

Truck and Transport Mechanic Level 4

Truck and Transport Mechanic

Unit: A4 Pre-IP Review

Level: Four

Duration: 60 hours

Theory: 60 hours

Practical: 0 hours

Overview:

This unit offers senior apprentices a systematic review of skills and knowledge required to pass the Interprovincial 'Red Seal' 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 Red Seal Interprovincial certification and the features of the Interprovincial exam. *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:	Percent of Unit Mark (%)
<p>1. Describe the significance, format and general content of Interprovincial (Red Seal) Examinations for the trade of Truck and Transport Mechanic.</p> <ul style="list-style-type: none"> a. Scope and aims of Red Seal system; value of certifications b. Obligations of candidates for IP certification <ul style="list-style-type: none"> • Relevance of IP Examinations to current, accepted trade practices; industry-based national validation of test items • Supplemental Policy (retesting) • Confidentiality of examination content c. Multiple-choice format (four-option) item format, Red Seal/Apprenticeship Manitoba standards for acceptable test items d. Government materials relevant to the IP Examinations for apprentice Truck and Transport Mechanics <ul style="list-style-type: none"> • National Occupational Analysis (NOA); prescribed cope of the skills and knowledge which comprise the trade • NOA "Pie-chart" and its relationship to content distribution of IP Examination items • Manitoba Apprentice Portfolio, especially the NOA-based Practical Training Record Book and task/sub-task checklists as these relate to apprentice's coverage of the skills and knowledge of his/her trade 	n/a
<p>2. Identify resources, strategies and other considerations for maximizing successful completion of written exams.</p> <ul style="list-style-type: none"> a. Personal preparedness <ul style="list-style-type: none"> • Rest • Nutrition • Personal study regimen • Prior experience in test situations (e.g., Unit Tests) b. Self-assessment, consultation and personal study plan <ul style="list-style-type: none"> • Self-assessment of individual strengths/weaknesses in trade related skills and knowledge 	n/a

- Approved textbooks
- Study groups

3. Review program content of all technical training units (from Levels 1 to 4 inclusive) n/a

Truck and Transport Mechanic

Unit: G3 Trailer Fundamentals and Transport Refrigeration

Level: Four

Duration: 14 hours

Theory: 10 hours

Practical: 4 hours

Overview:

This unit of instruction will provide the Truck and Transport Mechanic apprentice with the knowledge and skills required to service and/or repair trailer body panels, closers, landing gears, and transport refrigeration systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe insulated trailer bodies fundamentals, operating principles, functions, construction, composition, types, styles and applications.	15%
a. Purpose and fundamentals	
• Frame types	
• Sub frame and full frame	
• Unibody / monocoque	
b. Functions, construction, composition, types, styles and applications	
• Cross members, upper and lower rail, roof, roof bows, swing and roll-up doors, vent doors, side panels, floors, headers, sills and posts, scuff liners, logistics posts, corner caps	
• Composites	
• Load security	
• Insulation material types	
• Moisture protection (sealant)	
• Cargo venting systems	
• Thermal barriers	
• Curtains	
c. Operating principles	
• Unitized / monocoque construction	
• Cross member	
• Upper and lower rail	
• Roof, roof bows	
• Swing and roll-up doors	
• Vent doors	
• Side panels	
• Floors	
• Headers	
• Sills and posts	

- Scuff liners
 - Logistics posts
 - Corner caps
 - Radius corners
 - Composites
 - Upper coupler assembly
 - Insulating materials
 - Heat loss factors
 - Ventilation
 - Thermal barriers
- d. Inspection, testing and diagnostic procedures
- Visual assessment: trailer body damage and repairs.
 - Refinishing methods
 - Washing
 - Degreasing
 - Abrasive blasting
 - Aluminum repair preparation procedure
 - Electrolytic / galvanic action
 - Preparation and priming
 - Paint touch-up
 - Damage
 - Structural
 - Non-structural
 - Floor types
 - Leak testing methods
 - Damage appraisal
 - Preventative maintenance inspections
 - Insulation efficiency testing
 - Upper coupler inspection
 - Identification of body materials
 - Seals and sealing devices

2. Describe the reconditioning or repair of insulated trailer bodies; describe the purpose and fundamentals of trailer refrigeration and cargo heating systems. 15%

- a. Reconditioning or repair of insulated trailer bodies
- Preventative maintenance practices
 - Upper coupler repairs
 - Structural
 - Non-structural
 - Roof, sidewall, rail splice and floor repairs / replacements
 - Material repair techniques
 - Welding repair techniques and precautions
 - Insulation selection and replacement
- b. Purpose and fundamentals of trailer refrigeration and cargo heating systems
- Thermodynamics
 - Electronics fundamentals
 - Legal requirements
 - Chlorine dioxide
 - Ozone depletion
 - Cargo heating systems

3. Describe trailer refrigeration and cargo heating system fundamentals, components, operation and maintenance procedures; inspect and test refrigeration systems. 70%

a. Components

- Compressor
- Condenser
- Thermostatic expansion valves
- Dryer
- Evaporator
- System controls
- Compressor drive
- Refrigerant types
- Recovery, recycling, evacuation and recharging equipment
- Refrigerant leak detection
- Cargo heating systems
- Layout and construction
- Electronic control

b. Operation

- Environmental considerations (O.D.S.)
- Refrigeration system operation
- Compressor
- Condenser
- Metering devices
- Drier
- Evaporator
- System controls
- Electronic controls
- Refrigerant types
- Reclamation systems
- Cargo heating systems
- Layout and construction
- Compressed gas safety and handling precautions
- Propane
- Natural gas
- Storage
- Refilling practices
- Diesel engine maintenance
 - Oil change
 - Oil filter change
 - Fuel filter change
 - Bleeding of fuel systems
 - Belt inspection replacement, adjustment

c. Refrigeration systems: inspection and testing

- Location: major components and controls
- Manifold gauge installation
- Refrigerant leak test
- System test: operating pressures and control functions
- Compressor pumpdown
- Compressor test
- Low side pump down
- Refrigerant valve operation test

- Refrigerant level check
 - Electrical systems
 - Electronic control
 - Trouble shooting
- d. Manufacturers' maintenance procedures
- Removal and replacement of compressors, evaporators, condensers, driers, thermostatic expansion valves and control devices
 - Recovery, recycling, evacuation and recharging procedures
 - Line and leakage repairs
 - ODS criteria

Truck and Transport Mechanic

Unit: H4 ABS System Fundamentals and Traction Control

Level: Four

Duration: 21 hours

Theory: 16 hours

Practical: 5 hours

Overview:

This unit of instruction is designed to provide the Truck and Transport Mechanic apprentice with a working understanding of ABS brake system components and operation. The unit will also provide the apprentice with the basic skills to repair ABS braking and traction control systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe ABS fundamentals, components and configurations.	40%
a. ABS fundamentals	
• Overall purpose, description and operation	
-Split-coefficient stops	
-ABS diagnosis process	
• ABS vs. EBS diagnostic process	
b. ABS components	
• Wheel and axle speed sensors	
• ABS module	
• Electronic Control Unit (ECU)	
-ABS control logic	
• Output circuit components	
-Modulator (Purpose; Location; Inputs/outputs; Service precautions; ATC indicator light)	
• Interconnecting wiring and connectors	
• Dash warning indicator light	
c. ABS configurations	
• Six-channel system	
• Six/four-channel system	
• Two-channel system	
2. Describe and diagnose ABS problem components and circuits; describe procedures to remove, repair or replace ABS components.	40%
a. Problem components and circuits	
• Failure warning relay	
-Purpose and location	
• Safety precautions	
• System self-diagnosis	

- LED indicators
- Fault/trouble codes and tables
 - Blink codes
- Diagnostic procedures
 - Self-diagnostics: overall operation
 - ESTs
- Test equipment
 - Types and uses
- b. Removal, repair or replacement procedures
 - Wheel sensors
 - Location
 - Types
 - Adjustments
 - Dash warning lights
 - Verification of proper operation

3. Describe automatic traction control systems and trailer ABS systems.

20%

- a. ATC system purpose, key components and operation
- b. Trailer ABS operating principles and key components

Truck and Transport Mechanic

Unit: 17 Electronic Controls Systems, Programming and Scan Tools

Level: Four

Duration: 45 hours

Theory: 25 hours

Practical: 20 hours

Overview:

This unit of instruction will provide the Truck and Transport Mechanic apprentice with the knowledge and skills to understand and diagnose electronic control systems. The unit also provides the apprentice with a working knowledge of scan tools and their role in the diagnostic process.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
<p>1. Describe computer control component concepts, the operation of electronic control systems; describe the interaction between inputs, processors and outputs that control a circuit system.</p> <p>a. Computer controls and component concepts</p> <ul style="list-style-type: none">• Electronic control module• Electronic control system basics<ul style="list-style-type: none">-Voltage, voltage signals and charging system effects-Analog and digital signals-Encoding and decoding-Microprocessors-Memory types-Internal clock <p>b. Electronic control system operation</p> <ul style="list-style-type: none">• System functions• Inputs<ul style="list-style-type: none">-Sensors (reference voltage, voltage generating)-Reference voltage sensor• Controls• Outputs <p>c. Circuit system interaction: inputs, processors, and outputs</p> <ul style="list-style-type: none">• Antilock braking system• Automatic temperature controls• Autoshift transmission• Traction control	30%
<p>2. Describe school bus loading light systems.</p> <p>a. Overall concept</p> <p>b. 8-light warning system</p>	2%

- 3. Diagnose electronic control systems. 20%**
- a. System component failures
 - Role of control systems in diagnosis
 - b. Self testing features
 - Use of stored input and output values
 - Diagnostic trouble codes
 - On-board diagnostics
 - Off-board diagnostics
 - Scan tools
 - Datalink connectors
 - Datalink ports
 - Breakout connectors
 - c. High impedance meters
- 4. Describe the components and operation of motive power computers. 9%**
- a. Input circuits
 - Discrete inputs
 - Analogue inputs
 - 2-wire sensor systems
 - 3-wire sensor systems
 - b. Output circuits
 - High and low side circuit control
 - Pulse with modulation (PWM)
 - Current technologies' current-limiting protection vs. old tech burnout
 - Units with no self-protection
 - c. Sensing devices
 - Switches
 - Thermistors
 - Potentiometers
 - Pressure sensors
 - Permanent magnet (PM) generators
 - Hall effect switches
 - LED operated
 - Knock sensors
 - d. Feedback systems
 - Open vs. closed loop operation
 - Oxygen sensors
 - e. Adaptive learning
 - Purpose for adaptive strategies of computer systems
 - Short vs. long-term memories
 - Variation: counts or percentages
 - Conditions vs. commands
 - 115 integrator counts
 - 110% long-term fuel trim
 - f. Output systems
 - Solenoids: on-off and PWM
 - Relays
 - Stepper motors
 - Lights
 - Trouble codes and diagnostic information
- 5. Describe the relationship of safety to ECM programming. 9%**

- a. Construction and programmability of computers
 - Understanding OEM requirements: consequences for non-compliance
- b. Original PROMS and knock-sensor calibrators
- c. Programming of reprogrammable type before use

6. Describe scan tool fundamentals and how to use them.

30%

- a. Principles of digital computers
 - Analogue and digital signals
 - Digital computers
 - Analogue to digital converters
 - Data storage
- b. Overall purpose and concept of scan tools
 - Test circuitry for operation and defects
 - Identification of stored Diagnostic Trouble Codes (DTCs)
 - Clearing of DTCs
 - Performing output control tests
 - Solenoids on/off and PWM
 - Relays
 - Stepper motors
 - Lights
 - Trouble codes and diagnostic information retrieved
 - Reading of serial data
- c. Data Link Connectors (DLCs)
 - Location and purpose
- d. Scan tool usage
 - Monitoring of data streams
 - Access to freeze frame data
 - Obtaining stored DTCs
 - Clearance of stored DTCs
 - Bi-directional functions
 - "Snapshot" data recording
 - Road test with scanners and data recorders
- e. J139 technology
- f. Sensing devices
- g. Wiring diagrams
 - Power and ground wiring and connectors
 - Proper procedure for testing
- h. Logical approach to diagnosis
 - Verify complaint
 - Preliminary checks (visual, operational and other systems)
 - Diagnostic systems check
 - Service bulletins check
 - Check for DTCs
 - Use of symptoms diagnostic charts
 - Repair and operation check
- i. Diagnostic tools
 - Power and ground wiring and connectors
 - Shop manuals
 - Other print or electronic service information
 - Digital VOM
 - Various test lights
 - Pressure gauges

- Injector testers
 - Test connector sets (for weatherproof terminal circuits)
- j. Specific tests
- Precautions w/static electricity
 - Diagnostic system check
 - Computer feeds and grounds (voltage drops)
 - Scan tools: check of inputs
 - VOM and oscilloscopes to check inputs
 - Scan tool snapshot functions
 - Fuel injector balance and current tests
 - Fuel pump output
