing hydraulic system*
- *providing opportunities to evaluate various hydrostatic drive systems*
- *providing opportunities to repair faults*

Steering and Directional Control Systems – Theory **12 hours**

- explain differential directional control in a crawler tractor
- explain hydrostatic directional control in a crawler tractor
- discuss pilot control and orbital steering systems describe maintenance procedure for transmission, transaxle, transfer case, differential and engine

Steering and Directional Control Systems – Shop **18 hours**

- evaluate differential directional control in a crawler tractor
- evaluate hydrostatic directional control in a crawler tractor
- evaluate pilot control and orbital steering systems
- repair faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on the differential directional control in a crawler tractor*
- *providing instruction on the hydrostatic directional control in a crawler tractor*
- *providing instruction on the pilot control and orbital steering systems*
- *providing opportunities to evaluate the differential directional control in a crawler tractor*
- *providing opportunities to evaluate the hydrostatic directional control in a crawler tractor*
- *providing opportunities to evaluate the pilot control and orbital steering systems*
- *providing opportunities to repair faults*

Structural Components – Theory **12 hours**

- identify hoisting and rigging techniques
- describe undercarriage operation and troubleshooting
- identify undercarriage components and crawler tractor final drive systems

Structural Components – Shop **18 hours**

- perform hoisting and rigging techniques
- evaluate undercarriage and final drive components
- repair faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing instruction on hoisting and rigging techniques*
- *providing instruction on undercarriage operation and troubleshooting*
- *providing opportunities to identify undercarriage components and crawler tractor final drive systems*
- *providing opportunities to perform hoisting and rigging techniques*
- *providing opportunities to evaluate undercarriage and final drive components*
- *providing opportunities to repair faults*

Level Three — 8 weeks — 240 hours

Alternative Fuels – Theory — 12 hours

- describe the ignition process of a spark ignition engine.
- describe the fuel delivery process for various fuel types

Alternative Fuels – Shop — 18 hours

- perform servicing, diagnoses and replacement of spark ignition component.
- perform servicing, diagnosing and replacement of components related to fuel delivery

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing opportunity to inspect, test, and conduct failure analysis of engine ignition and fuel system components (spark ignition systems, fuel supply and fuel injection systems)*
- *providing direction on the* fuel delivery process for various fuelled engine types

Electrical – Theory — 14 hours

- explain common electrical components and their applications.
- interpret wiring diagrams.
- explain common electrical faults

Electrical – Shop — 16 hours

- measure electrical values.
- construct electrical circuits.
- analyze circuit operation.

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing opportunities for inspection and testing of electrical circuits, diodes, transistorized components, and computer input and output devices*
- *providing direction on the use of manual and auto-ranging DVOM to test and diagnose electrical circuits and components (engine management, transmission control, cab accessories, HVAC, suspension, hydraulic control, starting, and charging)*

Engine and Engine Support Systems – Theory — 55 hours

- describe the operational characteristics of a diesel engine
- describe metallurgy and fluid analysis as it pertains to diesel engines
- describe the operational characteristics of various diesel engine support systems
- describe the procedures involved in a diesel engine overhaul
- describe the processes involved in determining component serviceability
- describe diesel engine failure diagnosis

Engine and Engine Support Systems – Shop — 65 hours

- evaluate a diesel engine for potential faults prior to disassembly
- disassemble engine using correct procedures and shop practices
- evaluate engine components for serviceability
- assemble a diesel engine using proper procedures and serviceable components
- evaluate engines after assembly and inspect for potential faults
- evaluate operating engine for faults
- repair defects

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing opportunity to remove and install engines*
- *providing opportunity to inspect, test, and conduct failure analysis of engine and support system components (intake, exhaust, cooling, fuel supply, fuel injection, lubrication, compression)*
- *providing opportunity to R&R fuel injectors, turbo chargers, intercoolers, blowers, oil coolers, cylinder heads, and water pumps*
- *providing direction on engine disassembly, component measuring and evaluation, and rebuild procedures for wet and dry sleeve diesel engines*
- *providing direction on the correct use of precision measuring tools and engine rebuilding tools and equipment*
- *providing direction on engine start-up and break-in procedures*

Powershift Transmissions – Theory — 26 hours

- describe operation of fluid couplers and torque convertors
- describe various transmission hydraulic circuits
- describe the operation of various types of powershift and automatic transmissions
- describe the operation of transfer cases
- describe the operation of hydraulic retarders

Powershift Transmissions – Shop — 34 hours

- evaluate torque convertors
- utilize hydraulic schematics
- evaluate powershift and automatic transmissions
- evaluate transfer cases
- evaluate hydraulic retarders
- repair faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing opportunities on all aspects of servicing, testing, and repair of powershift transmissions and torque converters (removal, disassembly, evaluation, reassembly, installation, adjusting)*
- *providing direction on transmission control system inspection and testing procedures*

Level Four — 8 weeks — 240 hours

Drivetrains – Theory — 12 hours

- describe the operation of a hybrid drive system
- describe the operating principles of an automated manual transmission
- describe electronic controls related to automated shift technology

Drivetrains – Shop — 18 hours

- evaluate hybrid drive systems
- evaluate automated manual transmissions
- diagnose electronic faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing direction on hybrid drive systems*
- *providing opportunity to diagnose, troubleshoot and repair automated manual transmissions*
- *providing advanced direction on electronic faults*

Electrical – Theory — 40 hours

- apply scientific principles to explain electrical theory and magnetism
- identify electrical circuit types and faults utilizing test equipment
- explain the function and operation of a lead-acid battery
- explain the operation of cranking system and related components
- explain the operation of alternating current (AC) charging systems and related components
- explain common electrical and electronic components and their applications
- interpret wiring diagrams
- describe operation of electrical accessories and engine control circuits
- describe basic computer components using correct terminology
- explain operation of various electronic control systems and related components

Electrical – Shop — 50 hours

- diagnose electrical faults
- evaluate a lead acid battery
- evaluate an alternating current (AC) charging system and related components
- evaluate a cranking system and related components
- utilize wiring diagrams for fault diagnosis
- troubleshoot the accessory systems and engine control circuits
- operate various electronic control systems to check for proper function
- utilize diagnostic equipment
- repair defects

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing advanced direction to diagnose electronic faults*
- *providing opportunity for in-depth analysis, troubleshooting, and repair of electrical circuits, accessories, and computer and electronically controlled systems and devices*
- *providing advanced opportunities to use electric and electronic testing equipment (scan tool, DVOM, laptop computer, on-board diagnostics)*

Environmental Control Systems – Theory **12 hours**

- describe the operation of heating, ventilation and air conditioning systems
- identify various heating and air conditioning components
- describe proper usage of test equipment

Environmental Control Systems – Shop **18 hours**

- demonstrate service procedures
- repair air conditioning and heating components
- repair air conditioning systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing opportunity for in-depth analysis, troubleshooting and repair of heating, ventilation and air conditioning systems*

Fuel Systems – Theory **40 hours**

- describe preventive maintenance procedures for diesel fuel storage and delivery systems
- describe proper procedures to diagnose faults in fuel delivery and control systems
- describe proper procedures to inspect, adjust or repair fuel delivery and control systems
- describe the procedures involved in performance testing on diesel engines

Fuel Systems – Shop **50 hours**

- perform preventative maintenance
- evaluate diesel injection delivery and control components
- evaluate an operating diesel engine
- conduct performance testing
- repair faults

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing opportunity to inspect, test, and conduct failure analysis of engine diesel fuel system components (fuel supply, fuel pumps and fuel injection systems)*
- *providing direction on the* fuel delivery process for diesel fuelled engine types

Consider apprenticeship training as an investment in the future of your company and in the future of your workforce. Ultimately, skilled and certified workers increase your bottom line.

Get involved in the apprenticeship training system. Your commitment to training helps to maintain the integrity of the trade.

Do you have employees who have been working in the trade for a number of years but don't have trade certification? Contact your local apprenticeship office for details on how they might obtain the certification they need.

Saskatchewan Apprenticeship & Trade Certification Commission
2140 Hamilton St Regina SK S4P 2E3
Tel: (306) 787-2444
Fax: (306) 787-5105
Toll Free: 1-877-363-0536
web site: www.saskapprenticeship.ca

District Offices
Estevan (306) 637-4930
La Ronge (306) 425-4385
Moose Jaw (306) 694-3735
North Battleford (306) 446-7409
Prince Albert (306) 953-2632
Saskatoon (306) 933-8476
Swift Current (306) 778-8945
Yorkton (306) 786-1394