8676
Welding Processes and Fuels (11C)

30S/30E/30M

A Heavy Duty Equipment Technician Course

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Course Description

Students will develop skills in oxyacetylene welding and cutting and metallurgy. The student will also be able to diagnose and repair a variety of fuel-related problems, and demonstrate familiarity with alternate fuels.

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 11C.1.1.1	Demonstrate the ability to describe and apply appropriate health and safety practices.
SLO 11C.1.1.2	Demonstrate the ability to create and maintain a safe and organized working environment.
SLO 11C.1.1.3	Demonstrate an understanding of hazards associated with electric drive vehicles.
SLO 11C.1.1.4	Demonstrate an understanding of safety procedures associated with electric drive vehicles.
SLO 11C.1.1.5	Apply safety procedures associated with hydraulic hydrostatic system servicing.
SLO 11C.1.1.6	Apply safety procedures associated with HVAC system servicing.

A2 Trade Safety Awareness (7 hours)

SLO 11C.1.1.7 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 11C.1.1.8 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 11C.1.1.9 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 11C.1.1.10 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 11C.1.1.11 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 11C.1.1.12 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 11C.1.1.13 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 11C.1.1.14 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 11C.1.1.15 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 11C.1.1.16 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

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 11C.2.1.1 Demonstrate the knowledge and skills required to identify, select, use, and maintain tools, equipment, materials, and consumables used in welding.

SLO 11C.2.1.2 Demonstrate an understanding of the various fuels used in HDE technology.

SLO 11C.2.1.3 Demonstrate an awareness of alternate fuels (e.g., biodiesel, hydrogen, ethanol) used in HDE technology.

SLO 11C.2.1.4 Demonstrate an understanding of the use of electrical drive systems found in HDE technology.

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

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

No applicable SLOs.

GLO 3.2: Diagnose issues with HDE systems.

SLO 11C.3.2.1 Demonstrate an understanding of fuel injection systems.

SLO 11C.3.2.2 Demonstrate the knowledge and skills required to diagnose issues related to the use of inappropriate fuels.

SLO 11C.3.2.3 Demonstrate the knowledge and skills required to diagnose problems with welds.

SLO 11.C.3.2.4 Demonstrate the knowledge and skills required to diagnose problems with welding equipment.

A12 Welding I (28 hours)

SLO 11C.3.2.5 Define terminology associated with cutting, heating, and welding. (A12.1)

- oxyacetylene
- metallurgy

SLO 11C.3.2.6 Identify hazards and describe safe work practices pertaining to cutting, heating, and welding. (A12.2)

- personal
- shop/facility
  - awareness of surroundings
- equipment/vehicle
- ventilation
- oxyacetylene equipment

SLO 11C.3.2.7 Identify and describe the types of oxyacetylene cutting, heating, and welding equipment. (A12.3)

SLO 11C.3.2.8 Explain and demonstrate the principles of operation of oxyacetylene cutting, heating, and welding equipment. (A12.4)

SLO 11C.3.2.9 Demonstrate and perform the following processes using oxyacetylene equipment. (A12.5)

- cutting
- heating
- welding and/or brazing

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 11C.4.1.1 Demonstrate the ability to read, interpret, and communicate information found on welding equipment, accessories, and supplies.

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

SLO 11C.4.2.1 Demonstrate the mathematical skills required for welding.

SLO 11C.4.2.2 Demonstrate proficiency in the use of fractions, decimals, ratios, and percentages, and in converting between different units of measure (i.e., metric and imperial [standard]).

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

SLO 11C.4.3.1 Demonstrate an understanding of metallurgy as it applies to welding.

SLO 11C.4.3.2 Demonstrate an awareness of alternate fuels (e.g., hydrogen, electric).

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

SLO 11A.4.4.1 Describe general organization and basic retrieval strategies for trade-related documents. (A4.5)

- service bulletins
- tech bulletins
- service manuals
- other publications
- online resources, including Learning Management Systems (LMSs)

SLO 11C.4.4.2 Demonstrate trade-related computer skills. (A4.6)

- basic computer skills
  - application programs
  - common computer commands
  - file management tasks (create and organize)
- Internet searching skills for trade-related research
  - search engines via Universal Resource Locator (URL) addresses
  - key word search
  - filtering results

SLO 11C.4.4.3 Demonstrate an awareness of shop management software (e.g., electronic work order software).

SLO 11C.4.4.4 Demonstrate an understanding of the use of electronic diagnostic tools.

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 11C.5.1.1 Demonstrate an awareness of the effects of fuel spillage on the environment.

SLO 11C.5.1.2 Demonstrate an awareness of the effects of fuel emissions on the environment.

SLO 11C.5.1.3 Demonstrate an awareness of the environmental advantages of using alternate fuels.

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

SLO 11C.5.2.1 Demonstrate an awareness of the long-term health hazards related to welding.

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

No applicable SLOs.

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 11C.6.1.1 Demonstrate the ability to reflect on own ethics for the purpose of evaluating and possibly adjusting them.

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

SLO 11C.6.2.1 Demonstrate an awareness of liability concerns that could be related to welding and fuels.

SLO 11C.6.2.2 Demonstrate an awareness of regulations related to welding and fuels.

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

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

SLO 11C.7.1.1 Demonstrate regular attendance and punctuality.

SLO 11C.7.1.2 Demonstrate the ability to take responsibility for own actions.

SLO 11C.7.1.3 Demonstrate adaptability, initiative, and effort.

SLO 11C.7.1.4 Demonstrate the ability to accept and follow direction and feedback.

SLO 11C.7.1.5 Demonstrate the ability to work as a member of a team.

SLO 11C.7.1.6 Demonstrate the ability to stay on task and to make effective use of time.

SLO 11C.7.1.7 Describe the importance of effective communication. (A4.1)

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

SLO 11C.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 11C.7.2.1 Demonstrate an awareness of the importance of documentation and service reporting.

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

SLO 11C.7.3.1 Demonstrate the ability to solve problems by focusing only on the facts, and not allowing any biases to interfere with that process.

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

SLO 11C.7.4.1 Demonstrate an awareness of some of the consequences, to self and to others, of being culturally competent.

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**.

SLO 11C.8.1.1 Demonstrate an awareness of the scope of the use of alternate fuels in HDET trades and associated occupations.

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

SLO 11C.8.2.1 Demonstrate an awareness of career and training opportunities related to servicing fuel systems.

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 11C.9.1.1 Discuss the evolution of heavy duty equipment, including the trend towards electric drive vehicles.