8679
Electrical Fundamentals, Computers, and Diagnostic Equipment (12C)

40S/40E/40M

A Heavy Duty Equipment Technician Course

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Course Description

Students will learn electrical fundamentals, computers and diagnostic equipment, and electrical theory, including circuits. They will be able to use electronic diagnostic interfaces to service HDE systems and to diagnose and repair problems with them.

Goal 1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians.

GLO 1.1: Describe and apply appropriate **safety** practices for heavy duty equipment technicians.

SLO 12C.1.1.1	Describe and apply appropriate health and safety practices.
SLO 12C.1.1.2	Create and maintain a safe and organized working environment.
SLO 12C.1.1.3	Apply safety procedures associated with hydraulic hydrostatic system servicing.
SLO 12C.1.1.4	Apply safety procedures associated with HVAC system servicing.

A2 Trade Safety Awareness (7 hours)

SLO 12C.1.1.5 Identify safety and health requirements. (A2.1)

- overview of *The Workplace Safety and Health Act* (the *Act*)
  - rights and responsibilities of employees under the *Act*
  - rights and responsibilities of employers under the *Act*
  - rights and responsibilities of supervisors under the *Act*
- fourteen (14) regulations
- codes of practice
- guidelines

- right to refuse
  - explanation of right to refuse process
  - rights and responsibilities of employees
  - rights and responsibilities of employers
  - rights and responsibilities of supervisors under the *Act*

SLO 12C.1.1.6 Identify personal protective equipment (PPE) and procedures. (A2.2)

- employer and employee responsibilities as related to personal protective equipment
- standards: Canadian Standards Association (CSA), American National Standards Institute (ANSI), and guidelines
- work protective clothing and danger if it fits poorly
- gloves—importance of proper glove selection (when handling chemicals, cold items, slivers, etc.)
- headwear—appropriate protective headwear when required and the approved type of headwear
- eye protection—comparison and distinction of everyday eyeglasses, industrial safety glasses, and safety goggles
- foot protection—when required according to safety standards
- hearing protection
  - hazards of various noise levels (hearing protection must be worn)
  - laws
  - types of hearing protection
- respiratory protection—types, overview of proper selection
- fall protection—Manitoba requirements, standards, guidelines
  - ANSI (U.S.A. standards), etc.
- ladders and scaffolding
- safety principles for working with or around industrial trucks site-specific (forklifts, pallet trucks, etc.)

SLO 12C.1.1.7 Identify electrical safety. (A2.3)

- effects of electric current on the human body
- three factors that affect the severity of an electric shock
- the effects of arc and blast on the human body and equipment
- work with energized equipment

SLO 12C.1.1.8 Identify fire safety. (A2.4)

- types of fires
- types of firefighting equipment
- classifications of fire extinguishers (A, B, and C)
- location of fire extinguishers and fire exits
- fire alarms and drills

SLO 12C.1.1.9 Identify ergonomics. (A2.5)

- definition of ergonomics and conditions that may affect the body
  - working postures
  - repetition
  - force
  - lifting (simple safety procedures and precautions related to material handling procedures on how to lift, carry, and put down a load)
  - tools
  - identify tool and safety equipment
  - causes of hand tool accidents
  - equipment

SLO 12C.1.1.10 Hazard recognition and control. (A2.6)

- safe work practices
- basic risk assessment
- injury prevention and control measures
- identification of hazards involved in pneumatic tool use and explanation of how to guard against them

SLO 12C.1.1.11 Hazard of confined space entry. (A2.7)

- identification of a confined space
- hazards of a confined space
  - physical
  - biological
- working in a confined space

- emergency response plan
- self-contained breathing apparatus (SCBA)

SLO 12C.1.1.12 Identify First Aid/CPR. (A2.8)

- overview of First Aid Regulation
- obligations of employers regarding First Aid
  - Who is certified to provide First Aid?
  - What to do while waiting for help?
  - Where is First Aid kit?
- describe basic First Aid requirements and techniques
  - scope and limits of First Aid intervention
  - specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
  - What is it?
  - interface with other services and agencies (e.g., Workers Compensation claims)
- describe basic Cardiopulmonary Resuscitation (CPR) requirements and techniques
  - How do you get certified?
  - scope and limits of CPR intervention (include varieties of CPR certification)

SLO 12C.1.1.13 Identify the safety requirements as they apply to WHMIS with emphasis on (A2.9)

- WHMIS is a system
- provincial regulation under *The Workplace Safety and Health Act*
  - each province has a WHMIS regulation
- federal *Hazardous Products Act*
- WHMIS generic training:
  - WHMIS defined and the format used to convey information about hazardous materials in the workplace
  - information found on supplier and workplace labelling using WHMIS
  - hazardous materials in accordance with WHMIS
  - compliance with government safety standards and regulations

- description of WHMIS (include varieties of WHMIS certification)
  - typology of WHMIS labels, symbols, and classifications
  - scope and use of Materials Safety Data Sheets (MSDS)

SLO 12C.1.1.14 Identifying and controlling hazards. (A2.10)

- basic control measures (injury prevention)
- safe work procedures
- explanation on the importance of industrial housekeeping
- employer responsibilities
- how and where to store materials
- safety measures related to walkways, stairs, and floor openings
- explanation of how to protect the worker and others when working in traffic paths

GLO 1.2: Demonstrate knowledge of the *Trade Safety Awareness Curriculum for Level 1 Apprentices*.

No applicable SLOs.

Goal 2: Identify, select, use, and maintain **tools, equipment, materials, and consumables**.

GLO 2.1: Identify, select, use, and maintain **tools, equipment, materials, and consumables**.

SLO 12C.2.1.1 Identify, select, use, and maintain tools, equipment, materials, and consumables used for working with electrical fundamentals, computers, and diagnostic equipment.

Goal 3: **Maintain, diagnose, and repair** HDE systems.

GLO 3.1: Perform **maintenance** on HDE systems.

SLO 12C.3.1.1 Demonstrate an understanding of electrical systems.

SLO 12C.3.1.2 Demonstrate the ability to perform maintenance on electrical systems.

GLO 3.2: Diagnose issues with HDE systems.

A6 Electrical Fundamentals (70 hours)

SLO 12C.3.2.1 Define terminology associated with electrical systems. (A6.1)

- electricity, electronics, and magnetism
- batteries
- lighting circuits, wiring harnesses, gauges, and accessories

SLO 12C.3.2.2 Identify hazards and describe safe work practices pertaining to electrical systems. (A6.2)

- electricity, electronics, and magnetism
- batteries
- lighting circuits, wiring harnesses, gauges, and accessories

SLO 12C.3.2.3 Identify and describe tools and equipment used to service and repair electrical systems. (A6.3)

- laptop
- scanners
- multimeters/amp clamps
- battery load testers

SLO 12C.3.2.4 Explain and apply the principles of electrical systems and electricity. (A6.4)

- magnetism
- Ohm's law
- voltage potential
- current flow
- resistance
- conductors
- insulators

SLO 12C.3.2.5 Identify conventional electrical system components. (A6.5)

- batteries
- lighting
- circuit protection
- relays, switches, and solenoids
- motors and actuators
- gauges

SLO 12C.3.2.6 Identify electronic system components. (A6.6)

- semi-conductors
- capacitors
- resistors

SLO 12C.3.2.7 Interpret schematics and symbols. (A6.7)

- conventional electrical systems
- electronic components

SLO 12C.3.2.8 Describe and maintain batteries. (A6.8)

- types of batteries
- testing and evaluating battery condition
  - specific gravity
  - load testing
  - capacitance
- charging and boosting procedures
- hook up procedures for 12V/24V

SLO 12C.3.2.9 Perform basic tests to service and repair electrical systems. (A6.9)

- charging and starting systems
- lighting circuits, wiring harnesses, gauges, and accessories

SLO 12C.3.2.10 Diagnose issues related to electrical fundamentals.

GLO 3.3: **Repair** HDE systems.

No applicable SLOs.

Goal 4: Describe and demonstrate the transferable **cross-curricular** knowledge and skills pertaining to HDE technology.

GLO 4.1: **Read, interpret, and communicate** information relevant to HDE technology.

SLO 12C.4.1.1 Read, interpret, and communicate information relevant to heavy duty equipment technicians' practices as they apply to electrical fundamentals, computers, and diagnostic equipment.

GLO 4.2: Apply knowledge and skills from **mathematics** to HDE technology.

SLO 12C.4.2.1 Apply knowledge and skills from mathematics to heavy duty equipment technicians' practices as they apply to electrical fundamentals, computers, and diagnostic equipment.

GLO 4.3: Apply knowledge and skills from the **sciences** to HDE technology.

SLO 12C.4.3.1 Apply knowledge and skills from the sciences to heavy duty equipment technicians' practices as they apply to electrical fundamentals, computers, and diagnostic equipment.

GLO 4.4: Apply knowledge and skills from **information and communication technology** to HDE technology.

SLO 12C.4.4.1 Apply knowledge and skills from information and communication technology relevant to heavy duty equipment technicians' practices as they apply to electrical fundamentals, computers, and diagnostic equipment.

Goal 5: Demonstrate an awareness of **sustainability** as it pertains to HDE technology.

GLO 5.1: Describe the HDE industry's **sustainability practices** and its impact on the environment.

SLO 12C.5.1.1 Describe the HDE industry's sustainability practices with regard to electrical fundamentals, computers, and diagnostic equipment, and their impact on the environment.

GLO 5.2: Describe the impact of the HDE industry on **human health and well-being**.

SLO 12C.5.2.1 Describe the HDE industry's sustainability practices with regard to electrical fundamentals, computers, and diagnostic equipment, and their impact on human health and well-being.

GLO 5.3: Describe **sustainable business practices** within the HDE service and repair industry.

SLO 12C.5.3.1 Describe sustainable business practices within the HDE service and repair industry as they apply to electrical fundamentals, computers, and diagnostic equipment.

Goal 6: Demonstrate an awareness of **ethics** and **legal standards** as they pertain to the HDE industry.

GLO 6.1: Demonstrate an awareness of **ethics** as they pertain to the HDE industry.

SLO 12C.6.1.1 Demonstrate an awareness of some of the ethical issues in the HDE industry.

GLO 6.2: Demonstrate an awareness of **legal standards** as they pertain to the HDE industry.

SLO 12C.6.2.1 Demonstrate an awareness of some of the legal issues associated with operating an HDE service facility.

Goal 7: Demonstrate **employability skills** related to the HDE industry.

GLO 7.1: Demonstrate fundamental **employability skills**.

SLO 12C.7.1.1 Demonstrate regular attendance and punctuality.

SLO 12C.7.1.2 Demonstrate accountability by taking responsibility for own actions.

SLO 12C.7.1.3 Demonstrate adaptability, initiative, and effort.

SLO 12C.7.1.4 Demonstrate the ability to accept and follow direction and feedback.

SLO 12C.7.1.5 Demonstrate teamwork skills.

SLO 12C.7.1.6 Demonstrate the ability to stay on task and to make effective use of time in class and shop environments.

SLO 12C.7.1.7 Describe the importance of effective communication. (A4.1)

- customers
- co-workers
- related professionals
- journeyperson/apprentice

SLO 12C.7.1.8 Describe and demonstrate the methods of professional communication. (A4.2)

- phone
- email
- instant messaging/texting
- fax
- other methods of communication

GLO 7.2: Demonstrate an understanding of the **business operation** of an HDE service and repair facility.

SLO 12C.7.2.1 Demonstrate an understanding of the business operation of an HDE service and repair facility with regard to computers.

GLO 7.3: Demonstrate the knowledge, skills, and attitudes required to **think critically** in order to **solve complex problems**.

No applicable SLOs.

GLO 7.4: Demonstrate an awareness of **cultural competence**, and its importance in the workplace.

SLO 12C.7.4.1 Demonstrate an awareness of the need for cultural competence in the HDE industry.

Goal 8: Demonstrate an understanding of the **scope** of the HDET trades (along with associated occupations), including **working conditions**, and **training** and **career opportunities**.

GLO 8.1: Demonstrate an understanding of the **scope** of the HDET trades and associated occupations, including **working conditions**.

No applicable SLOs.

GLO 8.2: Demonstrate an understanding of **career** and **training opportunities** in HDE technology and associated professions.

SLO 12C.8.2.1 Demonstrate an awareness of training and career opportunities related to servicing electrical fundamentals, computers, and diagnostic equipment.

Goal 9: Demonstrate an awareness of the **evolution** of HDE technology, including its **technological progression and emerging trends**.

GLO 9.1: Describe the evolution of HDE service and repair, including its **technological progression and emerging trends**.

SLO 12C.9.1.1	Describe the evolution of HDE service and repair, including its technological progression and emerging trends, as related to electrical fundamentals, computers, and diagnostic equipment.