

Heavy Duty Equipment Technician Level 4

Heavy Duty Equipment Technician

Unit: D1 Journeyperson Trainer

Level: Four

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

Level 1 in-school technical training offers an entry-level orientation to the challenges of apprenticeship training as it relates to the development of core tasks and skill requirements, as well as social competencies. This unit introduces senior apprentices to the responsibilities of workplace training that they will assume as supervising journeypersons. Most trades have a rich tradition of refreshing and sharing their trade skills from one generation of trade practitioner to the next. This unit orients senior apprentices to some of the practical and conceptual tools that can enable them to contribute to this trade heritage when they become certified journeypersons and, ultimately, journeyperson trainers.

The journeyperson's obligation to assist entry-level apprentices to develop skills and knowledge is complex and challenging. It involves safety considerations, employer expectations, provincial regulations, as well as the tradition of skills stewardship that links modern practice with the long history of workplace teaching and learning that defines the apprenticeable trades. The ability to offer timely and appropriate support to apprentices is itself an important area of trade learning. This unit presents material intended to help refine this ability through reflection and discussion by senior apprentices, and discussion with their in-school instructor and journeyperson trainer.

This content reflects Manitoba and Canadian standards prescribed for journeyperson-level supervisory capabilities, as well as key topics in current research on the importance of workplace training in apprenticeship systems. These detailed descriptors represent suggested focal points or guidelines for potentially worthwhile exploration, and are neither mandatory nor exhaustive.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Compare/contrast role-options and responsibilities of the supervising journeyperson.	50%
a. Implicit vs. explicit standards and content: training goals are/are not codified; assessment measures are/are not used	
b. Accountability for results: e.g. journeyperson is/is not required to prepare performance evaluation that could affect apprentice's employability or wage-rate, etc.	
c. Long-term vs. short-term supervision assignments – e.g., considerable latitude/little latitude for apprentice to learn from mistakes	
d. Formally vs. informally structured – e.g. supervision assignment is part of a prescribed cycle of assignments involving coordination among multiple journeypersons; apprentice is trained according to an individual training plan negotiated with employer	
e. Types of supervisory role options and what is implied by each:	
• Journeyperson Trainer (JT) role: often initiated by someone other than apprentice, and limited to a particular skill set, task, or production requirement	
• Mentor role: often initiated by apprentice, and relatively open-ended regarding content, duration, etc.	

- Peer role: typically involves individual upgrading or cross-training of one journeyperson by another; can include senior apprentice assisting less-experienced trade learner
- Coordinator role: often a senior-level journeyperson appointed by an organization to assume responsibilities for monitoring progression of groups of apprentices
- Other roles: may be improvised by journeyperson, such as combination or multiple roles of the above

2. Describe and demonstrate common requirements about providing journeyperson level supervision. 50%

- Apprenticeship learning adapted to journeyperson supervision assignments and a journeyperson perspective
 - Application of adult education concepts to trades teaching and learning (e.g. responsibilities and expectations of senior-level apprentices)
 - Practical significance of 'styles' of adult learning and teaching
 - Helping senior-level apprentices integrate in-school technical training and on-the-job practical training experiences
 - Providing help and guidance about new tasks and skills
 - Providing help and guidance about fixing mistakes
 - Learning and teaching "the ropes" – socialization of apprentice within a community of trade practice (e.g. how to borrow a tool, interrupt a journeyperson, and seek advice of experienced co-workers)
 - Coverage and documentation of prescribed tasks and subtasks where applicable.
 - Discuss the limits of the journeyperson trainers' own responsibilities and competence (e.g. scope, willingness to train, etc.)
 - Benefits of maintaining a personal record of achievements, ideas, and needs as a journeyperson trainer (e.g. resume, portfolio, training credentials, logbook, etc.)
- Individual reflection and guided group discussion about personal experiences of workplace learning as an apprentice
 - Identification of best and worst practices of journeyperson trainer
 - Identification of workplace and other factors that can contribute to good and bad trades teaching/learning experiences
 - Development of professional standards and work ethics about responsibility to share one's knowledge and skill with others in the workplace (e.g., use/misuse of humour, rigour, discretion, craft-pride, etc.)
 - Qualities of a good journeyperson trainer
 - Components of workplace journeyperson training
 - Processes and recommended practices re: journeyperson training
 - Troubleshooting problems re: supervision assignments
- Role of assessment in supervising, coaching, or guiding other people to learn or improve their skills (e.g. formative and summative evaluation), and how this might contribute to how the journeyperson-level supervision task is approached in future
- Compare and contrast discussion results with current knowledge and resources about workplace training methods as they apply to journeyperson-level supervision assignments
- Other (as may be specified by instructor)

Heavy Duty Equipment Technician

Unit: D2 Electronics II: Automated Machine Control

Level: Four

Duration: 56 hours

Theory: 21 hours

Practical: 35 hours

Overview:

This unit builds on Electronics I: Fundamentals and provides heavy duty equipment technician apprentices further knowledge about electronics and machine control systems. This unit covers operating principles of electronics and machine control systems, and their types and components. The unit also covers the tools and equipment and procedures to inspect, diagnose, maintain and service electronics and machine control systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with electronics and machine control systems.	10%
2. Identify hazards and describe safe work practices pertaining to electronics and machine control systems.	5%
3. Identify and describe tools and equipment used to service and repair electronics and machine control systems.	5%
4. Explain the operating principles of electronics and machine control systems.	20%
a. Controller Area Network (CANBUS)	
b. Global Positioning System (GPS)	
c. Site mapping and data logging	
d. Implement automation	
e. Autonomous/remote control operation	
5. Identify types of electronics and machine control systems and components.	15%
a. CANBUS and electronic control modules (ECMs)	
b. GPS/2-dimensional (2-D) and 3-dimensional (3-D) implement automation systems	
c. Electro-hydraulic valves and smart cylinders (related to machine control)	
6. Describe and demonstrate procedures used to inspect, diagnose and maintain electronics and machine control systems.	25%
a. Electronic service tool (EST) diagnostics and data logging	
b. Digital multimeter (DMM) diagnostics	
c. Physical inspection	
7. Describe and demonstrate servicing procedures for electronics and machine control systems.	20%

- a. ECM reprogramming and updates
- b. System calibration
- c. Electro-hydraulic valve setup for automatic machine control

Heavy Duty Equipment Technician

Unit: D3 Hydraulic Testing and Diagnostics

Level: Four

Duration: 28 hours

Theory: 7 hours

Practical: 21 hours

Overview:

This unit provides heavy duty equipment technician apprentices with knowledge about hydraulic system testing and diagnostics. This unit also covers procedures used to inspect, diagnose, maintain and service hydraulic systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with hydraulic system testing and diagnostics.	5%
2. Identify hazards and describe safe work practices pertaining to hydraulic system testing and diagnostics	5%
3. Identify and describe tools and equipment used to service and repair hydraulic system testing and diagnostics	5%
4. Describe and perform procedures used to inspect, diagnose and maintain hydraulic systems including: <ul style="list-style-type: none"> a. Pressure testing b. Flow testing c. Leakage testing d. Component inspection and failure analysis 	50%
5. Describe and perform servicing procedures for hydraulic systems: <ul style="list-style-type: none"> a. Pumps and motors <ul style="list-style-type: none"> • Removal and replacement • Adjustment • System flushing b. Filters, reservoir and cooler <ul style="list-style-type: none"> • Removal and replacement • System flushing c. Valves <ul style="list-style-type: none"> • Removal and replacement • Repair or resealing • Adjustment d. Hydraulic steering systems 	35%

- Component removal and replacement
 - Adjustment
 - System flushing
- e. Accumulators
- Check nitrogen charge (pneumatic accumulators only)
 - Recharging or replacement

Heavy Duty Equipment Technician

Unit: D4 Hydrostatic Testing and Diagnostics

Level: Four

Duration: 21 hours

Theory: 7 hours

Practical: 14 hours

Overview:

This unit provides heavy duty equipment technician apprentices with knowledge of hydrostatic drive system testing and diagnostics. This unit also covers procedures used to inspect, diagnose, maintain and service hydrostatic drive systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with hydrostatic drive system testing and diagnostics.	5%
2. Identify hazards and describe safe work practices pertaining to hydrostatic drive system testing and diagnostics.	5%
3. Identify and describe tools and equipment used to service and repair hydrostatic drive systems	5%
4. Describe and demonstrate procedures used to inspect, diagnose and maintain hydrostatic drive systems including:	50%
a. Pump, motor, and charge pump	
• Pressure testing	
• Flow testing	
• Leakage testing	
b. Filters, reservoir and cooler	
• Pressure testing	
• Flow testing	
c. Valves	
• Pressure testing	
• Flow testing	
5. Describe and demonstrate servicing procedures for hydrostatic drive systems including:	35%
a. Pump, motor, and charge pump	
• Removal and replacement	
• Adjustment	
• System flushing	
b. Filters, reservoir and cooler	

- Removal and replacement
- System flushing
- c. Valves
 - Removal and replacement
 - Adjustment

Heavy Duty Equipment Technician

Unit: D5 Cabs and Protective Structures

Level: Four

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

This unit provides heavy duty equipment technician apprentices with knowledge about cabs and protective structures. The unit begins by covering terminology and safe work practices for cabs and protective structures. The unit also covers the function and identification of cabs and protective structures. Finally, the unit covers the procedures used to inspect cabs and protective structures.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with cabs and protective structures.	15%
2. Identify hazards and describe safe work practices pertaining to cabs and protective structures.	20%
3. Explain the function of cabs and protective structures.	20%
a. Roll over protective structure (ROPS)	
b. Falling object protective structure (FOPS)	
c. Frame components	
d. Sound suppression systems (insulation and isolation devices)	
e. Suspension systems	
4. Identify cabs and protective structure components.	20%
a. ROPS	
b. FOPS	
c. Frame components	
5. Describe procedures used to inspect cabs and protective structures.	25%
a. ROPS and FOPS	
• Cracks and structural damage	
• Repair and replacement criteria	

Heavy Duty Equipment Technician

Unit: D6 Material Handling and Ground Engaging Tools

Level: Four

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

This unit provides heavy duty equipment technician apprentices with knowledge about material handling equipment. The unit begins by covering terminology and safe work practices for material handling equipment. The unit also covers the procedures used to service and repair material handling equipment.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with material handling equipment. a. Ground-engaging tools b. Grapples, buckets and blades c. Impact equipment and drills	25%
2. Identify hazards and describe safe work practices pertaining to material handling equipment.	10%
3. Describe material handling equipment components and their principles of operation. a. Ground-engaging tools b. Grapples, buckets and blades c. Impact equipment and drills	35%
4. Describe servicing, repair and installation procedures for material handling equipment and accessory systems. a. Material Handling equipment • Ground-engaging tools • Grapples, buckets and blades • Impact equipment and drills	30%

Heavy Duty Equipment Technician

Unit: D7 Pre-Interprovincial Review

Level: Four

Duration: 35 hours

Theory: 35 hours

Practical: 0 hours

Overview:

This unit offers senior apprentices a systematic review of skills and knowledge required to pass the Inter-Provincial Examination. It promotes a purposeful personal synthesis between on-the-job learning and the content of in-school technical training. The unit includes information about the significance of Interprovincial (Red Seal) certification and the features of the Interprovincial Examination. **Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit in its entirety.**

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
<p>1. Describe the significance, format and general content of Inter-Provincial (IP) Examinations for the trade of Heavy Duty Equipment Technician.</p> <p>a. Scope and aims of Interprovincial (Red Seal) certification; value of certifications</p> <p>b. Obligations of candidates for Interprovincial certification</p> <ul style="list-style-type: none"> • Relevance of Interprovincial Examinations to current, accepted trade practices; industry-based provincial and national validation of test items • Supplemental Policy (retesting) • Confidentiality of examination content <p>c. Multiple-choice format (four-option) item format, Red Seal standards for acceptable test items</p> <p>d. Government materials relevant to the Interprovincial Examinations for apprentice Heavy Duty Equipment Technicians</p> <ul style="list-style-type: none"> • National Occupational Analysis (NOA); prescribed scope of the skills and knowledge which comprise the trade • NOA "Pie-chart" and its relationship to content distribution of Interprovincial Examination items • Apprenticeship Manitoba Technical Training package. 	n/a
<p>2. Identify resources, strategies and other considerations for maximizing successful completion of written examinations.</p> <p>a. Personal preparedness</p> <ul style="list-style-type: none"> • Rest • Nutrition • Personal study regimen • Prior experience in test situations (e.g., Unit Tests) <p>c. Self-assessment, consultation and personal study plan</p> <ul style="list-style-type: none"> • Self-assessment of individual strengths/weaknesses in trade related skills and 	n/a

knowledge

- Approved textbooks
- Study groups

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| 3. Review program content regarding common occupational skills. | n/a |
| 4. Review program content regarding engines and engine support systems. | n/a |
| 5. Review program content regarding hydraulic, hydrostatic and pneumatic systems. | n/a |
| 6. Review program content regarding drivetrain systems. | n/a |
| 7. Review program content regarding steering, suspension, brake systems, wheel assemblies and undercarriage. | n/a |
| 8. Review program content regarding electrical and vehicle management systems. | n/a |
| 9. Review program content regarding environmental control systems. | n/a |
| 10. Review program content regarding structural components, accessories and attachments. | n/a |
