COURSE ASA3400: BASIC TOOLS & MATERIALS

Level: First Period Apprenticeship, Section One

Prerequisite: ASA3900: Apprenticeship Safety

Description: Students develop knowledge, skills and attitudes to use workshop specialty hand tools, measuring tools and fasteners.

Parameters: Access to a materials work centre, complete with basic measuring tools, specialty hand tools and fastening devices, and to instruction from an individual with specialized training and/or an automotive service technician.

ILM Resources: Measuring Tools 090101e, Specialty Hand Tools 090101f, Fastening Devices 090101g

Outcomes: The student will:

1. demonstrate the correct use of measuring tools common to the trade

- 1.1 perform calculations related to measurement using imperial and metric units, including:
  - 1.1.1 system international (SI)
  - 1.1.2 SI prefixes
  - 1.1.3 length, area, volume and mass measurements
  - 1.1.4 force, velocity and pressure measurements
  - 1.1.5 heat and temperature energy measurements
  - 1.1.6 converting fractions to decimals
  - 1.1.7 converting decimals to fractions
- 1.2 perform linear measurements using basic non-precision measuring tools, including:
  - 1.2.1 tape measure
  - 1.2.2 protractor
  - 1.2.3 tri square
  - 1.2.4 feeler gauges
  - 1.2.5 level
  - 1.2.6 straight edge
  - 1.2.7 steel square
- 1.3 perform linear measurements using precision measuring tools, including:
  - 1.3.1 common callipers; e.g., spring, firm joint, lock joint, lock-joint transfer
  - 1.3.2 small hole gauges
  - 1.3.3 telescoping gauges
  - 1.3.4 outside, inside and depth micrometers
  - 1.3.5 Vernier, dial and electronic digital callipers
  - 1.3.6 dial indicators
- 1.4 perform accurate torque measurements demonstrating an understanding of the following:
  - 1.4.1 definition of torque
  - 1.4.2 beam, dial and click-type torque wrenches
  - 1.4.3 torque multipliers
  - 1.4.4 pull scales

2. demonstrate the correct use of hand tools common to the trade

- 2.1 perform double lap and SI tube flaring
- 2.2 demonstrate knowledge and use of drills and reamers, including:
  - 2.2.1 twist drill parts and angles
  - 2.2.2 drill sharpening
  - 2.2.3 use of cutting fluids
  - 2.2.4 drill problems
  - 2.2.5 reamer parts and usage
- 2.3 demonstrate knowledge and correct use of taps and dies, including:
  - 2.3.1 identifying taps as imperial, metric or pipe
  - 2.3.2 taper, plug and bottoming taps
  - 2.3.3 tap drill size and tapping lubricants
- 2.4 demonstrate thread repair and broken fastener removal, including:
  - 2.4.1 internal and external thread repair techniques
  - 2.4.2 broken stud and bolt removal techniques
- 2.5 describe types, uses and care of hammers, including:
  - 2.5.1 ball peen
  - 2.5.2 soft face
  - 2.5.3 sledge
  - 2.5.4 cross peen
  - 2.5.5 club
  - 2.5.6 hand
- 2.6 describe the types, uses and care of screwdrivers, including:
  - 2.6.1 blade
  - 2.6.2 Phillips
  - 2.6.3 Robertson
  - 2.6.4 clutch
  - 2.6.5 Torx
  - 2.6.6 pozi-drive
- 2.7 identify the various types of punches and their uses, including:
  - 2.7.1 hole
  - 2.7.2 prick
  - 2.7.3 centre
  - 2.7.4 taper
  - 2.7.5 starting parallel
  - 2.7.6 aligning
  - 2.7.7 roll pin
- 2.8 identify the various types of chisels and their uses, including:
  - 2.8.1 cold
  - 2.8.2 flat
  - 2.8.3 cape diamond point
  - 2.8.4 half-round
  - 2.8.5 bushing cutter
  - 2.8.6 rivet buster

2.9 describe the various types of wrenches and their uses, including:
- 2.9.1 open end
- 2.9.2 box end
- 2.9.3 flex head
- 2.9.4 flare nut
- 2.9.5 Allen
- 2.9.6 adjustable
- 2.9.7 socket

2.10 identify the various types of pliers and their uses, including:
- 2.10.1 standard or slip joint
- 2.10.2 adjustable
- 2.10.3 needle-nose
- 2.10.4 vise grip
- 2.10.5 diagonal

2.11 identify various types of holding devices, including:
- 2.11.1 fixed and swivel base vise
- 2.11.2 wood clamps
- 2.11.3 c-clamps
- 2.11.4 quick clamps
- 2.11.5 spring clamps

2.12 identify the various tools for removing broken fasteners and explain how to use them

2.13 describe the procedures required to safely operate various types and capacities of shop puller and pressing equipment, including:
- 2.13.1 two- and three-jaw pullers
- 2.13.2 specialty pullers
- 2.13.3 bearing separators or splitters
- 2.13.4 hydraulic presses

2.14 describe and use cutting hand tools common to the trade, including:
- 2.14.1 jab saw and adjustable frame hacksaws
- 2.14.2 hole saws
- 2.14.3 single- and double-cut files
- 2.14.4 half round, triangle, flat, square and round file configurations
- 2.14.5 twist drills
- 2.14.6 tapered, steeped and adjustable reamers
- 2.14.7 pipe, machine screw, taper, plug and bottoming taps
- 2.14.8 solid and adjustable dies

2.15 demonstrate how to sharpen a twist drill, including:
- 2.15.1 drill bit angles
- 2.15.2 sharpening tools

2.16 identify tools and demonstrate proper thread repair techniques, using:
- 2.16.1 thread repair tools; e.g., thread files, chasers, shaft thread repair and sparkplug hole
- 2.16.2 heli-coil and permanent lock thread inserts

2.17 demonstrate the use of:
- 2.17.1 tube flaring tools
- 2.17.2 sheet abrasives and grinding compounds
- 2.17.3 lapping blocks and honing stones

2.18 demonstrate the care and safe use of common power hand tools, including:
- 2.18.1 grinders
- 2.18.2 air impacts and pneumatic tools

2.19 demonstrate knowledge of personal safety equipment (PPE) and tool safety

3. assemble components, using a variety of fasteners, adhesives and sealers common to the trade

- 3.1 demonstrate fastening and torquing procedures using threaded fasteners, including:
  - 3.1.1 terminology
  - 3.1.2 types of threaded fasteners
  - 3.1.3 bolt grades/property classes
  - 3.1.4 bolt identification
  - 3.1.5 studs
  - 3.1.6 machine screws
  - 3.1.7 self-threading screws
  - 3.1.8 nuts
  - 3.1.9 washers
  - 3.1.10 use of torque wrenches and torqueing techniques
- 3.2 demonstrate the use of other retaining devices, including:
  - 3.2.1 internal and external snap rings, lock rings and clips
  - 3.2.2 set screws
  - 3.2.3 keys
  - 3.2.4 splines
  - 3.2.5 various pins
  - 3.2.6 plastic trim fasteners
- 3.3 demonstrate the use of sealers and adhesives common to the trade, including:
  - 3.3.1 safety considerations
  - 3.3.2 anaerobic and aerobic sealers
  - 3.3.3 tread sealers
- 3.4 describe tools and procedures used for plastic trim fasteners

4. demonstrate basic competencies

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

5. create a transitional strategy to accommodate personal changes and build personal values

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

COURSE ASA3402: VEHICLE SERVICE INFORMATION

Level: First Period Apprenticeship, Section One

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials

Description: Students develop the necessary knowledge, skills and attitudes to use electronic service information and scan tools in the servicing and repair of vehicles, and perform metal heating and cutting operations safely by using oxyacetylene equipment.

Parameters: Access to a materials work centre, complete with related service information tools and technologies, scan and test equipment and oxyacetylene equipment, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Electronic Service Information 090101h, Oxyacetylene Heating and Cutting 090101i, Scan Tools 090104f

Outcomes: The student will:

1. **use electronic service information from various sources when diagnosing, servicing or repairing vehicles**
   - 1.1 use electronic service information to diagnose, service or repair vehicles, including:
     - 1.1.1 paper versus CD or computer terminal information
     - 1.1.2 web-based (Internet) and internal network (intranet)
     - 1.1.3 original equipment manufacturer (OEM) database
     - 1.1.4 aftermarket electronic service information (ESI) databases
     - 1.1.5 technical service bulletins (TSBs)
     - 1.1.6 labour time guides
   - 1.2. access vehicle repair or service forums and online discussion groups for diagnostic purposes
2. **use generic, manufacturer-specific or laptop-based scan tools and software**
   - 2.1 use scan tools to retrieve diagnostic trouble codes and data, clear codes, reset warning systems and perform function tests, using:
     - 2.1.1 lab scopes
     - 2.1.2 digital multimeters
     - 2.1.3 code readers and data loggers
   - 2.2 analyze and interpret scan data related to first period automotive systems, including:
     - 2.2.1 inputs
     - 2.2.2 control module
     - 2.2.3 outputs
3. **perform metal heating and cutting operations safely using oxyacetylene equipment**
   - 3.1 describe the characteristics and handling procedures for oxygen and acetylene, considering:
     - 3.1.1 properties of oxygen
     - 3.1.2 properties of acetylene
     - 3.1.3 cylinders and valves
   - 3.2 demonstrate handling procedures for regulators (single- and two-stage), hoses and check valves

3.3 demonstrate the use, care and maintenance of torches and tips, considering:
- 3.3.1 torch parts
- 3.3.2 torch setup
- 3.3.3 purge and leak check
- 3.3.4 shutdown
- 3.3.5 tips, tip sizes, cleaning and installation
- 3.3.6 flame types
- 3.3.7 pressure adjustment and balancing
- 3.3.8 heating
- 3.3.9 backfires and flashbacks
- 3.3.10 cutting attachment parts, cleaning and maintenance
- 3.3.11 operation, pressure adjustment and lighting

3.4 perform basic cutting operations while displaying knowledge of:
- 3.4.1 preheating
- 3.4.2 cutting, torch inclination and hole piercing
- 3.4.3 cutting nuts, bolts and rivets

3.5 use personal protective equipment (PPE) when heating or cutting

4. demonstrate basic competencies

4.1 demonstrate fundamental skills to:
- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:
- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:
- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

5. create a transitional strategy to accommodate personal changes and build personal values

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

COURSE ASA3405: ELECTRICAL PRINCIPLES

Level: First Period Apprenticeship, Section Four

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information

Description: Students develop the knowledge, skills and attitudes necessary to understand how electricity is created, stored and used to support the requirements of the automobile.

Parameters: Access to a materials work centre, complete with hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Electrical Fundamentals 1 090104a, Fundamentals of Magnetism 090104c, Batteries 090104d

Outcomes: The student will:

1. explain basic electrical principles

1.1 explain the physical properties of insulators, conductors and semi-conductors, including:
- 1.1.1 elements and atom theory
- 1.1.2 compounds and molecular theory
- 1.1.3 law of electrical charges (Coulomb's law)
- 1.1.4 conductors and valence electron theory
- 1.1.5 insulators and valence electron theory
- 1.1.6 semiconductor usage
- 1.1.7 conductor insulation
- 1.1.8 insulator and conductor failure and protection

1.2 explain electricity in terms of voltage, current and resistance, including:
- 1.2.1 voltage – potential difference or electromotive force (EMF)
- 1.2.2 electrostatic energy (friction)
- 1.2.3 electromagnetic induction
- 1.2.4 electrochemical (chemical energy)
- 1.2.5 photoelectric
- 1.2.6 thermoelectric
- 1.2.7 piezoelectric
- 1.2.8 resistance
- 1.2.9 conventional theory of electron flow
- 1.2.10 electron theory of current flow
- 1.2.11 direct and alternating current flow
- 1.2.12 relationship between current, voltage and resistance

2. apply scientific principles to explain the theory of magnetism

2.1 explain the fundamental laws of magnetism, including:
- 2.1.1 magnetic fields and flux lines
- 2.1.2 permeability
- 2.1.3 reluctance
- 2.1.4 electromagnetism

2.2 explain the construction and operation of electromagnetic coils, including:
- 2.2.1 polarity direction
- 2.2.2 magnetic strength
- 2.2.3 induction, self-induction and mutual induction

2.3 describe how magnetism or electromagnetism can change electrical energy into mechanical energy, including:
- 2.3.1 electromagnets (relays)
- 2.3.2 solenoids
- 2.3.3 motors

2.4 describe how magnetism or electromagnetism can change mechanical energy into electrical energy through the form of generators

3. diagnose and service batteries

3.1 describe the purpose, construction, operation and ratings of batteries, including:
- 3.1.1 negative and positive plates and grids
- 3.1.2 plate separators, elements and cells
- 3.1.3 electrolyte
- 3.1.4 battery cases
- 3.1.5 chemical reaction during discharge and charging situations
- 3.1.6 temperature and performance
- 3.1.7 reserve capacity (RC) rating
- 3.1.8 ampere hour (Ah) rating
- 3.1.9 cold cranking amps (CCA)
- 3.1.10 cranking amps (CA)

3.2 test and service batteries, including:
- 3.2.1 preparation for battery service
- 3.2.2 visual inspection
- 3.2.3 open circuit voltage (OCV)
- 3.2.4 high rate discharge test (load test)
- 3.2.5 cable removal and installation, cleaning and storage

3.3 diagnose problems related to batteries, including:
- 3.3.1 self-discharge
- 3.3.2 low charging current
- 3.3.3 temperature affects
- 3.3.4 battery failure

3.4 perform battery charging and boosting repairs, including:
- 3.4.1 slow, fast and trickle charging
- 3.4.2 charging rates and times
- 3.4.3 boosting, connections and procedure

4. demonstrate basic competencies

4.1 demonstrate fundamental skills to:
- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:
    4.2.1 demonstrate positive attitudes and behaviours
    4.2.2 be responsible
    4.2.3 be adaptable
    4.2.4 learn continuously
    4.2.5 work safely
4.3 demonstrate teamwork skills to:
    4.3.1 work with others
    4.3.2 participate in projects and tasks

5. create a transitional strategy to accommodate personal changes and build personal values

5.1 identify short-term and long-term goals
5.2 identify steps to achieve goals

COURSE ASA3410: ELECTRICAL CIRCUITS

Level: First Period Apprenticeship, Section Four

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information
ASA3405: Electrical Principles

Description: Students develop the knowledge, skills and attitudes necessary to service and repair electrical circuits.

Parameters: Access to a materials work centre, complete with hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Electrical Circuits 1 090104b

Outcomes: The student will:

1. perform electrical circuit measurements

- 1.1 recognize common electrical symbols in order to read and understand basic electrical schematics
- 1.2 identify the three basic circuit types and their basic electrical properties, including:
  - 1.2.1 series circuits
  - 1.2.2 parallel circuits
  - 1.2.3 series-parallel circuits
- 1.3 identify and explain possible circuit issues and problems, including:
  - 1.3.1 open circuits and loss of continuity
  - 1.3.2 short circuits and power flow
  - 1.3.3 grounds or short-to-ground faults
- 1.4 using Ohm's law (voltage = current x resistance), calculate for any of its variable when two are known
- 1.5 apply Ohm's law to a circuit to calculate voltage, current and resistance, including:
  - 1.5.1 simple electrical schematic diagram calculations
  - 1.5.2 total resistance in series circuits
  - 1.5.3 total resistance of parallel circuits
  - 1.5.4 total resistance of series-parallel circuits
- 1.6 identify and explain circuit failures and their effects, including:
  - 1.6.1 effects of open circuits on voltage, current and resistance
  - 1.6.2 effects of short circuits on voltage, current and resistance
  - 1.6.3 effects of a short-to-ground on voltage, current and resistance
- 1.7 calculate power and explain the implications of power requirements in a circuit design whereas:
  - 1.7.1 the measurement of power is in watts (w)
  - 1.7.2 power = electromotive force x intensity of current flow

1.8 perform voltage drop measurements using a voltmeter, including:
    1.8.1 understanding digital and analog multimeter functions
    1.8.2 meter impedance
    1.8.3 meter inputs
    1.8.4 open circuit voltage
    1.8.5 voltage drop
    1.8.6 voltmeters in series
1.9 perform parasitic drain and current draw tests using an ammeter, including:
    1.9.1 series or non-inductive ammeters
    1.9.2 inductive ammeters
    1.9.3 parasitic draw test
1.10 measure electrical resistance using both digital and analog ohmmeters
1.11 service electrical circuit protection devices

2. demonstrate basic competencies

2.1 demonstrate fundamental skills to:
    2.1.1 communicate
    2.1.2 manage information
    2.1.3 use numbers
    2.1.4 think and solve problems
2.2 demonstrate personal management skills to:
    2.2.1 demonstrate positive attitudes and behaviours
    2.2.2 be responsible
    2.2.3 be adaptable
    2.2.4 learn continuously
    2.2.5 work safely
2.3 demonstrate teamwork skills to:
    2.3.1 work with others
    2.3.2 participate in projects and tasks

3. create a transitional strategy to accommodate personal changes and build personal values

3.1 identify short-term and long-term goals
3.2 identify steps to achieve goals

COURSE ASA3412: ELECTRICAL SERVICE

Level: First Period Apprenticeship, Section Four

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information
ASA3405: Electrical Principles
ASA3410: Electrical Circuits

Description: Students develop the knowledge, skills and attitudes necessary to diagnose service and repair electrical systems, and develop an understanding of active and passive restraint systems.

Parameters: Access to a materials work centre, complete with hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Electrical System Diagnosis I 090104e, Active Passenger Restraint Systems 090305kA

Outcomes: The student will:

1. diagnose and repair simple electrical circuits

1.1 use a variety of test equipment to test simple circuits and interpret results, including:
- 1.1.1 jumper wires
- 1.1.2 front and back probing technique
- 1.1.3 non-powered and self-powered test lights
- 1.1.4 digital test lights
- 1.1.5 testing with voltmeters, ohmmeters and ammeters
- 1.1.6 testing open circuits with test lights, voltmeters and ohmmeters
- 1.1.7 testing high resistance circuits using a voltmeter
- 1.1.8 testing short circuits and short-to-ground circuits using a test light, ohmmeter and voltmeter
- 1.1.9 troubleshooting intermittent circuit problems

1.2 perform simple wire and connector repairs, including:
- 1.2.1 opening wire harnesses without causing additional damage
- 1.2.2 performing wire repairs using solder techniques
- 1.2.3 using both rosin and acid core solder where appropriate
- 1.2.4 choosing solder gun, solder iron and torches
- 1.2.5 heat sink usage
- 1.2.6 splicing, cutting, stripping, crimping and sealing wire connections
- 1.2.7 repairing weatherproof connectors
- 1.2.8 heat shrink tubing, electrical tape and liquid electrical tape
- 1.2.9 coaxial and twisted cable repairs

1.3 understand the hazards associated with electrostatic discharge (ESD) when working on vehicle electronic systems, including:
    1.3.1 static charges and electrostatic discharges
    1.3.2 electrostatic voltage
    1.3.3 types of electrostatic damage
    1.3.4 preventing electrostatic damage

2. describe the purpose, function and operation of occupant restraint systems

2.1 describe the operation of active restraint systems, including:
    2.1.1 front and rear seat belts
    2.1.2 child safety seats
    2.1.3 head restraints
2.2 identify the components of an active restraint system, including:
    2.2.1 seat belt retractors
    2.2.2 inertia locks
    2.2.3 seat buckle
    2.2.4 seat belt reminder
    2.2.5 energy management loop
    2.2.6 child safety seat system components
2.3 describe the operation of passive restraint systems during:
    2.3.1 a frontal collision
    2.3.2 side collision
    2.3.3 rear impact
2.4 identify the components of a passive restraint system, including:
    2.4.1 impact sensors
    2.4.2 air bag diagnostic module
    2.4.3 air bag inflator modules
    2.4.4 air bag warning lamp
    2.4.5 passenger and side impact air bag systems
    2.4.6 seat belt pre-tensioners
    2.4.7 safety glass
    2.4.8 passive seat belts

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
    3.1.1 communicate
    3.1.2 manage information
    3.1.3 use numbers
    3.1.4 think and solve problems
3.2 demonstrate personal management skills to:
    3.2.1 demonstrate positive attitudes and behaviours
    3.2.2 be responsible
    3.2.3 be adaptable
    3.2.4 learn continuously
    3.2.5 work safely
3.3 demonstrate teamwork skills to:
    3.3.1 work with others
    3.3.2 participate in projects and tasks

4. create a transitional strategy to accommodate personal changes and build personal values

4.1 identify short-term and long-term goals
4.2 identify steps to achieve goals

COURSE ASA3415: FRAMES & UNDERCARRIAGE

Level: First Period Apprenticeship, Section Two

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information

Description: Students develop the knowledge, skills and attitudes necessary to service and maintain vehicle frames and suspension and steering linkage systems.

Parameters: Access to a materials work centre, complete with hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Frames 090102a, Suspension and Steering Linkage Systems 090102b

Outcomes: The student will:

1. identify automotive frame damage
- 1.1 identify various types of frame damage, including:
  - 1.1.1 skewed rear axle
  - 1.1.2 set back
  - 1.1.3 swayed frame
  - 1.1.4 diamond frame
  - 1.1.5 twist or sag
- 1.2 identify the design features and frame types, including:
  - 1.2.1 body over frame (BOF)
  - 1.2.2 unitized with stub frame
  - 1.2.3 unibody systems
- 1.3 perform frame-checking procedures using a variety of techniques, including:
  - 1.3.1 tracking bar checks
  - 1.3.2 reference lines and frame measurement charts
  - 1.3.3 self-centring gauges

2. describe the components and operation of suspension and steering systems
- 2.1 describe the construction and design features of common suspension systems, including:
  - 2.1.1 spring types and their purpose
  - 2.1.2 shock absorber types and their purpose
  - 2.1.3 stabilizer bar operation and location
  - 2.1.4 control arm function and operation
  - 2.1.5 suspension bushings function and types
  - 2.1.6 ball joints function and types
  - 2.1.7 automotive suspension designs
- 2.2 explain the principles of operation of suspension systems, including:
  - 2.2.1 roll, dive, steering, road and g-forces
  - 2.2.2 sprung and unsprung weight
  - 2.2.3 air suspension systems
  - 2.2.4 electronic dampening systems

2.3 diagnose and service suspension system components, including:
- 2.3.1 ball joints
- 2.3.2 suspension bushings
- 2.3.3 shock absorbers
- 2.3.4 struts
- 2.3.5 computerized suspension systems
- 2.3.6 control arms
- 2.3.7 stabilizers

2.4 identify steering linkage types and explain their operation, including:
- 2.4.1 fore-aft (drag link)
- 2.4.2 Haltenberger
- 2.4.3 parallelogram (solid centre link)
- 2.4.4 rack and pinion

2.5 diagnose and service steering linkage components, including:
- 2.5.1 tie rod ends
- 2.5.2 idler arms
- 2.5.3 pitman arms
- 2.5.4 inner sockets (rack and pinion)

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:
- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:
- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

4. create a transitional strategy to accommodate personal changes and build personal values

4.1 identify short-term and long-term goals

4.2 identify steps to achieve goals

COURSE ASA3420: STEERING SYSTEMS

Level: First Period Apprenticeship, Section Two

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information

Description: Students develop the knowledge, skills and attitudes necessary to service and repair electric assist and hydraulic assist steering systems.

Parameters: Access to a materials work centre, complete with hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Electric Assist Steering 090102d, Hydraulic Assist Steering 090102e

Outcomes: The student will:

1. diagnose and repair electrically assisted steering gear

1.1 explain the construction and operation of a manual steering rack and pinion assembly, including:
- 1.1.1 pinion gear
- 1.1.2 rack
- 1.1.3 rack bearing
- 1.1.4 rack bearing spring
- 1.1.5 dust seal
- 1.1.6 pinion bearings

1.2 explain the operation of an electrically assisted rack and pinion steering system, including:
- 1.2.1 steering column assisted
- 1.2.2 rack assisted with assist working a pinion gear
- 1.2.3 rack assisted with assist working on the rack gear

1.3 identify and explain the operation of the five primary components common to all electrically assisted systems, including:
- 1.3.1 electric assist motor
- 1.3.2 torque sensor
- 1.3.3 steering wheel position sensor
- 1.3.4 power steering control module
- 1.3.5 warning indicator

1.4 identify and explain the active steering modes, including:
- 1.4.1 lane departure
- 1.4.2 electronic stability control
- 1.4.3 automated parking
- 1.4.4 active nibble control
- 1.4.5 pull/drift compensation

1.5 explain the advantages of electrically assisted steering systems, including:
    1.5.1 improved fuel economy
    1.5.2 quiet operation
    1.5.3 fewer parts that could fail and need repair
    1.5.4 environmentally friendly due to no use of oil
    1.5.5 enhanced options for vehicle design
1.6 diagnose and repair mechanical problems related to electrically assisted steering gears, including:
    1.6.1 using scan tools and vehicle service information in order to diagnose electric power steering (EPS) failures
    1.6.2 isolating mechanical and electrical failures through the use of flow charts
    1.6.3 adjusting EPS systems
    1.6.4 completing a steering rack or column reprogramming and/or relearning procedure using a scan tool after replacing any parts or after performing a wheel alignment

2. diagnose and repair hydraulic assist steering systems

2.1 describe the construction and design of hydraulic assist steering gears, including:
    2.1.1 non-integral
    2.1.2 integral
    2.1.3 rack and pinion
2.2 identify hydraulic assist pump types and explain their operation, including:
    2.2.1 roller pumps
    2.2.2 vane pumps
    2.2.3 slipper pumps
    2.2.4 gear type
2.3 describe the operation of hydraulic assist steering systems, including:
    2.3.1 directional control valves
    2.3.2 flow control valves
    2.3.3 pressure relief valves
    2.3.4 speed sensitive steering
2.4 diagnose, repair and adjust hydraulic assist non-rack and pinion steering gears
2.5 diagnose and repair hydraulic assist rack and pinion steering gears
2.6 diagnose hydraulic steering problems, including:
    2.6.1 poor assist
    2.6.2 noises
    2.6.3 leaks
    2.6.4 shudder
    2.6.5 no assist
    2.6.6 no assist in one direction

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
    3.1.1 communicate
    3.1.2 manage information
    3.1.3 use numbers
    3.1.4 think and solve problems
3.2 demonstrate personal management skills to:
    3.2.1 demonstrate positive attitudes and behaviours
    3.2.2 be responsible
    3.2.3 be adaptable
    3.2.4 learn continuously
    3.2.5 work safely

3.3 demonstrate teamwork skills to:
    3.3.1 work with others
    3.3.2 participate in projects and tasks

4. create a transitional strategy to accommodate personal changes and build personal values

4.1 identify short-term and long-term goals
4.2 identify steps to achieve goals

COURSE ASA3425: SUSPENSION SYSTEMS

Level: First Period Apprenticeship, Section Two

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information
ASA3420: Steering Systems

Description: Students develop the knowledge, skills and attitudes necessary to service and repair suspension and steering systems.

Parameters: Access to a materials work centre, complete with hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Steering Angles 090102f, Suspension and Steering Diagnosis 090102i

Outcomes: The student will:

1. describe steering angles and how each affects vehicle handling

- 1.1 describe the function and effect of caster on vehicle operation, including:
  - 1.1.1 steering axis and point of contact
  - 1.1.2 positive caster and road shock, heavy steering and shimmy
  - 1.1.3 negative caster and instability at high speed, vehicle wander and weave
  - 1.1.4 directional control and steering stability
  - 1.1.5 road crown
  - 1.1.6 body roll on turns
- 1.2 describe the function and effect of camber on vehicle operation, including:
  - 1.2.1 positive and negative camber affects; e.g., tire wear, excessive ball joint and wheel bearing wear
  - 1.2.2 steering axis and point of contact
  - 1.2.3 scrub radius
  - 1.2.4 directional control and camber pull
- 1.3 describe the function and effect of steering axis inclination (SAI) on vehicle operation, including:
  - 1.3.1 reducing need for high camber
  - 1.3.2 bringing point of contact under the point of load
  - 1.3.3 providing a pivot point for the wheel to turn around producing ease of steering
  - 1.3.4 providing steering stability (directional control)
  - 1.3.5 reducing road shock
  - 1.3.6 reducing brake pull
- 1.4 describe the function and effect of toe on vehicle operation, including:
  - 1.4.1 excessive tire wear
  - 1.4.2 enhanced turning radius
  - 1.4.3 reduced tire squealing and scuffing on cornering
- 1.5 describe the effect of thrust angle on vehicle operation, including:
  - 1.5.1 lines of reference; e.g., vehicle centreline (VCL) and geometric centreline (GCL)
  - 1.5.2 thrust lines and thrust angle

1.6 describe the measurement procedures for each steering angle, using:
    1.6.1 concept of degrees
    1.6.2 alignment measurement equipment
1.7 describe the adjustment procedures for each steering angle, including:
    1.7.1 rear camber and toe adjustments
    1.7.2 use of eccentrics and shims
    1.7.3 front caster and camber adjustments
    1.7.4 front toe adjustment

2. diagnose and repair suspension systems and steering linkages

2.1 describe the diagnosis of suspension and steering problems
2.2 diagnose problem(s) related to suspension systems, including:
    2.2.1 noises, body roll, bounce, vibrations and shimmy
    2.2.2 pull or lead caused by alignment problems
    2.2.3 brake-induced pull
    2.2.4 tire pull
    2.2.5 spindle and strut diagnosis
    2.2.6 cradle shift
2.3 diagnose problem(s) related to steering systems, including:
    2.3.1 steering linkage
    2.3.2 steering gears
    2.3.3 pressure testing power steering system
    2.3.4 steering wheel off centre
    2.3.5 oversteer/understeer, torque steer, memory steer
2.4 choose an appropriate repair method to correct suspension or steering problem(s); e.g., replacement, adjustment or overhaul of steering and suspension components
2.5 service suspension and steering systems to correct problem(s)

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
    3.1.1 communicate
    3.1.2 manage information
    3.1.3 use numbers
    3.1.4 think and solve problems
3.2 demonstrate personal management skills to:
    3.2.1 demonstrate positive attitudes and behaviours
    3.2.2 be responsible
    3.2.3 be adaptable
    3.2.4 learn continuously
    3.2.5 work safely
3.3 demonstrate teamwork skills to:
    3.3.1 work with others
    3.3.2 participate in projects and tasks

4. create a transitional strategy to accommodate personal changes and build personal values

4.1 identify short-term and long-term goals
4.2 identify steps to achieve goals

COURSE ASA3430: ALIGNMENT PROCEDURES

Level: First Period Apprenticeship, Section Two

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information
ASA3420: Steering Systems
ASA3425: Suspension Systems

Description: Students develop the knowledge, skills and attitudes necessary to service and repair electrical assist and hydraulic assist steering systems.

Parameters: Access to a materials work centre, complete with hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Alignment Procedures 090102g, Steering Columns 090102h

Outcomes: The student will:

1. **perform a wheel alignment**
   - 1.1 select the appropriate alignment settings within specifications for a given vehicle and load
   - 1.2 perform a pre-alignment inspection and identify faulty components, including:
     - 1.2.1 interview the customer
     - 1.2.2 visual inspection
     - 1.2.3 road test
     - 1.2.4 wheels and tires check
     - 1.2.5 tracking
     - 1.2.6 shock absorbers
     - 1.2.7 ride height
     - 1.2.8 ball joints and upper and lower control arm bushings
     - 1.2.9 steering linkage checks
     - 1.2.10 rear suspension
     - 1.2.11 under hood inspection
   - 1.3 perform a wheel alignment to adjust primary alignment angles, including:
     - 1.3.1 rear camber, toe and thrust angles
     - 1.3.2 turning radius and steering axis inclination (SAI)
     - 1.3.3 caster and camber
   - 1.4 adjust the steering linkage to establish the toe setting and centre the steering wheel
   - 1.5 describe a road test procedure to verify alignment or alignment problems
2. **diagnose and repair steering column and their related safety devices**
   - 2.1 describe the construction and operation of steering columns and related safety features, including:
     - 2.1.1 flexible couplings
     - 2.1.2 breakaway mounting
     - 2.1.3 collapsible shafts
     - 2.1.4 air bags

2.2 describe the process to disarm, remove and install and re-arm a steering column air bag, including:
- 2.2.1 following manufacturer's disarming procedure
- 2.2.2 removing and handling the air bag
- 2.2.3 installing, seating, locking in position
- 2.2.4 following manufacturer's re-arming procedure
- 2.2.5 following safety procedures on energizing the system

2.3 diagnose and repair steering columns and related safety devices, including:
- 2.3.1 typical steering column construction
- 2.3.2 locking and interlock mechanisms
- 2.3.3 multifunction switches and components
- 2.3.4 tilt components
- 2.3.5 collapsible components
- 2.3.6 steering shaft couplings

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:
- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:
- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

4. create a transitional strategy to accommodate personal changes and build personal values

4.1 identify short-term and long-term goals

4.2 identify steps to achieve goals

COURSE ASA3435: BRAKE FUNDAMENTALS

Level: First Period Apprenticeship, Section Three

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information

Description: Students develop the knowledge, skills and attitudes necessary to service and repair brake systems.

Parameters: Access to a materials work centre, complete with hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Brake System Fundamentals 090103a, Hydraulic System Components 090103b

Outcomes: The student will:

1. describe brake system principles and operation

1.1 describe the operating principles of brake systems with emphasis on hydraulic forces and friction, including:
- 1.1.1 purpose of any automotive brake system
- 1.1.2 braking levels
- 1.1.3 work, torque and power calculations
- 1.1.4 law of conservation of energy
- 1.1.5 kinetic and thermal or heat energy and their effect on brake systems
- 1.1.6 friction, coefficient of friction, static and kinetic friction

1.2 choose the correct brake fluid for an application based on the purpose, function and characteristics of brake fluids, including:
- 1.2.1 viscosity
- 1.2.2 boiling point
- 1.2.3 non-corrosiveness
- 1.2.4 hygroscopic quality
- 1.2.5 lubrication
- 1.2.6 stability
- 1.2.7 miscibility
- 1.2.8 rubber compatibility
- 1.2.9 composition of brake fluid
- 1.2.10 United States Department of Transportation (DOT) and Society of Automotive Engineers (SAE) specifications
- 1.2.11 moisture contamination
- 1.2.12 handling and disposal procedures

1.3 state Pascal's law and its implications for brake systems, including:
- 1.3.1 hydraulic fundamentals
- 1.3.2 pressure and force calculations
- 1.3.3 piston size and multiple piston configurations
- 1.3.4 static versus dynamic motion

2. diagnose and repair steering brake system hydraulic components

2.1 explain the operating principles, construction and design feature of brake master cylinders, including:
- 2.1.1 single piston and tandem master cylinders
- 2.1.2 operation and failure conditions
- 2.1.3 quick take-up valve operation

2.2 describe the operating principles, construction and design features of wheel cylinders and callipers used in brake systems, including:
- 2.2.1 purpose, materials, design and operation
- 2.2.2 residual pressure
- 2.2.3 floating and fixed callipers
- 2.2.4 conventional and low drag callipers

2.3 describe the construction and design features of brake hoses and lines, including:
- 2.3.1 steel lines
- 2.3.2 Society of Automotive Engineers (SAE) and International Organization for Standardization (ISO) flaring
- 2.3.3 flex lines

2.4 describe the purpose and operation of metering, proportioning and pressure differential valves, including:
- 2.4.1 purpose, operation and location of pressure differential valves
- 2.4.2 purpose and operation of metering valves
- 2.4.3 purpose and operation of proportioning valves
- 2.4.4 load sensing proportioning valves
- 2.4.5 combination valves

2.5 describe the operation of the hydraulic components when used as a system, including:
- 2.5.1 resting position
- 2.5.2 applying position
- 2.5.3 releasing position

2.6 diagnose, service, adjust and repair brake system hydraulic components, including:
- 2.6.1 repair versus replacement decisions
- 2.6.2 diagnosis and overhaul procedures
- 2.6.3 bench bleeding a master cylinder
- 2.6.4 contamination concerns
- 2.6.5 steel line inspection and service
- 2.6.6 flex hose inspection and service

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:
- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:
- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

4. create a transitional strategy to accommodate personal changes and build personal values

4.1 identify short-term and long-term goals

4.2 identify steps to achieve goals

COURSE ASA3440: DISC & DRUM BRAKES

Level: First Period Apprenticeship, Section Three

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information
ASA3435: Brake Fundamentals

Description: Students develop the knowledge, skills and attitudes necessary to service and repair disc and drum brake systems.

Parameters: Access to a materials work centre, complete with hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Drum Brake Systems 090103c, Disc Brake Systems 090103d

Outcomes: The student will:

1. diagnose and repair drum brake systems

1.1 describe the construction, design features and operation of drum brake system components, including:
- 1.1.1 heel and toe location
- 1.1.2 brake shoe energization
- 1.1.3 dual-servo, leading-trailing and two leading brake shoe arrangements
- 1.1.4 backing plate purpose, materials and design
- 1.1.5 purpose, materials and design of brake shoes
- 1.1.6 organic, synthetic and semi-metallic linings
- 1.1.7 riveted and bonded brake lining attachment
- 1.1.8 brake fade
- 1.1.9 wheel cylinder purpose, materials, design and operation
- 1.1.10 hold down and return springs
- 1.1.11 self-adjuster purpose, design and operation
- 1.1.12 parking brake hardware
- 1.1.13 brake drum purpose, materials and construction
- 1.1.14 brake drum design; e.g., fixed and floating, cooling and balance

1.2 service, adjust and repair drum brake systems, including:
- 1.2.1 understanding brake dust biohazards, cleaning and disposal
- 1.2.2 marking brake drum location
- 1.2.3 backing off self-adjusters
- 1.2.4 heating and striking stuck drums
- 1.2.5 cleaning and inspection procedures
- 1.2.6 measuring and machining procedures
- 1.2.7 wheel cylinder inspection and service or replacement
- 1.2.8 backing plate inspection and pad height measurements
- 1.2.9 brake shoe contamination, wear and physical defects
- 1.2.10 springs, hardware and reassembly procedures

1.3 describe the construction and design features of drum-type parking brake systems, including:
    1.3.1 apply and release mechanisms
    1.3.2 warning lamps
    1.3.3 cables and wheel assemblies
1.4 inspect, service, adjust and repair drum-type parking brake systems

2. diagnose and repair disc brake systems

2.1 explain the construction, operation and design features of disc brake system components, including:
    2.1.1 advantages, weight transfer, direction control and four-wheel disc arrangements
    2.1.2 design features and components
    2.1.3 integral and floating discs
    2.1.4 solid and vented discs
    2.1.5 minimum versus machine to thickness markings and measurements
    2.1.6 calliper design; e.g., single piston, double piston, fixed and floating
    2.1.7 brake pad lining, tapered wear and wear indicators
2.2 service and repair disc brake systems, including:
    2.2.1 brake pad inspection for thickness, taper wear, glazing, cracks, contamination and looseness
    2.2.2 brake pad replacement, hardware, silencers and installation procedures
    2.2.3 calliper inspection and service
    2.2.4 disc inspection for thickness, surface condition, runout and parallelism
    2.2.5 disc measurement and machining procedures
2.3 describe the construction and operation of disc-type parking brake systems, including:
    2.3.1 drum in hat design, components and operation
    2.3.2 integral design, components and operation
    2.3.3 lead screw and ball and ramp adjusting mechanisms
2.4 service, adjust and repair disc-type parking brake systems, including:
    2.4.1 drum in hat adjustment and shoe replacement procedures
    2.4.2 mechanical calliper removal, piston retraction, pad and calliper installation procedure

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
    3.1.1 communicate
    3.1.2 manage information
    3.1.3 use numbers
    3.1.4 think and solve problems
3.2 demonstrate personal management skills to:
    3.2.1 demonstrate positive attitudes and behaviours
    3.2.2 be responsible
    3.2.3 be adaptable
    3.2.4 learn continuously
    3.2.5 work safely
3.3 demonstrate teamwork skills to:
    3.3.1 work with others
    3.3.2 participate in projects and tasks

4. create a transitional strategy to accommodate personal changes and build personal values

4.1 identify short-term and long-term goals
4.2 identify steps to achieve goals

COURSE ASA3445: BRAKE SYSTEM REPAIRS

Level: First Period Apprenticeship, Section Three

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information
ASA3435: Brake Fundamentals
ASA3440: Disc & Drum Brake Systems

Description: Students develop the knowledge, skills and attitudes necessary to service and repair power brake systems.

Parameters: Access to a materials work centre, complete with hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Power Brakes 090103e, Brake System Diagnosis and Service 090103f, Antilock Brake Systems 090305j

Outcomes: The student will:

1. diagnose and repair power brakes

- 1.1 describe the operation of a vacuum-operated power brake unit, including:
  - 1.1.1 principles of operation
  - 1.1.2 vacuum and atmospheric suspended vacuum boosters
  - 1.1.3 vacuum brake booster components
  - 1.1.4 vacuum pumps
  - 1.1.5 released, applied and holding positions
  - 1.1.6 actuation methods
- 1.2 describe the operation of hydraulically operated power brake units, including:
  - 1.2.1 principles of operation
  - 1.2.2 hydraulic brake booster components
  - 1.2.3 unapplied, applied, holding and released positions of operation
- 1.3 demonstrate the procedures for testing a power brake unit, including:
  - 1.3.1 function test
  - 1.3.2 unapplied leakage test
  - 1.3.3 applied leakage test
  - 1.3.4 pedal drop test
  - 1.3.5 accumulator test
- 1.4 diagnose problems related to and repair a power brake unit, including:
  - 1.4.1 indications of a defective booster
  - 1.4.2 removal, replacement and adjustment procedures
  - 1.4.3 troubleshooting and preliminary inspection procedure
- 1.5 describe safety precautions needed when working on hybrid vehicle braking systems

2. diagnose and service brake systems

2.1 demonstrate flushing and bleeding procedures on brake systems, including:
- 2.1.1 brake fluid level check, condition inspection and service
- 2.1.2 flushing versus bleeding
- 2.1.3 bleeding sequence
- 2.1.4 gravity bleeding
- 2.1.5 manual bleeding
- 2.1.6 vacuum bleeding
- 2.1.7 pressure bleeding

2.2 demonstrate a bleeding procedure for an antilock brake system (ABS), including:
- 2.2.1 two-person (recommended) bleeding procedure
- 2.2.2 low pressure (alternative) bleeding procedure

2.3 diagnose problems related to brake systems, including:
- 2.3.1 pedal feel
- 2.3.2 noise issues
- 2.3.3 vibration/pulsation conditions
- 2.3.4 brake pull
- 2.3.5 braking efficiency
- 2.3.6 analyze symptoms
- 2.3.7 disassemble and inspect
- 2.3.8 repair or replace
- 2.3.9 verify proper operation

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:
- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:
- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

4. create a transitional strategy to accommodate personal changes and build personal values

4.1 identify short-term and long-term goals

4.2 identify steps to achieve goals

COURSE ASA3450: WHEELS & DRIVE LINES

Level: First Period Apprenticeship, Section Two

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information

Description: Students develop the knowledge, skills and attitudes necessary to service and maintain vehicle wheel hubs, tires and drive shafts.

Parameters: Access to a materials work centre, complete with hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Wheels, Hubs and Tires 090102c; Drive Shafts 090102j

Outcomes: The student will:

1. diagnose and service wheels, tires and wheel bearings

- 1.1 describe the construction, sizing, rating and design features of tires, including:
  - 1.1.1 bias ply construction
  - 1.1.2 bias belted construction
  - 1.1.3 radial belted construction
  - 1.1.4 passenger (P), temporary (T) and commercial (C) tire sizing markings
  - 1.1.5 tire ratings; e.g., wear, traction, temperature resistance, speed and load ratings
  - 1.1.6 tread design
  - 1.1.7 tire deflection
  - 1.1.8 slip angle
- 1.2 describe the construction, sizing, rating and design features of wheels, including:
  - 1.2.1 stamped steel wheels
  - 1.2.2 alloy wheels
  - 1.2.3 directional wheels
  - 1.2.4 rim offset; e.g., positive, zero and negative offset
  - 1.2.5 two-piece and three-piece split rim design
- 1.3 demonstrate the correct procedures for balancing and installing wheels and tires, including:
  - 1.3.1 static imbalance
  - 1.3.2 dynamic imbalance
  - 1.3.3 tire rotation patterns
  - 1.3.4 torqueing wheel nut sequences
- 1.4 describe the construction and application of wheel bearings, including:
  - 1.4.1 tapered roller bearings
  - 1.4.2 sealed ball bearings
  - 1.4.3 bearing dust shields
- 1.5 demonstrate the correct procedures to install and adjust wheel bearings

1.6 diagnose problems related to wheels, tires and wheel bearings, including:
- 1.6.1 minimum tread depth
- 1.6.2 over-inflation
- 1.6.3 under-inflation
- 1.6.4 cupping
- 1.6.5 toe-out wear
- 1.6.6 shoulder wear
- 1.6.7 noise issues
- 1.6.8 vibration problems
- 1.6.9 steering wheel shimmy
- 1.6.10 rear tire waddle
- 1.6.11 wheel and tire runout

1.7 describe the purpose and operation of tire pressure monitoring systems (TPMS)

1.8 diagnose and service TPMS

2. diagnose, service and repair drive shafts, universal joints and constant velocity joints

2.1 describe the construction and operation and function of drive shaft components, including:
- 2.1.1 rear-wheel drive (Hotchkiss)
- 2.1.2 front-wheel drive
- 2.1.3 double tube and single tube drive shafts

2.2 identify drive line components and explain their function, including:
- 2.2.1 slip yokes
- 2.2.2 fixed yokes; e.g., U-bolt and strap type
- 2.2.3 cross and roller u-joints
- 2.2.4 constant velocity joints; e.g., double cardan, Rzeppa, double offset, tripod, cross groove (Lobro)

2.3 service and repair drive shaft assemblies and their components, including:
- 2.3.1 drive shafts
- 2.3.2 slip yokes
- 2.3.3 steady bearings

2.4 service and repair universal and constant velocity joints, including:
- 2.4.1 cross and roller universal joints
- 2.4.2 constant velocity joints

2.5 diagnose and repair drive shaft vibration problems, including:
- 2.5.1 drive shaft runout
- 2.5.2 driveshaft imbalance
- 2.5.3 driveshaft angle issues
- 2.5.4 misalignment of multiple drive shafts

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:
- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:
    3.3.1 work with others
    3.3.2 participate in projects and tasks

4. create a transitional strategy to accommodate personal changes and build personal values

4.1 identify short-term and long-term goals
4.2 identify steps to achieve goals

COURSE ASA3452: MAINTENANCE & TRAILERS

Level: First Period Apprenticeship, Section Five

Prerequisites: ASA3900: Apprenticeship Safety
ASA3400: Basic Tools & Materials
ASA3402: Vehicle Service Information

Description: Students develop the knowledge, skills and attitudes necessary to diagnose service, and to complete basic vehicle maintenance and light trailer service and repairs.

Parameters: Access to a materials work centre, complete with access to hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

ILM Resources: Basic Maintenance 090105a, Light Utility Trailers 090105b

Outcomes: The student will:

1. describe basic maintenance routines for vehicles

- 1.1 identify and describe the functions and characteristics of engine oils, transmission fluids and gear oils, including:
  - 1.1.1 lubrication
  - 1.1.2 cleaning
  - 1.1.3 cooling
  - 1.1.4 sealing
  - 1.1.5 absorbing shock
  - 1.1.6 transmitting force
- 1.2 explain engine oil service categories and ratings, including:
  - 1.2.1 Society of Automotive Engineers (SAE), International Lubricant Standardization and Approval Committee (ILSAC) and American Petroleum Institute (API) oil ratings
  - 1.2.2 viscosity index
  - 1.2.3 viscosity grades
  - 1.2.4 multigrade oil
  - 1.2.5 fuel economy rating
- 1.3 describe the purpose and function of oil additives, including:
  - 1.3.1 oil anti-wear agents and boundary lubricant properties
  - 1.3.2 oxidation, rust, corrosion and foam inhibitors
  - 1.3.3 detergents, dispersants and pour point depressants
- 1.4 explain the properties and advantages of using synthetic oil, including:
  - 1.4.1 reduced friction
  - 1.4.2 consistent viscosity
  - 1.4.3 superior sealing qualities
  - 1.4.4 reduced evaporation
  - 1.4.5 reduced fuel contamination
  - 1.4.6 cleaner engine

1.5 identify the various types of transmission and gear oil lubricants and describe the functions and characteristics, including:
- 1.5.1 automatic transmission fluid (ATF)
- 1.5.2 manual transmission lubricants
- 1.5.3 final drive and differential gear lubricants
- 1.5.4 power steering fluid

1.6 describe procedures for collecting, storing and disposal of coolant, lubricants and filters, including:
- 1.6.1 the role of the Alberta Used Oil Management Association (AUOMA)
- 1.6.2 collection equipment and methods
- 1.6.3 fluid storage and disposal methods and legislation
- 1.6.4 filter disposal
- 1.6.5 fluid container recycling programs

1.7 identify, service and properly dispose of automobile filters, including:
- 1.7.1 engine air filters
- 1.7.2 cabin air filters
- 1.7.3 inline and intank fuel filter removal and replacement
- 1.7.4 heating, ventilation and air conditioning (HVAC) filters, service and replacement
- 1.7.5 cartridge and canister style engine oil filters, service and replacement

1.8 describe safe and environmentally sensitive handling and storage practices for gasoline and diesel fuel, including:
- 1.8.1 storing and handling gasoline and diesel fuel
- 1.8.2 fuel spills
- 1.8.3 microbial contamination of diesel fuel and associated problems

1.9 identify and describe the functions and characteristics of engine coolants, including:
- 1.9.1 ethylene glycol
- 1.9.2 propylene glycol
- 1.9.3 inorganic coolants
- 1.9.4 organic acid technology (OAT) coolants
- 1.9.5 hybrid organic acid technology (HOAT) coolants
- 1.9.6 concentration ratios and testing techniques

1.10 describe, inspect, replace and adjust accessory drive belts, including:
- 1.10.1 accessory belt construction and types
- 1.10.2 inspection, removal and replacement procedures
- 1.10.3 manual and automatic belt tensioners

1.11 describe basic procedures for replacing vehicle lubricants and coolants, including:
- 1.11.1 changing engine oil
- 1.11.2 automatic transmission fluid service
- 1.11.3 additives and their use
- 1.11.4 manual transmission fluid service
- 1.11.5 final drive or differential fluid service
- 1.11.6 hydraulic power steering fluid service
- 1.11.7 coolant replacement

1.12 describe the purpose for maintenance schedules and reset maintenance minders, including:
- 1.12.1 preventative maintenance
- 1.12.2 scheduled maintenance
- 1.12.3 failure or breakdown maintenance
- 1.12.4 maintenance minders and resetting process

1.13 describe a maintenance inspection process and complete a scheduled maintenance inspection

2. describe service procedures for light utility trailers

2.1 describe the operation of electric brakes on light utility trailers, including:
- 2.1.1 electric brake system components and operation
- 2.1.2 6-, 7- and 9-circuit receptacle trailer connections
- 2.1.3 proportion and time delay electric brake controllers
- 2.1.4 electric brake assembly components
- 2.1.5 electro-hydraulic actuators
- 2.1.6 breakaway switch and battery

2.2 describe the service procedures for electric brakes on light utility trailers, including:
- 2.2.1 brake shoe, brake drum and electromagnet inspection
- 2.2.2 voltage testing
- 2.2.3 amperage (current draw) testing

2.3 describe wheel bearing service procedures for light utility trailers, including:
- 2.3.1 E-Z lube and Nev-R lube bearings
- 2.3.2 service, replacement and adjustment procedures

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:
- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:
- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

4. create a transitional strategy to accommodate personal changes and build personal values

4.1 identify short-term and long-term goals

4.2 identify steps to achieve goals

COURSE ASA3455: ASA PRACTICUM A

Level: First Period Apprenticeship

Prerequisite: None

Description: Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

Parameters: This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

Outcomes: The student will:

1. **perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
   - 1.1 identify regulations and regulatory bodies related to the credential
   - 1.2 describe personal roles and responsibilities, including:
     - 1.2.1 key responsibilities
     - 1.2.2 support functions/responsibilities
     - 1.2.3 code of ethics
   - 1.3 describe personal work responsibilities and categorize them as:
     - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
     - 1.3.2 non-routine tasks; e.g., emergencies
     - 1.3.3 tasks requiring personal judgement
     - 1.3.4 tasks requiring approval of a supervisor
2. **analyze personal performance in relation to established standards**
   - 2.1 evaluate application of competencies developed in related CTS courses
   - 2.2 evaluate standards of performance in terms of:
     - 2.2.1 quality of work
     - 2.2.2 quantity of work
   - 2.3 evaluate adherence to workplace policies and procedures related to health and safety
   - 2.4 evaluate the work environment in terms of:
     - 2.4.1 location
     - 2.4.2 floor plan of work area
     - 2.4.3 analysis of work flow patterns

2.5 evaluate a professional in a related occupation in terms of:
- 2.5.1 training and certification
- 2.5.2 interpersonal skills
- 2.5.3 technical skills
- 2.5.4 professional ethics

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:
- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:
- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

COURSE ASA3460: ASA PRACTICUM B

Level: First Period Apprenticeship

Prerequisite: None

Description: Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

Parameters: This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

Outcomes: The student will:

1. **perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
   - 1.1 identify regulations and regulatory bodies related to the credential
   - 1.2 describe personal roles and responsibilities, including:
     - 1.2.1 key responsibilities
     - 1.2.2 support functions/responsibilities
     - 1.2.3 code of ethics
   - 1.3 describe personal work responsibilities and categorize them as:
     - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
     - 1.3.2 non-routine tasks; e.g., emergencies
     - 1.3.3 tasks requiring personal judgement
     - 1.3.4 tasks requiring approval of a supervisor
2. **analyze personal performance in relation to established standards**
   - 2.1 evaluate application of competencies developed in related CTS courses
   - 2.2 evaluate standards of performance in terms of:
     - 2.2.1 quality of work
     - 2.2.2 quantity of work
   - 2.3 evaluate adherence to workplace policies and procedures related to health and safety
   - 2.4 evaluate the work environment in terms of:
     - 2.4.1 location
     - 2.4.2 floor plan of work area
     - 2.4.3 analysis of work flow patterns

2.5 evaluate a professional in a related occupation in terms of:
- 2.5.1 training and certification
- 2.5.2 interpersonal skills
- 2.5.3 technical skills
- 2.5.4 professional ethics

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:
- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:
- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

COURSE ASA3465: ASA PRACTICUM C

Level: First Period Apprenticeship

Prerequisite: None

Description: Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

Parameters: This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

Outcomes: The student will:

1. **perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
   - 1.1 identify regulations and regulatory bodies related to the credential
   - 1.2 describe personal roles and responsibilities, including:
     - 1.2.1 key responsibilities
     - 1.2.2 support functions/responsibilities
     - 1.2.3 code of ethics
   - 1.3 describe personal work responsibilities and categorize them as:
     - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
     - 1.3.2 non-routine tasks; e.g., emergencies
     - 1.3.3 tasks requiring personal judgement
     - 1.3.4 tasks requiring approval of a supervisor
2. **analyze personal performance in relation to established standards**
   - 2.1 evaluate application of competencies developed in related CTS courses
   - 2.2 evaluate standards of performance in terms of:
     - 2.2.1 quality of work
     - 2.2.2 quantity of work
   - 2.3 evaluate adherence to workplace policies and procedures related to health and safety
   - 2.4 evaluate the work environment in terms of:
     - 2.4.1 location
     - 2.4.2 floor plan of work area
     - 2.4.3 analysis of work flow patterns

2.5 evaluate a professional in a related occupation in terms of:
- 2.5.1 training and certification
- 2.5.2 interpersonal skills
- 2.5.3 technical skills
- 2.5.4 professional ethics

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:
- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:
- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

COURSE ASA3470: ASA PRACTICUM D

Level: First Period Apprenticeship

Prerequisite: None

Description: Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

Parameters: This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

Outcomes: The student will:

1. **perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
   - 1.1 identify regulations and regulatory bodies related to the credential
   - 1.2 describe personal roles and responsibilities, including:
     - 1.2.1 key responsibilities
     - 1.2.2 support functions/responsibilities
     - 1.2.3 code of ethics
   - 1.3 describe personal work responsibilities and categorize them as:
     - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
     - 1.3.2 non-routine tasks; e.g., emergencies
     - 1.3.3 tasks requiring personal judgement
     - 1.3.4 tasks requiring approval of a supervisor
2. **analyze personal performance in relation to established standards**
   - 2.1 evaluate application of competencies developed in related CTS courses
   - 2.2 evaluate standards of performance in terms of:
     - 2.2.1 quality of work
     - 2.2.2 quantity of work
   - 2.3 evaluate adherence to workplace policies and procedures related to health and safety
   - 2.4 evaluate the work environment in terms of:
     - 2.4.1 location
     - 2.4.2 floor plan of work area
     - 2.4.3 analysis of work flow patterns

2.5 evaluate a professional in a related occupation in terms of:
- 2.5.1 training and certification
- 2.5.2 interpersonal skills
- 2.5.3 technical skills
- 2.5.4 professional ethics

3. demonstrate basic competencies

3.1 demonstrate fundamental skills to:
- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:
- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:
- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

COURSE ASA3900: APPRENTICESHIP SAFETY

Level: First Period Apprenticeship

Prerequisite: None

Description: Students develop knowledge, skills and attitudes in the practice of workshop health and safety, communication and career planning.

Parameters: Access to a materials work centre and to instruction from an individual with specialized training in Occupational Health and Safety (and understanding of the automotive industry) and/or an automotive service technician.

ILM Resources: Safety Legislation, Regulations and Industry Policy in the Trades 650101a; Climbing, Lifting, Rigging and Hoisting 650101b; Hazardous Materials and Fire Protection 650101c; Communication 090101d

Note: This course may promote discussions around sensitive topics (e.g., injury and death) in the context of student safety with respect to workplace hazards.

Outcomes: The student will:

1. **describe legislation, regulations and practices intended to ensure a safe workplace in the automotive service technician apprenticeship trade**
   - 1.1 demonstrate the ability to apply the *Occupational Health and Safety (OHS) Act*, *Regulation* and *Code*, as well as the changes from Bill C-45
   - 1.2 explain the core requirements applicable to all industries, including:
     - 1.2.1 engineering controls
     - 1.2.2 administrative controls
     - 1.2.3 personal protective equipment (PPE)
   - 1.3 demonstrate an understanding of the 26 parts of the OHS Code requirements applicable to all industries
   - 1.4 demonstrate an understanding of the 12 parts of the OHS Code requirements applicable to specific industries and activities
   - 1.5 demonstrate an understanding of the 11 OHS Code Schedules that the Explanation Guide does not address
   - 1.6 explain the role of the employer and employee in regard to Occupational Health and Safety legislation, considering:
     - 1.6.1 employer responsibilities (OHS Regulation)
     - 1.6.2 employee responsibilities (OHS Regulation)
     - 1.6.3 Workplace Hazardous Materials Information System (WHMIS)
     - 1.6.4 fire regulations
     - 1.6.5 Workers' Compensation Board (WCB)
     - 1.6.6 related advisory bodies and agencies; e.g., Alberta Construction Safety Association (ACSA), Construction Owners Association of Alberta (COAA), Occupational Health and Safety Council (OHSC), Work Safe Alberta, Safety Codes Council
   - 1.7 explain industry practices for hazard assessment and control procedures in four main hazard categories, including:
     - 1.7.1 biological
     - 1.7.2 chemical
     - 1.7.3 ergonomic
     - 1.7.4 physical hazards

1.8 identify and describe hazard assessment tools that both employees and employers must use in assessing and controlling work-site hazards, including:
- 1.8.1 work-site hazard identification and assessment
- 1.8.2 health and safety plan
- 1.8.3 joint work-site health and safety committee
- 1.8.4 emergency response plans
- 1.8.5 first-aid and incident reports

1.9 identify and describe employer engineering controls that provide the highest level of worker protection, including:
- 1.9.1 elimination
- 1.9.2 substitution
- 1.9.3 redesign
- 1.9.4 isolation
- 1.9.5 automation

1.10 identify and describe employer administrative controls that limit hazards to the lowest level possible, including:
- 1.10.1 safe work practices
- 1.10.2 job procedures, policies and rules
- 1.10.3 work/rest schedules to reduce exposure
- 1.10.4 limiting hours of work
- 1.10.5 scheduling hazardous work during non-peak times
- 1.10.6 using optional methods; e.g., wet sanding as opposed to dry sanding or sweeping

1.11 describe the responsibilities of employees and employers to apply emergency procedures, including:
- 1.11.1 emergency response plans
- 1.11.2 first aid

1.12 describe positive tradesperson attitudes with respect to legal responsibilities for all workers, including:
- 1.12.1 housekeeping
- 1.12.2 lighting
- 1.12.3 personal protective equipment (PPE)
- 1.12.4 emergency procedures

1.13 describe the roles and responsibilities of employers and employees with respect to the selection and use of personal protective equipment (PPE), including:
- 1.13.1 eye protection; e.g., class 1 (spectacles), class 2 (goggles), class 3 (welding helmets), class 4 (welding hand shields), class 5 (hoods), class 6 (face shields), class 7 (respirator face pieces)
- 1.13.2 flame resistant clothing
- 1.13.3 foot protection; e.g., category 1, 2 or 3 footwear requirements
- 1.13.4 head protection; e.g., class G (general), class E (electrical), class C (conducting)
- 1.13.5 hearing protection; e.g., earplugs or earmuffs
- 1.13.6 life jackets and personal flotation devices (PFDs)
- 1.13.7 limb and body protection
- 1.13.8 respiratory protective equipment; e.g., particulate filters; chemical cartridges or canisters; airline respirators, hoods, helmets and suits; self-contained breathing apparatus (SCBA)
- 1.13.9 a combination of any of the above

2. describe the use of personal protective equipment (PPE) and safe practices for climbing, lifting, rigging and hoisting in the automotive service technician apprenticeship trade

- 2.1 select, use and maintain specialized PPE and materials for climbing, lifting and loading, including:
  - 2.1.1 full body harness
  - 2.1.2 body belt
  - 2.1.3 ladders
  - 2.1.4 scaffold systems
  - 2.1.5 lifting and moving equipment
  - 2.1.6 PPE for lifting
  - 2.1.7 materials handling equipment; e.g., forklift, four-wheel dolly, chain hoist, overhead crane
- 2.2 describe manual lifting procedures, including correct body mechanics, considering:
  - 2.2.1 back safety
  - 2.2.2 general procedure for lifting
  - 2.2.3 employer and employee preventive actions to avoid back injuries
- 2.3 describe rigging hardware and the safe work load associated with:
  - 2.3.1 wire rope slings
  - 2.3.2 synthetic fibre web slings
  - 2.3.3 chain slings
  - 2.3.4 rigging hardware inspection
- 2.4 select the correct equipment for rigging typical loads, including:
  - 2.4.1 eye bolts
  - 2.4.2 shackles
  - 2.4.3 rings and links
  - 2.4.4 hooks
  - 2.4.5 swivels
  - 2.4.6 spreader bars and equalization beams
  - 2.4.7 blocks
  - 2.4.8 sheaves
  - 2.4.9 turnbuckles
- 2.5 describe hoisting and load-moving procedures
- 2.6 explain the most commonly used sling configurations to connect a load to a hook, including:
  - 2.6.1 vertical hitch
  - 2.6.2 bridle hitch
  - 2.6.3 single and double basket hitch
  - 2.6.4 wrap hitch
  - 2.6.5 single and double choker hitch
- 2.7 demonstrate the standard movement signals a signaler is required to know to signal a crane operator, including:
  - 2.7.1 hoist and lower load
  - 2.7.2 raise and lower boom
  - 2.7.3 swing boom
  - 2.7.4 stop
  - 2.7.5 emergency stop
  - 2.7.6 dog everything

3. describe the safety practices for hazardous materials and fire protection in the automotive service technician apprenticeship trade

3.1 describe the roles, responsibilities, features and practices related to the Workplace Hazardous Materials Information System (WHMIS) program, including:
- 3.1.1 suppliers', employers' and employees' responsibilities
- 3.1.2 WHMIS classifications
- 3.1.3 health effects from exposure to chemicals

3.2 describe the three key elements of WHMIS, including:
- 3.2.1 worker education
- 3.2.2 supplier and workplace product labelling
- 3.2.3 material safety data sheets

3.3 describe handling, storage and transportation procedures when dealing with hazardous materials, including:
- 3.3.1 handling, storing and transporting flammable liquids
- 3.3.2 handling, storing and transporting compressed gas
- 3.3.3 storing incompatible materials

3.4 describe safe venting procedure when working with hazardous materials, including:
- 3.4.1 mechanical general ventilation
- 3.4.2 local ventilation
- 3.4.3 portable smoke extractor
- 3.4.4 working in a confined space

3.5 describe fire hazards, classes, procedures and equipment related to fire protection, including:
- 3.5.1 elements of a fire
- 3.5.2 classes of fires
- 3.5.3 fire extinguisher labels
- 3.5.4 extinguishing small fires
- 3.5.5 the PASS method

4. demonstrate communication skills and workshop safety as they pertain to Occupational Health and Safety standards

4.1 use various types of communication to provide trade-related information, employing standard terms for components and operations, including:
- 4.1.1 personal appearance
- 4.1.2 business appearance
- 4.1.3 suppliers and sales representatives
- 4.1.4 customers
- 4.1.5 tradespeople

4.2 identify key areas of responsibility that an employee has in regards to shop and trade safety, including:
- 4.2.1 housekeeping
- 4.2.2 waste containers
- 4.2.3 power tools and rotating machinery
- 4.2.4 compressed air
- 4.2.5 exhaust gases
- 4.2.6 control of carbon monoxide (CO)
- 4.2.7 hazardous materials, dangerous goods and controlled products

4.3 explain the correct use of fire extinguishers and explain fire prevention techniques

5. demonstrate an understanding of the automotive service technician apprenticeship trade and of apprenticeship opportunities that exist by creating a personal career portfolio

- 5.1 demonstrate an understanding of the automotive service technician apprenticeship trade and related job opportunities
- 5.2 describe what it means to be an apprentice and describe requirements for the employee and employer
- 5.3 refine and present a personal career portfolio, showing evidence of strengths and competencies, including:
  - 5.3.1 application completion
  - 5.3.2 cover letter
  - 5.3.3 résumé with references
- 5.4 demonstrate knowledge of workplace requirements, rights and responsibilities and relate this knowledge to personal career/employment expectations
- 5.5 outline the educational requirements to move into the automotive service technician apprenticeship trade and:
  - 5.5.1 conduct successful employment searches
  - 5.5.2 communicate in the language in which business is conducted
  - 5.5.3 prepare a personal employment search portfolio
  - 5.5.4 use technologies, tools and information systems appropriately for job preparation

6. demonstrate basic competencies

- 6.1 demonstrate fundamental skills to:
  - 6.1.1 communicate
  - 6.1.2 manage information
  - 6.1.3 use numbers
  - 6.1.4 think and solve problems
- 6.2 demonstrate personal management skills to:
  - 6.2.1 demonstrate positive attitudes and behaviours
  - 6.2.2 be responsible
  - 6.2.3 be adaptable
  - 6.2.4 learn continuously
  - 6.2.5 work safely
- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks

7. create a transitional strategy to accommodate personal changes and build personal values

- 7.1 identify short-term and long-term goals
- 7.2 identify steps to achieve goals