

# Truck and Transport Mechanic Level 2

## Truck and Transport Mechanic

**Unit:** B1 Welding II

**Level:** Two

**Duration:** 35 hours

Theory: 7 hours

Practical: 28 hours

### Overview:

This unit builds on Welding I and provides the apprentice with the knowledge about shielded metal arc welding (SMAW) when working with today's truck and transport equipment. The unit begins with terminology, hazards and safe work practices related to cutting, heating and welding. The unit also covers the types of welding and cutting equipment and their principles of operation. Finally, the unit provides for an opportunity to demonstrate and test the welds performed using SMAW equipment.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terminology associated with welding.</b>	<b>5%</b>
a. Metal inert gas (MIG)/shielded metal arc welding (SMAW).	
b. Stick welding/flux-cored arc welding (FCAW)	
<b>2. Identify hazards and describe safe work practices pertaining to SMAW and FCAW.</b>	<b>5%</b>
a. Personal	
b. Shop/facility	
c. Equipment/vehicle	
d. Ventilation	
e. SMAW equipment	
f. FCAW equipment	
<b>3. Describe the SMAW and FCAW processes and their applications in various environmental conditions.</b>	<b>5%</b>
<b>4. Identify SMAW and FCAW equipment, consumables and accessories and describe their applications and storage requirements.</b>	<b>5%</b>
a. Welding unit types	
b. Rod/wire selection	
c. Gas/flux types used	
d. Metal types used	
<b>5. Describe and perform the procedures used to set-up and adjust SMAW and FCAW equipment.</b>	<b>35%</b>
a. Surface preparation	
b. Amperage adjustment/wire feed speed	
c. Polarity	

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|---|------------|
| <b>6. Describe the procedures used to inspect and maintain SMAW and FCAW equipment.</b> | <b>5%</b>  |
| <b>7. Perform basic types of welds using SMAW and FCAW equipment.</b>                   | <b>35%</b> |
| <b>8. Describe weld defects, their causes and prevention.</b>                           | <b>5%</b>  |

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## Truck and Transport Mechanic

**Unit: B2 Vehicle Electrical Systems**

**Level:** Two

**Duration:** 63 hours

Theory: 14 hours

Practical: 49 hours

### Overview:

This unit builds on Electrical Fundamentals and provides the apprentice further knowledge on electrical systems, with a focus on the wiring harness and the charging and starting systems, when working with today's truck and transport equipment. The unit begins with terminology and safe work practices for electrical systems, then moves on to the principles of operation of starting and charging systems. Finally, the unit covers the procedures used to inspect, diagnose and service electrical systems, with a focus on the wiring harness and the charging and starting systems.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terminology associated with electrical systems.</b>	<b>5%</b>
a. Wiring harness	
• Lighting	
• Communication	
• Control circuits	
• Circuit protection	
b. Charging	
c. Starting	
<b>2. Identify hazards and describe safe work practices pertaining to electrical systems.</b>	<b>5%</b>
a. Wiring harness	
b. Charging	
c. Starting	
<b>3. Identify and describe tools and equipment used to service and repair electrical systems.</b>	<b>5%</b>
a. Wiring harness repair	
• Connectors	
• Test equipment	
b. Charging repair	
c. Starting repair	
<b>4. Explain the principles of operation of starting and charging systems.</b>	<b>15%</b>
<b>5. Identify electrical system components.</b>	<b>15%</b>

- a. Alternators, including:
    - Regulators
  - b. Starters, including:
    - Relays
    - Switches
    - Solenoids
  - c. Wiring harnesses
    - Wires
    - Connectors
    - Circuit protection
    - Power distribution
- 6. Interpret schematics and symbols. 15%**
- a. Starting system
  - b. Charging system
  - c. Wiring harness
- 7. Describe and perform procedures used to inspect, diagnose and maintain electrical systems. 20%**
- a. Wiring harness
    - Voltage drop test
    - Circuit integrity
  - b. Charging systems
    - Output test
    - Voltage drop test
    - Circuit integrity
  - c. Starting systems
    - Amperage draw test
    - Voltage drop test
    - Circuit integrity
- 8. Describe and perform servicing procedures for electrical systems. 20%**
- a. Wiring harness
    - Circuit integrity
    - Wire and connector repair
  - b. Charging systems
    - Circuit integrity
    - Alternator repair
  - c. Starting systems
    - Circuit integrity
    - Starter repair

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## Truck and Transport Mechanic

**Unit:** B3 Engines and Engine Support Systems

**Level:** Two

**Duration:** 70 hours

Theory: 21 hours

Practical: 49 hours

### Overview:

This unit is designed to provide the apprentice with the knowledge about engine principles when working with today's truck and transport equipment, including principles and theories of engine operation and classifications of engines. Finally, the unit covers major engine components and their purpose and operation.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terminology associated with engines and engine support systems, and their components.</b>	<b>10%</b>
a. Cooling	
b. Lubrication	
c. Diesel fuel supply systems	
d. Intake and exhaust	
e. Starting aids	
f. Base engine components	
• Cylinder block	
• Cylinder head	
• Valve train	
• Pistons and connecting rods	
• Crankshaft	
<b>2. Identify types and classifications of engines and describe their applications.</b>	<b>10%</b>
a. Diesel	
b. Gasoline	
c. Liquid-cooled	
c. Air-cooled	
<b>3. Identify hazards and describe safe work practices pertaining to engines and engine support systems.</b>	<b>10%</b>
<b>4. Identify and describe tools and equipment used to service and repair engines and engine support systems.</b>	<b>5%</b>
<b>5. Explain the operating principles of engine components and their support systems.</b>	<b>15%</b>
a. Engine support systems	

- Cooling (liquid-cooled, air-cooled)
  - Lubrication (fluids and filters, friction-type bearings)
  - Diesel fuel supply systems
  - Intake and exhaust (naturally-aspirated, forced induction)
  - Starting aids (ether starting systems, engine warming systems)
- b. Base engine components
- Cylinder block
  - Cylinder head
  - Valve train
  - Pistons and connecting rods
  - Crankshaft

**6. Describe and perform procedures used to diagnose and repair engines. 25%**

- a. Cooling
- Coolant testing
- b. Lubrication
- Oil sampling
- c. Diesel fuel supply systems
- d. Intake and exhaust
- e. Starting aids
- f. Measuring clearances and diameters
- Crankshaft
  - Camshaft
  - Piston and rings
  - Oil clearance
- g. Bore measurement
- h. Visual inspections
- Cracks and physical wear
  - Cavitation erosion
- i. Crack detection methods
- Magnetic
  - Penetrating dyes

**7. Describe and perform overhaul procedures for diesel engines. 25%**

- a. In-frame overhaul
- b. Complete overhaul
- c. Component reconditioning
- Cylinder block
  - Cylinder head and valves
  - Connecting rods
  - Crankshaft

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## Truck and Transport Mechanic

**Unit:** B4 Drivetrain Fundamentals

**Level:** Two

**Duration:** 56 hours

Theory: 14 hours

Practical: 42 hours

### Overview:

This unit is designed to provide the apprentice with the knowledge about drivetrains when working with today's truck and transport equipment. The unit also covers such topics as the safe work practices, tools and equipment and the principles of operation for drivetrains systems. Finally, the unit covers the procedures to inspect, diagnose and maintain drivetrain systems and components, and the related servicing procedures.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terminology associated with drivetrain components.</b>	<b>25%</b>
a. Single countershaft transmissions	
b. Power takeoffs (PTOs)	
• Engine-driven	
• Transmission-driven	
c. Transfer cases	
d. Drivelines	
e. Clutches	
• Wet	
• Dry	
<b>2. Identify hazards and describe safe work practices pertaining to drivetrain components.</b>	<b>10%</b>
a. Single countershaft transmissions	
b. Power takeoffs (PTOs)	
• Engine-driven	
• Transmission-driven	
c. Transfer cases	
d. Drivelines	
e. Clutches	
<b>3. Identify drivetrain components and their operation.</b>	<b>15%</b>
a. Single countershaft transmissions	
• Synchronizers	
• Collar clutches	
• Detents	
• Interlocks	



- Shifting mechanism
- Input/output/countershaft
- b. Power takeoffs (PTOs)
  - Shift mechanisms (manual, hydraulic and air)
  - Gear mechanisms
  - Output shafts (high speed, low speed)
- c. Transfer cases
  - Shift mechanisms (manual, hydraulic and air)
  - Gear mechanisms
  - Output shafts (high speed, low speed)
- d. Drivelines
  - Shafts and yokes
  - Universal joints
  - Support (hangar) bearings
- e. Clutches
  - Flywheel/pressure plate (push and pull)
  - Clutch disc
  - Bearings (release/pilot)

**4. Identify and describe tools and equipment used to service and repair drivetrain components. 10%**

- a. Component removal and installation equipment
- b. Bearing and shaft removal and installation equipment
- c. Dial indicator, angle and clearance measurement tools

**5. Describe and perform procedures used to diagnose and repair drivetrains. 40%**

- a. Single countershaft transmissions
  - Fluid analysis
  - Failure analysis (gears/synchronizers/bearings)
  - Component removal and installation
  - Component overhaul
- b. Power takeoffs (PTOs)
  - Component removal and installation
  - Component overhaul
- c. Transfer cases
  - Component removal and installation
  - Component overhaul
- d. Drivelines
  - Angle measurement
  - Phasing
  - Balance
  - Failure analysis
  - Component removal and installation
- e. Clutches
  - Adjustment
  - Failure analysis
  - Component removal and installation

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## Truck and Transport Mechanic

**Unit: B5 Electronics I: Fundamentals**

**Level:** Two

**Duration:** 35 hours

Theory: 7 hours

Practical: 28 hours

### Overview:

This unit is designed to provide the apprentice with the knowledge about electronics and spark ignition systems when working with today's truck and transport equipment. The unit begins with terminology, hazards and safe work practices. The unit also covers the principles of operation electronic systems. Finally, the unit provides for an opportunity to interpret schematics and symbols, and to demonstrate procedures used to inspect, diagnose and service electronic systems.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terminology associated with electronic and spark ignition systems.</b>	<b>5%</b>
a. Semi-conductors	
b. Sensors	
c. Control modules	
d. Communication	
<b>2. Identify hazards and describe safe work practices pertaining to electronic and spark ignition systems.</b>	<b>5%</b>
a. High voltage	
• Shock/electrocution	
• Capacitor discharge	
b. Static electricity	
• Semi-conductor damage	
c. Test equipment	
• Meter impedance	
• Insulation value	
d. Personal protective equipment (PPE)	
<b>3. Identify and describe tools and equipment used to service and repair electronic and spark ignition systems.</b>	<b>10%</b>
a. Semi-conductors	
• Digital volt-ohm meter (DVOM)	
b. Sensors	
• DVOM	
c. Control modules	
d. Communication	

- 4. Explain the principles of operation of electronic systems. 15%**
- a. Semi-conductors
    - Diodes
    - Transistors
    - Capacitors
    - Resistors
  - b. Sensors
    - Temperature
    - Pressure
    - Position
    - Speed
  - c. Control modules
    - Integrated circuits
  - d. Communication
    - Controller network
- 5. Identify electronic system components. 10%**
- a. Semi-conductors
    - Diodes
    - Transistors
    - Capacitors
    - Resistors
  - b. Sensors
    - Temperature
    - Pressure
    - Position
    - Speed
  - c. Control modules
    - Integrated circuits
  - d. Communication
    - Controller network
- 6. Identify the following spark ignition system components and describe their purpose and operation. 20%**
- a. Ignition coil
  - b. Distributor
  - c. Advanced mechanisms
    - Centrifugal
    - Vacuum
    - Electronic
  - d. Triggering devices
    - Breaker point
    - Magnetic pulse generator
    - Hall effect
    - Optical
    - Distributorless
  - e. Ignition module
  - f. Spark plugs

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|-----------|--|------------|
| <b>6.</b> | <b>Interpret schematics and symbols for electronic system components.</b>                                  | <b>15%</b> |
|           | a. Semi-conductors   |            |
|           | b. Sensors   |            |
| <br>      |  |            |
| <b>7.</b> | <b>Describe and perform procedures used to inspect and diagnose electronic and spark ignition systems.</b> | <b>10%</b> |
|           | a. Sensors   |            |
|           | • Input (reference voltage)  |            |
|           | • Signal output  |            |
| <br>      |  |            |
| <b>8.</b> | <b>Describe and perform servicing procedures for electronic and spark ignition systems.</b>                | <b>10%</b> |
|           | a. Sensors   |            |
|           | • Removal and replacement  |            |
|           | • Calibration and adjustment   |            |

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## Truck and Transport Mechanic

**Unit: B6 Steering and Suspension Systems I**

**Level:** Two

**Duration:** 14 hours

Theory: 7 hours

Practical: 7 hours

### Overview:

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

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with steering and suspension systems.	5%
2. Identify hazards and describe safe work practices pertaining to steering and suspension systems.	5%
3. Identify and describe tools and equipment used when servicing and repairing steering and suspension systems.	10%
4. Describe the operation of steering and suspension systems.	20%
5. Identify the following steering and suspension system components and describe their purpose and operation.	40%
a. Steering components	
• Columns	
• Steering linkage	
• Gear boxes	
• Hydraulic components	
b. Suspension components	
• Leaf springs	
• Air suspension	
• Solid block	
6. Describe and perform steering, frame and axle alignment procedures.	20%
a. Front axle	
b. Two axle	
c. Three axle	

d. Wheel and tire failure analysis

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## Truck and Transport Mechanic

**Unit:** B7 Alternate Fuels/Spark Ignition

**Level:** Two

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

### Overview:

This unit is designed to provide the apprentice with the knowledge about alternate fuels when working with today's truck and transport equipment. The unit begins by covering terminology and safe work practices for alternate fuels. The unit then covers the tools and equipment used when servicing and repairing alternate fuel systems. The unit focuses on the principles of operation of two main alternative fuel systems: propane fuel systems and gasoline fuel systems. Finally, the unit covers the procedures used to inspect, diagnose and maintain alternate fuel systems, and procedures for servicing them.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terminology associated with alternative fuel systems.</b>	<b>5%</b>
<b>2. Identify hazards and describe safe work practices pertaining to alternative fuel systems.</b>	<b>10%</b>
a. Propane and gasoline fuel safety	
• Fire hazards	
b. Hazardous emissions	
• Carbon monoxide	
<b>3. Identify and describe tools and equipment used to service and repair powertrains.</b>	<b>10%</b>
a. Propane fuel systems	
• Conventional propane fuel systems	
b. Gasoline fuel systems	
• Electronic fuel injection	
• Emission control systems	
<b>4. Explain the principles of operation of alternative fuel systems.</b>	<b>20%</b>
a. Propane fuel systems	
• Conventional propane fuel systems	
b. Gasoline fuel systems	
• Electronic fuel injection	
• Emission control systems	
<b>5. Identify alternative fuel system components.</b>	<b>15%</b>
a. Propane fuel systems	

- Conventional propane fuel systems
- b. Gasoline fuel systems
  - Electronic fuel injection
  - Emission control systems
  
- 6. Describe and demonstrate procedures used to inspect, diagnose and maintain alternative fuel systems. 20%**
  - a. Propane fuel systems
    - Emissions testing
    - Component inspection
  - b. Gasoline fuel systems
    - Fuel injection system tests
    - Emission control system tests
    - Electronic scan tool usage
  
- 7. Describe and demonstrate servicing procedures for alternative fuel systems. 20%**
  - a. Propane fuel systems
    - Mixture adjustment
    - Component repair or replacement
  - b. Gasoline fuel systems
    - Actuator service and cleaning (injectors, throttle body actuator, IAC, EGR)
    - EVAP system service
    - PCV system service

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