

Truck and Transport Mechanic Level 3

Truck and Transport Mechanic

Unit: C1 HVAC and Environmental Controls II

Level: Three

Duration: 35 hours

Theory: 7 hours

Practical: 28 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about heating, ventilation and air conditioning (HVAC) systems when working with today's truck and transport equipment. The unit begins by covering terminology and safe work practices for HVAC systems. The unit then covers the tools and equipment used when servicing and repairing HVAC systems. Finally, the unit covers the procedures used to inspect, diagnose and maintain HVAC systems, and procedures for servicing them.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with heating, ventilation and air conditioning (HVAC) systems and system components.	10%
2. Identify hazards and describe safe work practices pertaining to HVAC systems.	10%
a. Air conditioning, including: <ul style="list-style-type: none">• Refrigerants• High pressure gas safety (nitrogen testing)	
b. Heating system	
c. Environmental licensing requirements	
3. Identify and describe tools and equipment used to service and repair HVAC systems.	15%
a. Air conditioning <ul style="list-style-type: none">• Recovery/recycle/recharge unit• Manifold gauge set• Leak testing equipment• Refrigerant identifier• Evacuation equipment	
b. Heating system <ul style="list-style-type: none">• Flushing equipment• Unit pressurizer (filling and bleeding)	
c. Ventilation system <ul style="list-style-type: none">• Cleaning equipment	
4. Explain the principles of operation of air conditioning systems.	20%
a. Refrigerant	

- Heat movement
- Refrigeration cycle
- b. Refrigeration
 - Expansion valve systems
 - Orifice tube systems
- c. Dehumidification

5. Identify HVAC system components and identify refrigerant types. 20%

- a. Air conditioning
 - Compressor types
 - Heat exchangers
 - Hoses and fittings
 - Valves
 - Controls and pressure switches
- b. Heating system
 - Heat exchangers
 - Hoses and fittings
 - Valves
 - Control types
- c. Ventilation system
 - Climate controls (automatic and manual)
 - Air flow control
 - Cab air filtration
 - Ducting

6. Describe and demonstrate procedures used to diagnose and repair HVAC systems. 25%

- a. Air conditioning systems
 - System performance testing
 - Recover
 - Recharge
 - Evacuate
 - Leak test
 - Component replacement
- b. Heating systems
 - System performance testing
 - Flushing
 - Filling
- c. Ventilation systems
 - System performance testing
 - Air flow
 - Cleaning and filter replacement

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Unit: C2 Inspections Procedures: Truck and Bus

Level: Three

Duration: 7 hours

Theory: 2 hours

Practical: 5 hours

Overview:

This unit of instruction is designed to help the Truck and Transport Mechanic apprentice learn and apply safety inspection procedures as they relate to truck transport and passenger bus vehicles.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Objectives and content of this unit have been developed by the Manitoba Public Insurance (MPI) Vehicle Standards and Inspections. Delivery of this program is provided by MPI's Vehicle Standards Inspections Instructors through a 1-day course. There is an out-of-pocket cost associated with this program, which is paid for by employers.	n/a

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Unit: C3 Diesel Fuel Systems

Level: Three

Duration: 56 hours

Theory: 28 hours

Practical: 28 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about diesel fuel systems when working with today's truck and transport equipment. The unit begins by covering terminology, safe work practices, and operating principles for diesel fuel systems. The unit then covers the tools and equipment used when servicing and repairing diesel fuel systems. Finally, the unit covers the procedures used to inspect, diagnose, maintain and service diesel fuel systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with diesel fuel systems.	10%
2. Identify hazards and describe safe work practices pertaining to diesel fuel systems.	10%
3. Identify and describe tools and equipment used to service and repair diesel fuel systems.	10%
4. Describe principles and perform procedures for mechanical fuel injection systems.	10%
a. Operating principles and components	
b. Diagnosis and repair	
• Pumps	
• Injectors	
5. Describe principles and perform procedures for electronically-controlled fuel injection systems.	30%
a. Operating principles and components	
b. Diagnosis and repair	
• Pumps	
• Injectors	
• Common rail	
6. Describe and perform the basic engine tune-up procedures.	30%
a. Valve setting and timing	
b. Injection timing	
c. Intake and exhaust performance	

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Unit: C4 Emission Control Systems

Level: Three

Duration: 35 hours

Theory: 14 hours

Practical: 21 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about emission control systems when working with today's truck and transport equipment. The unit begins by covering terminology, safe work practices, and operating principles for emission control systems. The unit then covers the tools and equipment used when servicing and repairing emission control systems. Finally, the unit covers the procedures used to inspect, diagnose, maintain and service emission control systems and their components.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with emission control systems.	20%
2. Identify hazards and describe safe work practices pertaining to emission control systems.	20%
3. Identify and describe tools and equipment used to service and repair emission control systems.	20%
4. Describe principles and perform procedures for emissions control systems.	40%
a. Operating principles and components	
• Tier levels	
b. Diagnosis and repair	
• Hydrocarbon and particulate matter control system components	
• NOx (oxides of nitrogen) control system components	

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Unit: C5 Engine Brakes and Retarders

Level: Three

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about engine brakes, retarders and tune-ups when working with today's truck and transport equipment. The unit begins by covering terminology and safe work practices for engine brakes, retarders tune-ups. The unit then covers procedures used to inspect, diagnose, maintain, and service engine brakes and retarders. Finally, the unit covers diesel engine tune-up procedures.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with engine brakes, retarders and tune-up procedures.	5%
2. Identify hazards and describe safe work practices pertaining to engine brakes, retarders and tune-up procedures.	5%
3. Identify specialty tools and equipment used to service and repair engine brakes, retarders and tune-up procedures, and describe their applications and procedures for use.	5%
4. Identify types of engine brakes and retarders, and describe their applications and operation.	20%
a. Compression brakes	
b. Exhaust brakes	
c. Hydraulic retarders	
d. Electric retarders	
5. Identify engine brake and retarder components and describe their purpose and operation.	20%
6. Describe and demonstrate procedures used to inspect, diagnose and maintain engine brakes and retarders.	25%
7. Describe and demonstrate servicing procedures for engine brakes and retarders.	20%

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Unit: C6 Twin Countershaft Transmissions

Level: Three

Duration: 35 hours

Theory: 7 hours

Practical: 28 hours

Overview:

This unit provides the apprentice knowledge about twin countershaft transmissions when working with today's truck and transport equipment. The unit also covers such topics as safe work practices, tools and equipment and the principles of operation of powertrain components, again with a focus on twin countershaft transmissions. Finally, the unit covers the procedures to inspect, diagnose and maintain powertrain components, and the related servicing procedures.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with powertrain components.	5%
a. Twin countershaft transmissions	
• Conventional manual shift	
• Electronic auto shift	
2. Identify hazards and describe safe work practices pertaining to powertrain components.	5%
a. Twin countershaft transmissions	
• Conventional manual shift	
• Electronic auto shift	
3. Identify and describe tools and equipment used to service and repair powertrain components.	5%
a. Twin countershaft transmissions	
• Component removal and installation equipment	
• Bearing and shaft removal and installation equipment	
• Electronic service tools	
4. Explain the principles of operation of powertrain components.	20%
a. Twin countershaft transmissions	
• Conventional manual shift	
• Electronic auto shift	
5. Identify powertrain components.	10%
a. Twin countershaft transmissions	
• Conventional manual shift	

- Electronic auto shift

6. Describe and perform procedures used to inspect, diagnose and maintain powertrain components. 15%

- a. Twin countershaft transmissions
- Fluid analysis
 - Failure analysis (gears/synchronizers/bearings)
 - Air shift mechanisms

7. Describe and perform servicing procedures for powertrain components. 40%

- a. Twin countershaft transmissions
- Component removal and installation
 - Component overhaul
 - Electronic control diagnostics
 - Air shift mechanisms

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Unit: C7 Drive Axles and Differentials

Level: Three

Duration: 35 hours

Theory: 7 hours

Practical: 28 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about drive axles and differentials when working with today's truck and transport equipment. The unit begins by covering terminology and safe work practices for drive axles and differentials. The unit then covers the tools and equipment used when servicing and repairing drive axles and differentials. Finally, the unit covers the procedures used to inspect, diagnose and maintain drive axles and differentials, and procedures for servicing them.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with drive axles and differentials.	5%
2. Identify hazards and describe safe work practices pertaining to drive axles and differentials.	5%
3. Identify and describe tools and equipment used to service and repair drive axles and differentials.	10%
a. Lifting and hoisting equipment	
b. Dial indicators	
c. Clearance/preload measurement tools	
4. Explain the principles of operation of drive axles and differentials.	15%
a. Drive axles	
• Semi-floating	
• Full floating	
b. Differentials	
• Open/locking/limited-slip	
• Reduction-type	
• Power divider	
5. Identify drive axles and differential components.	10%
a. Drive axles	
• Semi-floating	
• Full floating	
b. Differentials	
• Open/locking/limited-slip	

- Reduction-type
- Power divider

6. Describe and perform procedures used to inspect, diagnose and maintain drive axles and differentials. 15%

- a. Drive axles
 - Hub and bearing clearance
 - Failure analysis
- b. Differentials
 - Fluid analysis
 - Failure analysis

7. Describe and perform servicing procedures for drive axles and differentials. 40%

- a. Drive axles
 - Hub and bearing clearance
- b. Differentials
 - Component disassembly and overhaul
 - Crown and pinion adjustment

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Unit: C8 Automatic Transmissions

Level: Three

Duration: 35 hours

Theory: 7 hours

Practical: 28 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about automatic transmission systems when working with today's truck and transport equipment. The unit begins by covering terminology and safe work practices for automatic transmissions and torque converters. The unit then covers the tools and equipment used when servicing and repairing automatic transmission system components. Finally, the unit covers the procedures used to inspect, diagnose and maintain automatic transmission system components, and procedures for servicing them.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with automatic transmissions and torque converters.	5%
2. Identify hazards and describe safe work practices pertaining to automatic transmissions and torque converters.	5%
3. Identify and describe tools and equipment used to service and repair automatic transmissions and torque converters.	5%
4. Explain the principles of operation of automatic transmissions and torque converters.	15%
5. Identify automatic transmission system components.	15%
a. Automatic transmission components, including:	
• Clutches	
• Pistons	
• Valve body	
• Oil pump	
• Planetary gear system	
• Shift control systems	
b. Torque converter components, including:	
• Impeller	
• Turbine	
• Stators	
• Lock-up clutches	

6. **Describe and perform procedures used to inspect, diagnose and maintain automatic transmission system components.** 15%
- a. Automatic transmission
 - Fluid analysis
 - Failure analysis (gears/clutches/bearings)
 - b. Torque converter
 - Failure analysis (clutches/bearings)
 - Stall test
7. **Describe and perform servicing procedures for automatic transmission system components.** 40%
- a. Automatic transmission
 - Fluid and filter replacement
 - Component removal and installation
 - Component overhaul
 - Electronic control diagnostics
 - b. Torque converter
 - Component removal and installation
 - Component overhaul
