



HEAVY DUTY EQUIPMENT TECHNICIAN

2017

Based on the CCDA Harmonization Recommendations and
the Interprovincial Program Guide
(pg. 12 for Program Structure)



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The Joint Planning Committee (JPC) recognizes this Interprovincial Program Guide as the national curriculum for the occupation of Heavy Duty Equipment Technician.

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Introduction

Jurisdictions have long recognized the benefit of pooling resources in the development and maintenance of apprenticeship training standards. A successful example of this is the Interprovincial Standards (Red Seal) program itself. Essential to the establishment of standards is the development of suitable training systems and programs which enable tradespeople to acquire certification based on these standards. While certification is the responsibility of Apprenticeship administrators throughout Canada, the development and delivery of technical training is the responsibility of jurisdictions.

In 1999, work to develop common training for apprenticeship programs within the Atlantic Provinces began. To date, 22 Curriculum Standards have been developed through the Atlantic Standards Partnership (ASP) project to assist programming staff and instructors in the design and delivery of technical training. Similarly, the Canadian Council of Directors of Apprenticeship (CCDA) embarked on a process for the development of national Interprovincial Program Guides (IPGs) for the Boilermaker, Carpenter and Sprinkler System Installer trades. At its January 2005 strategic planning session, the CCDA identified developing common training standards as one of key activities in moving towards a more cohesive apprenticeship system.

With the support of Human Resources and Social Development Canada (HRSDC), several provinces and territories have partnered to build on the ASP and the CCDA processes to further develop IPGs to be used across the country. This partnership will create efficiencies in time and resources and promote consistency in training and apprentice mobility.

User Guide

According to the Canadian Apprenticeship Forum, the Interprovincial Program Guide (IPG) is: "a list of validated technical training outcomes, based upon those sub-tasks identified as common core in the National Occupational Analysis, and validated by industry in the provinces and territories as incorporating the essential tasks, knowledge and skills associated with a given trade."

Learning outcomes contained in the IPG represent the minimum common core content for the development of jurisdictional training standards and outlines. IPGs are developed based on the National Occupational Analyses and extensive industry consultation. The IPG is intended to assist program development staff in the design of jurisdictional plans of training. Each jurisdiction has the flexibility to add additional content.

The IPG was deliberately constructed for ease of use and flexibility of structure in order to adapt to all delivery requirements. It details units of training, unit outcomes and objectives. It does 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 IPG does not dictate study materials, textbooks or learning activities to be used in delivery.

The IPG document includes a recommended leveling structure to facilitate mobility for apprentices moving from one jurisdiction to another. Because of difference in jurisdictional regulations and program durations, levels are offered as suggestions only.

Structure

The content of the IPG is divided into units. Unit codes are used as a means of identification and are not intended to convey the order of delivery. Prerequisites have not been detailed. Jurisdictions are free to deliver units one at a time or concurrently provided all outcomes are met.

User Guide *(continued)*

The IPG does not indicate the amount of time to be spent on a particular unit. The length of time required to deliver an outcome successfully will depend upon the learning activities and teaching methods used. Jurisdictions are encouraged to use practical demonstration and opportunities for hands-on learning whenever possible.

The unit outcomes are the specific performances that must be evaluated. Wording of outcomes, "Demonstrate knowledge of...", acknowledges the broad spectrum of ways in which knowledge can be shown. It is at the discretion of each jurisdiction to determine the manner in which outcomes are evaluated; theoretically, practically or a combination of both.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided. Content may be added or extended in jurisdictional training plans.

IPG Glossary of Terms

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

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 you 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.
DIAGNOSE	To analyze or identify a problem or malfunction.
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.

IPG Glossary of Terms *(continued)*

PURPOSE	The reason for which something exists or is done, made or used.
SERVICE	Routine inspection and replacement of worn or deteriorating parts. An act or business function provided to a customer in the course of one's profession. (e.g., haircut).
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

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

Over the past several years, the Government of Canada has conducted research examining the skills people use at work. From this research, Essential Skills Profiles have been developed for various occupations.

For more information regarding Essential Skills and to access Essential Skills Profiles for specific occupations, visit Human Resources and Social Development Canada's Essential Skills website at:

http://srv108.services.gc.ca/english/general/home_e.shtml

Profile Chart

OCCUPATIONAL SKILLS			
CHT-100 Safety	CHT-105 Tools and Equipment	CHT-110 Hoisting and Lifting	CHT-115 Communication and Documentation
CHT-125 Start, Move and Park Vehicle	CHT-130 Fasteners, Tubings, Hoses and Fittings	CHT-135 Lubrication and Fluids Servicing	CHT-140 Gaskets and Seals
CHT-145 Bearings	CHT-150 Metallurgy	CHT-155 Cutting and Heating	CHT-160 MIG Welding
CHT-200 SMAW Welding	CHT-120 Preventive Maintenance	HET-380 Fire Suppression Units	
ENGINES AND ENGINE SUPPORT SYSTEMS			
CHT-165 Engine Principles	CHT-167 Cooling Systems	CHT-170 Lubrication Systems	CHT-220 Non-Diesel Fuel Systems
CHT-225 Diesel Fuel Supply Systems	CHT-400 Diesel Fuel Injection Systems	CHT-405 Electronically-Controlled Diesel Fuel Systems	CHT-230 Intake and Exhaust Systems
CHT-425 Diesel Engine Overhaul	CHT-420 Base Engine Diagnostics	CHT-415 Engine Brakes and Retarders	CHT-410 Emission Control Systems
HYDRAULIC AND PNEUMATIC SYSTEMS			
CHT-183 Introduction to Hydraulics	CHT-185 Hydraulic Fittings, Piping, Tubing and Hoses	CHT-187 Reservoirs, Coolers and Filters	HET-300 Hydraulic Pumps and Motors
HET-305 Hydraulic Cylinders	HET-310 Control Valves	HET-315 Accumulators	HET-325 Hydraulic Systems Diagnostics and Testing
HET-385 Pneumatic Systems			

Profile Chart (continued)

DRIVE TRAIN			
CHT-205 Drive Lines	CHT-215 Engine Clutches	CHT-255 Automatic/Power Shift Transmissions	CHT-260 Torque Converters
CHT-210 Drive Axle Assemblies	HET-355 Final Drives	HET-340 Manual Transmissions and Power Take-offs	HET-350 Hydrostatic Drives
HET-345 Transfer Cases			
STEERING, SUSPENSION AND BRAKES			
CHT-193 Vehicle Hydraulic Brake Systems	CHT-163 Wheels, Tires and Rims	CHT-195 Basic Air Brakes	HET-335 Track-Type Undercarriage
HET-360 Power Assisted Steering Systems	HET-330 Front and Rear Suspensions	HET-370 Tracked Steering Systems	HET-365 Articulated Steering Systems
HET-320 Equipment Hydraulic Brake Systems			
ELECTRICAL AND ELECTRONIC SYSTEMS			
CHT-173 Electrical and Electronic Principles	CHT-175 Batteries	CHT-235 Starting Systems	CHT-240 Starting Aids
CHT-245 Charging Systems	CHT-250 Electronic Ignition Systems	CHT-177 Conventional Lighting Circuits	CHT-430 Gauges
CHT-180 Wiring Harnesses and Accessories	CHT-435 Vehicle Management Systems		
STRUCTURAL COMPONENTS, CLIMATE CONTROL, ACCESSORIES AND ATTACHMENTS			
CHT-265 Air Conditioning Systems	CHT-270 Heating and Ventilation Systems	HET-393 Winches, Wire Ropes and Accessories	HET-375 Cabs and Protective Structures
HET-390 Blades, Buckets and Cutting Edges	HET-395 Material Handling Equipment		

Nova Scotia Program Structure

CHT = Units common to Heavy Duty Equipment Technician & Truck and Transport Mechanic

HET = Units specific to Heavy Duty Equipment Technician

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Interprovincial Program Guide (IPG) Content To Be Covered	
			IPG Units	Page #
Level 1 (8 Weeks) Common with Truck and Transport Mechanic				
MENT-1801	Integrated Milestone Workplace Mentoring I	None	MENT-1801 Workplace Mentoring I <i>(NS unit of instruction)</i>	14
IMPA-0801	Fundamental Shop Skills	None	CHT-100 Safety	15
			CHT-140 Gaskets, Seals and Sealing Compounds	17
			CHT-145 Bearings	18
			CHT-115 Communication & Documentation	19
			CHT-105 Tools and Equipment	20
			CHT-130 Fasteners, Tubings, Hoses and Fittings	22
			CHT-110 Hoisting and Lifting	23
IMPA-1803	Basic Electrical & Electronic Principles	IMPA-0801	CHT-125 Start, Move and Park Vehicle	24
			CHT-173 Electrical & Electronic Principles	25
			CHT-175 Batteries	27
			CHT-177 Conventional Lighting Circuits	28
IMPA-1804	Hydraulics 1	IMPA-0801	CHT-180 Wiring Harnesses and Accessories	29
			CHT-183 Introduction to Hydraulics	31
			CHT-185 Hydraulic Fittings, Piping, Tubing and Hoses	33
IMPA-1805	Lubricants, Lubrication & Cooling	IMPA-0801	CHT-187 Reservoirs, Coolers and Filters	34
			CHT-135 Lubrication and Fluids Servicing	36
IMPA-1806	Braking Systems	IMPA-0801, 1804	CHT-167 Cooling Systems	38
			CHT-190 Vehicle Hydraulic Brake Systems	41
			CHT-170 Engine Lubrication Systems	40
MPOA-1800	Basic Welding	IMPA-0801	HET-320 Equipment Hydraulic Braking Systems	42
			CHT-150 Metallurgy	47
			CHT-195 Basic Air Brake Systems	44
			CHT-160 MIG Welding	50
IMPA-1823	Wheel Assemblies and Preventive Maintenance	IMPA-0801	CHT-200 SMAW Welding	51
			CHT-163 Tires, Rims and Wheels	52
			CHT-120 Preventive Maintenance	54

LEVEL 1

MENT-1801

Workplace Mentoring I

(Nova Scotia Unit of Instruction)

Learning Outcomes:

- Identify and explain strategies for learning workplace skills.
- Demonstrate strategies to assist in learning skills in the workplace.

Objectives and Content:

1. Describe the importance of your own experiences.
2. Identify the partners involved in apprenticeship.
3. Describe the shared responsibilities for workplace learning.
4. Determine your own learning preferences and explain how these relate to learning new skills.
5. Describe the importance of different types of skills in the workplace.
6. Describe the importance of essential skills in the trade.
7. Identify different ways of learning.
8. Identify your learning preferences.
9. Identify different learning needs and strategies to meet learning needs.
10. Identify techniques for effective communication.
11. Identify strategies to assist in learning a skill.

Resource:

- Recommended resource to use in the delivery of this unit:
www.apprenticeship.nsc.ca/mentoring/apprentice.htm

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.

Objectives and Content:

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
 - high voltage systems
 - high pressure systems
 - hydraulic
 - fuel
 - air
 - fire suppression systems
 - HVAC systems
4. Identify and explain workplace safety and health regulations.
 - i) federal
 - material safety data sheets (MSDS)

- ii)
 - workplace hazardous material information system (WHMIS) provincial/territorial
 - occupational health and safety (OHS)

Learning Outcomes:

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

Objectives and Content:

1. Define terminology associated with gaskets, seals and sealing compounds.
2. Identify hazards and describe safe work practices pertaining 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.

CHT-145 Bearings

Learning Outcomes:

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

Objectives and Content:

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 adjust bearings.

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.

Objectives and Content:

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

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
 - ii) schematics and service information
 - iii) technical service bulletins (TSB)
 - iv) preventive maintenance schedules
 - v) parts lists
 - vi) time estimates

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.

Objectives and Content:

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
 - 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.

CHT-130

Fasteners, Tubings, Hoses and Fittings

Learning Outcomes:

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

Objectives and Content:

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.

CHT-110 Hoisting and Lifting

Learning Outcomes:

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

Objectives and Content:

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
5. Identify types of hoisting and lifting equipment accessories and describe their applications and procedures for use.
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.

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.

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to 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.

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.

Objectives and Content:

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
 - programmable logic controls (PLCs)
 - non-programmable logic controls
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.

CHT-175 Batteries

Learning Outcomes:

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

Objectives and Content:

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 start engines with a battery booster.
8. Identify battery problems and describe the procedures used to diagnose and correct them.

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.

Objectives and Content:

1. Define terminology associated with conventional lighting circuits.
2. Identify hazards and describe safe work practices pertaining to conventional lighting circuits.
3. Identify specialty tools and equipment used to service and repair conventional lighting circuits and describe their applications and procedures for use.
4. Identify types of conventional lighting circuits and describe their components, purpose and operation.
 - i) high voltage
 - ii) low voltage
5. Interpret electrical symbols and wiring diagrams relating to conventional lighting circuits.
6. Describe the procedures used to inspect and maintain conventional lighting circuits and their components.
7. Identify conventional lighting circuit problems and their causes.
8. Describe the procedures used to diagnose conventional lighting circuits.
9. Describe the procedures used to remove and install conventional lighting circuit components.
10. Describe the procedures to repair conventional lighting circuits and components.

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.

Objectives and Content:

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.
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 and accessories and their components.

CHT-183 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.

Objectives and Content:

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.

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.

Objectives and Content:

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.

Learning Outcomes:

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

Objectives and Content:

1. Define terminology associated with reservoirs, coolers and filters.
2. Identify hazards and describe safe work practices pertaining to reservoirs, coolers and filters.
3. Identify specialty tools and equipment used to service and repair reservoirs, coolers and filters and describe their applications and procedures for use.
4. Identify types of reservoirs and describe their characteristics and applications.
 - i) vented
 - ii) pressurized
5. Identify 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 reservoirs, coolers and filters and their components.
9. Identify reservoir, cooler and filter problems and describe their causes.
10. Describe the procedures used to diagnose reservoirs, coolers and filters and their components.

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

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.

Objectives and Content:

1. Define terminology associated with lubrication 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.

CHT-167 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.

Objectives and Content:

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.

CHT-170 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.

Objectives and Content:

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.

Learning Outcomes:

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

Objectives and Content:

1. Define terminology associated with vehicle hydraulic brake systems.
2. Identify hazards and describe safe work practices pertaining to vehicle hydraulic brake systems.
3. Identify specialty tools and equipment used to service and repair vehicle hydraulic brake systems and describe their applications and procedures for use.
4. Identify types of vehicle hydraulic brake systems and describe their applications and operation.
 - i) drum
 - ii) disc
5. Identify vehicle hydraulic brake system components and describe their purpose and operation.
6. Describe the procedures used to inspect and maintain vehicle hydraulic brake systems and their components.
7. Identify vehicle hydraulic brake system problems and their causes.
8. Describe the procedures used to diagnose vehicle hydraulic brake systems.
9. Describe the procedures used to remove and install vehicle hydraulic brake system components.
10. Describe the procedures used to repair and adjust vehicle hydraulic brake systems and their components.

Learning Outcomes:

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

Objectives and Content:

1. Define terminology associated with equipment hydraulic brake systems.
2. Identify hazards and describe safe work practices pertaining to equipment hydraulic brake systems.
3. Identify specialty tools and equipment used to service and repair equipment hydraulic brake systems and describe their applications and procedures for use.
4. Identify types of equipment hydraulic brake systems and describe their applications and operation.
 - i) drum
 - ii) disc
 - iii) multi-disc
5. Identify equipment hydraulic brake system components and describe their purpose and operation.
6. Describe the procedures used to inspect and maintain equipment hydraulic brake systems and their components.
7. Identify equipment hydraulic brake system problems and their causes.
8. Describe the procedures used to diagnose equipment hydraulic brake systems.
9. Describe the procedures used to remove and install equipment hydraulic brake systems components.

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

CHT-195 Basic Air Brake Systems

Learning Outcomes:

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

Objectives and Content:

1. Define terminology associated with basic air brake systems.
2. Identify hazards and describe safe work practices pertaining to basic air brake systems.
3. Identify specialty tools and equipment used to service and repair basic air brake systems and describe their applications and procedures for use.
4. Identify types of basic air brake systems and describe their applications and operation.
 - i) air
 - ii) air over hydraulic
5. Identify basic 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
 - vii) brake chambers
 - viii) valves
 - ix) indicators and warning devices
6. Describe the procedures used to inspect and maintain basic air brake systems and components.

7. Identify basic air brake system problems and their causes.
8. Describe the procedures used to diagnose basic air brake systems.
9. Describe the procedures used to remove and install basic air brake system components.
10. Describe the procedures used to repair and adjust basic air brake system components.

CHT-165 Engine Principles

Learning Outcomes:

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

Objectives and Content:

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.

CHT-150 Metallurgy

Learning Outcomes:

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

Objectives and Content:

1. Define terminology associated with metallurgy.
2. Identify types of metals and describe their properties.
 - i) ferrous
 - ii) non-ferrous
3. Identify common metal tests and describe their associated procedures.

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.

Objectives and Content:

1. Define terminology associated with oxy-fuel cutting and heating.
2. Identify hazards and describe safe work practices pertaining to oxy-fuel 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
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.

Learning Outcomes:

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

Objectives and Content:

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.

Learning Outcomes:

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

Objectives and Content:

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.

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.

Objectives and Content:

1. Define terminology associated with tires, rims and wheels.
2. Identify hazards and describe safe work practices pertaining to tires, rims and wheels.
3. Identify codes and regulations pertaining to tires, rims and wheels.
 - i) jurisdictional requirements
4. Identify specialty tools and equipment used to service and repair tires, rims and wheels 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 wheels and describe their characteristics and applications.
7. Identify tire, rim and wheel components and accessories and describe their purpose.
8. Describe the procedures used to inspect and maintain tires, rims and wheels.

9. Describe the procedures used to remove and install tires, rims and wheels.
10. Describe the procedures used to repair tires, rims and wheels.
11. Describe the procedures used to balance wheels.

CHT-120 Preventive Maintenance

Learning Outcomes:

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

Objectives and Content:

1. Define terminology associated with preventive maintenance.
2. Describe preventive maintenance programs.
 - i) scheduled lubrication
 - ii) scheduled servicing
 - iii) scheduled cleaning
 - iv) inspections (including pre-delivery)
 - v) completing documentation
 - vi) legal responsibilities
3. Describe the procedures used to perform preventive maintenance.