



8677
STANDARD TRANSMISSIONS,
DRIVELINES, TRANSFER
CASES, AND POWER
TAKEOFFS (12A)

40S/40E/40M

A Heavy Duty Equipment Technician Course

8677 STANDARD TRANSMISSIONS, DRIVELINES, TRANSFER CASES, AND POWER TAKEOFFS (12A) 40S/40E/40M

Course Description

Students will learn the basic principles of standard transmissions, drivelines, transfer cases, and power takeoffs. They will be able to service standard transmissions, drivelines, transfer cases, and power takeoffs, and 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 12A.1.1.1 Describe and apply appropriate health and safety practices.
- SLO 12A.1.1.2 Create and maintain a safe and organized working environment.
- SLO 12A.1.1.3 Apply safety procedures associated with hydraulic hydrostatic system servicing.
- SLO 12A.1.1.4 Apply safety procedures associated with HVAC system servicing.
- SLO 12A.1.1.5 Demonstrate an understanding of the safe use of HDET tools and equipment.

A2 Trade Safety Awareness (7 hours)

- SLO 12A.1.1.6 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 12A.1.1.7

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 12A.1.1.8 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 12A.1.1.9 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 12A.1.1.10 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 12A.1.1.11 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 12A.1.1.12 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 12A.1.1.13 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 12A.1.1.14 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 12A.1.1.15 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
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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 12A.2.1.1 Identify, select, use, and maintain tools, equipment, materials, and consumables used for working with standard transmissions, drivelines, transfer cases, and power takeoffs.
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Goal 3: Maintain, diagnose, and repair HDE systems.

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

- SLO 12A.3.1.1 Demonstrate an understanding of standard transmissions, drivelines, transfer cases, and power takeoffs.
- SLO 12A.3.1.2 Demonstrate the ability to perform maintenance on standard transmissions, drivelines, transfer cases, and power takeoffs.
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GLO 3.2: Diagnose issues with HDE systems.

SLO 12A.3.2.1 Diagnose issues related to standard transmissions, drivelines, transfer cases, and power takeoffs.

A8 Hoisting and Lifting (7 hours)

SLO 12A.3.2.2 Define terminology associated with hoisting and lifting. (A8.1)

SLO 12A.3.2.3 Describe towing, lifting, and hoisting equipment and their procedures. (A8.2)

- hoisting and lifting equipment, including their limitations
- safety practices, hand signals communications, and maintenance of hoisting and lifting equipment
- towing, transporting, and coasting precautions
- hoisting and lifting equipment construction, grading, sizing, and limits
- selection and inspection of correct equipment for rigging typical loads
- hoisting and lifting equipment including slings, ropes, and chains

A9 Basic Hydraulic Systems (21 hours)

SLO 12A.3.2.4 Define terminology associated with hydraulic/hydrostatic systems and system components. (A9.1)

SLO 12A.3.2.5 Identify hazards and describe safe work practices pertaining to hydraulic/hydrostatic systems. (A9.2)

- hydraulic system and hydraulic system components
- hydraulic fittings, piping, tubing, hoses
- reservoirs, coolers, and filters

SLO 12A.3.2.6 Identify and describe tools and equipment used to service and repair hydraulic/hydrostatic systems. (A9.3)

- hydraulic system and hydraulic system components
- hydraulic fittings, piping, tubing, hoses
- reservoirs, coolers, and filters

- SLO 12A.3.2.7 Explain the principles and theories of hydraulics/hydrostatics. (A9.4)
- Pascal's law
 - Bernoulli's principle
 - units of measure
 - formulae and their applications
- SLO 12A.3.2.8 Identify hydraulic/hydrostatic system components and interpret hydraulic/hydrostatic-related symbols. (A9.5)
- schematics
 - pumps
 - positive displacement
 - non-positive displacement
 - fixed displacement
 - variable displacement
 - charge pump
 - actuators
 - linear
 - rotary
 - valves
 - pressure
 - directional
 - flow control
 - reservoirs, coolers, and accumulators
 - fluids and filters
 - fittings, piping, tubing, and hoses
 - motors
- SLO 12A.3.2.9 Describe and demonstrate procedures used to inspect, diagnose, and maintain hydraulic/hydrostatic systems. (A9.6)
- hydraulic system and hydraulic system components
 - hydraulic fittings, piping, tubing, hoses
 - reservoirs, coolers, and filters
- SLO 12A.3.2.10 Describe and demonstrate servicing procedures for hydraulic/hydrostatic systems. (A9.7)
- hydraulic system and hydraulic system components
 - hydraulic fittings, piping, tubing, hoses
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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 12A.4.1.1 Read, interpret, and communicate information relevant to heavy duty equipment technicians' practices as they apply to transmission systems, drivelines, transfer cases, and power takeoffs.

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

SLO 12A.4.2.1 Apply knowledge and skills from mathematics to heavy duty equipment technicians' practices as they apply to transmission systems, drivelines, transfer cases, and power takeoffs.

SLO 12A.4.2.2 Demonstrate an understanding of gear ratios.

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

SLO 12A.4.3.1 Apply knowledge and skills from the sciences to heavy duty equipment technicians' practices as they apply to transmission systems, drivelines, transfer cases, and power takeoffs.

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

SLO 12A.4.4.1 Apply knowledge and skills from information and communication technology relevant to heavy duty equipment technicians' practices as they apply to transmission systems, drivelines, transfer cases, and power takeoffs.

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 12A.5.1.1 Describe the HDE industry's sustainability practices in the areas of standard transmissions, drivelines, transfer cases, and power takeoffs, and their impact on the environment.

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

SLO 12A.5.2.1 Describe the HDE industry's sustainability practices in the areas of standard transmissions, drivelines, transfer cases, and power takeoffs, and their impact on human health and well-being.

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

SLO 12A.5.3.1 Describe sustainable business practices within the HDE service and repair industry as they apply to standard transmissions, drivelines, transfer cases, and power takeoffs.

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 12A.6.1.1 Demonstrate an awareness of the need for ethics in the workplace.

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

No applicable SLOs.

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

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

- SLO 12A.7.1.1 Demonstrate regular attendance and punctuality.
- SLO 12A.7.1.2 Demonstrate accountability by taking responsibility for own actions.
- SLO 12A.7.1.3 Demonstrate adaptability, initiative, and effort.
- SLO 12A.7.1.4 Demonstrate the ability to accept and follow direction and feedback.
- SLO 12A.7.1.5 Demonstrate teamwork skills.
- SLO 12A.7.1.6 Demonstrate the ability to stay on task and to make effective use of time in class and shop environments.
- SLO 12A.7.1.7 Describe the importance of effective communication. (A4.1)
- customers
 - co-workers
 - related professionals
 - journeyperson/apprentice
- SLO 12A.7.1.8 Describe and demonstrate the methods of professional communication. (A4.2)
- phone
 - email
 - instant messaging/texting
 - fax
 - other methods of communication
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GLO 7.2: Demonstrate an understanding of the **business operation** of an HDE service and repair facility.

- SLO 12A.7.2.1 Demonstrate an understanding of the business operation of an HDE service and repair facility with regard to standard transmissions, drivelines, transfer cases, and power takeoffs.
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GLO 7.3: Demonstrate the knowledge, skills, and attitudes required to **think critically** in order to **solve complex problems**.

- SLO 12A.7.3.1 Demonstrate an awareness of some of the types of complex problems in HDE technology that require critical thinking (e.g., diagnosing complex issues).
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GLO 7.4: Demonstrate an awareness of **cultural competence**, and its importance in the workplace.

SLO 12A.7.4.1 Demonstrate an awareness of workplace culture.

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 12A.8.2.1 Demonstrate an awareness of training and career opportunities related to servicing transmissions, drivelines, transfer cases, and power takeoffs.

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 12A.9.1.1 Describe the evolution of HDE service and repair, including its technological progression and emerging trends, as related to transmissions, drivelines, transfer cases, and power takeoffs.
