Appendix O

TRANSPORTATION, DISTRIBUTION AND LOGISTICS
YOUTH APPRENTICESHIP

AUTO TECHNICIAN PATHWAY
VEHICLE BASICS & GENERAL SERVICE (UNIT 7)

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

1. Obtain and apply basic vehicle and servicing knowledge

Performance Standard Condition

Competence will be demonstrated

- at the worksite
- in the classroom

Performance Standard Criteria

Performance will be successful when learners:

- Demonstrate vehicle systems knowledge based on current understanding
- Comply with personal safety practices concerning clothing, hand and power tool usage, proper ventilation of fumes and lifting and securing of vehicles
- Comply with environmental safety standards concerning handling, storage and disposal of hazardous materials and chemicals in accordance with local, state and federal regulations
- Identify approved service procedure prior to completing any work on a vehicle
- Perform all procedures according to manufacturer and regulatory requirements

Learning Objectives

- Identify and locate the most important parts of a vehicle
- Describe the purpose of the fundamental automotive systems
- Explain the interaction of automotive systems
- Identify commonly used automotive fasteners
- Explain common broken fastener removal techniques
- Describe basic automotive engine classifications
- Compare gasoline and diesel engines
- Contrast combustion chamber designs
- Discuss alternative engine types
- Compare two- and four-stroke cycle engines

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

2. Operate tools and equipment safely

Performance Standard Condition

Competence will be demonstrated

- at the worksite
- in the classroom

Performance Standard Criteria

Performance will be successful when learners:

- Operates only equipment that he/she is trained on
- Chooses correct tool or equipment for the task
- Verifies tool/equipment is available for use and in working order
- Verifies tool/equipment is current for preventative maintenance and/or calibration
- Verifies safety equipment and any Personal Protective Equipment (PPE) needed for tool/equipment use
- Operates tool/equipment safely with guarding devices if applicable in the manner required for the job task
- Monitors tool/equipment for safe operation while operating
- Follows procedures for clean up and shut down after use
- Performs any required preventative maintenance procedures
- Investigates and promptly reports abnormal tool/equipment conditions
- Properly shuts down and labels any tool/equipment that is not operating as expected, if applicable
- Follows Lock Out/Tag Out procedures as applicable
- Documents use and maintenance as required

Learning Objectives

- Describe how to properly & safely position a vehicle for different types of service
- Identify common automotive hand tools
- List the most commonly used power tools and equipment
- List commonly used measuring tools
- Describe the uses for power tools and equipment
- Explain the advantages of one type of tool over another
- Describe and demonstrate the safety requirements for each tool and equipment
- Discuss start up and shut down procedures for each tool/equipment you will operate
- Explain the purpose of preventative maintenance
- Describe emergency shutdown procedures for the tool/equipment you will operate
- Explain how to recognize and address malfunctions for the tool/equipment you will operate
- Describe how to recognize wear and tear on equipment components
- List the OSHA and other regulatory requirements as they apply to the equipment that you operate
- Describe proper techniques for lifting loads
- List the safeguards that apply to the equipment used in your facility for tools, automated machines, material handling equipment, and lifts

- List which tools and equipment require safety certification
- Explain Lock Out/Tag Out indications and procedures in your facility

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

3. Maintain work area

Performance Standard Condition

Competence will be demonstrated

- at the worksite
- in the classroom

Performance Standard Criteria

Performance will be successful when learners:

- Maintain shop manuals and/or electronic retrieval systems
- Organize tools
- Sweep work area
- Put shop equipment away
- Clean work area and work bench
- Dispose of old parts properly

Learning Objectives

- Describe the typical layout and sections of an auto shop
- Explain the importance of proper housekeeping in the shop
- List the types of accidents that can occur in an auto shop
- Explain how to prevent auto shop accidents
- Describe general safety rules for the auto shop

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

4. Process work order

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Verify customer complaint (concern)
- Obtain customer information, vehicle identifying information, customer concern, and related service history
- Document customer concern and complaint information on repair order
- Obtain customer signature(s) when required
- Handle complaints tactfully without insult or conflict
- Prepare vehicle for service with floor mat, steering wheel cover, etc.

Learning Objectives

- Define the purpose & use of the vehicle identification number (VIN), engine numbers, and date codes
- Identify references that are used to estimate vehicle repair charges
- Identify an auto repair business' internal & external customers
- Define customer service
- Describe how customer service affects a company's "bottom line"
- List strategies to maximize customer satisfaction
- List the steps to follow when handling complaints

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

5. Acquire parts

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Collect necessary information to determine part required
- Locate and interpret vehicle and component identification numbers such as make, model, year, VIN, vehicle certification labels, calibration decals
- Check part price
- Check part availability
- Obtain part
- Verify correct part upon receipt

Learning Objectives

- Explain how to use service manuals to locate component part information
- Identify sources available for replacement parts
- List requirements of replacement parts
- Explain the information needed to in order to obtain the correct replacement part
- Describe how parts are purchased & charged to the customer
- Compare and contrast new, used, rebuilt & remanufactured automotive parts
- Describe situations in which one type of part is desirable over new parts
- Define OEM and how this affects automotive servicing

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

6. Assist to diagnose vehicle problems

Performance Standard Condition

Competence will be demonstrated

- at the worksite
- while assisting a worksite professional

Performance Standard Criteria

Performance will be successful when learners:

- Consult with worksite professional to determine appropriate inspections and test(s) to perform based on customer concern
- Retrieve shop manuals and/or electronic retrieval systems
- Research applicable vehicle and service information, normal system operation specifications, vehicle service history, service precautions, and applicable technical service bulletins
- Assist worksite professional to complete diagnostic tests necessary to identify cause of customer concern

Learning Objectives

- Explain the 3 Cs (concern, cause, correction) of automotive service
- Describe the different types of service manuals
- Find and use the service manual index and contents sections
- Explain the different kinds of information and illustrations used in a service manual
- Describe the three basic types of troubleshooting charts found in service manuals
- Explain how to use computer-based service information

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

7. Check & adjust fluid levels

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Check & adjust engine oil level
- Check & adjust engine coolant level
- Check & adjust power steering fluid level
- Check & adjust brake fluid level
- Check & adjust transmission fluid
- Locate fluid leaks
- Inspect for general problems with hoses, belts, and other components
- After servicing, verify service and make adjustments as needed, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Determine fluid type requirements and identify fluids
- Explain the importance of vehicle maintenance
- Explain safe practices while working with vehicle fluids
- Describe the typical difference between a minor tune-up and a major tune-up
- List the basic steps for an engine tune-up
- Explain service operations commonly performed during a tune-up
- List the safety precautions that should be remembered during a tune-up

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency
8. Inspect & replace air filter

Performance Standard Condition
Competence will be demonstrated
- at the worksite

Performance Standard Criteria
Performance will be successful when learners:
- Obtain equipment & materials needed
- Review safety & service procedures
- Locate the air-filter housing
- Remove the screws or clamps that hold on the top of the housing
- Take out the old air filter
- Clean any dirt and debris from the housing with a clean rag
- Put the new air filter in
- Screw or clamp the lid of the air-filter housing back on
- After servicing, verify service and make adjustments as needed, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives
- Describe the function and main components of a vehicles heating and ventilation system
- Describe the construction and action of air filters
- Explain the importance of a clean air filter
- Summarize the operation and interaction of heating, ventilation, and air conditioning systems

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

9. Perform oil & filter change

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Position vehicle
- Locate the oil drain plug on the underside of the engine
- Place the oil drain pan under the plug
- Remove the plug
- Let the oil drain into the pan
- Wipe off the drain plug and the plug opening when the oil finishes draining
- Replace the drain plug gasket
- Reinstall and tighten the plug
- Locate the existing oil filter
- Position the oil pan underneath the filter to catch any remaining oil
- Unscrew the old oil filter
- Wipe the area where the filter mounts to the engine
- Lightly coat the rubber seal of the new filter with new oil
- Screw the new filter into place
- Remove the oil filler cap on top of the engine
- Place the funnel in the opening and pour in the new oil
- Replace the oil filler cap
- Run the engine for a minute, then check the dipstick
- Add more oil if necessary
- Check the area around the oil drain plug and the filter for oil leaks
- Tighten the plug or oil filter if you find leakage
- Wipe away excess oil
- Pour the used oil into a plastic container after the used oil cools
- Dispose the used oil properly
- After servicing, verify service and make adjustments as needed, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Explain why it is best to run the vehicle prior to changing oil
- Describe possible hazards associated with this procedure
- Identify different types of engine oils and their purposes
- Explain how to determine correct oil capacity
- Discuss the disposal procedures for engine oil
- List the basic parts of a lubrication system

- Summarize the operation of a lubrication system
- Describe the construction of lubrication system parts
- Compare different lubrication system designs
- Discuss safety procedures that should be followed when working with the lubrication system

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency
10. Replace fuel filter

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Disconnect the negative battery cable
- Locate the fuel filter
- Let the pressure out of the fuel system by gradually unscrewing the fuel tank fill cap
- Loosen and remove the clip near where the fuel line and filter meet
- Pull the fuel lines off of both ends of the filter
- Loosen the filter-retaining clamp
- Remove the fuel filter
- Replace it with the new filter
- Check to make sure the arrow on the fuel filter points toward the engine
- Tighten the filter-retaining clamp
- Put the fuel lines back on the filter
- Put the clip back on the fuel line and snap it into place
- Tighten the fuel tank cap
- Connect the negative battery cable
- Start vehicle and check for fuel leaks
- After servicing, verify service and make adjustments as needed, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Summarize how crude oil is converted into gasoline, diesel fuel, liquefied petroleum gas, and other products
- Describe properties of gasoline and diesel fuel
- Explain octane and octane ratings
- Describe normal and abnormal combustion of gasoline and diesel fuel
- Summarize the properties of alternative fuels
- Define the major parts of a fuel supply system
- Describe the operation of mechanical and electric fuel pumps
- Explain the tests used to diagnose problems with fuel pumps, fuel filters, and fuel lines
- State safety rules for working on fuel supply systems

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

11. Replace cabin filter

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Locate the air cabin filter housing
- Determine if the cabin filter needs to be changed
- Remove the filter housing retainer clips or screws
- Remove the filter
- Gently tap the filter
- If dust falls from the air cleaner it is filled to capacity and needs to be replaced
- Remove the main access cover
- Undo the cover fasteners to remove cover and side cover if needed
- Locate and undo retainer clip to remove air cabin filter
- Compare the filter size to the replacement filter
- Reassemble the filter housing with the new filter
- After servicing, verify service and make adjustments as needed, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe the common location for air cabin filters
- Compare common air filters to automobile air cabin filters
- List common reasons for clogged air filters
- Describe the importance of a clean air filter

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

12. Drain, recover, flush & refill cooling system

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Position vehicle
- Allow engine to cool
- Place large catch pan underneath radiator drain plug
- Remove radiator drain plug and collect all old coolant
- Remove radiator fill cap to expedite draining process
- Remove all coolant from your radiator reservoir
- Inspect drained coolant as it exits the system
- Dispose of the coolant as required
- Replace the radiator drain plug
- Fill system with water to dilute remaining antifreeze in the engine block
- Replace radiator fill cap and run the engine allowing it to reach operating temperature
- Run engine for few minutes after engine's cooling fan turns on
- Shut off and cool engine
- Repeat draining process; collect and dispose of all waste coolant
- Replace radiator drain plug and refill the cooling system with distilled water only
- Once the cooling system has been completely filled, start the engine to allow the water to circulate
- Remove the radiator drain plug
- As the engine runs, pour fresh distilled water into the radiator fill hole at the same rate that it exits the system
- Continue until water being drained from the radiator appears to be clear and free of debris
- Stop engine and allow all remaining water to drain out
- Replace radiator drain plug
- Mix distilled water and coolant in recommended ratio
- Funnel fresh coolant into radiator fill hole
- Fill radiator at recommended rate until coolant reaches bottom of fill neck
- Fill the radiator reservoir to the full mark
- With the radiator fill cap still off, start the car and allow it to idle
- Continue to add coolant as air escapes the engine and cooling system
- Bleed air from cooling system as needed
- Once unable to fill the radiator any further, replace radiator fill cap and stop the engine
- After servicing, verify service and make adjustments as needed, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- List common cooling system problems and their symptoms
- Describe the most common causes of system leakage, overheating, and overcooling
- Describe safe working practices to use when testing, maintaining, or repairing a cooling system
- Explain the importance of antifreeze
- Discuss the hazards & dangers of ethylene glycol in antifreeze coolant
- Explain the required disposal methods for all stages of drain material
- Discuss the importance of cooling the engine first
- Explain what debris in drained coolant means
- Discuss why 2 cycles of water are used for draining
- Explain the purpose of the distilled water

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

13. Lubricate suspension & steering systems

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Position vehicle for service
- Determine the type of lubricant recommended
- Inspect all steering & suspension joint grease seals
- Replace any torn or missing seals
- Wipe grease from each grease fitting
- Install plugs are used, install temporary fittings
- Apply grease to each fitting until grease begins to flow out of the bleed area or until the seal swells
- Apply a heavy film of grease to the steering stops on the steering knuckle and control arms
- Wipe excessive grease from all joints & reinstall plugs
- Lower vehicle
- After servicing, verify service and make adjustments as needed, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Summarize the operation of a lubrication system
- Describe the construction of lubrication system parts
- Compare different lubrication system designs
- Explain the characteristics and ratings of engine oil
- Discuss safety procedures that should be followed when working with the lubrication system
- Locate the areas of typical joint grease seals
- Describe the safe & proper operation of a grease gun
- Compare & contrast different types of grease used for lubrication

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

14. Rotate tires

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Verify tire rotation recommended by the manufacturer
- Secure vehicle on even surface
- Safely jack or hoist the vehicle up
- Remove right rear tire
- Inspect tires for wear with each tire removal
- Inspect brake pads for wear with each tire removal
- Place tire to the left front of the vehicle
- Remove left front tire and place to the right rear of the vehicle
- Re-install the tire from right rear to the left front
- Re-install the left front tire on the right rear
- Remove left rear tire and place tire to the right front of the vehicle
- Remove right front tire and place tire to the left rear
- Re-install tires
- Adjust tire pressure
- After servicing, verify service and make adjustments as needed, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Explain the purpose of tire rotation
- Identify the recommended frequency of tire rotation
- Discuss how tire rotation depends on tire wear
- List specific hazards associated with changing tires
- List common tire, wheel, and wheel bearing problems
- Describe tire inflation and rotation procedures
- Measure tire and wheel runout

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

15. Inspect, replace, adjust drive belts, tensioners, & pulleys

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety &service procedures
- Locate your vehicle drive belts
- Inspect the belts by turning them sideways and looking for cracks, glazing or visible signs of fraying
- Replace the belts by loosening the mounting and retaining bolts or nuts on the accessory that it drives
- Pry the accessory towards the belt, allowing the belt to loosen enough to come off the pulley
- Remove the belt from the crankshaft pulley
- Install the new belt by positioning it on the crankshaft pulley and then slipping it over the pulley of the accessory
- Pry the accessory from the belt to tighten the slack
- Adjust the belt tension so that there is no more than 1/2" deflection, up or down
- Reinstall any other belts you removed and adjust them
- Start the engine and turn on the accessory run by the belt that you just changed
- Check that the belt or belts that you removed are not slipping under the engine load
- If there is a slipping belt, turn off the engine, readjust the belt and check again
- After servicing, verify service and make adjustments as needed, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Describe the purpose of a vehicle's engine drive belts
- Discuss the composition of drive belts and common wear tear
- Locate common accessory drive belts and what they run
- Describe the issues with stretched belts
- Explain why belts should not be over-tightened

Comments:

Unit 7: Auto Technician Pathway
Vehicle Basics & General Service

Competency

16. Inspect, replace transmission fluid & filters

Performance Standard Condition

Competence will be demonstrated

- at the worksite

Performance Standard Criteria

Performance will be successful when learners:

- Obtain equipment & materials needed
- Review safety & service procedures
- Warm up car so transmission is at normal operating temperature
- Check transmission fluid
- Select the correct filter replacement
- prepare a large pan to catch the fluid
- Loosen each pan bolt a turn or two and loosen one corner more than rest. Drain mostly from this corner.
- Finish removing the pan and any gasket material from the pan or case.
- Inspect the pan's gasket surface for damage
- Remove the old filter.
- Install new filter; Use the clips or bolts from the old filter
- Inspect the drain pan for metal shavings
- Position gasket on pan
- Hand-tighten pan bolts
- tighten bolts to proper specifications
- refill the transmission pan to "refill capacity" per vehicle specification
- replace the fluid in the torque converter and oil cooler also
- Determine total system capacity per vehicle specification
- Disconnect the oil cooler line from the oil cooler
- With another tech, be prepared to add fluid to the fill area as it is being pumped out of the oil cooler line
- Start the engine, and as the old fluid is pumped out, add fresh fluid to the pan.
- When either the fluid color brightens or the total capacity has been replaced, shut the engine off and re-attach the oil cooler line.
- Recheck the fluid level
- With the vehicle on level ground, idle the engine idle for a few minutes & then shift the transmission into different positions before returning to "Park" or "Neutral"
- Check the fluid level again and check for leaks
- After servicing, verify service and make adjustments as needed, cleanup work area, return tools to proper location, complete appropriate documentation

Learning Objectives

- Identify the basic components of an automatic transmission
- Describe the function and operation of the major parts of an automatic transmission
- Trace the flow of power through an automatic transmission

- Explain how an automatic transmission shifts gears
- Compare the different types of automatic transmissions
- Compare normal versus abnormal color/odor of transmission fluid

Comments: