Heavy Duty Equipment Technician

Guide to Course Content

2026

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Recognition:
To promote transparency and consistency, this document has been adapted from the 2023 Heavy Duty Equipment Technician Red Seal Occupational Standard (Employment and Social Development Canada).

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

STRUCTURE OF THE GUIDE TO COURSE CONTENT

To facilitate understanding of the occupation, this guide to course content 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.

Training Profile Chart: a chart which outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training.

Technical Training Course Content for the Heavy Duty Equipment Technician trade: a chart which outlines the model for SATCC technical training sequencing.

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.

There are four levels of technical training delivered by Saskatchewan Polytechnic in Saskatoon.

Level One: 8 weeks
Level Two: 8 weeks
Level Three: 8 weeks
Level Four: 8 weeks

The information contained in this guide to course content details the technical training delivered for each level of apprenticeship. An apprentice spends approximately 15% of their apprenticeship term in a technical training institute learning the technical and theoretical aspects of the trade. The hours and percentages of technical and practical training may vary according to class needs and progress.

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

Entrance Requirements for Apprenticeship Training

Your grade twelve transcripts (with no modified classes) or GED 12 is your guarantee that you meet the educational entrance requirements for apprenticeship in Saskatchewan. In fact, employers prefer and recommend apprentices who have completed high school. This ensures the individual has all of the necessary skills required to successfully complete the apprenticeship program, and receive journeyperson certification.

Individuals with “modified” or “general” classes in math or science do not meet our entry requirements. These individuals are required to take an entrance assessment prescribed by the SATCC.

English is the language of instruction in all apprenticeship programs and is the common language for business in Saskatchewan. Before admission, all apprentices and/or “upgraders” must be able to understand and communicate in the English language. Applicants whose first language is not English must have a minimum Canadian Language Benchmark Assessment of six (CLB6).

Note: A CLB assessment is valid for a one-year period from date of issue.

Designated Trade Name	**Math Credit** at the Indicated Grade Level❶	**Science Credit** at Grade Level
Heavy Duty Equipment Technician	Grade 11	Grade 10

❶ - (One of the following) WA – Workplace and Apprenticeship; or F – Foundations; or P – Pre-calculus, or a Math at the indicated grade level (Modified and General Math credits are not acceptable.).

*Applicants who have graduated in advance of 2015-2016, or who do not have access to the revised Science curricula will require a Science at the minimum grade level indicated by trade.

For information about high school curriculum, including Math and Science course names, please see: http://www.curriculum.gov.sk.ca/

Individuals not meeting the entrance requirements will be subject to an assessment and any required training.

HEAVY DUTY EQUIPMENT TECHNICIAN TASK MATRIX

This chart outlines the major work activities, tasks and sub-tasks from the 2023 Red Seal Occupational Standard. Each sub-task details the corresponding essential skill and level of training where the content is covered. *

* Sub-tasks with numbers in the boxes are where the content will be delivered in training.

A – Performs Common Occupational Skills — 7%

A-1 Performs safety-related functions	1.01 Performs hazard analysis	1.02 Uses hoisting and lifting equipment	1.03 Uses personal protective equipment (PPE) and safety equipment	1.04 Implements safety protocols for hybrid and all-electric equipment and attachments	
A-2 Uses and maintains tools and equipment	2.01 Uses hand, power, measuring, testing and diagnostic tools	2.02 Uses shop equipment	2.03 Uses access equipment	2.04 Uses hoisting, rigging, lifting, cribbing and blocking equipment	2.05 Uses welding equipment
	2.06 Uses heating and cutting equipment	2.07 Uses electronic service tools and systems for diagnostics and programming			
A-3 Performs routine work practices	3.01 Uses documentation and reference materials	3.02 Prepares job action plan	3.03 Maintains fluids and lubricants	3.04 Services hoses, tubing, piping and fittings	3.05 Services bearings and seals
	3.06 Uses fasteners and sealing materials	3.07 Services safety features	3.08 Performs operational check-out		

A-4 Uses communication and mentoring techniques	4.01 Uses communication techniques	4.02 Uses mentoring techniques

B – Services, Diagnoses and Repairs Engines and Engine Support Systems — 15%

B-5 Diagnoses engines and engine support systems	5.01 Services base engine	5.02 Diagnoses base engines	5.03 Repairs base engines
B-6 Services, diagnoses and repairs lubrication systems	6.01 Services lubrication systems	6.02 Diagnoses lubrication systems	6.03 Repairs lubrication systems
B-7 Services, diagnoses and repairs intake systems	7.01 Services intake systems	7.02 Diagnoses intake systems	7.03 Repairs intake systems
B-8 Services, diagnoses and repairs exhaust systems	8.01 Services exhaust systems	8.02 Diagnoses exhaust systems	8.03 Repairs exhaust systems
B-9 Services, diagnoses and repairs engine management systems	9.01 Services engine management systems	9.02 Diagnoses engine management systems	9.03 Repairs engine management systems
B-10 Services, diagnoses and repairs fuel delivery systems	10.01 Services fuel delivery systems	10.02 Diagnoses fuel delivery systems	10.03 Repairs fuel delivery systems

B-11 Services, diagnoses and repairs emission control systems	**11.01 Services emission control systems**	**11.02 Diagnoses emission control systems**	**11.03 Repairs emission control systems**
B-12 Services, diagnoses and repairs cooling systems	**12.01 Services cooling systems**	**12.02 Diagnoses cooling systems**	**12.03 Repairs cooling systems**

C – Services, Diagnoses and Repairs Steering, Suspension, Brake Systems, Undercarriage Systems and Wheel Assemblies

12%

C-13 Services, diagnoses and repairs steering systems	**13.01 Services steering systems**	**13.02 Diagnoses steering systems**	**13.03 Repairs steering systems**
C-14 Services, diagnoses and repairs suspension systems	**14.01 Services suspension systems**	**14.02 Diagnoses suspension systems**	**14.03 Repairs suspension systems**
C-15 Services, diagnoses and repairs brake systems	**15.01 Services brake systems**	**15.02 Diagnoses brake systems**	**15.03 Repairs brake systems**
C-16 Services, diagnoses and repairs undercarriage systems	**16.01 Services undercarriage systems**	**16.02 Diagnoses undercarriage systems**	**16.03 Repairs undercarriage systems**
C-17 Services, diagnoses and repairs wheel assemblies	**17.01 Services wheel assemblies**	**17.02 Diagnoses wheel assemblies**	**17.03 Repairs wheel assemblies**

D – Services, Diagnoses and Repairs Electrical and Electronic Systems

19%

D-18 Services, diagnoses and repairs charging systems	18.01 Services charging system	18.02 Diagnoses charging systems	18.03 Repairs charging systems
D-19 Services, diagnoses and repairs starting systems	19.01 Services starting systems	19.02 Diagnoses starting systems	19.03 Repairs starting systems
D-20 Services, diagnoses and repairs battery systems	20.01 Services battery systems	20.02 Diagnoses battery systems	20.03 Repairs battery systems

E – Services, Diagnoses and Repairs Drivetrain Systems

12%

E-23 Services, diagnoses and repairs clutches	23.01 Services clutches	23.02 Diagnoses clutches	23.03 Repairs clutches
E-24 Services, diagnoses and repairs torque converters, fluid couplers and hydraulic retarders	24.01 Services torque converters, fluid couplers and hydraulic retarders	24.02 Diagnoses torque converters, fluid couplers and hydraulic retarders	24.03 Repairs torque converters, fluid couplers and hydraulic retarders
E-25 Services, diagnoses and repairs manual transmissions and transfer cases	25.01 Services manual transmissions and transfer cases	25.02 Diagnoses manual transmissions and transfer cases	25.03 Repairs manual transmissions and transfer cases

E-26 Services, diagnoses and repairs automatic and powershift transmissions	**26.01 Services automatic and powershift transmissions**	**26.02 Diagnoses automatic and powershift transmissions**	**26.03 Repairs automatic and powershift transmissions**
E-27 Services, diagnoses and repairs driveline systems	**27.01 Services driveline systems**	**27.02 Diagnoses driveline systems**	**27.03 Repairs driveline systems**
E-28 Services, diagnoses and repairs drive axles and differentials	**28.01 Services drive axles and differentials**	**28.02 Diagnoses drive axles and differentials**	**28.03 Repairs drive axles and differentials**
E-29 Services, diagnoses and repairs final drive systems	**29.01 Services final drive systems**	**29.02 Diagnoses final drive systems**	**29.03 Repairs final drive systems**

F – Services, Diagnoses and Repairs Environmental Control — 7%

F-30 Services, diagnoses and repairs heating systems	30.01 Services heating systems	30.02 Diagnoses heating systems	30.03 Repairs heating systems
F-31 Services, diagnoses and repairs ventilation and filtration systems	31.01 Services ventilation and filtration systems	31.02 Diagnoses ventilation and filtration systems	31.03 Repairs ventilation and filtration systems
F-32 Services, diagnoses and repairs air conditioning systems	32.01 Services air conditioning systems	32.02 Diagnoses air conditioning systems	32.03 Repairs air conditioning systems
F-33 Services, diagnoses and repairs sound suppression systems	33.01 Services sound suppression systems	33.02 Diagnoses sound suppression systems	33.03 Repairs sound suppression systems

G– Services, Diagnoses and Repairs Hydraulic, Hydrostatic and Pneumatic Systems — 18%

G-34 Services, diagnoses and repairs hydraulic systems	34.01 Services hydraulic systems	34.02 Diagnoses hydraulic systems	34.03 Repairs hydraulic systems
G-35 Services, diagnoses and repairs hydrostatic systems	35.01 Services hydrostatic systems	35.02 Diagnoses hydrostatic systems	35.03 Repairs hydrostatic systems

G-36 Services, diagnoses and repairs pneumatic systems	**36.01 Services pneumatic systems**	**36.02 Diagnoses pneumatic systems**	**36.03 Repairs pneumatic systems**

H – Services, Diagnoses and Repairs Structural Components, Operator Stations, Attachments and Accessories

7%

H-37 Services, diagnoses and repairs structural components	37.01 Services structural components	37.02 Diagnoses structural components	37.03 Performs mechanical repairs on structural components	
H-38 Services, diagnoses and repairs operator station components	38.01 Services operator station components	38.02 Diagnoses operator station components	38.03 Repairs operator station components	
H-39 Services, diagnoses and repairs attachments and accessories	39.01 Services attachments and accessories	39.02 Diagnoses attachments and accessories	39.03 Repairs attachments and accessories	39.04 Installs attachments and accessories

I – Services, Diagnoses and Repairs Hybrid and All-Electric Equipment

3%

I-40 Services, diagnoses and repairs hybrid equipment	40.01 Services hybrid equipment	40.02 Diagnoses hybrid equipment	40.03 Repairs hybrid equipment
I-41 Services, diagnoses and repairs all-electric equipment	41.01 Services all-electric equipment	41.02 Diagnoses all-electric equipment	41.03 Repairs all-electric equipment

TRAINING PROFILE CHART

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

Level One	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 – Theory	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	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
OFC/SMAW/GMAW Welding	WELD 235 – Theory	6
	WELD 235 – Shop	24
Structural Components	MAIN 200 – Theory	12
	MAIN 201 – Shop	18
		240

Level Three	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

TECHNICAL TRAINING COURSE CONTENT

This chart outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training sequencing.

Sub-tasks listed are the minimum to be covered in a topic. Related sub-tasks not listed may be used as a reference and taught “in context” in other topics.

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
- describe safety practices associated with welding and oxy-fuel cutting

Basic Tools – Shop — 12 hours

- demonstrate safety
- explain legislative regulations
- demonstrate use and care of hand tools and shop equipment
- demonstrate safety practices associated with welding and oxy-fuel cutting

RSOS topics covered in this section of training:

A-1 Performs safety-related functions
A-1.01 Performs hazard analysis
A-1.02 Maintains safe work environment
A-1.03 Uses personal protective equipment (PPE) and safety equipment

A-2 Uses and maintains tools and equipment
A-2.01 Uses hand, power, measuring, testing and diagnostic tools
A-2.02 Uses shop equipment
A-2.04 Uses hoisting, rigging, lifting, cribbing and blocking equipment
A-2.05 Uses welding equipment
A-2.06 Uses heating and cutting equipment

A-3 Performs routine work practices
A-3.01 Uses documentation and reference materials
A-3.04 Services hoses, tubing, piping and fittings
A-3.06 Uses fasteners and sealing materials

A-4 Uses communication and mentoring techniques
A-4.01 Uses communication techniques

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

RSOS topics covered in this section of training:

C-15 Services, diagnoses and repairs brake systems
C-15.01 Services brake systems
C-15.02 Diagnoses brake systems
C-15.03 Repairs brake systems

G-36 Services, diagnoses and repairs pneumatic systems
G-36.01 Services pneumatic systems
G-36.02 Diagnoses pneumatic systems
G 36.03 Repairs pneumatic systems

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

RSOS topics covered in this section of training:

A-2 Uses and maintains tools and equipment
A-2.07 Uses electronic service tools and systems for diagnostics and programming

D-18 Services, diagnoses and repairs charging systems

D-18.01 Services charging systems
D-18.02 Diagnoses charging systems
D-18.03 Repairs charging systems

D-19 Services, diagnoses and repairs starting systems
D-19.01 Services starting systems
D-19.02 Diagnoses starting systems
D-19.03 Repairs starting systems

D-20 Services, diagnoses and repairs battery systems
D-20.01 Services battery systems
D-20.02 Diagnoses battery systems
D-20.03 Repairs battery systems

D-21 Services, diagnoses and repairs electrical components
D-21.01 Services electrical components
D-21.02 Diagnoses electrical components
D-21.03 Repairs electrical components

Environmental Control Systems – Theory — 6 hours

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

RSOS topics covered in this section of training:

F-31 Services, diagnoses and repairs ventilation and filtration systems
F-31.01 Services ventilation and filtration systems
F-31.02 Diagnoses ventilation and filtration systems
F-31.03 Repairs ventilation and filtration systems

F-32 Services, diagnoses and repairs air conditioning systems
F-32.01 Services air conditioning systems
F-32.02 Diagnoses air conditioning systems
F-32.03 Repairs air conditioning systems

Hydraulics – Theory — 24 hours

- explain the fundamentals of a basic hydraulic system and related components
- interpret hydraulic symbol diagrams
- describe hydraulic system maintenance and testing procedures
- describe open and closed center hydraulic systems

Hydraulics – Shop — 36 hours

- service hydraulic system and various components
- test hydraulic systems using correct tools and procedures

RSOS topics covered in this section of training:

G-34 Services, diagnoses and repairs hydraulic systems
G-34.01 Services hydraulic systems
G-34.02 Diagnoses hydraulic systems
G-34.03 Repairs hydraulic systems

G-35 Services, diagnoses and repairs hydrostatic systems
G-35.01 Services hydrostatic systems
G-35.02 Diagnoses hydrostatic systems
G-35.03 Repairs hydrostatic systems

Steering Systems – Theory — 12 hours

- explain basic wheel and frame alignment angles
- explain manual and integral steering system operation
- describe mounting procedures for tires, rims and hubs

Steering Systems – Shop — 18 hours

- perform a basic wheel alignment
- evaluate manual and integral power steering systems
- perform mounting procedures for tires, rims and hubs
- repair system faults

RSOS topics covered in this section of training:

A-3 Performs routine work practices
A-3.02 Prepares job action plan
A-3.05 Services bearings and seals
A-3.08 Performs operational check-out

C-13 Services, diagnoses and repairs steering systems
C-13.01 Services steering systems
C-13.02 Diagnoses steering systems
C-13.03 Repairs steering systems

C-14 Services, diagnoses and repairs suspension systems
C-14.01 Services suspension systems
C-14.02 Diagnoses suspension systems
C-14.03 Repairs suspension systems

C-17 Services, diagnoses and repairs wheel assemblies
C-17.01 Services wheel assemblies
C-17.02 Diagnoses wheel assemblies
C-17.03 Repairs wheel assemblies

G-36 Services, diagnoses and repairs pneumatic systems
G-36.01 Services pneumatic systems
G-36.02 Diagnoses pneumatic systems
G 36.03 Repairs pneumatic systems

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

RSOS topics covered in this section of training:

A-2 Uses and maintains tools and equipment
A-2.01 Uses hand, power, measuring, testing and diagnostic tools
A-2.02 Uses shop equipment
A-2.03 Uses access equipment
A-2.04 Uses hoisting, rigging, lifting, cribbing and blocking equipment
A-2.05 Uses welding equipment
A-2.06 Uses heating and cutting equipment

A-3 Performs routine work practices
A-3.03 Maintains fluids and lubricants
A-3.07 Services safety features

B-6 Services, diagnoses and repairs lubrication systems
B-6.01 Services lubrication systems
B-6.02 Diagnoses lubrication systems
B-6.03 Repairs lubrication systems

C-14 Services, diagnoses and repairs suspension systems
C-14.01 Services suspension systems
C-14.02 Diagnoses suspension systems
C-14.03 Repairs suspension systems

F-31 Services, diagnoses and repairs ventilation and filtration systems
F-31.01 Services ventilation and filtration systems
F-31.02 Diagnoses ventilation and filtration systems
F-31.03 Repairs ventilation and filtration systems

H-37 Services, diagnoses and repairs structural components
H-37.01 Services structural components

H-38 Services, diagnoses and repairs operator station components
H-38.01 Services operator station components
H-38.02 Diagnoses operator station components
H-38.03 Repairs operator station components

Level Two — 8 weeks — 240 hours

Brake Systems ABS – Theory — 14 hours

- describe antilock braking system components
- describe electric braking system components
- describe traction and stability control system components
- describe multidisc braking systems

Brake Systems ABS – Shop — 16 hours

- evaluate antilock braking systems
- evaluate an electric braking system
- evaluate traction and stability control systems
- repair system faults
- evaluate multidisc braking systems

RSOS topics covered in this section of training:

B-9 Services, diagnoses and repairs engine management systems
B-9.01 Services engine management systems
B-9.02 Diagnoses engine management systems
B-9.03 Repairs engine management systems

C-15 Services, diagnoses and repairs brake systems
C-15.01 Services brake systems
C-15.02 Diagnoses brake systems
C-15.03 Repairs brake systems

D-21 Services, diagnoses and repairs electrical components
D-21.01 Services electrical components
D-21.02 Diagnoses electrical components
D-21.03 Repairs electrical components

D-22 Services, diagnoses and repairs equipment management systems and electronic components
D-22.01 Services equipment management systems and electronic components
D-22.02 Diagnoses equipment management systems and electronic components
D-22.03 Repairs equipment management systems and electronic components

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

RSOS topics covered in this section of training:

E-23 Services, diagnoses and repairs clutches
E-23.01 Services clutches
E-23.02 Diagnoses clutches
E-23.03 Repairs clutches

E-25 Services, diagnoses and repairs manual transmissions and transfer cases
E-25.01 Services manual transmissions and transfer cases
E-25.02 Diagnoses manual transmissions and transfer cases
E-25.03 Repairs manual transmissions and transfer cases

E-27 Services, diagnoses and repairs driveline systems
E-27.01 Services driveline systems
E-27.02 Diagnoses driveline systems
E-27.03 Repairs driveline systems

E-28 Services, diagnoses and repairs drive axles and differentials
E-28.01 Services drive axles and differentials
E-28.02 Diagnoses drive axles and differentials
E-28.03 Repairs drive axles and differentials

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

RSOS topics covered in this section of training:

D-18 Services, diagnoses and repairs charging systems
D-18.01 Services charging systems
D-18.02 Diagnoses charging systems
D-18.03 Repairs charging systems

D-19 Services, diagnoses and repairs starting systems
D-19.01 Services starting systems
D-19.02 Diagnoses starting systems
D-19.03 Repairs starting systems

D-21 Services, diagnoses and repairs electrical components
D-21.01 Services electrical components
D-21.02 Diagnoses electrical components
D-21.03 Repairs electrical components

Hydraulics – Theory — 30 hours

- describe the operation of the different types of flow control valves
- discuss pilot control and orbital steering systems.
- 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 pilot control and orbital steering systems.
- evaluate open and closed loop hydraulic systems

- evaluate a load sensing hydraulic system
- evaluate various hydrostatic drive systems
- repair faults

RSOS topics covered in this section of training:

E-24 Services, diagnoses and repairs torque converters, fluid couplers and hydraulic retarders
E-24.01 Services torque converters, fluid couplers and hydraulic retarders
E-24.02 Diagnoses torque converters, fluid couplers and hydraulic retarders
E-24.03 Repairs torque converters, fluid couplers and hydraulic retarders

G-34 Services, diagnoses and repairs hydraulic systems
G-34.01 Services hydraulic systems
G-34.02 Diagnoses hydraulic systems
G-34.03 Repairs hydraulic systems

G-35 Services, diagnoses and repairs hydrostatic systems
G-35.01 Services hydrostatic systems
G-35.02 Diagnoses hydrostatic systems
G-35.03 Repairs hydrostatic systems

G-36 Services, diagnoses and repairs pneumatic systems
G-36.01 Services pneumatic systems
G-36.02 Diagnoses pneumatic systems
G 36.03 Repairs pneumatic systems

WELD 235- OFC/SMAW/GMAW Welding – Theory **6 Hours**

- identify safety considerations associated with oxy-fuel units, shielded metal arc welding and gas metal arc welding
- describe the setup and operation of an oxy-fuel unit, shielded metal arc welding and gas metal arc welding equipment

WELD 235- OFC/SMAW/GMAW Welding – Shop **24 Hours**

- cut plate and gauge metal using oxy-fuel unit
- weld ¼" material, T joint, horizontal fillet and surface build up using the SMAW process
- demonstrate use of GMAW in the horizontal and vertical down positions

RSOS topics covered in this section of training:

A-2 Uses and maintains tools and equipment
A-2.05 Uses welding equipment

H-37 Services, diagnoses and repairs structural components
H-37.01 Services structural components
H-37.02 Diagnoses structural components
H-37.03 Performs mechanical repairs on structural components

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

RSOS topics covered in this section of training:

A-2 Uses and maintains tools and equipment
A-2.04 Uses hoisting, rigging, lifting, cribbing and blocking equipment

C-13 Services, diagnoses and repairs steering systems
C-13.01 Services steering systems
C-13.02 Diagnoses steering systems
C-13.03 Repairs steering systems

C-16 Services, diagnoses and repairs undercarriage systems
C-16.01 Services undercarriage systems
C-16.02 Diagnoses undercarriage systems
C-16.03 Repairs undercarriage systems

E-23 Services, diagnoses and repairs clutches
E-23.01 Services clutches
E-23.02 Diagnoses clutches
E-23.03 Repairs clutches

E-29 Services, diagnoses and repairs final drive systems
E-29.01 Services final drive systems
E-29.02 Diagnoses final drive systems
E-29.03 Repairs final drive systems

H-37 Services, diagnoses and repairs structural components
H-37.01 Services structural components
H-37.02 Diagnoses structural components
H-37.03 Performs mechanical repairs on structural components

Level Two topics that are taught in context:

A-1 Performs Safety-Related Functions
A-2 Uses and Maintains Tools and Equipment
A-3 Routine Work Practices
H-38 Services, diagnoses and repairs operator station components

For details regarding the In Context Topic, see page 31

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

RSOS topics covered in this section of training:

B-9 Services, diagnoses and repairs engine management systems
B-9.01 Services engine management systems
B-9.02 Diagnoses engine management systems
B-9.03 Repairs engine management systems

B-10 Services, diagnoses and repairs fuel delivery systems
B-10.01 Services fuel delivery systems
B-10.02 Diagnoses fuel delivery systems
B-10.03 Repairs fuel delivery systems

D-18 Services, diagnoses and repairs charging systems
D-18.01 Services charging systems
D-18.02 Diagnoses charging systems
D-18.03 Repairs charging systems

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.

RSOS topics covered in this section of training:

B-9 Services, diagnoses and repairs engine management systems
B-9.01 Services engine management systems
B-9.02 Diagnoses engine management systems
B-9.03 Repairs engine management systems

D-22 Services, diagnoses and repairs equipment management systems and electronic components
D-22.01 Services equipment management systems and electronic components
D-22.02 Diagnoses equipment management systems and electronic components
D-22.03 Repairs equipment management systems and electronic components

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

RSOS topics covered in this section of training:

B-5 Services, diagnoses and repairs base engines
B-5.01 Services base engines
B-5.02 Diagnoses base engines
B-5.03 Repairs base engines

B-6 Services, diagnoses and repairs lubrication systems
B-6.01 Services lubrication systems
B-6.02 Diagnoses lubrication systems
B-6.03 Repairs lubrication systems

B-7 Services, diagnoses and repairs intake systems
B-7.01 Services intake systems
B-7.02 Diagnoses intake systems
B-7.03 Repairs intake systems

B-8 Services, diagnoses and repairs exhaust systems
B-8.01 Services exhaust systems
B-8.02 Diagnoses exhaust systems
B-8.03 Repairs exhaust systems

B-10 Services, diagnoses and repairs fuel delivery systems
B-10.01 Services fuel delivery systems
B-10.02 Diagnoses fuel delivery systems
B-10.03 Repairs fuel delivery systems

B-11 Services, diagnoses and repairs emission control systems
B-11.01 Services emission control systems
B-11.02 Diagnoses emission control systems
B-11.03 Repairs emission control systems

B-12 Services, diagnoses and repairs cooling systems
B-12.01 Services cooling systems
B-12.02 Diagnoses cooling systems
B-12.03 Repairs cooling systems

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

RSOS topics covered in this section of training:

D-22 Services, diagnoses and repairs equipment management systems and electronic components
D-22.01 Services equipment management systems and electronic components
D-22.02 Diagnoses equipment management systems and electronic components
D-22.03 Repairs equipment management systems and electronic components

E-23 Services, diagnoses and repairs clutches
E-23.01 Services clutches
E-23.02 Diagnoses clutches
E-23.03 Repairs clutches

E-24 Services, diagnoses and repairs torque converters, fluid couplers and hydraulic retarders
E-24.01 Services torque converters, fluid couplers and hydraulic retarders
E-24.02 Diagnoses torque converters, fluid couplers and hydraulic retarders
E-24.03 Repairs torque converters, fluid couplers and hydraulic retarders

E-25 Services, diagnoses and repairs manual transmissions and transfer cases
E-25.01 Services manual transmissions and transfer cases
E-25.02 Diagnoses manual transmissions and transfer cases
E-25.03 Repairs manual transmissions and transfer cases

E-26 Services, diagnoses and repairs automatic and powershift transmissions
E-26.01 Services automatic and powershift transmissions
E-26.02 Diagnoses automatic and powershift transmissions
E-26.03 Repairs automatic and powershift transmissions

Level Three topics that are taught in context:

A-1 Performs Safety-Related Functions
A-2 Uses and Maintains Tools and Equipment
A-3 Routine Work Practices
H-38 Services, diagnoses and repairs operator station components
H-39 Services, diagnoses and repairs attachments and accessories

For details regarding the In Context Topic, see page 31

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

RSOS topics covered in this section of training:

D-22 Services, diagnoses and repairs equipment management systems and electronic components
D-22.01 Services equipment management systems and electronic components
D-22.02 Diagnoses equipment management systems and electronic components
D-22.03 Repairs equipment management systems and electronic components

E-26 Services, diagnoses and repairs automatic and powershift transmissions
E-26.02 Diagnoses automatic and powershift transmissions
E-26.03 Repairs automatic and powershift transmissions

E-27 Services, diagnoses and repairs driveline systems
E-27.02 Diagnoses driveline systems
E-27.03 Repairs driveline systems

E-29 Services, diagnoses and repairs final drive systems
E-29.02 Diagnoses final drive systems
E-29.03 Repairs final drive systems

I-40 Services, diagnoses and repairs hybrid equipment
I-40.01 Services hybrid equipment
I-40.02 Diagnoses hybrid equipment
I-40.03 Repairs hybrid equipment

I-41 Services, diagnoses and repairs all-electric equipment
I-41.01 Services all-electric equipment
I-41.02 Diagnoses all-electric equipment
I-41.03 Repairs all-electric equipment

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

RSOS topics covered in this section of training:

D-21 Services, diagnoses and repairs electrical components
D-21.01 Services electrical components
D-21.02 Diagnoses electrical components

D-21.03 Repairs electrical components **D-22 Services, diagnoses and repairs equipment management systems and electronic components**
D-22.01 Services equipment management systems and electronic components
D-22.02 Diagnoses equipment management systems and electronic components
D-22.03 Repairs equipment management systems and electronic components

I-41 Services, diagnoses and repairs all-electric equipment
I-41.01 Services all-electric equipment
I-41.02 Diagnoses all-electric equipment
I-41.03 Repairs all-electric equipment

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

RSOS topics covered in this section of training:

F-30 Services, diagnoses and repairs heating systems
F-30.01 Services heating systems
F-30.02 Diagnoses heating systems
F-30.03 Repairs heating systems

F-31 Services, diagnoses and repairs ventilation and filtration systems
F-31.01 Services ventilation and filtration systems
F-31.02 Diagnoses ventilation and filtration systems
F-31.03 Repairs ventilation and filtration systems

F-32 Services, diagnoses and repairs air conditioning systems
F-32.01 Services air conditioning systems
F-32.02 Diagnoses air conditioning systems
F-32.03 Repairs air conditioning systems

G-36 Services, diagnoses and repairs pneumatic systems
G-36.01 Services pneumatic systems
G-36.02 Diagnoses pneumatic systems
G 36.03 Repairs pneumatic 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

RSOS topics covered in this section of training:

B-5 Services, diagnoses and repairs base engines
B-5.01 Services base engines
B-5.02 Diagnoses base engines
B-5.03 Repairs base engines

B-6 Services, diagnoses and repairs lubrication systems
B-6.01 Services lubrication systems
B-6.02 Diagnoses lubrication systems
B-6.03 Repairs lubrication systems

B-7 Services, diagnoses and repairs intake systems
B-7.01 Services intake systems
B-7.02 Diagnoses intake systems
B-7.03 Repairs intake systems

B-8 Services, diagnoses and repairs exhaust systems
B-8.01 Services exhaust systems
B-8.02 Diagnoses exhaust systems
B-8.03 Repairs exhaust systems

B-9 Services, diagnoses and repairs engine management systems
B-9.01 Services engine management systems
B-9.02 Diagnoses engine management systems
B-9.03 Repairs engine management systems

B-10 Services, diagnoses and repairs fuel delivery systems
B-10.01 Services fuel delivery systems
B-10.02 Diagnoses fuel delivery systems
B-10.03 Repairs fuel delivery systems

B-11 Services, diagnoses and repairs emission control systems
B-11.01 Services emission control systems
B-11.02 Diagnoses emission control systems
B-11.03 Repairs emission control systems

B-12 Services, diagnoses and repairs cooling systems
B-12.01 Services cooling systems
B-12.02 Diagnoses cooling systems
B-12.03 Repairs cooling systems

D-22 Services, diagnoses and repairs equipment management systems and electronic components
D-22.02 Diagnoses equipment management systems and electronic components

E-28 Services, diagnoses and repairs drive axles and differentials
E-28.02 Diagnoses drive axles and differentials
E-28.03 Repairs drive axles and differentials

Level Four topics that are taught in context:

A-1 Performs Safety-Related Functions
A-2 Uses and Maintains Tools and Equipment
A-3 Routine Work Practices
H-38 Services, diagnoses and repairs operator station components
H-39 Services, diagnoses and repairs attachments and accessories

For details regarding the In Context Topic, see page 31

IN CONTEXT TOPICS

Some material may be taught 'in context.' In context means learning that has already taken place and is being applied to the applicable task. Learning outcomes for in context topics are accomplished in other topics in that level.

A-1 Performs safety-related functions
A-1.01 Performs hazard analysis
A-1.02 Maintains safe work environment
A-1.03 Uses personal protective equipment (PPE) and safety equipment
A-1.04 Implements safety protocols for hybrid and all electric equipment and attachments

A-2 Uses and maintains tools and equipment
A-2.01 Uses hand, power, measuring, testing and diagnostic tools
A-2.02 Uses shop equipment
A-2.03 Uses access equipment
A-2.04 Uses hoisting, rigging, lifting, cribbing and blocking equipment
A-2.05 Uses welding equipment
A-2.06 Uses heating and cutting equipment
A-2.07 Uses electronic service tools and systems for diagnostics and programming

A-3 Routine work practices
A-3.01 Uses documentation and reference materials
A-3.02 Prepares job action plan
A-3.03 Maintains fluids and lubricants
A-3.04 Services hoses, tubing, piping and fittings
A-3.05 Services bearings and seals
A-3.06 Uses fasteners and sealing materials
A-3.07 Services safety features
A-3.08 Performs operational check-out

H-38 Services, diagnoses and repairs operator station components
H-38.01 Services operator station components
H-38.02 Diagnoses operator station components
H-38.03 Repairs operator station components

H-39 Services, diagnoses and repairs attachments and accessories
H-39.01 Services attachments and accessories
H-39.02 Diagnoses attachments and accessories
H-39.03 Repairs attachments and accessories
H-39.04 Installs attachments and accessories