COURSE AEA3400: TOOLS & MATERIALS

Level: First Period Apprenticeship

Prerequisite: AEA3900: Apprenticeship Safety

Description: Students develop knowledge, skills and attitudes in the areas of material handling, fastening devices, sealing systems, measuring tools and hand tools.

Parameters: Access to a materials work centre, complete with basic measuring, hand and power tools, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Materials, Fastening Devices and Sealing Systems 320101d; Precision Measuring Tools 320101e; Hand Tools 320101f

Outcomes: The student will:

1. identify materials, fasteners and sealing systems commonly used in the trade

- 1.1 describe materials commonly used in agricultural machinery, including:
  - 1.1.1 ferrous metals; e.g., steel, cast iron, wrought iron, stainless steel
  - 1.1.2 nonferrous metals; e.g., aluminum, brass, copper, lead, magnesium, nickel, gold, silver
  - 1.1.3 non-metallic materials; e.g., natural rubber, synthetic rubber, fibreglass, nylon, plastic
- 1.2 describe properties of metals and fastening devices used in agricultural machinery, including:
  - 1.2.1 ductility, toughness, malleability and elasticity
  - 1.2.2 elastic limit, tensile strength, harness and work hardening
  - 1.2.3 oxidation, annealing, tempering and quench
- 1.3 describe materials used in sealing systems commonly used in agricultural machinery, including:
  - 1.3.1 Teflon
  - 1.3.2 nylon
  - 1.3.3 silicone
- 1.4 describe various types of fastening devices used in agricultural machinery and sizing standards, including:
  - 1.4.1 bolts; e.g., square head, hex head, carriage bolt, plow bolt
  - 1.4.2 hex head cap screws; e.g., hex (Allen) socket head and 12-pointed cap screws
  - 1.4.3 bolt length, diameter and head markings
  - 1.4.4 thread pitch and thread class
  - 1.4.5 hex, acorn, self-locking, castle, square and 12-point nuts
  - 1.4.6 flat, helical spring, internal and external washers
  - 1.4.7 machine screws and set screws
  - 1.4.8 non-threaded fasteners; e.g., square keys, woodruff keys, splines
  - 1.4.9 cotter pins, spring pins, roll pins, internal and external snap rings
- 1.5 demonstrate selected torque procedures, including:
  - 1.5.1 torque in three stages
  - 1.5.2 sequence methods
  - 1.5.3 torque and turn method

1.6 describe the safe selection, application and storage of gaskets, sealers, adhesives and cleaners, including:
- 1.6.1 aerobic sealers
- 1.6.2 anaerobic sealers
- 1.6.3 gasket sealers, glues and gasket sprays

2. use precision measuring tools calibrated in imperial and metric measure

2.1 demonstrate the use of precision measuring tools, including:
- 2.1.1 steel rules
- 2.1.2 feeler gauges
- 2.1.3 vernier, dial and digital calipers
- 2.1.4 inside, outside and depth micrometers
- 2.1.5 dial indicators
- 2.1.6 small hole and telescoping gauges
- 2.1.7 Plastigauge
- 2.1.8 pull scales

2.2 describe the care and storage of measuring tools, including:
- 2.2.1 adjusting
- 2.2.2 recalibrating
- 2.2.3 cleaning
- 2.2.4 checking for zero

2.3 interpret the dimensions taken with precision measuring tools, including:
- 2.3.1 length
- 2.3.2 area
- 2.3.3 volume
- 2.3.4 mass
- 2.3.5 force
- 2.3.6 velocity
- 2.3.7 pressure
- 2.3.8 temperature

3. describe the use and maintenance of hand tools

3.1 describe the use and maintenance of selected hand tools, including:
- 3.1.1 hammers
- 3.1.2 screwdrivers
- 3.1.3 chisels and punches
- 3.1.4 wrenches
- 3.1.5 pliers
- 3.1.6 vises and clamps
- 3.1.7 pullers and presses
- 3.1.8 cutting hand tools
- 3.1.9 tubing and flaring tools
- 3.1.10 specialty tools
- 3.1.11 abrasives and sanding tools

3.2 describe the use and maintenance of air and electrical power tools, including:
- 3.2.1 drills and drill bits
- 3.2.2 portable and mounted grinders
- 3.2.3 air impact tools

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 AEA3405: WELDING EQUIPMENT

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials

Description: Students operate equipment in a safe manner and perform welding operations such as metal cutting and tack welding.

Parameters: Access to a materials work centre, complete with basic electric welding, oxyfuel cutting and hand and power tools, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Welding Safety 320102a; Oxy-Fuel Equipment 320102b

Outcomes: The student will:

1. describe methods to demonstrate personal safety

1.1 describe hazards associated with welding applications and activities, including:
- 1.1.1 radiation burns to eyes and skin
- 1.1.2 burns to the skin and/or flesh from heat contact
- 1.1.3 injuries due to flying metal particles
- 1.1.4 noise concerns
- 1.1.5 working with compressed gases
- 1.1.6 fires and explosions
- 1.1.7 noxious, toxic fumes and gases
- 1.1.8 poisonous gases

1.2 demonstrate the use of personal protective clothing and equipment, including:
- 1.2.1 head protection
- 1.2.2 eye protection
- 1.2.3 spark-repelling clothing, such as leather
- 1.2.4 welding gloves
- 1.2.5 protective footwear
- 1.2.6 hearing protection

1.3 describe methods to protect other personnel in the area

2. demonstrate the use of the torch for welding, heating, brazing and cutting

2.1 describe the characteristics and safe-handling procedures for gases and cylinders, including:
- 2.1.1 oxygen
- 2.1.2 acetylene
- 2.1.3 propane

2.2 describe care and maintenance procedures for the oxyfuel outfit, including:
- 2.2.1 regulators
- 2.2.2 torch handle, valves and hoses
- 2.2.3 cutting tips and cutting attachment
- 2.2.4 welding tips
- 2.2.5 check valves

2.3 demonstrate equipment set-up, adjustment and shutdown procedures, including:
    2.3.1 balancing pressures
    2.3.2 oxidizing, carbonizing and neutral flames for welding
    2.3.3 backfires, burnbacks and flashbacks
    2.3.4 tip cleaning
2.4 demonstrate use of personal protective equipment (PPE) and safe operating procedures
2.5 perform heating, welding and cutting operations using oxyfuel equipment, considering:
    2.5.1 travel speed
    2.5.2 torch inclination
    2.5.3 cutting slag to scrap
    2.5.4 across cut, push cut or pull cut method usage
    2.5.5 amount of heat, tip size and size of flame
    2.5.6 thickness of materials
2.6 describe temperature indicators and the effect of heat on metal

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 AEA3410: ELECTRIC WELDING

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials
AEA3405: Welding Equipment

Description: Students operate equipment in a safe manner and perform welding operations such as metal cutting and tack welding.

Parameters: Access to a materials work centre, complete with basic electric welding, oxyfuel cutting and hand and power tools, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Shielded Metal Arc Welding (SMAW) – Part A 320102cA; Shielded Metal Arc Welding (SMAW) – Part B 320102cB; Gas Metal Arc Welding (GMAW) 320102d

Outcomes: The student will:

1. perform welding operations using arc welding equipment

1.1 define basic electricity terms related to SMAW, including:
- 1.1.1 alternating current (AC)
- 1.1.2 amperage and voltage
- 1.1.3 constant current (CC)
- 1.1.4 constant voltage (CV)
- 1.1.5 direct current (DC)
- 1.1.6 flux core arc welding (FCAW)
- 1.1.7 gas metal arc welding (GMAW)
- 1.1.8 gas tungsten arc welding (GTAW)
- 1.1.9 metal inert gas (MIG)
- 1.1.10 shielded metal arc welding (SMAW)
- 1.1.11 direct current reverse polarity (DCRP) and direct current straight polarity (DCSP)

1.2 describe selected machine types, welding currents and polarities, including:
- 1.2.1 alternating current transformers
- 1.2.2 AC/DC transformer-rectifiers
- 1.2.3 generators and alternators
- 1.2.4 direct current straight polarity (DCSP)
- 1.2.5 direct current reverse polarity (DCRP)
- 1.2.6 alternating current (AC)

1.3 describe care and maintenance procedures of SMAW equipment, including:
- 1.3.1 welding cables
- 1.3.2 cable connectors and cable lugs
- 1.3.3 electrode holders (stingers)
- 1.3.4 ground clamps

1.4 demonstrate equipment set-up and adjustments

1.5 describe the electrode designation system, including:
- 1.5.1 non-consumable electrodes
- 1.5.2 consumable electrodes
- 1.5.3 core wire diameter
- 1.5.4 coatings (fluxes)
- 1.5.5 tensile strength
- 1.5.6 welding position

1.6 select electrodes for specific applications, based upon:
- 1.6.1 static loading
- 1.6.2 dynamic loading
- 1.6.3 mineral (rutile) electrodes
- 1.6.4 cellulose electrodes
- 1.6.5 low hydrogen (basic) electrodes
- 1.6.6 mild steel electrodes
- 1.6.7 power source
- 1.6.8 filler material compatibility with parent material
- 1.6.9 welding position
- 1.6.10 joint type
- 1.6.11 material thickness

1.7 describe arc welding puddle controls, including:
- 1.7.1 amount of heat (amps)
- 1.7.2 length of arc (i.e., distance from the electrode to the plate)
- 1.7.3 angle of the electrode in relation to the work
- 1.7.4 inclination of the electrode relative to the direction of travel
- 1.7.5 rate of travel
- 1.7.6 following the desired path

1.8 demonstrate joint preparation and fit-up

1.9 demonstrate the use of personal protective equipment (PPE) and safe operating procedures

1.10 perform basic welding techniques (single and multi-pass fillets in horizontal and flat positions) using arc welding equipment, displaying knowledge of:
- 1.10.1 weld quality required
- 1.10.2 speed and cost of application
- 1.10.3 residual stress or distortion
- 1.10.4 the positions in which the technique will give satisfactory results
- 1.10.5 the time it takes to master the technique

2. perform welding operations using the gas metal arc welding (GMAW) process

2.1 describe GMAW components and process, including:
- 2.1.1 welding power source
- 2.1.2 wire feeder compatible with the power source
- 2.1.3 welding gun and cable assembly
- 2.1.4 spooled filler wire
- 2.1.5 shielding gas
- 2.1.6 gas control equipment

2.2 describe GMAW puddle controls, including:
- 2.2.1 amount of heat (volts)
- 2.2.2 wire speed (amps)
- 2.2.3 shielding gas
- 2.2.4 electrode extension
- 2.2.5 angle of the electrode in relation to the work
- 2.2.6 inclination of electrode relative to the direction of travel

2.2.7 travel speed
2.2.8 position of the arc relative to the puddle

2.3 describe care and maintenance of GMAW equipment, including:
2.3.1 covering wire spool
2.3.2 changing contact tubes
2.3.3 cleaning the gas nozzle using anti-spatter compound
2.3.4 ensuring the nozzle is in alignment
2.3.5 cleaning contact surfaces to ensure proper ground connections

2.4 demonstrate set-up and adjustment procedures for GMAW, including:
2.4.1 setting the shielding gas flow rate
2.4.2 ensuring the arc volts are proportional to the heat required
2.4.3 setting the wire speed

2.5 perform fillet welds on light gauge plate using the GMAW process

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 AEA3415: ELECTRICAL FUNDAMENTALS

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials

Description: Students develop knowledge, skills and attitudes in electrical principles and magnetism; use electrical test equipment; and learn to read electrical schematics.

Parameters: Access to a materials work centre, complete with hand and power tools and electrical test equipment, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Electrical Fundamentals 320103a; Magnetism Fundamentals 320103b; Voltage 320103c

Outcomes: The student will:

1. apply scientific principles to explain electrical theory
- 1.1 explain the physical properties of conductors, insulators and semiconductors
- 1.2 explain electricity in terms of voltage, current and resistance, including:
  - 1.2.1 electrostatic (friction)
  - 1.2.2 electromagnetic induction
  - 1.2.3 electrochemical (chemical energy)
  - 1.2.4 photoelectric
  - 1.2.5 conventional theory
  - 1.2.6 electron theory
  - 1.2.7 resistance determination factors
  - 1.2.8 direct current and alternating current

2. apply scientific principles to explain the theory of magnetism
- 2.1 explain the fundamental laws of magnetism, including:
  - 2.1.1 direction of flow of magnetic field
  - 2.1.2 concentration and direction of flux lines; e.g., unlike poles attract and like poles repel
  - 2.1.3 permeability
  - 2.1.4 reluctance
- 2.2 explain the properties and applications of permanent magnets
- 2.3 explain the construction, operation and applications of electromagnets, including:
  - 2.3.1 right-hand rule for conductors
  - 2.3.2 right-hand rule for coils
  - 2.3.3 electrical energy to mechanical energy conversion in relays, coils and motors
  - 2.3.4 mechanical energy to electrical energy conversion in alternators and generators
- 2.4 explain the principles of electromagnetic induction

3. use electrical test equipment to measure electrical voltage
- 3.1 explain the construction and operation of voltmeters
- 3.2 measure electrical voltage

3.3 calculate and measure voltage drops in electrical circuits, using:
    3.3.1 Ohm's law
    3.3.2 Kirchhoff's current law
    3.3.3 Kirchhoff's voltage law
3.4 demonstrate safe operation of voltmeters, understanding:
    3.4.1 meter polarity
    3.4.2 meter impedance

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 AEA3420: CURRENT & RESISTANCE

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials
AEA3415: Electrical Fundamentals

Description: Students develop knowledge, skills and attitudes in electrical principles; use electrical test equipment; and learn to read electrical schematics.

Parameters: Access to a materials work centre, complete with hand and power tools and electrical test equipment, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Electrical Current 320103d; Electrical Resistance 320103e

Outcomes: The student will:

1. use electrical test equipment to measure electrical current (amperes)
- 1.1 calculate electrical amperage using Ohm's law
- 1.2 explain the construction and operation of ammeters
- 1.3 measure electrical current
- 1.4 demonstrate precautions while using ammeters, including:
  - 1.4.1 connection in series
  - 1.4.2 meter polarity concerns

2. use electrical test equipment to measure electrical resistance (ohms)
- 2.1 calculate electrical resistance using Ohm's law
- 2.2 explain the construction and operation of ohmmeters
- 2.3 use ohmmeters to measure electrical resistance
- 2.4 demonstrate precautions while using ohmmeters

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 AEA3425: BATTERIES & DIAGNOSTICS

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials
AEA3415: Electrical Fundamentals
AEA3420: Current & Resistance

Description: Students develop knowledge, skills and attitudes in electrical principles; use electrical test equipment; and learn to service, test and store batteries.

Parameters: Access to a materials work centre, complete with hand and power tools and electrical test equipment, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Battery Fundamentals and Service 320103f

Outcomes: The student will:

1. service, test and store agricultural batteries

- 1.1 identify hazards encountered with the use of batteries, including:
  - 1.1.1 electrolyte burns
  - 1.1.2 inhalation of fumes
  - 1.1.3 explosions
  - 1.1.4 injuries related to improper grounding
- 1.2 explain battery construction, sizing and capacity, including:
  - 1.2.1 battery case
  - 1.2.2 plate grids
  - 1.2.3 positive and negative plates
  - 1.2.4 plate separators
  - 1.2.5 elements
  - 1.2.6 electrolyte
  - 1.2.7 battery cells
  - 1.2.8 reserve capacity rating
  - 1.2.9 ampere hour rating
  - 1.2.10 cold cranking amps rating
  - 1.2.11 cranking amps
- 1.3 perform battery maintenance and testing, including:
  - 1.3.1 visible inspection
  - 1.3.2 open circuit voltage
  - 1.3.3 specific gravity
  - 1.3.4 high rate discharge test (load test)
  - 1.3.5 battery sulphation test
- 1.4 list safety precautions and procedures for boosting batteries
- 1.5 list safety precautions and procedures for charging batteries, including:
  - 1.5.1 slow charging
  - 1.5.2 trickle charging
  - 1.5.3 fast charging

1.6 explain multiple battery circuits in relation to connections and battery compatibility, including:
    1.6.1 batteries connected in series
    1.6.2 batteries connected in parallel
    1.6.3 battery compatibility within a battery group

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 AEA3430: ELECTRICAL DIAGNOSTICS

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials
AEA3415: Electrical Fundamentals
AEA3420: Current & Resistance
AEA3425: Batteries & Diagnostics

Description: Students develop knowledge, skills and attitudes in electrical principles; read schematic symbols and diagrams; and demonstrate electrical wiring and repairs.

Parameters: Access to a materials work centre, complete with hand and power tools and electrical test equipment, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Diagnostic Procedures 320103g

Outcomes: The student will:

1. interpret electrical circuit schematics
- 1.1 identify commonly used schematic symbols
- 1.2 explain simple electrical schematic drawings
- 1.3 identify commonly used electrical weather and non-weather sealed connections
- 1.4 demonstrate wiring and connection repairs, using:
  - 1.4.1 solder splicing
  - 1.4.2 heat shrink and wire wrap
  - 1.4.3 soldering equipment, including lead and lead-free solder and soldering paste
- 1.5 use appropriate test equipment to test simple machine circuits, including:
  - 1.5.1 voltmeters
  - 1.5.2 ohmmeters
  - 1.5.3 ammeters
- 1.6 explain precautions related to accessories and electronics when servicing electrical circuits

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 AEA3435: HYDRAULIC FUNDAMENTALS

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials

Description: Students develop knowledge, skills and attitudes around hydraulic fundamentals and their components and operation principles and repairs.

Parameters: Access to a materials work centre, complete with hand and power tools and hydraulic test equipment, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Hydraulic Fundamentals – Part A 320104aA; Hydraulic Fundamentals – Part B 320104aB; Hydraulic System Components: Reservoirs, Filters, Hoses and Coolers 320104b

Outcomes: The student will:

1. explain hydraulic principles used on agricultural equipment
- 1.1 define hydraulic terminology
- 1.2 using mathematical calculations, explain the hydraulic principles of pressure, force, area, volume, flow rate, cycle times and power, utilizing:
  - 1.2.1 Pascal's law for liquids
  - 1.2.2 formula for area
  - 1.2.3 formula for force
  - 1.2.4 formula for volume
  - 1.2.5 formula for pressure
  - 1.2.6 formula for work
- 1.3 draw and interpret basic hydraulic schematics, including:
  - 1.3.1 pictorial schematic diagrams
  - 1.3.2 cutaway hydraulic schematic diagrams
  - 1.3.3 schematic diagrams using graphic symbols
- 1.4 state the safety precautions that must be observed when working with hydraulic systems, with special focus on:
  - 1.4.1 hydraulic pressure and pressurized hydraulic lines
  - 1.4.2 pinhole leaks
  - 1.4.3 hydraulically supported equipment
  - 1.4.4 pinch points

2. explain the function of the following hydraulic system components: hydraulic oils, reservoirs, filters, conductors and heat exchangers
- 2.1 explain the properties of hydraulic fluid and the criteria for its selection, including:
  - 2.1.1 transmission of power
  - 2.1.2 lubrication value
  - 2.1.3 sealing component
  - 2.1.4 cooling function
  - 2.1.5 quality characteristics of hydraulic oil

2.2 state the functions of the hydraulic reservoir and its related components, including:
- 2.2.1 reservoir capacity
- 2.2.2 heat absorption
- 2.2.3 separation of air and contaminants from the oil
- 2.2.4 independent and integral reservoirs
- 2.2.5 vented and pressurized reservoirs

2.3 state the functions and principles of operation of filtration devices, including:
- 2.3.1 prevention of built-in, ingressed and internally generated contamination
- 2.3.2 filter micron rating; e.g., absolute, nominal and beta filter ratings
- 2.3.3 the physical location of filters

2.4 explain the construction and applications of common types of hydraulic conductors, including:
- 2.4.1 steel pipe, types of connections and fittings
- 2.4.2 steel tubing, flared and flareless connections, split flange and compression connectors
- 2.4.3 hydraulic hose, permanent and reusable hose connectors

2.5 state the functions and applications of hydraulic heat exchangers

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 AEA3440: HYDRAULIC SYSTEMS

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials
AEA3435: Hydraulic Fundamentals

Description: Students develop knowledge, skills and attitudes around hydraulic systems and their components and operation principles and repairs.

Parameters: Access to a materials work centre, complete with hand and power tools and hydraulic test equipment, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Hydraulic System Components: Pumps, Valves, Cylinders and Accumulators 320104c; Hydraulic Systems 320104d

Outcomes: The student will:

1. explain the functions and principles of operation of hydraulic system components
- 1.1 explain hydraulic sealing methods, including:
  - 1.1.1 external and integral seals
  - 1.1.2 static seals such as O-rings, gaskets and sealants
  - 1.1.3 dynamic seals such as radial lip seals, mechanical seals and packings
- 1.2 explain selected pump operating principles, including:
  - 1.2.1 vane pumps
  - 1.2.2 internal gear pumps
  - 1.2.3 external gear pumps
  - 1.2.4 piston pumps
- 1.3 explain the function and principles of operation for a direct acting pressure relief valve
- 1.4 explain the principles of operation and applications of hydraulic control valves, including:
  - 1.4.1 pressure control valves
  - 1.4.2 flow control valves
  - 1.4.3 directional control valve types
- 1.5 explain the principles of operation and applications of hydraulic cylinders, including:
  - 1.5.1 single-acting cylinders with and without return springs
  - 1.5.2 double-acting cylinders
- 1.6 explain the principles of operation and applications of spring-loaded and gas-charged hydraulic accumulators

2. explain the fundamental operating characteristics of hydraulic systems used in agricultural equipment
- 2.1 explain the operating principles of an open centre hydraulic system, including:
  - 2.1.1 types of pumps used
  - 2.1.2 oil flow with control valve in neutral position
  - 2.1.3 applications for system
  - 2.1.4 testing equipment and procedures

2.2 explain the operating principles of a closed centre hydraulic system, including:
    2.2.1 types of pumps used
    2.2.2 oil flow with control valve in neutral position
    2.2.3 applications for use
    2.2.4 testing equipment and procedures
2.3 explain the operating principles of a closed centre load sensing hydraulic system, including:
    2.3.1 applications and advantages
    2.3.2 testing equipment and procedures
2.4 perform selected hydraulic cylinder repair
2.5 perform a basic hydraulic system pressure and flow test, including:
    2.5.1 open centre system pressure test
    2.5.2 closed centre system pressure tests

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 AEA3445: FARM EQUIPMENT 1

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials

Description: Students service and repair tractors, steering systems and cutting equipment.

Parameters: Access to a materials work centre, complete with hand and power tools, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Tractor Performance 320105a; Suspension and Steering Systems on Agricultural Equipment 320105b; Cutting Equipment 320105c

Outcomes: The student will:

1. identify factors that influence tractor field performance

- 1.1 define tractor horsepower concepts, including:
  - 1.1.1 brake horsepower
  - 1.1.2 drawbar horsepower
  - 1.1.3 power takeoff (PTO) horsepower
- 1.2 calculate drawbar horsepower requirements
- 1.3 describe and calculate slippage, showing an understanding of:
  - 1.3.1 wheel slip
  - 1.3.2 tractive efficiency
  - 1.3.3 ballast amounts
  - 1.3.4 soil conditions
- 1.4 describe power hop and its control, including:
  - 1.4.1 causes; e.g., inadequate weight to horsepower, improper weight distribution, improper drawbar position, insufficient tires and incorrect tire pressures
  - 1.4.2 solutions to reduce or eliminate power hop
- 1.5 calculate ballasting solutions for tractors, utilizing:
  - 1.5.1 rolling resistance
  - 1.5.2 weight and speed
  - 1.5.3 weight and horsepower
  - 1.5.4 weight distribution
  - 1.5.5 tire inflation
- 1.6 compare the use of tires and rubber tracks, including:
  - 1.6.1 pull-to-weight ratio
  - 1.6.2 optimal performance
  - 1.6.3 increased efficiency
  - 1.6.4 ride considerations
  - 1.6.5 steerability
  - 1.6.6 cost
  - 1.6.7 soil compaction

1.7 interpret Nebraska tractor test results, including:
- 1.7.1 PTO performance
- 1.7.2 drawbar performance, e.g., drawbar horsepower, maximum power with or without ballast, drawbar pull and ground speed
- 1.7.3 sound test
- 1.7.4 three-point hitch performance

2. explain steering systems on agricultural equipment

2.1 describe selected steering system designs used on wheeled agricultural equipment, including:
- 2.1.1 fifth wheel steering
- 2.1.2 Ackerman steering, front or rear
- 2.1.3 articulated steering
- 2.1.4 four-wheel coordinated steering
- 2.1.5 crab steering
- 2.1.6 skid steering

2.2 describe service of wheels, tires and hubs

3. describe and adjust cutting equipment

3.1 describe the operation of a reciprocating knife mower, including:
- 3.1.1 pitman drive systems
- 3.1.2 pitmanless drive systems such as wobble box and epicyclic gearbox
- 3.1.3 smooth, top serrated and bottom serrated knife sections
- 3.1.4 knife and stub guard variations

3.2 perform adjustments and repairs to a reciprocating knife mower, including:
- 3.2.1 skid shoes
- 3.2.2 guard alignment or replacement
- 3.2.3 header flotation device adjustments

3.3 describe the operation of a rotary disc mower, including:
- 3.3.1 advantages; e.g., cutting at a higher ground speed, cutting cleanly through damp crop without plugging and cutting through dirt mounds without causing damage
- 3.3.2 disadvantages; e.g., expense, more horsepower required

3.4 perform adjustments and repairs to a disc type mower, including:
- 3.4.1 header flotations
- 3.4.2 knives
- 3.4.3 discs
- 3.4.4 shear hubs
- 3.4.5 cutterbeds/gearbeds

3.5 describe types of hay conditioners, including:
- 3.5.1 impeller/scuffing finger conditioners
- 3.5.2 roll conditioners; e.g., crushing rolls, crimping rolls and combination rolls

3.6 perform adjustments to hay conditioners, including:
- 3.6.1 roll balance
- 3.6.2 roll gap
- 3.6.3 roll timing

3.7 identify reel types and components, including:
- 3.7.1 batt reels
- 3.7.2 pick-up reels

3.8 describe adjustments to reels, including:
- 3.8.1 reel speed
- 3.8.2 reel height
- 3.8.3 fore and aft positioning
- 3.8.4 reel finger timing

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 AEA3450: FARM EQUIPMENT 2

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials

Description: Students service and repair baling equipment.

Parameters: Access to a materials work centre, complete with hand and power tools, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Baling Equipment 320105d

Outcomes: The student will:

1. describe and adjust hay baling equipment

- 1.1 describe the basic procedure of dry hay production, including:
  - 1.1.1 end use of the hay
  - 1.1.2 cutting time
  - 1.1.3 moisture content
- 1.2 describe operation and construction of fixed chamber balers producing soft core bales
- 1.3 describe operation and construction of variable chamber balers producing hard core bales
- 1.4 describe operation and construction of balers used for haylage or silage
- 1.5 perform adjustments and repairs to round balers, including:
  - 1.5.1 bale diameter
  - 1.5.2 bale density
  - 1.5.3 twine spacing
  - 1.5.4 twine edge distance
  - 1.5.5 belts and lacings
- 1.6 adjust baler monitor systems, including:
  - 1.6.1 bale size
  - 1.6.2 tying and twine wrap patterns
  - 1.6.3 daily or total bale count indicators
  - 1.6.4 net or twine selection
  - 1.6.5 bale slice control
- 1.7 describe operation and construction of small square balers, including:
  - 1.7.1 conventional or in-line pick-up
  - 1.7.2 knotter style
  - 1.7.3 bale size
- 1.8 perform adjustments and repairs to small square balers, including:
  - 1.8.1 needle timing adjustments
  - 1.8.2 packer fork adjustments
  - 1.8.3 plunger adjustments
  - 1.8.4 stationary and moving knife maintenance and adjustments
  - 1.8.5 bale density adjustments
  - 1.8.6 bale length adjustments
- 1.9 perform adjustments to knotters
- 1.10 describe operation and construction of large square balers

1.11 describe adjustments to large square balers
1.12 describe baler accessories, including:
- 1.12.1 large bale accumulators
- 1.12.2 swath saver wheels
- 1.12.3 chemical preservative applicators
- 1.12.4 bale moisture sensors
- 1.12.5 central lubrication systems
- 1.12.6 bale slicing devices
- 1.12.7 net wrap options

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 AEA3455: FARM EQUIPMENT 3

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials

Description: Students service and repair tillage equipment and other types of agriculture equipment.

Parameters: Access to a materials work centre, complete with hand and power tools, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Tillage Implements 320105e; Other Types of Agricultural Equipment 320105f

Outcomes: The student will:

1. describe the components and usage of selected types of tillage equipment

- 1.1 define common tillage terms, including:
  - 1.1.1 conventional tillage
  - 1.1.2 reduced tillage
  - 1.1.3 zero-till
  - 1.1.4 direct seeding
- 1.2 describe tillage practices, including:
  - 1.2.1 continuous cropping
  - 1.2.2 half-and-half cropping
  - 1.2.3 one-third/two-thirds cropping
  - 1.2.4 summerfallowing
- 1.3 describe types and components of ground-engaging tools, including:
  - 1.3.1 spike varieties and angles
  - 1.3.2 shovel types and angles
  - 1.3.3 rod weeders
  - 1.3.4 rippers or sub-soilers
  - 1.3.5 deep plows
- 1.4 analyze the levelling controls used on ground-engaging tools, including:
  - 1.4.1 solid hitch
  - 1.4.2 floating hitch
  - 1.4.3 adjustable sub-frame
  - 1.4.4 side-to-side levelling
  - 1.4.5 wheel, axle and depth controls
- 1.5 describe the shank protection used on ground-engaging tools, including:
  - 1.5.1 cushion spring variations
  - 1.5.2 cam-type trip system
- 1.6 explain the operation of disc implements, including:
  - 1.6.1 single disc
  - 1.6.2 double disc
  - 1.6.3 offset disc
  - 1.6.4 double offset disc
  - 1.6.5 spherical, cone, cutout and plain blade disc styles and shapes

1.7 describe selected ground pressure systems, including:
- 1.7.1 packers
- 1.7.2 rollers
- 1.7.3 seedbed finishers
- 1.7.4 mulch finishers
- 1.7.5 harrow types

2. describe adjustments and repairs of other selected types of equipment

2.1 describe selected short-line and materials-handling equipment, including:
- 2.1.1 skid steer machines
- 2.1.2 front-end loaders
- 2.1.3 yard tractors
- 2.1.4 mower decks
- 2.1.5 bale processing equipment

2.2 describe the operation and adjustment of selected three-point hitch categories, including:
- 2.2.1 category 0, up to 20 HP
- 2.2.2 category 1, 20-45 HP
- 2.2.3 category 2, 55-95 HP
- 2.2.4 category 3, above 95 HP

2.3 describe the installation and inspection of agricultural loaders and frames, including:
- 2.3.1 manual levelling
- 2.3.2 self-levelling
- 2.3.3 loader bucket types
- 2.3.4 loader repairs

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 AEA3460: POWER TRANSMISSION

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials

Description: Students service and repair clutches and drivelines.

Parameters: Access to a materials work centre, complete with hand and power tools, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Clutch Fundamentals and Service – Part A 320106aA; Clutch Fundamentals and Service – Part B 320106aB; Driveline Fundamentals and Service 320106b

Outcomes: The student will:

1. service and diagnose common clutch types

1.1 explain the function and operating principles of spring-loaded clutch systems, including:
- 1.1.1 push-type clutches
- 1.1.2 pull-type clutches
- 1.1.3 mechanically released clutches
- 1.1.4 hydraulically released clutches

1.2 state the function of spring-loaded clutch components, including:
- 1.2.1 flywheel variations
- 1.2.2 clutch cover variations
- 1.2.3 pressure plate and spring arrangements
- 1.2.4 intermediate plate
- 1.2.5 solid hub and torsional load spring-dampened clutch discs
- 1.2.6 organic and ceramic clutch disc lining materials
- 1.2.7 release bearings

1.3 diagnose spring-loaded clutch systems, including:
- 1.3.1 slipping
- 1.3.2 dragging
- 1.3.3 chattering
- 1.3.4 clutch vibration
- 1.3.5 clutch noises

1.4 perform service procedures for spring-loaded friction clutches, including checking:
- 1.4.1 warpage of pressure and intermediate plates
- 1.4.2 pressure spring for squareness, height and tension
- 1.4.3 clutch disc pad wear and spline damage
- 1.4.4 crankshaft end play
- 1.4.5 flywheel face and flywheel bore runout
- 1.4.6 clutch and clutch brake adjustment is maintained
- 1.4.7 free travel clearance

1.5 explain the operation and maintenance of overcentre clutches, including checking:
- 1.5.1 overcentre pull force
- 1.5.2 flywheel housing concentricity and runout
- 1.5.3 crankshaft end play

1.5.4 flywheel face runout
1.5.5 flywheel bore runout

1.6 explain the operation principles of overrunning, dog, cone and bevel clutches

1.7 explain the operating principles of electromagnetic clutches

2. diagnose and service drivelines and universal joints

2.1 explain the function and operating principles of common driveline assemblies, including:
2.1.1 single and multiple shafts
2.1.2 solid shafts
2.1.3 telescoping shafts

2.2 explain the construction and design features of common driveline components, including:
2.2.1 driveline tube
2.2.2 universal joints (U-joints or cardan joints)
2.2.3 U-joint retainers
2.2.4 yokes
2.2.5 constant velocity (CV) joint types; e.g., ball and socket, Rzeppa ball, tripod joint
2.2.6 driveline protection; e.g., shear bolts, slip clutches, pin-type and sprag-type over-running clutches
2.2.7 centre-support bearings (steady bearings)
2.2.8 driveline shields
2.2.9 belts; e.g., banded V-belt, flat belt, V-belt, timing belt
2.2.10 pulleys
2.2.11 chains; e.g., single-strand roller, double-strand roller, double-pitch roller
2.2.12 power takeoff (PTO) shaft variations

2.3 diagnose and service universal joints, checking for:
2.3.1 driveline runout
2.3.2 trunnion wear; e.g., spalling, end galling, brinelling, pitting
2.3.3 yoke and bearing cups

2.4 explain driveline phasing and angle limitations

2.5 evaluate driveline phasing and angles

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 AEA3465: GEARS & AXLES

Level: First Period Apprenticeship

Prerequisites: AEA3900: Apprenticeship Safety
AEA3400: Tools & Materials

Description: Students operate, service and repair gear types, drive axles and differentials.

Parameters: Access to a materials work centre, complete with hand and power tools, and to instruction from an individual with journeyperson certification as an agricultural equipment technician.

ILM Resources: Gearing Principles 320106c; Drive Axle and Differential Fundamentals 320106d

Outcomes: The student will:

1. explain basic gearing principles

1.1 define gear terminology, including:
- 1.1.1 standard gear tooth descriptions
- 1.1.2 circular gear measurements; e.g., root diameter, pitch diameter, circular gear pitch, gear tooth clearance, gear tooth backlash
- 1.1.3 hunting design and non-hunting design gear sets

1.2 explain gear relationships with regards to ratios and input/output direction, including:
- 1.2.1 torque increase/decrease
- 1.2.2 speed increase/decrease
- 1.2.3 direction change
- 1.2.4 transmit power to another plane

1.3 identify common gear types and applications, including:
- 1.3.1 straight cut spur gears
- 1.3.2 helical cut gears; e.g., single helical and double helical (herringbone) gears
- 1.3.3 tapered gear sets
- 1.3.4 internal and external gear combinations
- 1.3.5 rack and pinion gears
- 1.3.6 hypoid angle and amboid gear sets
- 1.3.7 worm gear and worm wheel drive sets
- 1.3.8 planetary gear sets

1.4 identify and calculate speed and torque relationships in single reduction planetaries

2. explain the functions and operating principles of mechanical front-wheel assist drive axle assemblies

2.1 state the functions of a drive axle assembly, including:
- 2.1.1 supporting the weight of the machine
- 2.1.2 providing gear reduction in the powertrain
- 2.1.3 changing the path of power 90 degrees
- 2.1.4 allowing for wheel speed differences

2.2 identify single reduction drive axle configurations, including:
    2.2.1 semi-floating designs
    2.2.2 floating designs
    2.2.3 non-floating designs
2.3 explain common axle shaft configurations, including:
    2.3.1 semi-floating designs
    2.3.2 full-floating designs
    2.3.3 non-floating designs

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 AEA3470: AEA 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 with journeyperson certification or an experienced professional with journeyperson certification, 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 workflow 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 AEA3475: AEA 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 with journeyperson certification or an experienced professional with journeyperson certification, 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 workflow 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 AEA3480: AEA 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 with journeyperson certification or an experienced professional with journeyperson certification, 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 workflow 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 AEA3485: AEA 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 with journeyperson certification or an experienced professional with journeyperson certification, 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 workflow 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 AEA3900: 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 agriculture industry) and/or a journeyman agricultural equipment technician.

ILM Resources: Safety Legislation, Regulations and Industry Policy in the Trades 650101a (270101a); Climbing, Lifting, Rigging and Hoisting 650101b (270101b); Hazardous Materials and Fire Protection 650101c (270101c); Communication 320101c

Other Resources: Safety, Housekeeping Practices and Lifting Procedures – Part A (320101aA); Safety, Housekeeping Practices and Lifting Procedures – Part B (320101aB); Fire Prevention and Fuel and Oil Storage (320101b)

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 agricultural equipment technician apprenticeship trade**
   - 1.1 demonstrate the ability to apply the *Occupational Health and Safety Act (OHS), 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 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, 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
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 agricultural equipment 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 agricultural equipment 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 material, 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 procedures 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 define standard terms used by an agricultural equipment technician
- 4.4 demonstrate oral and written communication as appropriate to the agricultural equipment technician

4.5 use a computer for communication and information access
4.6 demonstrate the use of service information and service bulletins as they relate to an agricultural equipment technician
4.7 describe the requirements of the *Farm Implement Act*
4.8 explain the correct use of fire extinguishers and explain fire prevention techniques

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

5.1 demonstrate an understanding of the agricultural equipment technician 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 describe Alberta's apprenticeship and industry training system
5.4 describe the roles and responsibilities of the Alberta Apprenticeship and Industry Training Board, government and post-secondary institutions
5.5 describe the roles and responsibilities of the provincial apprenticeship committees (PAC), local apprenticeship committees (LAC) and occupational committees
5.6 refine and present a personal career portfolio, showing evidence of strengths and competencies, including:
- 5.6.1 application completion
- 5.6.2 cover letter
- 5.6.3 résumé with references

5.7 demonstrate knowledge of workplace requirements, rights and responsibilities and relate this knowledge to personal career/employment expectations
5.8 outline the educational requirements to move into the agricultural equipment technician apprenticeship trade and:
- 5.8.1 conduct successful employment searches
- 5.8.2 communicate in the language in which business is conducted
- 5.8.3 prepare a personal employment search portfolio
- 5.8.4 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