Atlantic Workforce Partnership

Curriculum Standard

Heavy Duty Equipment Technician

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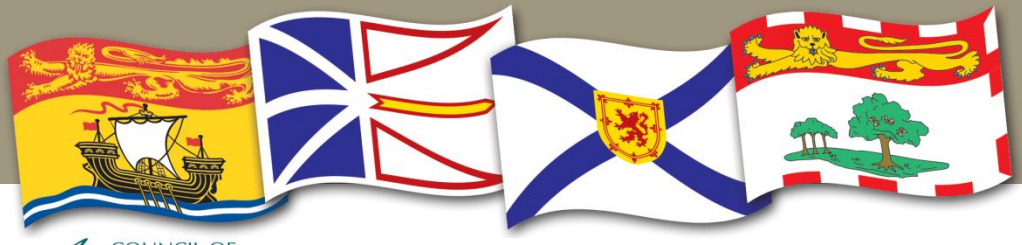
Atlantic Apprenticeship



COUNCIL OF ATLANTIC PREMIERS
CONSEIL DES PREMIERS MINISTRES DE L'ATLANTIQUE

Employment and Social Development Canada
Emploi et Développement social Canada

Atlantic Apprenticeship Curriculum Standard

Heavy Duty Equipment Technician

PLAN OF TRAINING

Atlantic Apprenticeship Curriculum Standard

Heavy Duty Equipment Technician

March, 2019

Newfoundland Labrador

Government of Newfoundland and Labrador
Department of Advanced Education, Skills and Labour
Apprenticeship and Trades Certification Division

Approved by:

Chairperson, Provincial Apprenticeship and Certification Board

Date: March 20, 2019

Preface

This Atlantic Apprenticeship Curriculum Standard is intended to assist instructional staff in the design and delivery of technical, in-class training in support of the Heavy Duty Equipment Technician program.

This document contains all the technical training elements required to complete the Heavy Duty Equipment Technician apprenticeship program and has been developed based on the 2014 National Occupation Analysis. The NOA can be found on the Red Seal website (www.red-seal.ca).

Implementation of this AACS for Apprenticeship training is outlined in the following table.

Level	Implementation Effective
Level 1	2020-2021
Level 2	2021-2022
Level 3	2022-2023
Level 4	2023-2024

*** The above implementation schedule was current at time of printing. Please **confirm** with Apprenticeship Staff prior to commencing training.*

Granting of credit or permission to challenge Level examinations for pre-employment or pre-apprenticeship training for the Heavy Duty Equipment Technician trade will be based on the content outlined in this standard. Training providers must contact their provincial apprenticeship authority for more information on the process and requirements for determining eligibility for credit towards an apprenticeship program. Programs which have been deemed acceptable by the provincial apprenticeship authority will be identified in transfer credit matrix developed through the Atlantic Apprenticeship Harmonization Project.

Acknowledgements

The Atlantic Apprenticeship Curriculum Standard (AACS) is an initiative under the Atlantic Apprenticeship Harmonization Project (AAHP) through the Atlantic Workforce Partnership and Employment and Social Development Canada.

The Atlantic apprenticeship authorities wish to acknowledge the contributions of the following industry and instructional representatives on the Atlantic Trade Advisory Committee (ATAC) who participated in the development of this document in October 2018.

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Advisory committees, industry representatives, instructors and apprenticeship staff provided valuable input to the development of this document. Without their dedication to quality apprenticeship training, this document could not have been produced.

Table of Contents

User Guide

Atlantic Apprenticeship Curriculum Standards (AACS) are developed based on National Occupational Analyses (NOA), Interprovincial Program Guides (IPG) (if available) and extensive industry consultation. This document represents the minimum content to be delivered as part of the harmonized Atlantic program for the Heavy Duty Equipment Techniciantrade.

The AACS are deliberately constructed for ease of use and flexibility of structure in order to adapt to all delivery requirements. They detail units of training, unit outcomes and objectives. They do not impose a delivery model or teaching format.

Jurisdictions and/or training providers will select and develop delivery materials and techniques that accommodate a variety of learning styles and delivery patterns. The AACS does not dictate study materials, textbooks or learning activities to be used in delivery.

The document includes a Level Structure to facilitate mobility for apprentices moving from one jurisdiction to another.

Structure

The content of the AACS is divided into units. Unit codes are used as a means of identification and are not intended to convey the order of delivery. It is at the discretion of the training provider to deliver the content in the required logical sequence of delivery within the level. Jurisdictions are free to deliver units one at a time or concurrently within a level, provided all outcomes are met.

The Learning Outcomes describe what the apprentice should know or be able to do at the end of training. Wording of the Learning Outcomes, "Demonstrate knowledge of…" acknowledges the broad spectrum of ways in which knowledge can be assessed (i.e. practical projects, multiple choice testing, presentations, etc.) by instructional staff within the training.

Summative evaluation will be through a multiple-choice Level Examination administered through the jurisdictional Apprenticeship Authority.

The 2014 National Occupational Analysis References (NOA) to AACS Comparison chart outlines the relation between each NOA sub-task and the AACS units. NOA References have also been detailed in each unit to highlight the direct link between the unit and relevant sub-tasks in the NOA.

In the Level Structure section, the document identifies suggested hours in order to provide an indication of the time it should take to cover the material in the unit and is provided as a guide only. Adjustments to the suggested hours for each unit may be required to account for rate of apprentice learning, statutory holidays, storm days, registration and examinations. These suggested hours detailed for each unit will represent both theory and practical training (if relevant) and for consistency will be based on a standard of 30 hours per week of training. The true length of time required to deliver an outcome successfully will depend upon the learning activities and teaching methods used.

There are two types of objectives found in the AACS document: theoretical and practical.

The theoretical objectives represent the material that is to be covered during the technical training in order to convey the required knowledge to the apprentice.

The practical objectives represent the tasks or skills that have been deemed by the Atlantic Trade Advisory Committee as critical for the apprentices to receive exposure to while attending technical training. For example, exposure could be done through instructor demonstration or individual or group performance of the skill or task. Training providers are encouraged to use practical demonstration and opportunities for hands-on learning whenever possible. Practical objectives are not intended to replace the on-the-job training component of the apprentice's program or to mirror or replace the logbook skills that are to be taught and evaluated in the workplace.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided.

Glossary of Terms

These definitions are intended as a guide to how language is used in the document.

ADJUST	To put in good working order; regulate; bring to a proper state or position.
APPLICATION	The use to which something is put and/or the circumstance in which an individual would use it.
CHARACTERISTIC	A feature that helps to identify, tell apart or describe recognizably; a distinguishing mark or trait.
COMPONENT	A part that can be separated from or attached to a system; a segment or unit.
DEFINE	To state the meaning of (a word, phrase, etc.).
DESCRIBE	To give a verbal account of; tell about in detail.
EXPLAIN	To make plain or clear; illustrate; rationalize.
IDENTIFY	To point out or name objectives or types.
INTERPRET	To translate information from observation, charts, tables, graphs and written material.
MAINTAIN	To keep in a condition of good repair or efficiency.
METHOD	A means or manner of doing something that has procedures attached to it.
OPERATE	How an object works; to control or direct the functioning of.
PROCEDURE	A prescribed series of steps taken to accomplish an end.
PURPOSE	The reason for which something exists or is done, made or used.

Glossary of Terms *(continued)*

SERVICE	Routine inspection and replacement of worn or deteriorating parts. An act or business function provided to a customer in the course of an individual's profession (e.g., haircut).
TECHNIQUE	Within a procedure, the manner in which technical skills are applied.
TEST	v. To subject to a procedure that ascertains effectiveness, value, proper function or other quality. n. A way of examining something to determine its characteristics or properties, or to determine whether or not it is working correctly.

Essential Skills Profiles

Through extensive research, the Government of Canada and other national and international agencies have identified and validated key essential skills for the workplace. These skills are used in nearly every job and at different levels of complexity. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Essential Skills Profiles describe how workers in various occupations use each of the key essential skills. They include:

- a brief description of the occupation;
- examples of tasks that illustrate how each essential skill is applied; and,
- complexity ratings that indicate the level of difficulty of the example tasks.

Essential Skills profiles can be found on the Employment and Social Development Canada (ESDC) website at www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml

The development and improvement of these Essential Skills is inherent throughout the apprenticeship training program as apprentices work towards achieving journeyperson status.

Profile Chart

COMMON OCCUPATIONAL SKILLS			
CHT-100 Safety	CHT-105 Tools and Equipment	CHT-110 Hoisting and Lifting	CHT-115 Communication and Documentation
CHT-120 Preventive Maintenance	CHT-125 Start, Move and Park Vehicle	CHT-130 Fasteners, Tubings, Hoses and Fittings	CHT-135 Lubrication and Fluids Servicing
CHT-140 Gaskets, Seals and Sealing Compounds	CHT-145 Bearings	CHT-150 Metallurgy	CHT-155 Cutting and Heating
CHT-160 Metal Inert Gas (MIG) Welding	CHT-625 Shielded Metal Arc Welding		
ENGINES AND ENGINE SUPPORT SYSTEMS			
CHT-170 Engine Principles	CHT-300 Cooling Systems	CHT-305 Engine Lubrication Systems	CHT-325 Diesel Fuel Supply Systems
CHT- 345 Electronic Ignition Systems	CHT-350 Non-Diesel Fuel Systems	CHT-400 Base Engine Diagnostics	CHT-405 Diesel Fuel Injection Systems
CHT-410 Electronically-Controlled Diesel Fuel Injection Systems	CHT-415 Intake and Exhaust Systems	CHT-420 Emission Control Systems	CHT-425 Engine Brakes and Retarders
CHT-430 Diesel Engine Overhaul	CHT-440 Vehicle Mangement Systems		
HYDRAULIC, HYDROSTATIC, AND PNEUMATIC SYSTEMS			
CHT-195 Introduction to Hydraulics	CHT-600 Hydraulic Fittings, Piping, Tubing and Hoses	CHT-605 Hydraulic Reservoirs, Coolers and Filters	HET-200 Hydraulic Pumps and Motors
HET-205 Hydraulic Cylinders	HET-210 Control Valves	HET-215 Accumulators	HET-225 Hydraulic Systems Diagnostics and Testing
HET-270 Pneumatic Systems			
DRIVETRAIN SYSTEMS			
HET-240 Hydrostatic Drives	HET-245 Final Drives	CHT-310 Drivelines	CHT-315 Drive Axle Assemblies

Profile Chart *(continued)*

DRIVETRAIN SYSTEMS *(continued)*			
CHT-320 Engine Clutches	CHT-355 Manual Transmissions	CHT-360 Pump Drives/ Power Take-Offs	CHT-365 Transfer Cases
CHT-370 Automatic/Powershift and CVT Transmissions	CHT-375 Torque Converters		
STEERING, SUSPENSION, BRAKE SYSTEMS, WHEEL ASSEMBLIES, AND UNDERCARRIAGE			
CHT-165 Tires, Rims, Wheels and Hubs	CHT-610 Hydraulic Brake Systems I	CHT-615 Introduction to Air Brake Systems	CHT-630 Introduction to Steering System Components
HET-220 Hydraulic Brake Systems II	HET-230 Front and Rear Suspension	HET-235 Track-Type Undercarriage	HET-250 Hydraulic Steering Systems
HET-255 Tracked Steering Systems			
ELECTRICAL AND VEHICLE MANAGEMENT SYSTEMS			
CHT-175 Electrical and Electronic Principles	CHT-180 Batteries	CHT-185 Lighting Circuits	CHT-190 Wiring Harnesses and Accessories
CHT-330 Starting Systems	CHT-335 Starting Aids	CHT-340 Charging Systems	CHT-345 Electronic Ignition Systems
CHT-350 Non-Diesel Fuel Systems	CHT-405 Diesel Fuel Injection Systems	CHT-410 Electronically-Controlled Diesel Fuel Injection Systems	CHT-420 Emission Control Systems
CHT-425 Engine Brakes and Retarders	CHT-435 Gauges and Instrumentation	CHT-440 Vehicle Management Systems	
ENVIRONMENTAL CONTROL SYSTEMS			
CHT-620 Ozone Depleting Substances	CHT-445 Air Conditioning Systems	CHT-450 Heating and Ventilation Systems	
STRUCTURAL COMPONENTS, ACCESSORIES, AND ATTACHMENTS			
HET-260 Cabs and Protective Structures	HET-265 Fire Suppression Units	HET-275 Blades, Buckets and Cutting Edges	HET-280 Winches, Wire Ropes and Accessories
HET-285 Hydraulic Attachments	HET-290 Frames and Structures	HET-295 Material Handling Equipment	

Level Structure

Level 1 – 9 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
CHT-100	Safety	9	22
CHT-105	Tools and Equipment	9	24
CHT-110	Hoisting and Lifting	6	26
CHT-115	Communication and Documentation	6	28
CHT-120	Preventive Maintenance	3	30
CHT-125	Start, Move and Park Vehicle	3	31
CHT-130	Fasteners, Tubings, Hoses and Fittings	9	32
CHT-135	Lubrication and Fluids Servicing	18	33
CHT-140	Gaskets, Seals and Sealing Compounds	3	35
CHT-145	Bearings	3	37
CHT-150	Metallurgy	3	38
CHT-155	Cutting and Heating	9	40
CHT-160	Metal Inert Gas (MIG) Welding	9	42
CHT-165	Tires, Rims,Wheels and Hubs	12	44
CHT-170	Engine Principles	21	46
CHT-175	Electrical and Electronic Principles	30	47
CHT-180	Batteries	6	49
CHT-185	Lighting Circuits	6	51
CHT-190	Wiring Harnesses and Accessories	18	53
CHT-195	Introduction to Hydraulics	18	55
CHT-600	Hydraulic Fittings, Piping, Tubing and Hoses	6	57
CHT-605	Hydraulic Reservoirs, Coolers and Filters	6	59
CHT-610	Hydraulic Brake Systems I	15	61
CHT-615	Introduction to Air Brake Systems	15	63
CHT-620	Ozone Depleting Substances	6	65
CHT-625	Shielded Metal Arc Welding (SMAW)	9	66
CHT-630	Introduction to Steering System Components	12	68

Level 2 – 7 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
HET-200	Hydraulic Pumps and Motors	15	72
HET-205	Hydraulic Cylinders	12	75
HET-210	Control Valves	21	77
HET-215	Accumulators	6	79
HET-220	Hydraulic Brake Systems II	12	81
HET-225	Hydraulic Systems Diagnostics and Testing	21	83
HET-230	Front and Rear Suspensions	12	85
HET-235	Track-Type Undercarriage	15	87
HET-240	Hydrostatic Drives	6	89
HET-245	Final Drives	6	91
HET-250	Hydraulic Steering Systems	9	93
HET-255	Tracked Steering Systems	15	95
HET-260	Cabs and Protective Structures	6	97
HET-265	Fire Suppression Units	3	99
HET-270	Pneumatic Systems	3	101
HET-275	Blades, Buckets and Cutting Edges	6	103
HET-280	Winches, Wire Ropes and Accessories	9	106
HET-285	Hydraulic Attachments	6	108
HET-290	Frames and Structures	18	110
HET-295	Material Handling Equipment	9	112

Level 3 - 7 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
CHT-300	Cooling Systems	6	116
CHT-305	Engine Lubrication Systems	9	118
CHT-310	Drivelines	6	120
CHT-315	Drive Axle Assemblies	18	122
CHT-320	Engine Clutches	18	124
CHT-325	Diesel Fuel Supply Systems	6	126
CHT-330	Starting Systems	15	128
CHT-335	Starting Aids	6	130
CHT-340	Charging Systems	15	132
CHT-345	Electronic Ignition Systems	6	134
CHT-350	Non-Diesel Fuel Systems	30	136
CHT-355	Manual Transmissions	18	138
CHT-360	Pump Drives/Power Take-Offs	6	140
CHT-365	Transfer Cases	6	142
CHT-370	Automatic/Power Shift and CVT Transmissions	36	144
CHT-375	Torque Converters	9	146

Level 4 – 8 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
CHT-400	Base Engine Diagnostics	12	150
CHT-405	Diesel Fuel Injection Systems	24	152
CHT-410	Electronically-Controlled Diesel Fuel Injection Systems	27	154
CHT-415	Intake and Exhaust Systems	12	156
CHT-420	Emission Control Systems	27	158
CHT-425	Engine Brakes and Retarders	12	160
CHT-430	Diesel Engine Overhaul	30	162
CHT-435	Gauges and Instrumentation	6	164
CHT-440	Vehicle Management Systems	30	166
CHT-445	Air Conditioning Systems	18	169
CHT-450	Heating and Ventilation Systems	6	171
CHT-455	Mentoring	6	173
CHT-460	Program Review	30	177

2014 NOA Sub-Task to Curriculum Guide Unit Comparison

2014 NOA Task		Curriculum Guide Unit	
Task 1 - Uses and maintains tools and equipment			
1.01	Maintains tools and equipment	CHT 105	Tools and Equipment
		CHT 160	MIG Welding
		CHT 625	SMAW Welding
1.02	Uses hoisting and lifting equipment	CHT 110	Hoisting and lifting
1.03	Operates access equipment	CHT 110	Hoisting and Lifting
1.04	Uses PPE and Safety Equipment	CHT 100	Safety
		CHT 620	Ozone Depleting Substances
Task 2 - Performs general maintenance and inspections			
2.01	Maintains fluids	CHT 120	Preventive Maintenance
		CHT 135	Lubrication and Fluids Servicing
2.02	Services fasteners, sealing devices, adhesives, and gaskets	CHT 130	Fasteners, Tubings, Hoses and Fittings
		CHT 140	Gaskets, Seals and Sealing Compounds
2.03	Services hoses, tubing, piping, and fittings	CHT 130	Fasteners, Tubing, Hoses and Fittings
2.04	Services bearings and seals	CHT 140	Gaskets, Seals and Sealing Compounds
		CHT 145	Bearings
2.05	Services safety features	HET 260	Cabs and Protective Structures
		HET 265	Fire Suppression Units
2.06	Perform scheduled maintenance procedures	CHT 120	Preventive Maintenance
2.07	Identifies operational faults	CHT 125	Start, Move and Park Vehicle
2.08	Performs operational check outs	CHT 125	Start, Move and Park Vehicle
Task 3 - Organizes work			
3.01	Uses documentation and reference materials	CHT 115	Communication and Documentation
3.02	Completes documentation	CHT 115	Communication and Documentation
3.03	Communicates with others	CHT 115	Communication and Documentation
3.04	Prepares job action plan	CHT 115	Communication and Documentation
3.05	Maintains safe work environment	CHT 100	Safety
Task 4 - Performs routine trade activities			
4.01	Heats material	CHT 155	Cutting and Heating
4.02	Cools material	CHT 145	Bearings
4.03	Cuts material	CHT 150	Metallurgy
		CHT 155	Cutting and Heating
4.04	Welds material	CHT 150	Metallurgy
		CHT 160	MIG Welding
		CHT 625	SMAW Welding

2014 NOA Task		Curriculum Guide Unit	
4.05	Cleans parts and materials	CHT 105	Tools and Equipment
Task 5 - Diagnoses engines and support systems			
5.01	Diagnoses base engine	CHT 170	Engine Principles
		CHT 400	Base Engine Diagnostics
5.02	Diagnoses lubrication systems	CHT 305	Engine Lubrication Systems
5.03	Diagnoses cooling systems	CHT 300	Cooling Systems
5.04	Diagnoses intake and exhaust sytems	CHT 415	Intake and Exhaust Systems
5.05	Diagnoses fuel systems	CHT 325	Diesel Fuel Supply Systems
		CHT 350	Non-Diesel Fuel Systems
		CHT 405	Diesel Fuel Injection Systems
		CHT 410	Electronically-Controlled Diesel Fuel Injection Systems
5.06	Diagnoses engine control systems	CHT 325	Diesel Fuel Supply Systems
		CHT 345	Electronic Ignition Systems
		CHT 350	Non-Diesel Fuel Systems
		CHT 405	Diesel Fuel Injection Systems
		CHT 410	Electronically-Controlled Diesel Fuel Injection Systems
		CHT 440	Vehicle Management Systems
5.07	Diagnoses emission control system	CHT 420	Emission Control Systems
Task 6 - Repairs engine and engine support sytems			
6.01	Repairs base engines	CHT 170	Engine Principles
		CHT 400	Base Engine Diagnostics
		CHT 430	Diesel Engine Overhaul
6.02	Repairs lubrication systems	CHT 305	Engine Lubrication Systems
6.03	Repairs cooling systems	CHT 300	Cooling Systems
6.04	Repairs intake and exhaust sytems	CHT 415	Intake and Exhaust Systems
6.05	Repairs fuel systems	CHT 325	Diesel Fuel Supply Systems
		CHT 350	Non-Diesel Fuel Systems
		CHT 405	Diesel Fuel Injection Systems
		CHT 410	Electronically-Controlled Diesel Fuel Injection Systems
6.06	Repairs engine control systems	CHT 325	Diesel Fuel Supply Systems
		CHT 345	Electronic Ignition Systems
		CHT 350	Non-Diesel Fuel Systems
		CHT 405	Diesel Fuel Injection Systems
		CHT 410	Electronically-Controlled Diesel Fuel Injection Systems
		CHT 440	Vehicle Management Systems
6.07	Repairs emission control system	CHT 420	Emission Control Systems
Task 7 - Diagnoses hydraulic, hydrostatic, and pneumatic systems			
7.01	Diagnoses hydraulic systems	CHT 195	Introduction to Hydraulics
		CHT 600	Hydraulic Fittings, Piping, Tubing, and Hoses
		CHT 605	Hydraulic Reservoirs, Coolers, and Filters

2014 NOA Task		Curriculum Guide Unit	
		HET 200	Hydraulic Pumps and Motors
		HET 205	Hydraulic Cylinders
		HET 210	Control Valves
		HET 215	Accumulators
		HET 225	Hydraulic Systems Diagnostics and Testing.
7.02	Diagnoses hydrostatic systems	HET 240	Hydrostatic Drives
7.03	Diagnoses pneumatic systems	CHT 615	Introduction to Air Brake Systems
		HET 270	Pneumatic Systems
Task 8 - Repairs hydraulic, hydrostatic, and pneumatic systems			
8.01	Repairs hydraulic systems	CHT 195	Introduction to Hydraulics
		CHT 600	Hydraulic Fittings, Piping, Tubing, and Hoses
		CHT 605	Hydraulic Reservoirs, Coolers, and Filters
		HET 200	Hydraulic Pumps and Motors
		HET 205	Hydraulic Cylinders
		HET 210	Control Valves
		HET 215	Accumulators
		HET 225	Hydraulic Systems Diagnostics and Testing.
8.02	Repairs hydrostatic systems	HET 240	Hydrostatic Drives
8.03	Repairs Pneumatic systems	CHT 615	Introduction to Air Brake Systems
		HET 270	Pneumatic Systems
Task 9 - Diagnoses drivetrain systems			
9.01	Diagnoses clutch systems	CHT 320	Engine Clutches
9.02	Diagnoses torque converters, fluid couplers, and retarders	CHT 375	Torque Converters
		CHT 425	Engine Brakes and Retarders
9.03	Diagnoses driveline systems	CHT 310	Drivelines
9.04	Diagnoses transmission and transfer case systems	CHT 355	Manual Transmissions
		CHT 360	Pump Drives/Power Take-Offs
		CHT 365	Transfer Cases
		CHT 370	Automatic/Power Shift, CVT Transmissions
9.05	Diagnoses axle and differential systems	CHT 315	Drive Axle Assemblies
9.06	Diagnoses final drive systems	HET 245	Final Drives
Task 10 - Repairs drivetrain systems			
10.01	Repairs clutch systems	CHT 320	Engine Clutches
10.02	Repairs torque converters, fluid couplers, and retarders	CHT 375	Torque Converters
		CHT 425	Engine Brakes and Retarders
10.03	Repairs driveline systems	CHT 310	Drivelines
10.04	Repairs transmission and transfer case systems	CHT 355	Manual Transmissions
		CHT 360	Pump Drives/Power Take-Offs
		CHT 365	Transfer Cases
		CHT 370	Automatic/Power Shift, CVT Transmissions

2014 NOA Task		Curriculum Guide Unit	
10.05	Repairs axle and differential systems	CHT 315	Drive Axle Assemblies
10.06	Repairs final drive systems	HET 245	Final Drives
Task 11 - Diagnoses steering, suspension, brake systems, wheel assemblies and undercarriage			
11.01	Diagnoses steering systems	CHT 630	Introduction to Steering System Components
		HET 250	Hydraulic Steering Systems
		HET 255	Tracked Steering Systems
11.02	Diagnoses suspension systems	HET 230	Front and Rear Suspensions
11.03	Diagnoses brake systems	CHT 610	Hydraulic Brake Systems I
		CHT 615	Introduction to Air Brake Systems
		HET 220	Hydraulic Brake Systems II
11.04	Diagnoses wheel assemblies	CHT 165	Tires,Rims, Wheels and Hubs
11.05	Diagnoses undercarriage systems	HET 235	Track-Type Undercarriage
Task 12 - Repairs steering, suspension, brake systems, wheel assemblies and undercarriage			
12.01	Repairs steering systems	CHT 630	Introductin to Steering System Components
		HET 250	Hydraulic Steering Systems
		HET 255	Tracked Steering Systems
12.02	Repairs suspension systems	HET 230	Front and Rear Suspensions
12.03	Repairs brake systems	CHT 610	Hydraulic Brake Systems I
		CHT 615	Introduction to Air Brake Systems
		HET 220	Hydraulic Brake Systems II
12.04	Repairs wheel assemblies	CHT 165	Tires, Rims, Wheels and Hubs
12.05	Repairs undercarriage systems	HET 235	Track-Type Undercarriage
Task 13 - Diagnoses electrical systems			
13.01	Diagnoses starting/charging systems and batteries	CHT 175	Electrical and Electronic Principles
		CHT 180	Batteries
		CHT 330	Starting Systems
		CHT 335	Starting Aids
		CHT 340	Charging Systems
13.02	Diagnoses electrical components, motors, and accessories	CHT 175	Electrical and Electronic Principles
		CHT 185	Lighting Circuits
		CHT 190	Wiring Harnesses and Accessories
		CHT 435	Gauges and Instrumentation
Task 14 - Repairs electrical systems			
14.01	Repairs starting/charging systems and batteries	CHT 175	Electrical and Electronic Principles
		CHT 180	Batteries
		CHT 330	Starting Systems
		CHT 335	Starting Aids
		CHT 340	Charging Systems
14.02	Repairs electrical components, motors, and accessories	CHT 175	Electrical and Electronic Principles
		CHT 185	Lighting Circuits
		CHT 190	Wiring Harnesses and Accessories
		CHT 435	Gauges and Instrumentation
Task 15 - Diagnoses electronic vehicle management systems			
15.01	Reads diagnostic trouble codes	CHT 440	Vehicle Management Systems

2014 NOA Task		Curriculum Guide Unit	
15.02	Monitors parameters	CHT 435	Gauges and Instrumentation
		CHT 440	Vehicle Management Systems
15.03	Interprets test results	CHT 440	Vehicle Management Systems
15.04	Test system circuitry and components	CHT 175	Electrical and Electronic Principles
		CHT 190	Wiring Harnesses and Accessories
		CHT 440	Vehicle Management Systems
Task 16 - Repair electronic vehicle management systems			
16.01	Updates component software	CHT 440	Vehicle Management Systems
16.02	Repair components	CHT 440	Vehicle Management Systems
Task 17 - Diagnoses environmental control systems			
17.01	Diagnoses heating systems	CHT 450	Heating and Ventilation Systems
17.02	Dianoses ventilation and filtration systems	CHT 450	Heating and Ventilation Systems
17.03	Diagnoses air conditioning systems	CHT 445	Air Conditioning Systems
17.04	Diagnoses sound suppression systems	HET 260	Cabs and Protective Structures
Task 18 - Repairs environmental control systems			
18.01	Repairs heating systems	CHT 450	Heating and Ventilation Systems
18.02	Repairs ventilation and filtration systems	CHT 450	Heating and Ventilation Systems
18.03	Repairs air conditioning systems	CHT 445	Air Conditioning Systems
18.04	Repairs sound suppression systems	HET 260	Cab and Protective Structures
Task 19 - Diagnoses structural components, accessories, and attachments			
19.01	Diagnoses structural components	HET 235	Track-Type Undercarriage
		HET 260	Cabs and Protective Structures
		HET 290	Frames and Structures
19.02	Diagnoses operator station components	HET 260	Cabs and Protective Structures
		CHT 435	Gauges and Instrumentation
19.03	Diagnoses attachments and accessories	HET 275	Blades, Buckets and Cutting Edges
		HET 280	Winches, Wire Ropes and Accessories
		HET 285	Hydraulic Attachments
		HET 295	Material Handling Equipment
Task 20 - Diagnoses structural components, accessories, and attachments			
20.01	Performs mechanical repairs on structural components	HET 235	Track-Type Undercarriage
		HET 260	Cabs and Protective Structures
		HET 290	Frames and Structures
20.02	Repairs operator station components	HET 260	Cabs and Protective Structures
20.03	Repairs attachments and accessories	HET 275	Blades, Buckets and Cutting Edges
		HET 280	Winches, Wire Ropes and Accessories
		HET 285	Hydraulic Attachments
		HET 295	Material Handling Equipment
20.04	Installs attachments and accessories	HET 275	Blades, Buckets and Cutting Edges
		HET 280	Winches, Wire Ropes and Accessories

2014 NOA Task		Curriculum Guide Unit	
		HET 285	Hydraulic Attachments
		HET 295	Material Handling Equipment

LEVEL 1

CHT-100 Safety

Learning Outcomes:

- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety.
- Demonstrate knowledge of safety equipment, their applications and procedures for use.

2014 National Occupational Analysis Reference:

1.04 Uses PPE and safety equipment.
3.05 Maintains safe work environment.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Identify types of personal protective clothing and equipment and describe their applications.

2. Describe the care and maintenance of personal protective equipment (PPE).

3. Identify workplace hazards and describe safe work practices.
   - i) personal
   - ii) shop/facility
     - fire
     - explosion
     - gases
     - electrical
     - housekeeping
     - awareness of surroundings
   - iii) environmental awareness
   - iv) vehicle/equipment
     - restraint systems
     - lock out/tag out

- high voltage systems
- high pressure systems
    - hydraulic
    - fuel
    - air
- fire suppression systems

4. Identify and explain workplace safety and health regulations.
    i) federal
        - material safety data sheets (MSDS)
        - workplace hazardous material information system (WHMIS)
    ii) provincial/territorial
        - occupational health and safety (OHS)

Practical Objectives

N/A

CHT-105 Tools and Equipment

Learning Outcomes:

- Demonstrate knowledge of hand and power tools, their applications, maintenance and procedures for use.
- Demonstrate knowledge of measuring tools, their applications, maintenance and procedures for use.
- Demonstrate knowledge of diagnostic tools, their applications and maintenance.
- Demonstrate knowledge of shop equipment, their applications, maintenance and procedures for use.

2014 National Occupational Analysis Reference:

1.01 Maintains tools and equipment.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Identify types of hand tools and describe their applications and procedures for use.

2. Describe the procedures used to store and maintain hand tools.

3. Identify types of power tools and describe their applications and procedures for use.
   i) electric/cordless
   ii) pneumatic
   iii) hydraulic

4. Describe the procedures used to store and maintain power tools.

5. Identify types of measuring tools and describe their applications and procedures for use.
   i) imperial

ii) metric

6. Identify types of diagnostic tools and describe their applications.

7. Describe the procedures used to store and maintain measuring and diagnostic tools.

8. Identify types of shop equipment and describe their applications and procedures for use.

9. Describe the procedures used to store and maintain shop equipment.

Practical Objectives

N/A

CHT-110 Hoisting and Lifting

Learning Outcomes:

- Demonstrate knowledge of hoisting and lifting equipment, their applications and procedures for use.

2014 National Occupational Analysis Reference:

1.02 Uses hoisting and lifting equipment.
1.03 Operates access equipment.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hoisting and lifting.

2. Identify hazards and describe safe work practices pertaining to hoisting and lifting.

3. Identify and interpret codes and regulations pertaining to hoisting and lifting.

4. Identify types of hoisting and lifting equipment and describe their applications, limitations and procedures for use.
   i) vehicle
   ii) component/equipment
   iii) jack stands and cribbing

5. Identify types of hoisting and lifting equipment accessories and describe their applications and procedures for use.
   i) chain
   ii) chain hoist
   iii) slings
   iv) shackles

6. Describe the procedures used to inspect, store and maintain hoisting and lifting equipment and accessories.

7. Describe the procedures used to determine lift points and perform lifts.

8. Identify hand signals used to perform hoisting and lifting operations.

Practical Objectives

N/A

CHT-115 Communication and Documentation

Learning Outcomes:

- Demonstrate knowledge of effective communication practices.
- Demonstrate knowledge of trade related documentation.
- Demonstrate knowledge of vehicle identification codes.

2014 National Occupational Analysis Reference:

3.01 Uses documentation and reference materials.
3.02 Completes documentation.
3.03 Communicates with others.
3.04 Prepares job action plan.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Describe the importance of effective communication.
   i) customers
   ii) co-workers
   iii) related professionals
   iv) journeyperson/apprentice
   v) operator

2. Locate and interpret identification codes found on the vehicle and vehicle components.

3. Identify and interpret types of service related documents.
   i) work orders
      - service report writing
      - identify complaint, cause and correction
   ii) schematics and service information
   iii) technical service bulletins (TSB)/recalls
   iv) preventive maintenance schedules

v) parts lists
vi) time estimates

Practical Objectives

N/A

CHT-120 Preventive Maintenance

Learning Outcomes:

- Demonstrate knowledge of preventive maintenance and its purpose.
- Demonstrate knowledge of the procedures used to perform preventive maintenance.

2014 National Occupational Analysis Reference:

2.01 Maintains fluids.
2.06 Perform scheduled maintenance procedures.

Suggested Hours:

3 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with preventive maintenance.

2. Describe preventive maintenance programs.
   i) scheduled lubrication
   ii) scheduled servicing
   iii) scheduled cleaning
   iv) inspections
   v) completing documentation
   vi) legal responsibilities

3. Describe the procedures used to perform preventive maintenance.

Practical Objectives

N/A

CHT-125 Start, Move and Park Vehicle

Learning Outcomes:

- Demonstrate knowledge of the procedures used to start-up, operate and shut-down equipment/vehicle.
- Demonstrate knowledge of the procedures used to prepare equipment/vehicle to be towed or pushed.
- Demonstrate knowledge of equipment/vehicle lock-out procedures.

2014 National Occupational Analysis Reference:

2.07 Identifies operational faults.
2.08 Performs operational check-outs.

Suggested Hours:

3 Hours

Objectives and Content:

Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to entering, starting, moving and parking vehicles.

2. Describe the procedures used to start-up and shut down equipment/vehicles.

3. Describe the procedures used to operate equipment/vehicles.

4. Describe the procedures used to prepare equipment/vehicles to be towed or pushed.

5. Describe the procedures used to lock-out equipment/vehicles prior to servicing.

Practical Objectives

N/A

CHT-130 Fasteners, Tubings, Hoses and Fittings

Learning Outcomes:

- Demonstrate knowledge of fasteners, tubings, hoses and fittings, their applications and procedures for use.

2014 National Occupational Analysis Reference:

2.02 Services fasteners, sealing devices, adhesives and gaskets.
2.03 Services hoses, tubing, piping, and fittings.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to fasteners, tubings, hoses and fittings.

2. Identify specialty tools and equipment used to remove and install fasteners, tubings, hoses and fittings and describe their applications and procedures for use.

3. Identify types of fasteners and describe their applications and procedures for use.

4. Identify types of tubings and hoses and describe their applications and procedures for use.

5. Identify types of fittings and describe their applications and procedures for use.

Practical Objectives

N/A

CHT-135 Lubrication and Fluids Servicing

Learning Outcomes:

- Demonstrate knowledge of lubricants and fluids, their characteristics and applications.
- Demonstrate knowledge of the procedures to lubricate vehicle/equipment components.
- Demonstrate knowledge of the procedures for lubrication and fluid servicing.

2014 National Occupational Analysis Reference:

2.01 Maintains fluids.
2.06 Perform scheduled maintenance procedures.

Suggested Hours:

18 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with lubrication/coolants and fluids servicing.

2. Identify hazards and describe safe work practices pertaining to lubrication and fluid servicing.
   i) personal
   ii) equipment
   iii) environmental

3. Identify specialty tools and equipment used for lubrication and fluid servicing and describe their applications and procedures for use.

4. Identify types of lubricants and fluids and describe their applications.

5. Identify the properties and characteristics of lubricants and fluids.

6. Identify types of filters and describe their characteristics and applications.

7. Describe the procedures used to check lubricant and fluid levels and condition.

8 Describe the procedures used to sample fluids.

9. Describe the procedures used to change fluids and filters.

10. Describe the procedures used to lubricate vehicle/equipment components.

11. Identify types of automatic lubrication systems and describe their purpose and operation.

12. Describe the procedures used to service and maintain automatic lubrication systems.

13. Describe the procedures used to handle, store and dispose of lubricants and fluids.

Practical Objectives

N/A

CHT-140 Gaskets, Seals and Sealing Compounds

Learning Outcomes:

- Demonstrate knowledge of gaskets, seals and sealing compounds, their applications and procedures for use.

2014 National Occupational Analysis Reference:

2.02 Services fasteners, sealing devices, adhesives, and gaskets.
2.04 Services bearings and seals.

Suggested Hours:

3 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with gaskets, seals and sealing compounds.

2. Identify hazards and describe safe work practices pertaining to gaskets, seals and sealing compounds.

3. Identify specialty tools and equipment used to remove and install gaskets, seals and sealing compounds and describe their applications and procedures for use.

4. Identify types of gaskets and seals and describe their applications.

5. Identify types of sealing compounds and describe their applications.
   i) room temperature vulcanizing
   ii) anaerobic

6. Describe the procedures used to remove, fabricate and install gaskets.

7. Describe the procedures used to remove and install seals.

8. Describe the procedures used to apply sealing compounds.

Practical Objectives

N/A

CHT-145 Bearings

Learning Outcomes:

- Demonstrate knowledge of bearings and their applications.
- Demonstrate knowledge of the procedures to remove and install bearings.

2014 National Occupational Analysis Reference:

2.04 Services bearings and seals.
4.02 Cools material.

Suggested Hours:

3 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with bearings.

2. Identify hazards and describe safe work practices pertaining to bearings.

3. Identify specialty tools and equipment used to remove and install bearings and describe their applications and procedures for use.

4. Identify types of bearings and describe their applications.
   i) friction
   ii) anti-friction

5. Describe bearing failure and its causes.

6. Describe the procedures used to remove and install bearings.

7. Describe the procedures used to lubricate and maintain bearings.

Practical Objectives

N/A

CHT-150 Metallurgy

Learning Outcomes:

- Demonstrate knowledge of metals and their characteristics.
- Demonstrate knowledge of material testing procedures.

2014 National Occupational Analysis Reference:

4.03 Cuts material.
4.04 Welds material.

Suggested Hours:

3 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with metallurgy.

2. Identify types of metals.
   - i) ferrous
   - ii) plain carbon steels
   - iii) cast irons
   - iv) low alloy steels
   - v) heat treated steels
   - vi) stainless steels
   - vii) non ferrous

3. Describe mechanical and physical properties of metals.
   - i) common mechanical properties
     - tensile strength
     - ductility
     - hardness
     - brittleness
   - ii) common physical properties
     - melting point
     - electrical and thermal conductivity

- corrosion resistance

4. Identify common metal tests and describe their associated procedures.
   i) hardness tests (Rockwell and Brinell)
   ii) spark testing
   iii) file test
   v) magnetic test

Practical Objectives

N/A

CHT-155 Cutting and Heating

Learning Outcomes:

- Demonstrate knowledge of cutting and heating equipment and accessories.
- Demonstrate knowledge of the procedures used to cut and heat using oxy-fuel equipment.

2014 National Occupational Analysis Reference:

4.01 Heats material.
4.03 Cuts material.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with cutting and heating.
   i) oxy-fuel
   ii) induction

2. Identify hazards and describe safe work practices pertaining to cutting and heating.
   i) personal
   ii) shop/facility
      - awareness of surroundings
   iii) equipment/vehicle
   iv) ventilation
   v) cutting and heating equipment

3. Identify and interpret codes and regulations pertaining to oxy-fuel cutting and heating.

4. Identify cutting and heating equipment and accessories and describe their applications.
   i) oxy-fuel

ii) plasma-arc
iii) induction

5. Describe the procedures used to set-up, adjust and shut-down oxy-fuel equipment.

6. Describe the procedures used to inspect and maintain oxy-fuel equipment.

7. Describe the procedures used to transport and store oxy-fuel equipment.

8. Describe the procedures used to cut and heat material using oxy-fuel equipment.

9. Describe the procedures used to solder, braze and fuse using oxy-fuel equipment.

Practical Objectives

1. Set up, operate and shut down oxy-fuel equipment.

CHT-160 Metal Inert Gas (MIG) Welding

Learning Outcomes:

- Demonstrate knowledge of MIG welding equipment and accessories.
- Demonstrate knowledge of the procedures used to weld using MIG welding equipment.

2014 National Occupational Analysis Reference:

4.04 Welds material.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with MIG welding.

2. Identify hazards and describe safe work practices pertaining to MIG welding.
   - i) personal
   - ii) shop/facility
     - awareness of surroundings
   - iii) equipment/vehicle
   - iv) ventilation
   - v) MIG equipment

3. Describe MIG welding processes and their applications.
   - i) Gas Metal Arc Welding (GMAW)
   - ii) Flux-Cored Arc Welding (FCAW)

4. Identify MIG welding equipment, consumables and accessories and describe their applications.

5. Describe the procedures used to set-up, adjust and shut-down MIG welding equipment.

6. Describe the procedures used to inspect and maintain MIG welding equipment.

7. Identify the types of welds performed using MIG welding equipment.
   i) joints
   ii) positions

8. Describe the procedures used to weld using MIG welding equipment.

9. Describe weld defects, their causes and prevention.

Practical Objectives

N/A

CHT-165 Tires, Rims, Wheels and Hubs

Learning Outcomes:

- Demonstrate knowledge of tires, rims and wheels, their characteristics and applications.
- Demonstrate knowledge of the procedures used to service and repair tires, rims and wheels.

2014 National Occupational Analysis Reference:

11.04 Diagnoses wheel assemblies.
12.04 Repairs wheel assemblies.

Suggested Hours:

12 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with tires,rims, wheels, and hubs.

2. Identify hazards and describe safe work practices pertaining to tires,rims, wheels, and hubs.

3. Identify codes and regulations pertaining to tires, rims, wheels and hubs.
   i) jurisdictional requirements

4. Identify specialty tools and equipment used to service and repair tires, wheels, and hubs and describe their applications and procedures for use.

5. Identify types of tires and describe their characteristics and applications.
   i) on-road
      - radial
      - bias-ply
      - tube
      - tubeless
   ii) off-road

- loaded
- non-loaded

6. Identify types of rims and wheel assemblies and describe their characteristics and applications.

7. Identify tire and wheel assembly components and accessories and describe their purpose.

8. Describe the procedures used to inspect and maintain tires,rims wheels, and hubs.

9. Describe the procedures used to remove and install tires,rims wheels, and hubs.

10. Describe the procedures used to repair tires,wheel assemblies, and hubs.

11. Describe the procedures used to balance wheels.

Practical Objectives

N/A

CHT-170 Engine Principles

Learning Outcomes:

- Demonstrate knowledge of engine operating principles.
- Demonstrate knowledge of major engine components, their purpose and operation.

2014 National Occupational Analysis Reference:

5.01 Diagnoses base engine.
6.01 Repairs base engine.

Suggested Hours:

21 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with engine principles.

2. Explain the principles and theories of engine operation.

3. Identify types and classifications of engines and describe their applications.

4. Identify major engine components and describe their purpose and operation.

Practical Objectives

N/A

CHT-175 Electrical and Electronic Principles

Learning Outcomes:

- Demonstrate knowledge of electrical and electronic principles.
- Demonstrate knowledge of the principles of magnetism.
- Demonstrate knowledge of electrical and electronic testing devices and their procedures for use.

2014 National Occupational Analysis Reference:

13.01 Diagnoses starting/charging systems and batteries.
13.02 Diagnoses electrical components, motors, and accessories.
14.01 Repairs starting/charging systems and batteries.
14.02 Repairs electrical components, motors, and accessories.
15.04 Test system circuitry and components.

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with electricity, electronics and magnetism.

2. Identify hazards and describe safe work practices pertaining to electricity, electronics and magnetism.

3. Explain the principles of electricity and electronics.

4. Explain the principles of magnetism.

5. Describe Ohm's law and its applications.

6. Describe the procedures used to perform electrical-related calculations using Ohm's law.

7. Identify types of circuits and describe their characteristics and applications.

i) electrical
ii) electronic

8. Identify electrical components and describe their purpose and operation.

9. Identify electronic components and describe their purpose and operation.
   i) diodes
   ii) transistors
   iii) capacitors
   iv) resistors

10. Identify testing devices used to test circuits and describe their applications and procedures for use.

11. Identify and interpret information found on schematics.

12. Describe electrical malfunctions and their causes.

13. Describe the procedures used to test circuits.

Practical Objectives

N/A

CHT-180 Batteries

Learning Outcomes:

- Demonstrate knowledge of batteries and their operating principles.
- Demonstrate knowledge of the procedures used to service and test batteries.

2014 National Occupational Analysis Reference:

13.01 Diagnoses starting/charging systems and batteries.
14.01 Repairs starting/charging systems and batteries.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with batteries.

2. Identify hazards and describe safe work practices pertaining to batteries.
   i) personal
   ii) shop/facility
   iii) vehicle

3. Identify equipment used to test and recharge batteries and describe their applications and procedures for use.

4. Identify types of batteries and describe their applications, construction and operating principles.

5. Describe the procedures used to remove and install batteries.

6. Describe the procedures used to activate, maintain and store batteries.
   i) maintenance free
   ii) dry charge
   iii) gel

7. Describe the procedures used to boost start engines
   i) battery booster
   ii) cables

8. Identify battery problems and describe the procedures used to diagnose and correct them.

Practical Objectives

N/A

CHT-185 Lighting Circuits

Learning Outcomes:

- Demonstrate knowledge of conventional lighting circuits, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair conventional lighting circuits.

2014 National Occupational Analysis Reference:

13.02 Diagnoses electrical components, motors, and accessories.
14.02 Repairs electrical components, motors, and accessories.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with lighting circuits.

2. Identify hazards and describe safe work practices pertaining to lighting circuits.

3. Identify specialty tools and equipment used to service and repair lighting circuits and describe their applications and procedures for use.

4. Identify types of lighting circuits and describe their components, purpose and operation.
   i) high voltage
   ii) low voltage

5. Interpret electrical symbols and wiring diagrams relating to lighting circuits.

6. Describe the procedures used to inspect and maintain lighting circuits and their components.

7. Identify lighting circuit problems and their causes.

8. Describe the procedures used to diagnose lighting circuits.

9. Describe the procedures used to remove and install cl lighting circuit components.

10. Describe the procedures to repair lighting circuits and components.

Practical Objectives

N/A

CHT-190 Wiring Harnesses and Accessories

Learning Outcomes:

- Demonstrate knowledge of wiring harnesses and accessories, their purpose and operation.
- Demonstrate knowledge of the procedures used to service and repair wiring harnesses and accessories.

2014 National Occupational Analysis Reference:

13.02 Diagnoses electrical components, motors, and accessories.
14.02 Repairs electrical components, motors, and accessories.
15.04 Test system circuitry and components.

Suggested Hours:

18 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with wiring harnesses and accessories.

2. Identify hazards and describe safe work practices pertaining to wiring harnesses and accessories.

3. Identify specialty tools and equipment used to service and repair wiring harnesses and accessories and describe their applications and procedures for use.

4. Identify types of wiring harnesses and their components and describe their purpose and operation.

5. Identify types of wiring accessories and their components and describe their purpose and operation.
   i) switches
   ii) relays
   iii) plugs
   iv) sealed connectors

v) resistors
vi) solenoids

6. Interpret electrical symbols and wiring diagrams relating to wiring harnesses and accessories.

7. Describe the procedures used to inspect and maintain wiring harnesses and accessories and their components.

8. Identify wiring harness and accessory component problems and their causes.

9. Describe the procedures used to diagnose wiring harnesses and accessories.

10. Describe the procedures used to remove and install wiring harnesses and accessories and their components.

11. Describe the procedures used to repair wiring harnesses, plugs, connectors and their components.

Practical Objectives

1. Repair an electrical connection.

CHT-195 Introduction to Hydraulics

Learning Outcomes:

- Demonstrate knowledge of the principles of hydraulics.
- Demonstrate knowledge of hydraulic components, their purpose and operation.
- Demonstrate knowledge of the procedures used to remove, install, service and maintain hydraulic components.

2014 National Occupational Analysis Reference:

7.01 Diagnoses hydraulic systems.
8.01 Repairs hydraulic systems.

Suggested Hours:

18 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydraulics.

2. Identify hazards and describe safe work practices pertaining to hydraulics.

3. Explain the principles and theories of hydraulics.
   i) Pascal's law
   ii) Bernoulli's principle

4. Describe units of measure as they relate to hydraulics.

5. Identify hydraulic-related formulae and describe their applications.

6. Identify and interpret hydraulic-related symbols and abbreviations found on schematics.

7. Describe the properties of hydraulic fluids.

8. Identify tools and equipment used to remove, install, service and maintain hydraulic components and describe their applications and procedures for use.

9. Identify hydraulic components and describe their purpose, applications and operation.
   i) pumps
      - positive displacement
      - non-positive displacement
      - fixed displacement
      - variable displacement
   ii) actuators
      - linear
      - rotary
   iii) pressure control valves
   iv) directional control valves
   v) flow control valves
   vi) accumulators

10. Describe the procedures used to remove and install hydraulic components.

11. Describe the procedures used to service and maintain hydraulic components.

Practical Objectives

N/A

CHT-600 Hydraulic Fittings, Piping, Tubing and Hoses

Learning Outcomes:

- Demonstrate knowledge of hydraulic fittings, piping, tubing and hoses, their characteristics and applications.
- Demonstrate knowledge of the procedures used to maintain hydraulic fittings, piping, tubing and hoses.
- Demonstrate knowledge of the procedures used to remove and install hydraulic fittings, piping, tubing and hoses.

2014 National Occupational Analysis Reference:

7.01 Diagnoses hydraulic systems.
8.01 Repairs hydraulic systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydraulic fittings, piping, tubing and hoses.

2. Identify hazards and describe safe work practices pertaining to hydraulic fittings, piping, tubing and hoses.

3. Identify specialty tools and equipment used to remove and install hydraulic fittings, piping, tubing and hoses and describe their applications and procedures for use.

4. Identify types of hydraulic fittings and describe their characteristics and applications.

5. Identify types of hydraulic piping and tubing and describe their characteristics and applications.

6. Identify types of hydraulic hoses and describe their characteristics and applications.

7. Describe the procedures used to inspect and maintain hydraulic fittings, piping, tubing and hoses.

8. Describe the procedures used to remove and install hydraulic fittings, piping, tubing and hoses.

Practical Objectives

N/A

CHT-605 Hydraulic Reservoirs, Coolers and Filters

Learning Outcomes:

- Demonstrate knowledge of hydraulic reservoirs, coolers and filters, their applications and operation.
- Demonstrate knowledge of the procedures used to service and repair hydraulic reservoirs, coolers and filters.

2014 National Occupational Analysis Reference:

7.01 Diagnoses hydraulic systems.
8.01 Repairs hydraulic systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydraulic reservoirs, coolers and filters.

2. Identify hazards and describe safe work practices pertaining to hydraulic reservoirs, coolers and filters.

3. Identify specialty tools and equipment used to service and repair hydraulic reservoirs, coolers and filters and describe their applications and procedures for use.

4. Identify types of hydraulic reservoirs and describe their characteristics and applications.
   i) vented
   ii) pressurized

5. Identify hydraulic reservoir components and describe their purpose and operation.

6. Identify types of coolers and filters and describe their characteristics and applications.

7. Identify cooler and filter components and describe their purpose and operation.

8. Describe the procedures used to inspect and maintain hydraulic reservoirs, coolers and filters and their components.

9. Identify hydraulic reservoir, cooler and filter problems and describe their causes.

10. Describe the procedures used to diagnose hydraulic reservoirs, coolers and filters and their components.

11. Describe the procedures used to remove and install hydraulic reservoirs, coolers and filters and their components.

12. Describe the procedures used to repair hydraulic reservoirs and coolers and their components.

Practical Objectives

N/A

CHT-610 Hydraulic Brake Systems I

Learning Outcomes:

- Demonstrate knowledge of hydraulic brake systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair hydraulic brake systems.

2014 National Occupational Analysis Reference:

11.03 Diagnoses brake systems.
12.03 Repairs brake systems.

Suggested Hours:

15 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydraulic brake systems.
   i) drum
   ii) single disc

2. Identify hazards and describe safe work practices pertaining to hydraulic brake systems.

3. Identify specialty tools and equipment used to service and repair hydraulic brake systems and describe their applications and procedures for use.

4. Identify types of hydraulic brake systems and describe their applications and operation.
   i) drum
   ii) single disc

5. Identify hydraulic brake system components and describe their purpose and operation.

6. Describe the procedures used to inspect and maintain hydraulic brake systems and their components.

7. Identify hydraulic brake system problems and their causes.

8. Describe the procedures used to diagnose hydraulic brake systems.

9. Describe the procedures used to remove and install hydraulic brake system components.

10. Describe the procedures used to repair and adjust hydraulic brake systems and their components.

Practical Objectives

N/A

CHT-615 Introduction to Air Brake Systems

Learning Outcomes:

- Demonstrate knowledge of air brake systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and replace air brake systems components.

2014 National Occupational Analysis Reference:

7.03 Diagnoses pneumatic systems.
8.03 Repairs pneumatic systems.
11.03 Diagnoses brake systems.
12.03 Repairs brake systems.

Suggested Hours:

15 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with air brake systems.

2. Identify hazards and describe safe work practices pertaining to air brake systems.

3. Identify specialty tools and equipment used to service and repair air brake systems and describe their applications and procedures for use.

4. Identify types of air brake systems and describe their applications and operation.
   i) air
   ii) air over hydraulic

5. Identify air brake system components and describe their purpose and operation.
   i) compressors
   ii) reservoirs
   iii) governors
   iv) hoses, lines and fittings

v) air dryers
vi) foundation brakes
- drum
- disc brakes
vii) brake chambers
viii) valves
ix) indicators and warning devices

6. Describe the procedures used to inspect and maintain air brake systems and components.

7. Identify air brake system problems and their causes.

8. Describe the procedures used to remove and install basic air brake system components.

9. Describe the procedures used to adjust air brake system components.

Practical Objectives

N/A

CHT-620 Ozone Depleting Substances

Learning Outcomes:

- Demonstrate knowledge of handling ozone-depleting substances (refrigerants) used in motor vehicle.

2014 National Occupational Analysis Reference:

1.04 Uses PPE and safety equipment.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with ozone depleting substances.

2. Identify hazards and describe safe work practices pertaining to ozone depleting substances.

3. Identify and interpret codes federal/provincial regulations and ceritfications pertaining to ozone depleting substances.

Practical Objectives

N/A

CHT-625 Shielded Metal Arc Welding (SMAW)

Learning Outcomes:

- Demonstrate knowledge of SMAW equipment and accessories.
- Demonstrate knowledge of the procedures used to weld using SMAW equipment.

2014 National Occupational Analysis Reference:

1.01 Maintains tools and equipment.
4.04 Welds material.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with SMAW.

2. Identify hazards and describe safe work practices pertaining to SMAW.
   i) personal
   ii) shop/facility
      - awareness of surroundings
   iii) equipment/vehicle
   iv) ventilation
   v) SMAW equipment

3. Identify and interpret codes and regulations pertaining to SMAW.

4. Describe the SMAW process and its application.

5. Identify SMAW equipment, consumables and accessories and describe their applications and storage requirements.

6. Describe the procedures used to set-up, adjust and shut-down SMAW equipment.

7. Describe the procedures used to inspect and maintain SMAW equipment.

8. Identify the types of welds performed using SMAW equipment.
   i) joints
   ii) positions

9. Describe the procedures used to weld using SMAW equipment.

10. Describe weld defects, their causes and prevention.

Practical Objectives

N/A

CHT-630 Introduction to Steering System Components

Learning Outcomes:

- Demonstrate basic knowledge of steering systems, their components and operation.
- Demonstrate basic knowledge of the procedures used to service and replace steering systems components.

2014 National Occupational Analysis Reference:

11.01 Diagnoses steering systems.
12.01 Repairs steering systems.

Suggested Hours:

12 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with steering systems.

2. Identify hazards and describe safe work practices pertaining to steering systems.

3. Identify specialty tools and equipment used to service and replace steering system components and describe their applications and procedures for use.

4. Identify types of steering systems and describe their applications and operation.

5. Identify steering components and describe their purpose and operation.
   - i) steering columns
   - ii) steering linkage
   - iii) gear boxes
   - iv) hydraulic components
     - orbital motor
     - steering cylinders
     - power assist
     - priority valve

6. Describe the procedures used to inspect and maintain steering systems and their components.

7. Describe the procedures used to remove and install steering system components.

8. Describe the procedures used to replace steering system components.

Practical Objectives

N/A

Level 2

HET-200 Hydraulic Pumps and Motors

Learning Outcomes:

- Demonstrate knowledge of hydraulic pumps and motors, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair hydraulic pumps and motors.

2014 National Occupational Analysis Reference:

7.01 Diagnoses hydraulic systems.
7.02 Diagnoses hydrostatic systems.
8.01 Repairs hydraulic systems.
8.02 Repairs hydrostatic systems.

Suggested Hours:

15 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydraulic pumps and motors.

2. Identify hazards and describe safe work practices pertaining to hydraulic pumps and motors.

3. Identify specialty tools and equipment used to diagnose and repair pumps and motors and describe their applications and procedures for use.

4. Identify classifications of hydraulic pumps and describe their characteristics, applications and operation.
   i) non-positive displacement
   ii) positive displacement
   iii) fixed displacement
   iv) variable displacement
      - load sensing
      - pressure compensating

- negative flow

5. Identify types of hydraulic pumps and describe their characteristics, applications and operation.
   i) gear
   ii) vane
   iii) piston

6. Identify hydraulic pump components and describe their purpose and operation.

7. Describe the procedures used to inspect hydraulic pumps and their components.

8. Identify hydraulic pump problems and their causes.

9. Describe the procedures used to diagnose hydraulic pumps.

10. Describe the procedures used to repair hydraulic pumps and their components.
    i) start-up process and procedures

11. Identify classifications of hydraulic motors and describe their characteristics, applications and operation.
    i) fixed displacement
    ii) variable displacement

12. Identify types of hydraulic motors and describe their characteristics, applications and operation.
    i) gear
    ii) vane
    iii) piston

13. Identify hydraulic motor components and describe their purpose and operation.

14. Describe the procedures used to inspect hydraulic motors and their components.

15. Identify hydraulic motor problems and their causes.

16. Describe the procedures used to diagnose hydraulic motors.

17. Describe the procedures used to repair and adjust hydraulic motors and their components.
    i) start-up process and procedures

Practical Objectives

1. Demonstrate cut aways.

2. Identify different pumps and motors.

HET-205 Hydraulic Cylinders

Learning Outcomes:

- Demonstrate knowledge of hydraulic cylinders, their components and operation.
- Demonstrate knowledge of the procedures used to diagnose and repair hydraulic cylinders.

2014 National Occupational Analysis Reference:

7.01 Diagnoses hydraulic systems.

Suggested Hours:

12 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydraulic cylinders.

2. Identify hazards and describe safe work practices pertaining to hydraulic cylinders.

3. Identify specialty tools and equipment used to diagnose and repair hydraulic cylinders and describe their applications and procedures for use.

4. Identify types of hydraulic cylinders and describe their characteristics and applications.

5. Identify hydraulic cylinder components and describe their purpose and operation.
   i) snubbers
   ii) anti-cavitation valves
   iii) load-check valves
   iv) drop valves

6. Describe the procedures used to inspect hydraulic cylinders and their components.

7. Identify hydraulic cylinder problems and their causes.

8. Describe the procedures used to diagnose hydraulic cylinders.

9. Describe the procedures used to disassemble and assemble hydraulic cylinders and their components.

10. Describe the procedures used to adjust and repair hydraulic cylinders and their components.

Practical Objectives

1. Demonstrate procedure to test a hydraulic cylinder.

HET-210 Control Valves

Learning Outcomes:

- Demonstrate knowledge of control valves, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair control valves.

2014 National Occupational Analysis Reference:

7.01 Diagnoses hydraulic systems.
7.02 Diagnoses hydrostatic systems.
8.01 Repairs hydraulic systems.
8.02 Repairs hydrostatic systems.

Suggested Hours

21 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with control valves.

2. Identify hazards and describe safe work practices pertaining to control valves.

3. Identify specialty tools and equipment used to service and repair control valves and describe their applications and procedures for use.

4. Identify types of control valves and describe their characteristics and applications.
   i) pressure control
   ii) directional control
   iii) volume control
   iv) hydraulic swivel

5. Identify control valve components and describe their purpose and operation.

6. Identify the methods of valve actuation and describe their characteristics and applications.
   i) manual
   ii) pneumatic
   iii) hydraulic
   iv) electric

7. Describe the procedures used to inspect and maintain control valves and components.

8. Identify control valve problems and their causes.

9. Describe the procedures used to diagnose control valves and components.

10. Describe the procedures used to remove and install control valves and components.

11. Describe the procedures used to disassemble and assemble control valves and components.

12. Describe the procedures used to adjust and repair control valves and their components.

Practical Objectives

1. Adjust and verify the operation of a system and circuit relief valve.

2. Follow a schematic and identify components.

HET-215 Accumulators

Learning Outcomes:

- Demonstrate knowledge of accumulators, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair accumulators.

2014 National Occupational Analysis Reference:

7.01 Diagnoses hydraulic systems.
7.02 Diagnoses hydrostatic systems.
8.01 Repairs hydraulic systems.
8.02 Repairs hydrostatic systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with accumulators.

2. Identify hazards and describe safe work practices pertaining to accumulators.

3. Identify specialty tools and equipment used to service and repair accumulators and describe their applications and procedures for use.

4. Identify the types and design of accumulators and describe their applications and operation.
   i) gas charged
   ii) spring-loaded

5. Identify accumulator components and describe their purpose and operation.

6. Describe the procedures used to inspect and maintain accumulators.

7. Identify accumulator problems and their causes.

8. Describe the procedures used to diagnose accumulators.

9. Describe the procedures used to remove and install accumulators and their components.

10. Describe the procedures used to disassemble, assemble and recharge accumulators.

11. Describe the procedures used to adjust and repair accumulators.

Practical Objectives

1. Demonstrate procedures of releasing hydraulic pressure of an accumulator.

HET-220 Hydraulic Brake Systems II

Learning Outcomes:

- Demonstrate knowledge of hydraulic brake systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair hydraulic brake systems.
- Demonstrate knowledge of the procedures to service and repair anti-lock braking systems.
- Demonstrate knowledge of the procedures to service and repair traction control systems.

2014 National Occupational Analysis Reference:

11.01 Diagnoses steering systems.
11.02 Diagnoses suspension systems.
11.03 Diagnoses brake systems.
12.01 Repairs steering systems.
12.02 Repairs suspension systems.
12.03 Repairs brake systems.

Suggested Hours:

12 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydraulic brake systems, anti-lock brake systems and traction control systems.

2. Identify hazards and describe safe work practices pertaining to hydraulic brake systems.

3. Identify hazards and describe safe work practices pertaining to anti-lock brakes and traction control systems.

4. Identify specialty tools and equipment used to service and repair hydraulic brake systems, anti-lock brake systems and traction control systems and describe their applications and procedures for use.

5. Identify types of hydraulic brake systems, anti-lock brake systems and traction control systems and describe their applications and operation.
   i) drum
   ii) disc
   iii) multi-disc
      - wet
      - dry
   iv) park
      - drive line
      - internal

6. Identify hydraulic brake systems, anti-lock brake systems and traction control systems components and describe their purpose and operation.

7. Describe the procedures used to inspect and maintain hydraulic brake systems, anti-lock brake systems and traction control systems and their components.

8. Identify hydraulic brake systems, anti-lock brake systems and traction control systems problems and their causes.

9. Describe the procedures used to diagnose hydraulic brake systems, anti-lock brake systems and traction control systems.

10. Describe the procedures used to remove and install hydraulic brake systems, anti-lock brake systems and traction control systems and their components.

11. Describe the procedures used to adjust and repair hydraulic brake systems, anti-lock brake systems and traction control systems and their components.

Practical Objectives

1. Verify cut-in and cut-out pressure.

2. Perform park brake adjustment.

HET-225 Hydraulic Systems Diagnostics and Testing

Learning Outcomes:

- Demonstrate knowledge of the procedures used to test and diagnose hydraulic systems.

2014 National Occupational Analysis Reference:

7.01 Diagnoses hydraulic systems.
7.02 Diagnoses hydrostatic systems.
7.03 Diagnoses pneumatic systems.
8.01 Repairs hydraulic systems.
8.02 Repairs hydrostatic systems.
8.03 Repairs pneumatic systems.

Suggested Hours:

21 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydraulic system diagnostics and testing.

2. Identify hazards and describe safe work practices pertaining to hydraulic system diagnostics and testing.

3. Identify specialty tools and equipment used to diagnose and test hydraulic systems and describe their applications and procedures for use.

4. Describe the procedures used to test hydraulic systems and their components.

5. Describe the procedures used to diagnose hydraulic systems and components.

6. Interpret schematics and hydraulic diagrams.

7. Interpret hydraulic test and diagnostic data.

Practical Objectives

1. Preform a flow and pressure test on various parts of a hydraulic system.

2. Preform cylinder drift and cycle time test.

3. Follow a schematic of a complete hydraulic system.

4. Follow trouble shooting tree.

HET-230 Front and Rear Suspensions

Learning Outcomes:

- Demonstrate knowledge of front and rear suspensions, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair front and rear suspensions.

2014 National Occupational Analysis Reference:

11.02 Diagnoses suspension systems.
12.02 Repairs suspension systems.

Suggested Hours:

12 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with front and rear suspensions.

2. Identify hazards and describe safe work practices pertaining to front and rear suspensions.

3. Identify specialty tools and equipment used to service and repair front and rear suspensions and describe their applications and procedures for use.

4. Identify the types of front and rear suspensions and describe their characteristics and applications.

5. Identify front and rear suspension components and describe their purpose and operation.
   i) walking beam
   ii) rubber block
   iii) hydro pneumatic
   iv) ride control
   v) payload system

vi) kingpin

6. Describe the procedures used to inspect and maintain front and rear suspension components.

7. Identify front and rear suspension problems and their causes.

8. Describe the procedures used to diagnose front and rear suspensions.

9. Describe the procedures used to remove and install front and rear suspension components.

10. Describe the procedures used to disassemble and assemble front and rear suspension components.

11. Describe the procedures used to adjust and repair front and rear suspensions components.

Practical Objectives

N/A

HET-235 Track-Type Undercarriage

Learning Outcomes:

- Demonstrate knowledge of track-type undercarriages, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair track-type undercarriages.

2014 National Occupational Analysis Reference:

11.05 Diagnoses undercarriage systems.
12.05 Repairs undercarriage systems.

Suggested Hours:

15 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with track type undercarriages.

2. Identify hazards and describe safe work practices pertaining to track-type undercarriages.

3. Identify specialty tools and equipment used to service and repair track-type undercarriages and describe their applications and procedures for use.

4. Identify track-type undercarriage components and describe their purpose and operation.
   - i) idler
   - ii) sprocket
   - iii) rollers
     - carrier
     - single/double
   - iv) recoil and adjuster
   - v) track link
   - vi) track pad

vii) track belt (crane)

5. Describe the procedures used to inspect and maintain track-type undercarriages and their components.

6. Identify track-type undercarriage problems and their causes.

7. Describe the procedures used to diagnose track-type undercarriages.

8. Describe the procedures used to remove and install track-type undercarriage components.

9. Describe the procedures used to adjust and repair track-type undercarriages components.

Practical Objectives

1. Measure track-type undercarriage components.

2. Adjust track tension.

3. Measure frame alignment.

HET-240 Hydrostatic Drives

Learning Outcomes:

- Demonstrate knowledge of hydrostatic drives, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair hydrostatic drives.

2014 National Occupational Analysis Reference:

7.02 Diagnoses hydrostatic systems.
8.02 Repairs hydrostatic systems.
9.04 Diagnoses transmission and transfer case systems.
10.04 Repairs transmission and transfer case systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydrostatic drives.

2. Identify hazards and describe safe work practices pertaining to hydrostatic drives.

3. Identify specialty tools and equipment used to service and repair hydrostatic drives and describe their applications and procedures for use.

4. Identify types of hydrostatic drives and describe their characteristics and operation.
   i) open loop
   ii) closed loop
      - fan drives

5. Identify hydrostatic drive components and describe their purpose and operation.
   i) pump
   ii) motor

iii) charge pump
iv) filter
v) reservoir
vi) flushing/cooler
vii) valves

6. Describe the procedures used to inspect and maintain hydrostatic drives and their components.

7. Identify hydrostatic drive problems and their causes.

8. Describe the procedures used to diagnose hydrostatic drives and their components.

9. Describe the procedures used to remove and install hydrostatic drives and their components.

10. Describe the procedures used to disassemble and assemble hydrostatic drives and their components.

11. Describe the procedures used to adjust and repair hydrostatic drives and their components.

Practical Objectives

N/A

HET-245 Final Drives

Learning Outcomes:

- Demonstrate knowledge of final drives, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair final drives.

2014 National Occupational Analysis Reference:

9.06 Diagnoses final drive systems.
10.06 Repairs final drive systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with final drives.

2. Identify hazards and describe safe work practices pertaining to final drives.

3. Identify specialty tools and equipment used to service and repair final drives and describe their applications and procedures for use.

4. Identify types of final drives and describe their applications and operation.
   i) planetary
   ii) bullgear

5. Identify final drive components and describe their purpose and operation.

6. Describe the procedures used to inspect and repair final drives and their components.

7. Identify final drive problems and their causes.

8. Describe the procedures used to diagnose final drives.

9. Describe the procedures used to remove and install final drive components.

10. Describe the procedures used to adjust and repair final drives and their components.

Practical Objectives

N/A

HET-250 Hydraulic Steering Systems

Learning Outcomes:

- Demonstrate knowledge of hydraulic steering systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair hydraulic steering systems.

2014 National Occupational Analysis Reference:

11.01 Diagnoses steering systems.
11.02 Diagnoses suspension systems.
11.03 Diagnoses brake systems.
12.01 Repairs steering systems.
12.02 Repairs suspension systems.
12.03 Repairs brake systems.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydraulic steering systems.

2. Identify hazards and describe safe work practices pertaining to hydraulic steering systems.

3. Identify specialty tools and equipment used to service hydraulic steering system components and describe their applications and procedures for use.

4. Identify hydraulic steering system components and describe their applications and operation.
   i) front/rear wheel
   ii) articulated
   iii) all-wheel
   iv) supplementary emergency

5. Describe the procedures used to inspect and maintain hydraulic steering systems and their components.

6. Describe the procedures to diagnose hydraulic steering systems and their components.

7. Describe the procedures used to remove and install hydraulic steering system components.

8. Describe the procedures used to disassemble and assemble hydraulic steering system components.

9. Describe the procedures used to adjust and repair hydraulic steering system components.

Practical Objectives

N/A

HET-255 Tracked Steering Systems

Learning Outcomes:

- Demonstrate knowledge of tracked steering systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair tracked steering systems.

2014 National Occupational Analysis Reference:

11.01 Diagnoses steering systems.
11.02 Diagnoses suspension systems.
11.03 Diagnoses brake systems.
12.01 Repairs steering systems.
12.02 Repairs suspension systems.
12.03 Repairs brake systems.

Suggested Hours

15 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with tracked steering systems.

2. Identify hazards and describe safe work practices pertaining to tracked steering systems.

3. Identify specialty tools and equipment used to service and repair tracked steering systems and describe their applications and procedures for use.

4. Identify types of tracked steering systems and describe their applications and operation.
   i) differential
   ii) clutch and brake
      - dry/wet
   iii) modularized

iv) hydrostatic
v) electric

5. Identify tracked steering system components and describe their purpose and operation.

6. Describe the procedures used to inspect and maintain tracked steering systems and their components.

7. Identify tracked steering system problems and their causes.

8. Describe the procedures used to diagnose tracked steering systems.

9. Describe the procedures used to remove and install tracked steering system components.

10. Describe the procedures used to adjust and repair tracked steering systems components.

Practical Objectives

N/A

HET-260 Cabs and Protective Structures

Learning Outcomes:

- Demonstrate knowledge of cabs and protective structures, their purpose and operation.
- Demonstrate knowledge of the procedures used to service and repair cabs and protective structures.

2014 National Occupational Analysis Reference:

2.05 Services safety features.
17.04 Diagnoses sound suppression systems.
18.04 Repairs sound suppression systems.
19.01 Diagnoses structural components.
19.02 Diagnoses operator station components.
20.01 Performs mechanical repairs on structural components.
20.02 Repairs operator station components.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with cabs and protective structures.

2. Identify hazards and describe safe work practices pertaining to cabs and protective structures.

3. Identify codes and regulations pertaining to protective structures.

4. Identify cab components and describe their purpose and operation.

5. Describe the procedures used to remove and install cab components.

6. Describe the procedures used to inspect and maintain cab components.

7. Describe the procedures used to repair cab components.

8. Identify types of protective structures and describe their purpose.
   i) roll-over protective structures (ROPS)
   ii) falling-object protective structures (FOPS)
   iii) operator protective structures (OPS)

9. Describe the procedures used to remove and install protective structures.
   i) practice safe refrigerant recovery

10. Describe the procedures and limitations for protective structure repair.

11. Describe the function of sound suppression material in the operator's station.

12. Diagnose and repair sound suppression material in the operator's station.

Practical Objectives

1. Adjust cab doors.

HET-265 Fire Suppression Units

Learning Outcomes:

- Demonstrate knowledge of fire suppression units, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair fire suppression units.

2014 National Occupational Analysis Reference:

2.05 Services safety features.

Suggested Hours:

3 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with fire suppression units.

2. Identify hazards and describe safe work practices pertaining to fire suppression units.

3. Identify codes and regulations pertaining to fire suppression units.

4. Identify specialty tools and equipment used to service and repair fire suppression units and describe their applications and procedures for use.

5. Identify types of fire suppression units and describe their applications and operation.
   i) manual
      - dry/wet
   ii) automatic
      - dry/wet

6. Identify fire suppression unit components and describe their purpose and operation.

7. Describe the procedures used to inspect and maintain fire suppression units.
   i) employer specific
   ii) manufacturer specific

8. Describe the procedures used to remove and install fire suppression units.

9. Describe the procedures used to repair fire suppression units.

Practical Objectives

N/A

HET-270 Pneumatic Systems

Learning Outcomes:

- Demonstrate knowledge of pneumatic systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair pneumatic systems and components.

2014 National Occupational Analysis Reference:

19.03 Diagnoses attachments and accessories.
20.03 Repairs attachments and accessories.
20.04 Installs attachments and accessories.

Suggested Hours:

3 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with pneumatic systems.

2. Identify hazards and describe safe work practices pertaining to pneumatic systems.

3. Explain the principles and theories of pneumatics.
   i) Charles' law
   ii) Boyle's law

4. Describe units of measure as they relate to pneumatics.

5. Identify pneumatic related formulae and describe their applications.

6. Identify and interpret pneumatic related symbols and abbreviations found on schematics.

7. Identify specialty tools and equipment used to service and repair pneumatic systems and describe their applications and procedures for use.

8. Identify types of pneumatic systems and describe their applications and operation.
    i) portable air compressors
        - rotary
            - single-stage
            - two-stage
        - reciprocating
            - single-stage
            - two-stage

9. Identify pneumatic system components and describe their purpose and operation.

10. Describe the procedures used to inspect and maintain pneumatic systems and components.

11. Identify pneumatic system problems and their causes.

12. Describe the procedures used to diagnose pneumatic systems.

13. Describe the procedures used to remove and install pneumatic system components.

14. Describe the procedures used to adjust and repair pneumatic systems.

Practical Objectives

N/A

HET-275 Blades, Buckets and Cutting Edges

Learning Outcomes:

- Demonstrate knowledge of blades, buckets and cutting edges, their purpose and operation.
- Demonstrate knowledge of the procedures used to service and repair blades, buckets and cutting edges.

2014 National Occupational Analysis Reference:

19.03 Diagnoses attachments and accessories.
20.03 Repairs attachments and accessories.
20.04 Installs attachments and accessories.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with blades, buckets and cutting edges.

2. Identify hazards and describe safe work practices pertaining to blades, buckets and cutting edges.

3. Identify types and components of ground engaging tools and describe their construction and applications as used on:
   i) scraper
   ii) dozer
   iii) grader
   iv) loader
   v) excavator

4. Identify blade components and describe their purpose and operation.
   i) push arm/trunnions
   ii) pitch arm
   iii) tilt arm

iv) pins
v) cutting edge
vi) corner edge
vii) c-frame

5. Describe the procedures used to inspect and maintain blades and their components.

6. Describe the procedures used to remove and install blades and their components.

7. Identify types of buckets and describe their characteristics and applications.
   i) loader
   ii) excavator
   iii) front shovels

8. Identify bucket components and describe their purpose and operation.
   i) cutting edges
   ii) teeth
   iii) shanks
   iv) bushings
   v) pins

9. Describe the procedures used to inspect and maintain buckets and their components.

10. Describe the procedures used to remove and install buckets and their components.

11. Identify types of quick-coupling attachments and describe their applications and procedures for use.
   i) mechanical
   ii) hydraulic

12. Describe the procedures used to inspect and maintain quick-coupling attachments.

13. Describe the procedures used to remove and install quick-coupling attachments.

14. Describe the procedures used to repair quick-coupling attachments.

Practical Objectives

N/A

HET-280 Winches, Wire Ropes and Accessories

Learning Outcomes:

- Demonstrate knowledge of winches, wire ropes and accessories, their characteristics and applications.
- Demonstrate knowledge of the procedures used to service and repair winches, wire ropes and accessories.

2014 National Occupational Analysis Reference:

19.03 Diagnoses attachments and accessories.
20.03 Repairs attachments and accessories.
20.04 Installs attachments and accessories.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with winches, wire ropes and accessories.

2. Identify hazards and describe safe work practices pertaining to winches, wire ropes and accessories.

3. Identify specialty tools and equipment used to service and repair winches and describe their applications and procedures for use.

4. Identify the types of winches and describe their applications and operation.
   i) mechanical
   ii) hydraulic
   iii) electric

5. Identify winch components and describe their purpose and operation.

6. Describe the procedures used to inspect and maintain winches and their components.

7. Identify winch problems and their causes.

8. Describe the procedures used to diagnose winches.

9. Describe the procedures used to remove and install winches and their components.

10. Describe the procedures used to disassemble and assemble winches and their components.

11. Describe the procedures used to adjust and repair winches and their components.

12. Identify the types of wire ropes and describe their characteristics and applications.

13. Identify winch and wire rope accessories and describe their applications and procedures for use.
    i) fittings
    ii) clamps
    iii) wedges
    iv) hooks
    v) thimbles

14. Describe the procedures used to remove and install wire ropes and accessories.

15. Describe the procedures used to inspect and maintain wire ropes and accessories.

16. Identify wire rope problems and their causes.

Practical Objectives

N/A

HET-285 Hydraulic Attachments

Learning Outcomes:

- Demonstrate knowledge of hydraulic attachments, its purpose and operation.
- Demonstrate knowledge of the procedures used to service and repair hydraulic attachments.

2014 National Occupational Analysis Reference:

19.03 Diagnoses attachments and accessories.
20.03 Repairs attachments and accessories.
20.04 Installs attachments and accessories.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydraulic attachments.

2. Identify hazards and describe safe work practices pertaining to hydraulic attachments.

3. Identify specialty tools and equipment used to service and repair equipment attachments and describe their applications and procedures for use.

4. Identify the types of equipment attachments and describe their applications and operation related to:
   i) construction
   ii) mining
   iii) forestry
   iv) industrial

5. Identify hydraulic attachments and describe their purpose and operation.

6. Describe the procedures used to inspect and maintain hydraulic attachments.

7. Identify hydraulic attachment problems and their causes.

8. Describe the procedures used to diagnose hydraulic attachments.

9. Describe the procedures used to remove and install hydraulic attachments and components.

10. Describe the procedures used to adjust and repair hydraulic attachments.

Practical Objectives

N/A

HET-290 Frames and Structures

Learning Outcomes:

- Demonstrate knowledge of frames and structures, their components and characteristics.
- Demonstrate knowledge of the procedures used to service and repair frames and structures.

2014 National Occupational Analysis Reference:

19.01 Diagnoses structural components.
20.01 Repairs structural components.

Suggested Hours:

18 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with frames and structures.

2. Identify hazards and describe safe work practices pertaining to frames and structures.

3. Identify and interpret codes and regulations pertaining to frames and structures.

4. Identify specialty tools and equipment used to service and repair frames and structures and describe their applications and procedures for use.

5. Identify types of frames and structures, their components and describe their purpose and characteristics.
   i) turntable bearing
   ii) a-frame
   iii) car body (super structure)
   iv) x-frame
   v) track frame
   vi) equalizer

vii) booms
viii) stabilizers/outriggers
ix) bowl/apron/elevator
x) articulation/ossilation
xi) counter weights

6. Describe the procedures used to perform track frame alignment.

7. Describe the procedures used to inspect frames and structures and their components for damage.

8. Describe the procedures used to remove and install frame and structure components.

9. Describe the procedures used to reinforce frames and structures.

Practical Objectives

N/A

HET-295 Material Handling Equipment

Learning Outcomes:

- Demonstrate knowledge of material handling equipment, its purpose and operation.
- Demonstrate knowledge of the procedures used to service and repair material handling equipment.

2014 National Occupational Analysis Reference:

19.03 Diagnoses attachments and accessories.
20.03 Repairs attachments and accessories.
20.04 Installs attachments and accessories.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with material handling equipment.

2. Identify hazards and describe safe work practices pertaining to material handling equipment.

3. Identify and interpret codes and regulations pertaining material handling equipment.

4. Identify specialty tools and equipment used to service and repair material handling equipment and describe their applications and procedures for use.

5. Identify the types of material handling equipment and describe their applications and operation.
   i) construction related
   ii) mining related
   iii) forestry related
   iv) industrial related

6. Identify material handling equipment and describe their purpose and operation.

7. Describe the procedures used to inspect and maintain material handling equipment.

8. Identify material handling equipment problems and their causes.

9. Describe the procedures used to diagnose material handling equipment.

10. Describe the procedures used to remove and install on material handling equipment:
    i) scissor lifts
    ii) telehandler
    iii) manlift
    iv) forklift
    v) container handlers

11. Describe the procedures used to adjust and repair material handling equipment.

Practical Objectives

N/A

LEVEL 3

CHT-300 Cooling Systems

Learning Outcomes:

- Demonstrate knowledge of engine cooling systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair cooling systems.

2014 National Occupational Analysis Reference:

5.03 Diagnoses cooling systems.
6.03 Repairs cooling systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with cooling systems.

2. Identify hazards and describe safe work practices pertaining to cooling systems and their components.

3. Identify specialty tools and equipment used to service and repair cooling systems and describe their applications and procedures for use.

4. Identify types of cooling systems and describe their applications and operation.
   i) liquid-cooled
   ii) air-cooled

5. Identify cooling system components and describe their purpose and operation.

6. Identify types of cooling system fluids and describe their characteristics and applications.

7. Describe the procedures used to handle and dispose of cooling system fluids.

8. Identify cooling system fluid tests and describe their associated procedures.

9. Describe the procedures used to service cooling systems.

10. Describe the procedures used to inspect and maintain cooling systems and components.

11. Identify cooling system problems and their causes.

12. Describe the procedures used to diagnose cooling systems and components.

13. Describe the procedures used to remove and install cooling system components.

14. Describe the procedures used to repair cooling systems and components.

Practical Objectives

N/A

CHT-305 Engine Lubrication Systems

Learning Outcomes:

- Demonstrate knowledge of engine lubrication systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair engine lubrication systems.

2014 National Occupational Analysis Reference:

5.02 Diagnoses lubrication systems.
6.02 Repairs lubrication systems.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with engine lubrication systems.

2. Identify hazards and describe safe work practices pertaining to engine lubrication systems.

3. Identify types of engine lubrication systems and describe their applications and operation.

4. Identify engine lubrication system components and describe their purpose and operation.

5. Describe the procedures used to inspect and maintain engine lubrication systems and components.

6. Identify engine lubrication system failures and their causes.

7. Describe the procedures used to diagnose engine lubrication systems and components.

8. Describe the procedures used to remove and install engine lubrication system components.

9. Describe the procedures used to disassemble and assemble engine lubrication system components.

10. Describe the procedures used to repair engine lubrication systems and components.

Practical Objectives

N/A

CHT-310 Drivelines

Learning Outcomes:

- Demonstrate knowledge of drivelines, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair drivelines.

2014 National Occupational Analysis Reference:

9.03 Diagnoses driveline systems.
10.03 Repairs driveline systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with drivelines.

2. Identify hazards and describe safe work practices pertaining to drivelines.

3. Identify specialty tools and equipment used to service and repair drivelines and describe their applications and procedures for use.

4. Identify driveline configurations and describe their characteristics and operation.

5. Identify driveline components and describe their purpose and operation.

6. Describe the procedures used to inspect and maintain driveline components.

7. Identify driveline problems and their causes.

8. Describe the procedures used to diagnose drivelines.

9. Describe the procedures used to remove and install driveline components.

10. Describe the procedures used to repair and adjust driveline components.

Practical Objectives

1. Calculate driveline angles and phasing.

2. Adjust ride height.

CHT-315 Drive Axle Assemblies

Learning Outcomes:

- Demonstrate knowledge of drive axle assemblies, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair drive axle assemblies.

2014 National Occupational Analysis Reference:

9.05 Diagnose axle and differential systems.
10.05 Repair axle and differential systems.

Suggested Hours:

18 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with drive axle assemblies.

2. Identify hazards and describe safe work practices pertaining to drive axle assemblies.

3. Identify specialty tools and equipment used to service and repair drive axle assemblies and describe their applications and procedures for use.

4. Identify types of drive axle assemblies and describe their applications and operation.
   i) locking
   ii) non-locking
   iii) single reduction
   iv) double reduction
   v) planetary two-speed
   vi) planetary double reduction
   vii) double reduction two-speed
   viii) power divider

5. Identify drive axle assembly components and describe their purpose and operation.

6. Describe the procedures used to inspect and maintain drive axle assemblies and their components.

7. Identify drive axle assembly problems and their causes.

8. Describe the procedures used to diagnose drive axle assemblies.

9. Describe the procedures used to remove and install drive axle assemblies and their components.

10. Describe the procedures used to repair and adjust drive axle assemblies.

Practical Objectives

1. Disassemble and assemble a drive axle assembly/power divider.

CHT-320 Engine Clutches

Learning Outcomes:

- Demonstrate knowledge of engine clutches, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair engine clutches.

2014 National Occupational Analysis Reference:

9.01 Diagnose clutch systems.
10.01 Repair clutch systems.

Suggested Hours:

18 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with engine clutches.

2. Identify hazards and describe safe work practices pertaining to engine clutches.

3. Identify specialty tools and equipment used to service and repair engine clutches and describe their applications and procedures for use.

4. Identify types of engine clutches and describe their characteristics and operation.
   i) single plate
   ii) double plate
   iii) over-center
   iv) wet/dry

5. Identify types of engine clutch actuating mechanisms and describe their principles of operation.
   i) mechanical
   ii) hydraulic
   iii) pneumatic
   iv) electronically controlled

6. Identify engine clutch components and describe their purpose and operation.
   i) pressure plate assemblies
   ii) release bearings
   iii) pilot bearings
   iv) brakes
   v) flywheels
   vi) housings

7. Describe the procedures used to inspect and maintain engine clutch components.

8. Identify engine clutch related problems and their causes.

9. Describe the procedures used to diagnose engine clutches.

10. Describe the procedures used to remove and install engine clutches and their components.

11. Describe the procedures to repair and adjust engine clutches and their components.

Practical Objectives

1. Remove, replace and adjust a clutch.

CHT-325 Diesel Fuel Supply Systems

Learning Outcomes:

- Demonstrate knowledge of diesel fuel supply systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair diesel fuel supply systems.

2014 National Occupational Analysis Reference:

5.05 Diagnoses fuel systems.
6.05 Repairs fuel systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with diesel fuel supply systems.

2. Identify hazards and describe safe work practices pertaining to diesel fuel supply systems.

3. Identify the properties and characteristics of diesel fuels.

4. Identify and interpret codes and regulations pertaining to the handling and storage procedures of diesel fuels.

5. Identify specialty tools and equipment used to service and repair diesel fuel supply systems and describe their applications and procedures for use.

6. Identify diesel fuel supply system components and describe their purpose and operation.

7. Describe the procedures used to inspect and maintain diesel fuel supply systems and components.

8. Identify diesel fuel supply system problems and their causes.

9. Describe the procedures used to diagnose diesel fuel supply system and components.

10. Describe the procedures used to remove and install diesel fuel supply system components.

11. Describe the procedures used to disassemble and assemble diesel fuel supply system components.

12. Describe the procedures used to repair and adjust diesel fuel supply systems and components.

Practical Objectives

1. Perform a vaccum, pressure and flow test.

CHT-330 Starting Systems

Learning Outcomes:

- Demonstrate knowledge of starting systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair starting systems.

2014 National Occupational Analysis Reference:

13.01 Diagnoses starting/charging systems and batteries.
14.01 Repairs starting/charging systems and batteries.

Suggested Hours:

15 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with starting systems.

2. Identify hazards and describe safe work practices pertaining to starting systems.

3. Identify specialty tools and equipment used to service and repair starting systems and describe their applications and procedures for use.

4. Identify types of starting systems and describe their applications and operation.
   i) electrical
   ii) hydraulic
   iii) pneumatic

5. Identify starting system components and describe their applications and operation.
   i) 12/24
   ii) magnetic switches
   iii) solenoids
   iv) thermal protection switches
   v) relays

vi) clutch switch
vii) neutral start
viii) ignition switch
ix) starter drives

6. Describe the procedures used to inspect and maintain starting system components.
   i) electrical
   ii) hydraulic
   iii) pneumatic

7. Identify starting system problems and their causes.
   i) electrical
   ii) hydraulic
   iii) pneumatic

8. Describe the procedures used to diagnose starting system components.
   i) electrical
   ii) hydraulic
   iii) pneumatic

9. Describe the procedures used to remove and install starting system components.
   i) electrical
   ii) hydraulic
   iii) pneumatic

10. Describe the procedures used to repair starting system components.
    i) electrical
    ii) hydraulic
    iii) pneumatic

Practical Objectives

1. Perform a voltage drop test.

2. Dissassemble and assemble starter and test components.

CHT-335 Starting Aids

Learning Outcomes:

- Demonstrate knowledge of starting aids, their purpose and operation.
- Demonstrate knowledge of the procedures used to service and repair starting aids.

2014 National Occupational Analysis Reference:

13.01 Diagnose starting/charging systems and batteries.
14.01 Repairs starting/charging systems and batteries.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with starting aids.

2. Identify hazards and describe safe work practices pertaining to starting aids.

3. Identify the types of starting aids and describe their purpose and operation.
   i) ether starting systems
   ii) oil heaters
   iii) coolant heaters
   iv) battery warmers
   v) glow plugs
   vi) intake manifold heaters
   vii) decompression mechanisms

4. Describe the procedures used to inspect and maintain starting aids and their components.

5. Identify starting aid problems and their causes.

6. Describe the procedures used to diagnose starting aids and their components.

7. Describe the procedures used to remove and install starting aids and their components.

8. Describe the procedures used to repair starting aids and their components.

Practical Objectives

1. Measure current draw of intake heater.

2. Test a glow-plug circuit.

3. Test immersion heaters.

CHT-340 Charging Systems

Learning Outcomes:

- Demonstrate knowledge of charging systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair charging systems.

2014 National Occupational Analysis Reference:

13.01 Diagnoses starting/charging systems and batteries.
14.01 Repairs starting/charging systems and batteries.

Suggested Hours:

15 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with charging systems.

2. Identify hazards and describe safe work practices pertaining to charging systems.

3. Identify specialty tools and equipment used to service and repair charging systems and describe their applications and procedures for use.

4. Identify charging system components and describe their purpose and operation.

5. Describe the procedures used to inspect and maintain charging system components.

6. Identify charging system problems and their causes.

7. Describe the procedures used to diagnose charging system components.

8. Describe the procedures used to remove and install charging system components.

9. Describe the procedures used to disassemble and assemble charging system components.

10. Describe the procedures used to repair charging system components.

Practical Objectives

1. Disassemble and assemble an alternator.

2. Verify remote sense wire.

3. Diagnose and repair charging system components.

CHT-345 Electronic Ignition Systems

Learning Outcomes:

- Demonstrate knowledge of electronic ignition systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair electronic ignition systems.

2014 National Occupational Analysis Reference:

5.06 Diagnoses engine control systems.
6.06 Repairs engine control systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with electronic ignition systems.

2. Identify hazards and describe safe work practices pertaining to electronic ignition systems.

3. Identify specialty tools and equipment used to service and repair electronic ignition systems and describe their applications and procedures for use.

4. Identify types of electronic ignition systems and describe their operating principles.

5. Identify electronic ignition system components and describe their purpose and operation.

6. Describe the procedures used to inspect and maintain electronic ignition systems and components.

7. Identify electronic ignition system problems and their causes.

8. Describe the procedures used to diagnose electronic ignition systems and components.

9. Describe the procedures used to remove and install electronic ignition system components.

10. Describe the procedures used to repair and adjust electronic ignition systems and components.

Practical Objectives

N/A

CHT-350 Non-Diesel Fuel Systems

Learning Outcomes:

- Demonstrate knowledge of non-diesel fuel systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair non-diesel fuel systems.

2014 National Occupational Analysis Reference:

5.05 Diagnoses fuel systems.
5.06 Diagnoses engine control systems.
6.05 Repairs fuel systems.
6.06 Repairs engine control systems.

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with non-diesel fuel systems.

2. Identify hazards and describe safe work practices pertaining to non-diesel fuel systems.

3. Identify the properties and characteristics of non-diesel fuels and describe the handling and storage procedures.
   i) gasoline
   ii) liquefied petroleum gas (LPG)
   iii) compressed natural gas (CNG)
   iv) hybrid

4. Identify specialty tools and equipment used to service and repair non-diesel fuel systems and describe their applications and procedures for use.

5. Identify non-diesel fuel system components and describe their purpose and operation.
   i) tanks
   ii) filters
   iii) converters
   iv) carburetors
   v) valves
   vi) gauges
   vii) fuel lines and fittings
   viii) pumps
   ix) batteries
   x) motors
   xi) cables
   xii) capacitors

6. Describe the procedures used to inspect and maintain non-diesel fuel systems and components.

7. Identify non-diesel fuel system problems and their causes.

8. Describe the procedures used to diagnose non-diesel fuel systems and components.

9. Describe the procedures used to remove and install non-diesel fuel system components.

10. Describe the procedures used to disassemble and assemble non-diesel fuel system components.

11. Describe the procedures used to repair and adjust non-diesel fuel systems and components.

Practical Objectives

N/A

CHT-355 Manual Transmissions

Learning Outcomes:

- Demonstrate knowledge of manual transmissions, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair manual transmissions.

2014 National Occupational Analysis Reference:

9.04 Diagnose transmission and transfer case systems.
10.04 Repairs transmission and transfer case systems.

Suggested Hours:

18 Hours

Objectives and Content:

Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to servicing and repairing manual transmissions.

2. Identify specialty tools and equipment used to service and repair manual transmissions and describe their applications and procedures for use.

3. Identify types of manual transmissions and describe their applications and operation.
   i) conventional manual shift
   ii) electronic
   iii) automated manual

4. Identify manual transmission components and describe their purpose and operation.

5. Describe the procedures used to disassemble and assemble manual transmissions and their components.

6. Describe the procedures used to inspect and maintain manual transmissions and their components.

7. Identify manual transmission problems and their causes.

8. Describe the procedures used to diagnose manual transmissions.

9. Describe the procedures used to remove and install manual transmissions and their components.

10. Describe the procedures used to repair manual transmissions and their components.

Practical Objectives

1. Identify internal components and find path of power.

CHT-360 Pump Drives/Power Take-Offs

Learning Outcomes:

- Demonstrate knowledge of pump drives/power take-offs, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair pump drives/ power take-offs.

2014 National Occupational Analysis Reference:

9.04 Diagnoses transmission and transfer case systems.
10.04 Repairs transmission and transfer case systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with pump drives/power take-offs.

2. Identify hazards and describe safe work practices pertaining to servicing and repairing pump drives/power take-offs.

3. Identify specialty tools and equipment used to service and repair pump drives/ power take-offs and describe their applications and procedures for use.

4. Identify types of pump drives/power take-offs and their components and describe their purpose and operation.
   - i) engine driven
     - front crankshaft
     - gear train
   - ii) transmission driven
   - iii) driveline driven
   - iv) independent (540rpm/1000 rpm)

5. Describe the procedures used to disassemble and assemble pump drives/power take-offs and their components.

6. Describe the procedures used to inspect and maintain pump drives/power take-offs and their components.

7. Identify pump drives/ power take-off problems and their causes.

8. Describe the procedures used to diagnose pump drives/power take-offs and their components.

9. Describe the procedures used to remove and install pump drives/power take-offs and their components.

10. Describe the procedures used to adjust and repair pump drives/power take-offs and their components.

Practical Objectives

N/A

CHT-365 Transfer Cases

Learning Outcomes:

- Demonstrate knowledge of transfer cases, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair transfer cases.

2014 National Occupational Analysis Reference:

9.04 Diagnoses transmission and transfer case systems.
10.04 Repairs transmission and transfer case systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with transfer cases.

2. Identify hazards and describe safe work practices pertaining to transfer cases.

3. Identify specialty tools and equipment used to service and repair transfer cases and describe their applications and procedures for use.

4. Identify types of transfer cases and describe their applications and operation.

5. Identify transfer case components and describe their purpose and operation.

6. Describe the procedures used to inspect and maintain transfer cases and their components.

7. Identify transfer case problems and their causes.

8. Describe the procedures used to diagnose transfer cases.

9. Describe the procedures used to remove and install transfer cases and their components.

10. Describe the procedures used to overhaul and repair transfer cases and their components.

Practical Objectives

N/A

CHT-370 Automatic/Power Shift and CVT Transmissions

Learning Outcomes:

- Demonstrate knowledge of automatic/power shift transmissions, CVT transmissions, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair automatic/power shift transmissions and CVT transmissions.

2014 National Occupational Analysis Reference:

9.04 Diagnoses transmission and transfer case systems.
10.04 Repairs transmission and transfer case systems.

Suggested Hours:

36 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with automatic/power shift, and CVT transmissions.

2. Identify hazards and describe safe work practices pertaining to automatic/power shift transmissions.

3. Identify specialty tools and equipment used to service and repair automatic/power shift, and CVT transmissions and describe their applications and procedures for use.

4. Identify types of automatic/power shift, and CVT transmissions and describe their applications and operation.
   i) hydromechanical
   ii) electrohydraulic (electronically controlled)

5. Identify automatic/power shift, and CVT transmission components and describe their purpose and operation.

6. Describe the procedures used to inspect and maintain automatic/power shift, and CVT transmissions and their components.

7. Identify automatic/power shift, and CVT transmission problems and their causes.

8. Describe the procedures used to diagnose automatic/power shift, and CVT transmissions.

9. Describe the procedures used to remove and install automatic/power shift, and CVT transmissions and their components.

10. Describe the procedures used to repair and adjust automatic/power shift, and CVT transmissions and their components.
    i) shift point learning
    ii) shift point programming
    iii) valve body adjustments

Practical Objectives

1. Perform stall and pressure test.

CHT-375 Torque Converters

Learning Outcomes:

- Demonstrate knowledge of torque converters, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair torque converters.

2014 National Occupational Analysis Reference:

9.02 Diagnoses torque converters, fluid couplers, and retarders.
10.02 Repairs torque converters, fluid couplers, and retarders.

Suggested Hours:

9 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with torque converters.

2. Identify hazards and describe safe work practices pertaining to torque converters.

3. Identify specialty tools and equipment used to service and repair torque converters and describe their applications and procedures for use.

4. Identify types of torque converters and describe their applications and operation.
   i) torque divider
   ii) torque converter
   iii) fluid coupling

5. Identify torque converter components and describe their purpose and operation.
   i) impeller(s)
   ii) turbine(s)
   iii) stator(s)
   iv) split guide rings
   v) flex plate

vi) lock-up clutches
vii) charge pump
viii) oil circuits
ix) valves
x) oil coolers

6. Describe the procedures used to inspect and maintain torque converters and their components.

7. Identify torque converter problems and their causes

8. Describe the procedures used to diagnose torque converters.

9. Describe the procedures used to remove and install torque converters and their components.

10. Describe the procedures used to repair and adjust torque converters and their components.

Practical Objectives

N/A

Level 4

CHT-400 Base Engine Diagnostics

Learning Outcomes:

- Demonstrate knowledge of the procedures used to diagnose base engines and their components.

2014 National Occupational Analysis Reference:

5.01 Diagnoses base engine.
6.01 Repairs base engine.

Suggested Hours:

12 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with base engine diagnostics.

2. Identify hazards and describe safe work practices pertaining to base engine diagnostics.

3. Identify specialty tools and equipment used to diagnose base engines and describe their applications and procedures for use.

4. Identify base engine problems and their causes.

5. Identify the procedures used for base engine diagnostics and describe their applications and associated procedures.
   i) compression test
   ii) cylinder balance
   iii) cylinder leak down

6. Interpret diagnostic test results to determine base engine problems.

Practical Objectives

1. Perform a base pressure test.

2. Perform cylinder balance test.

3. Perform oil pressure test.

CHT-405 Diesel Fuel Injection Systems

Learning Outcomes:

- Demonstrate knowledge of diesel fuel injection systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair diesel fuel injection systems.

2014 National Occupational Analysis Reference:

5.05 Diagnoses fuel systems.
5.06 Diagnoses engine control systems.
6.05 Repairs fuel systems.
6.06 Repairs engine control systems.

Suggested Hours:

24 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with diesel fuel injection systems.

2. Identify hazards and describe safe work practices pertaining to diesel fuel injection systems.
   i) high pressure injection injuries

3. Identify specialty tools and equipment used to service and repair diesel fuel injection systems and describe their applications and procedures for use.

4. Identify types of diesel fuel injection systems and describe their applications and operation.
   i) in-line pump
   ii) distributor pump
   iii) unit injector
   iv) high pressure common rail
   v) hydraulic electric unit injector (HEUI)

5. Identify diesel fuel injection system components and describe their purpose and operation.

6. Describe the procedures used to inspect and maintain diesel fuel injection system components.

7. Identify diesel fuel injection system problems and their causes.

8. Describe the procedures used to diagnose diesel fuel injection systems and components.

9. Describe the procedures used to remove and install diesel fuel injection system components.

10. Describe the procedures used to disassemble and assemble diesel fuel injection system components.

11. Describe the procedures used to repair and adjust diesel fuel injection system components.

Practical Objectives

1. Perform a bench test on an injector.

2. Pin time a fuel injection pump.

CHT-410 Electronically-Controlled Diesel Fuel Injection Systems

Learning Outcomes:

- Demonstrate knowledge of electronically-controlled diesel fuel injection systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair electronically-controlled diesel fuel injection systems.

2014 National Occupational Analysis Reference:

5.05 Diagnoses fuel systems.
5.06 Diagnoses engine control systems.
6.05 Repairs fuel systems.
6.06 Repairs engine control systems.

Suggested Hours:

27 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with electronically-controlled diesel fuel injection systems.

2. Identify hazards and describe safe work practices pertaining to electronically-controlled diesel fuel injection systems.
   i) high voltage
   ii) high pressure

3. Identify specialty tools and equipment used to service and repair electronically-controlled diesel fuel injection systems and describe their applications and procedures for use.

4. Identify types of electronically-controlled diesel fuel injection systems and describe their applications and operation.

5. Identify electronically-controlled diesel fuel injection system components and describe their purpose and operation.
   i) inputs (sensors)
   ii) outputs
   iii) processors

6. Describe the procedures used to inspect and maintain electronically-controlled diesel fuel injection system components.

7. Identify electronically-controlled diesel fuel injection system problems and their causes.

8. Describe the procedures used to diagnose electronically-controlled diesel fuel injection systems and components.

9. Describe the procedures used to remove and install electronically-controlled diesel fuel injection system components.

10. Describe the procedures used to disassemble and assemble electronically-controlled diesel fuel injection system components.

11. Describe the procedures used to repair and adjust electronically-controlled diesel fuel injection system components.

Practical Objectives

1. Program an injector.

2. Perform cylinder cut out test.

3. Perform cylinder balance test.

4. Perform solenoid cut out test.

5. Perform an injector leak test.

6. Perform fault code trouble shooting.

CHT-415 Intake and Exhaust Systems

Learning Outcomes:

- Demonstrate knowledge of intake and exhaust systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair intake and exhaust systems.

2014 National Occupational Analysis Reference:

5.04 Diagnoses intake and exhaust systems.
6.04 Repairs intake and exhaust systems.

Suggested Hours:

12 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with intake and exhaust systems.

2. Identify hazards and describe safe work practices pertaining to intake and exhaust systems.

3. Identify specialty tools and equipment used to service and repair intake and exhaust systems and describe their applications and procedures for use.

4. Identify types of air filtration systems and describe their applications and operation.

5. Identify types of turbo systems and describe their applications and operation.
   i) constant geometry
   ii) constant volute
   iii) variable geometry
   iv) twin

6. Identify intake system components and describe their purpose and operation.

7. Identify exhaust system components and describe their purpose and operation.

8. Describe the procedures used to inspect and maintain intake and exhaust systems and components.

9. Identify intake and exhaust system problems and their causes.

10. Describe the procedures used to diagnose intake and exhaust systems and components.

11. Describe the procedures used to remove and install intake and exhaust system components.

12. Describe the procedures used to repair intake and exhaust systems and components.

Practical Objectives

1. Perform air flow restriction.

2. Perform boost pressure test.

3. Perform air to air leak test (charge air cooler CAC).

4. Perform exhaust back pressure test.

5. Dissassemble turbo charger.

6. Verify waste gate operation.

CHT-420 Emission Control Systems

Learning Outcomes:

- Demonstrate knowledge of emission control systems, their components, and operation.
- Demonstrate knowledge of the procedures used to service and repair emission control systems.

2014 National Occupational Analysis Reference:

5.07 Diagnoses emission control systems.
6.07 Repairs emission control systems.

Suggested Hours:

27 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with emission control systems.

2. Identify hazards and describe safe work practices pertaining to emission control systems.
   i) Diesel Exhaust Fluid (DEF)
   ii) Diesel Particulate Filter (DPF)
   iii) high temperature

3. Identify and interpret codes and regulations pertaining to emission control.
   i) federal/provincial

4. Identify specialty tools and equipment used to service and repair emission control systems and describe their applications and procedures for use.

5. Identify types of emission control systems and describe their characteristics and applications.
   i) reducing particulate matter
   ii) reducing NOx

iii) reducing CO and CO^2
iv) reducing hydrocarbons

6. Identify emission control system components and describe their purpose and operation.

7. Describe the procedures used to inspect and maintain emission control system components.
   i) start up and shut down

8. Identify emission control system problems and their causes.

9. Describe the procedures used to diagnose emission control systems and components.

10. Describe the procedures used to remove and install emission control system components.

11. Describe the procedures used to adjust and repair emission control systems and components.

12. Describe the procedures used to test vehicle emission controls.

Practical Objectives

1. Diagnose emission control systems.

2. Remove and install emission control system components.

3. Repair emission control system components.

4. Inspect, clean and maintain emission control system components.

5. Test vehicle emission controls.

6. Perform a forced regeneration.

CHT-425 Engine Brakes and Retarders

Learning Outcomes:

- Demonstrate knowledge of engine brakes and retarders, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair engine brakes and retarders.

2014 National Occupational Analysis Reference:

9.02 Diagnoses torque converters, fluid couplers, and retarders.
10.02 Repairs torque converters, fluid couplers, and retarders.

Suggested Hours:

12 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with engine brakes and retarders.

2. Identify hazards and describe safe work practices pertaining to engine brakes and retarders.

3. Identify specialty tools and equipment used to service and repair engine brakes and retarders and describe their applications and procedures for use.

4. Identify types of engine brakes and retarders and describe their applications and operation.
   i) engine brakes
   ii) exhaust brakes
   iii) hydraulic retarders
   iv) electric retarders

5. Identify engine brake and retarder components and describe their purpose and operation.

6. Identify engine brake and retarder problems and their causes.

7. Describe the procedures used to diagnose engine brakes and retarders and their components.

8. Describe the procedures used to remove and install engine brakes and retarders and their components.

9. Describe the procedures used to disassemble and assemble engine brakes and retarders.

10. Describe the procedures used to inspect, adjust and repair engine brakes and retarders and their components.

Practical Objectives

1. Diagnose engine brakes and retarders.

2. Diassemble and assemble engine brakes and retarders.

3. Adjust engine brakes.

CHT-430 Diesel Engine Overhaul

Learning Outcomes:

- Demonstrate knowledge of the procedures used to overhaul diesel engines.

2014 National Occupational Analysis Reference:

6.01 Repairs base engines.

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with diesel engine overhauling.

2. Identify hazards and describe safe work practices pertaining to diesel engine overhauling.

3. Identify specialty tools and equipment used for diesel engine overhauling and describe their applications and procedures for use.

4. Describe the procedures used to remove and install diesel engines.

5. Describe the procedures used to inspect engine mounting components for wear.

6. Describe the procedures used to disassemble and assemble diesel engines and components.

7. Describe the procedures used to clean and inspect diesel engines and their components.

8. Describe the procedures used to measure diesel engine components for wear.

9. Diagnose root cause of failure of diesel engine components.
   i) failure analysis

10. Describe the procedures used to repair diesel engine components.

11. Describe the procedures used to commission diesel engines.

Practical Objectives

1. Perform precision measurements of diesel engine components.

2. Perform a top end adjustment.

CHT-435 Gauges and Instrumentation

Learning Outcomes:

- Demonstrate knowledge of gauges and instrumentation, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair gauges and instrumentation.

2014 National Occupational Analysis Reference:

13.02 Diagnoses electrical components, motors, and accessories.
14.02 Repairs electrical components, motors, and accessories.
15.02 Monitors parameters.
19.02 Diagnoses operator station components.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with gauges and instrumentation.

2. Identify hazards and describe safe work practices pertaining to gauges and instrumentation.

3. Identify specialty tools and equipment used to service and repair gauges and instrumentation and describe their applications and procedures for use.

4. Identify types of gauges and instrumentation and their components and describe their purpose and operation.

5. Interpret electrical symbols and wiring diagrams relating to gauges and instrumentation.

6. Describe the procedures used to inspect and maintain gauges and instrumentation and their components.

7. Identify gauge and instrumentation problems and their causes.

8. Describe the procedures used to diagnose gauge and instrumentation circuits and their components.

9. Describe the procedures used to remove and install gauges and instrumentation and their components.

10. Describe the procedures to repair and calibrate gauge and instrumentation components.

Practical Objectives

1. Demonstrate knowledge smart switches and programming.

2. Demonstrate knowledge of gauge and instrument symbols.

CHT-440 Vehicle Management Systems

Learning Outcomes:

- Demonstrate knowledge of vehicle management systems, their components and operation.
- Demonstrate knowledge of reprogramming software.
- Demonstrate knowledge of the procedures used to diagnose and repair vehicle management system components.

2014 National Occupational Analysis Reference:

5.06 Diagnoses engine control systems.
6.06 Repairs engine control systems.
15.01 Reads diagnostic trouble codes.
15.02 Monitors parameters.
15.03 Interprets test results.
15.04 Test system circuitry and components.
16.01 Updates component software.
16.02 Repair components.

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Explain basic computer operation and its relationship to vehicle management systems.

2. Identify computer diagnostic systems and describe their components and operation.

3. Describe the networking of modules, multi-plexing and power line carriers (PLCs).
   i) datalink protocol
      - J 1708/1587

- J 1939
- Control Area Network (CAN)

4. Identify and interpret diagnostic trouble codes (DTC).

5. Identify the parameters of inputs and outputs and describe their relationships.

6. Identify types of specialized tools and equipment used to diagnose network and electronic circuitry and describe their applications and procedures for use.
   i) digital volt ohmmeter (DVOM)
   ii) scopes
   iii) probes
   iv) break out boxes
   v) scan tools
   vi) laptops

7. Identify the methods to diagnose vehicle management systems and describe their associated procedures.
   i) PLCs
   ii) on-board diagnostic (OBD)
   iii) laptop/scan tools

8. Identify methods used to access/transfer and reprogram software and describe their associated procedures.
   i) CD/DVD
   ii) Internet
   iii) scan tool
   iv) electronically erasable programmable read only memory (EEPROM)

9. Describe the procedures used to repair and replace vehicle management system components.

Practical Objectives

1. Troubleshoot datalink communication.

2. Read and interpret schematics and flowcharts.

3. Demonstrate use of a multimeter.

4. Check, troubleshoot and clear fault codes.

5. Perform ECM downloads.

CHT-445 Air Conditioning Systems

Learning Outcomes:

- Demonstrate knowledge of air conditioning systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair air conditioning systems.

2014 National Occupational Analysis Reference:

17.03 Diagnoses air conditioning systems.
18.03 Repairs air conditioning systems.

Suggested Hours:

18 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with air conditioning systems.

2. Identify hazards and describe safe work practices pertaining to air conditioning systems.

3. Identify codes and regulations pertaining to refrigerants and air conditioning systems.
   i) federal/provincial
   ii) certification requirements

4. Identify specialty tools and equipment used to service and repair air conditioning systems and describe their applications and procedures for use.

5. Describe the principles of refrigeration.

6. Identify refrigerant types and describe their characteristics and applications.

7. Identify and interpret information found on pressure/temperature charts.

8. Identify air conditioning system components and describe their purpose and operation.

9. Describe the procedures used to inspect and maintain air conditioning system and components.

10. Identify air conditioning system problems and their causes.

11. Describe the procedures used to diagnose air conditioning systems.

12. Describe the procedures used to remove and install air conditioning system components.

13. Describe the procedures used to repair and adjust air conditioning systems and components.

Practical Objectives

1. Conduct a standing leak test.

2. Evacuate and recharge an air conditioning system.

3. Performance testing.

CHT-450 Heating and Ventilation Systems

Learning Outcomes:

- Demonstrate knowledge of heating and ventilation systems, their components and operation.
- Demonstrate knowledge of the procedures used to service and repair heating and ventilation systems.

2014 National Occupational Analysis Reference:

17.01 Diagnoses heating systems.
17.02 Diagnoses ventilation and filtration systems.
18.01 Repairs heating systems.
18.02 Repairs ventilation and filtration systems.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with heating and ventilation systems.

2. Identify hazards and describe safe work practices pertaining to heating and ventilation systems.

3. Identify types of heating and ventilation systems and describe their applications and operation.
   i) cab
   ii) auxiliary

4. Identify heating and ventilation system components and describe their purpose and operation.

5. Describe the procedures used to inspect and maintain heating and ventilation systems and components.

6. Identify heating and ventilation system problems and their causes.

7. Describe the procedures used to diagnose heating and ventilation systems.

8. Describe the procedures used to remove and install heating and ventilation system components.

9. Describe the procedures used to repair and adjust heating and ventilation systems and components.

Practical Objectives

N/A

CHT-455 Mentoring

Learning Outcomes:

- Demonstrate knowledge of trade terminology.
- Demonstrate knowledge of effective communication practices.
- Demonstrate knowledge of strategies for learning skills in the workplace.
- Demonstrate knowledge of strategies for teaching workplace skills.

2014 National Occupational Analysis Reference:

3.03 Communicates with others.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives:

1. Define terminology used in the trade.

2. Describe the importance of using effective verbal and non-verbal communication with people in the workplace.
   - i) other tradespeople
   - ii) colleagues
   - iii) apprentices
   - iv) supervisors
   - v) clients
   - vi) authority having jurisdiction
   - vii) manufacturers

3. Identify sources of information to effectively communicate.

4. Identify communication and learning styles.
   - i) learning styles
     - audible
     - visual
     - experiential

- theoretical
- any combination of the above

5. Describe effective listening and speaking skills.
   i) hearing
   ii) interpreting
   iii) reflecting
   iv) responding
   v) paraphrasing

6. Identify personal responsibilities and attitudes that contribute to on-the-job success.
   i) asking questions
   ii) working safely
   iii) accepting constructive feedback
   iv) time management and punctuality
   v) respect for authority
   vi) good stewardship of materials, tools and property
   vii) efficient work practices

7. Identify the value of diversity in the workplace.

8. Identify communication that constitutes harassment and discrimination.
   i) harassment
      - objectionable conduct
      - comment or display made either on a one-time or continuous basis that demeans, belittles, or causes personal humiliation or embarrassment to the recipient
   ii) discrimination
      - an opinion or negative action of someone based on race, national or ethnic origin, colour, religion, age, sex, sexual orientation, marital status, family status, disability or conviction for which a pardon has been granted

9. Describe the importance of individual experience in the mentoring process.

10. Describe the shared responsibilities for workplace learning.

11. Determine one's own learning preferences and explain how these relate to learning new skills.

12. Describe the importance of different types of skills in the workplace.

13. Describe the importance of essential skills in the workplace.
    i) reading
    ii) document use
    iii) writing
    iv) oral communication
    v) numeracy
    vi) thinking
    vii) working with others
    viii) digital technology
    ix) continuous learning

14. Identify different ways of learning.

15. Identify different learning needs and strategies to meet learning needs.
    i) learning needs
        - learning disabilities
        - learning preferences
        - language proficiency

16. Identify strategies to assist in learning a skill.
    i) understanding the basic principles of instruction
    ii) developing coaching skills
    iii) being patient
    iv) providing feedback

17. Identify different roles played by a workplace mentor.

18. Describe the steps involved in teaching skills.
    i) identifying the point of the lesson
    ii) linking the lesson
    iii) demonstrating the skill
    iv) providing practice
    v) giving feedback
    vi) assessing skills and progress

19. Explain the importance of identifying the point of a lesson.

20. Identify how to choose a good time to present a lesson.

21. Explain the importance of linking the lessons.

22. Identify the components of the skill (the context).

23. Describe considerations in setting up opportunities for skill practice.

24. Explain the importance of providing feedback.

25. Identify techniques for giving effective feedback.

26. Describe a skills assessment.

27. Identify methods of assessing progress.

28. Explain how to adjust a lesson to different situations.

Practical Objectives:

N/A

CHT-460 Program Review

Learning Outcomes:

- Demonstrate knowledge of the National Occupational Analysis and its relationship to the Interprovincial Exam.
- Demonstrate knowledge of overall comprehension of the trade in preparation for the Interprovincial Exam.

National Occupational Analysis Reference:

Entire 2014 National Occupational Analysis

Suggested Hours

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with an NOA.
   i) blocks
   ii) tasks
   iii) sub-tasks

2. Explaini how an NOA is developed and the link it has with the Interprovincial Exam.
   i) development
   ii) validation
   iii) block and task weighting
   iv) examination break-down (pie chart)

3. Identify Red Seal products and describe their use for preparing for the Interprovincial Red Seal Exam.
   i) Red Seal website
   ii) examination preparation guide
   iii) sample questions
   iv) examination counselling sheets

4. Explain the relationship between the NOA and the AACS and the IPG.

5. Review Common Occupational Skills for the HDET trade as identified in the NOA.
   i) Uses and maintains tools and equipment.
   ii) Performs general maintenance and inspections.
   iii) Organizes work.
   iv) Performs routine trade activities.

6. Review Engines and Support Systems for the HDET trade as identified in the NOA.
   i) Diagnoses engines and engine support systems.
   ii) Repairs engines and engine support systems.

7. Review Hydraulic, Hydrostatic, and Pneumatic Systems for the HDET trade as idenfied in the NOA.
   i) Diagnose hydraulic, hyrdrostatic, and pneumatic systems.
   ii) Repairs hydraulic, hyrdrostatic, and pneumatic systems.

8. Review Drivetrain Systems for the HDET trade as idenfied in the NOA.
   i) Diagnose drivetrain systems.
   ii) Repair drivetrain systems.

9. Review Steering, Suspension, Brake Systems, Wheel Assemblies, and Undercarriage for the HDET trade as idenfied in the NOA.
   i) Diagnose steering, suspension, brake systems, wheel assemblies, and undercarriage.
   ii) Repair steering, suspension, brake systems, wheel assemblies, and undercarriage.

10. Review Electrical and Vehicle Management for the HDET trade as idenfied in the NOA.
   i) Diagnoses electrical systems.
   ii) Repairs electrical systems.
   iii) Diagnoses electronic vehicle management systems.
   iv) Repair electronic vehicle management systems

11. Review Environmental Control Systems for the HDET trade as idenfied in the NOA.
   i) Diagnose environmental control systems.
   ii) Repair environmental control systems.

12. Review Structural Components, Accessories, and Attachments for the HDET trade as idenfied in the NOA.
    i) Diagnose structural components, accessories, and attachments.
    ii) Repair structural components, accessories, and attachments.

Practical Objectives

N/A

Feedback and Revisions

This AACS will be amended periodically; comments or suggestions for improvements should be directed to:

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Any comments or suggestions received will be reviewed and considered to determine the course of action required. If the changes are deemed to be minor, they will be held for implementation during the next review cycle. If immediate change is deemed appropriate and approved by the Atlantic Trade Advisory Committee, it will result in a revision to this version of the AACS and will be detailed in the following section.

Version Changes
