

**CONTENT STANDARD 1.0: IDENTIFY AND UTILIZE SAFETY PROCEDURES AND PROPER TOOLS**

**Performance Standard 1.1: Demonstrate General Lab Safety Rules and Procedures**

- 1.1.1 Describe general shop safety rules and procedures.
- 1.1.2 Utilize safe procedures for handling of tools and equipment.
- 1.1.3 Identify and use proper placement of floor jacks and jack standards.
- 1.1.4 Identify and use proper procedures for safe vehicle life operation.
- 1.1.5 Utilize proper ventilation procedures for working within the lab/shop area.
- 1.1.6 Identify marked safety areas.
- 1.1.7 Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.
- 1.1.8 Identify the location and use of eye wash stations.
- 1.1.9 Identify the location of the posted evacuation routes.  
Comply with the required use of safety glasses, ear protection, gloves and shoes during
- 1.1.10 lab/shop activities.
- 1.1.11 Identify and wear appropriate clothing for lab/shop activities.
- 1.1.12 Secure hair and jewelry for lab/shop activities.  
Identify safety aspects of supplemental restraint systems (SRS), electronic brake control
- 1.1.13 systems, and hybrid vehicle high voltage circuits.  
Identify safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps,
- 1.1.14 ignition systems, injection systems, etc.)
- 1.1.15 Locate and interpret safety data sheets (SDS).
- 1.1.16 Handle and dispose of hazardous waste and materials.
- 1.1.1 Describe general shop safety rules and procedures.

**Performance Standard 1.2: Identify and Utilize Proper Tools**

- 1.2.1 Identify tools and their usage in automotive applications.
- 1.2.2 Identify standard and metric designations and fasteners.
- 1.2.3 Demonstrate safe handling and use of appropriate tools.
- 1.2.4 Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
- 1.2.5 Demonstrate proper use of precision measuring tools (e.g., micrometer, dial-indicate, dial-caliper).

**CONTENT STANDARD 2.0: PERFORM BASIC VEHICLE SERVICE**

**Performance Standard 2.1: Identify and Utilize Vehicle Service Information**

- 2.1.1 Locate and utilize paper and/or electronic service information.
- 2.1.2 Locate and utilize Technical Service Bulletins (TSBs).
- 2.1.3 Demonstrate knowledge of special service messages, quotes, service campaigns/recalls,

vehicle/service warranty applications and service interval recommendations.

- 2.1.4 Locate Vehicle Identification Number (VIN) and production data code.
- 2.1.5 Analyze Vehicle Identification Number (VIN) information.
- 2.1.6 Identify other vehicle information labels (such as tire, emissions, etc.)

**Performance Standard 2.2: Prepare a Vehicle for the Customer**

- 2.2.1 Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)
- 2.2.2 Verify vehicle repair.

**CONTENT STANDARD 3.0: APPLY CONCEPTS OF ENGINE REPAIR (A1)**

**Performance Standard 3.1: Demonstrate General Engine Service Techniques**

- 3.1.1 Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 3.1.2 Verify operation of the instrument panel engine warning indicators.
- 3.1.3 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
- 3.1.4 Install engine covers using gaskets, seals and sealers as required.
- 3.1.5 Demonstrate knowledge of timing belt removal and replacement.
- 3.1.6 Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
- 3.1.7 Identify hybrid vehicle internal combustion engine service precautions.

**Performance Standard 3.2: Perform Cylinder Head and Valve Train Service and Repair**

- 3.2.1 Identify various cylinder head configurations (i.e., OHV, OHC, DOHC, VVT).
- 3.2.2 Demonstrate knowledge of valve adjustment (mechanic and hydraulic lifters).

**Performance Standard 3.3: Perform Lubrication and Cooling Systems Service and Repair**

- 3.3.1 Diagnose various cooling system faults including block test, thermostat operation, coolant restrictions, leaks, and fan operation.
- 3.3.2 Inspect, replace and adjust drive belts, tensioners, and pulleys, check pulley and belt alignment.
- 3.3.3 Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.
- 3.3.4 Perform oil and filter change.

**CONTENT STANDARD 4.0: ANALYZE AUTOMATIC TRANSMISSION/TRANSAXLE FOR SERVICE (A2)**

**Performance Standard: 4.1: Perform General Transmission/Transaxle Service**

- 4.1.1 Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.

- 4.1.2 Check fluid level in a transmission, or a transaxle equipped with a dip-stick.
- 4.1.3 Check fluid level in a transmission, or a transaxle not equipped with a dip-stick.
- 4.1.4 Check transmission fluid condition; check for leaks.

**Performance Standard 4.2: Perform In-Vehicle Transmission/Transaxle Service and Repair**

- 4.2.1 Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
- 4.2.2 Inspect for leakage at external seals, gaskets, and bushings.
- 4.2.3 Inspect powertrain mounts.
- 4.2.4 Drain and replace fluid and filter(s).

**CONTENT STANDARD 5.0: ANALYZE MANUAL DRIVETRAIN AND AXLES FOR SERVICE (A3)**

**Performance Standard 5.1: Perform General Drive Train Service**

- 5.1.1 Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.
- 5.1.2 Drain and refill manual transmission/transaxle and final drive unit.
- 5.1.3 Check fluid condition; check for leaks.

**Performance Standard 5.2: Investigate Clutch Systems for Service and Repair**

- 5.2.1 Check and adjust clutch master cylinder fluid level.
- 5.2.2 Check for system leaks.
- 5.2.3 Describe basic operation of a manual clutch system.

**Performance Standard 5.3: Perform Drive Shaft and Half Shaft, Universal and Constant Velocity (CV) Joint Service and Repair**

- 5.3.1 Diagnose, inspect, remove and replace front wheel drive (FWD) bearings, hubs, and seals.
- 5.3.2 Diagnose, inspect, service and replace shafts, yokes, boots, and universal/CV joints.

**Performance Standard 5.4: Assess Differential Case Assembly for Service**

- 5.4.1 Demonstrate knowledge of differential operation.
- 5.4.2 Clean and inspect differential housing; check for leaks; inspect housing vent.
- 5.4.3 Check and adjust differential housing fluid level + A71.
- 5.4.4 Drain and fill differential housing.

**Performance Standard 5.5: Perform Drive Axle Service and Repair**

- 5.5.1 Inspect and replace drive axle wheel studs.
- 5.6.1 Inspect front-wheel bearings and locking hubs.

**CONTENT STANDARD 6.0: PERFORM SUSPENSION AND STEERING SERVICE AND REPAIR (A4)**

**Performance Standard 6.1: Prepare Vehicle for General Suspension and Steering Systems Service**

- Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 6.1.1
  - 6.1.2 Disable and enable supplemental restraint system (SRS).

**Performance Standard 6.2: Perform Steering Systems Service and Repair**

- 6.2.1 Demonstrate knowledge of various power steering systems.
- 6.2.2 Identify and inspect various steering system components.
- 6.2.3 Demonstrate knowledge of various suspension systems.
- 6.2.4 Identify and inspect various suspension system components.
- 6.2.5 Inspect electric power-assisted steering.
- 6.2.6 Identify electronically controlled suspension systems and safety precautions.
- 6.2.7 Identify hybrid vehicle power steering system electrical circuits and safety precautions.

**Performance Standard 6.3: Investigate Wheel Alignment Conditions**

- 6.3.1 Demonstrate knowledge of alignment angles, including camber, caster, toe, and SAI.
- 6.3.2 Perform pre-alignment inspection and measure vehicle ride height, perform necessary action.

**Performance Standard 6.4: Perform Wheel and Tire Service and Repair**

- 6.4.1 Inspect tire condition; identify tire wear patterns; check for correct size and application (load and speed ratings) and adjust air pressure; determine necessary action.
- 6.4.2 Rotate tires according to manufacturer's recommendations.
- 6.4.3 Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).
- 6.4.4 Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
- 6.4.5 Inspect tire and wheel assembly for air loss; perform necessary action.
- 6.4.6 Repair tire according to industry standards.
- 6.4.7 Identify TPMS maintenance and relearn procedures.

**CONTENT STANDARD 7.0: ANALYZE BRAKE SYSTEMS FOR SERVICE AND REPAIR (A5)**

**Performance Standard 7.1: Prepare Vehicle for General Suspension and Steering Systems Service Demonstrate Knowledge of General Brake Systems**

- 7.1.1 Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 7.1.2 Describe procedure for performing a road test to check brake system operation, including the anti-lock brake system (ABS).
- 7.1.3 Demonstrate knowledge of basic hydraulic principles.

**Performance Standard 7.2: Perform Hydraulic System Service and Repair**

- 7.2.1 Measure brake pedal height, travel, and free play (as applicable); determine necessary action.
- 7.2.2 Check master cylinder for internal/external leaks and proper operation.
- 7.2.3 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks bulging, wear, loose fittings and support; determine necessary action.

- 7.2.4 Select, handle, store, and fill brake fluids to proper level.
- 7.2.5 Identify components of brake warning light system.
- 7.2.6 Bleed and/or flush brake system.
- 7.2.7 Test brake fluid for contamination.

**Performance Standard 7.3: Perform Drum Brake Service and Repair**

- 7.3.1 Remove, clean, inspect, and measure brake drum diameter; determine necessary action.
- 7.3.2 Refinish brake drum and measure final drum diameter; compare with specifications.  
Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
- 7.3.3 Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.  
Readjust brake shoes and parking brake; install brake drums or drum/hub assemblies, wheel bearings; make final checks and adjustments.
- 7.3.4 Install wheel and torque lug nuts to proper specifications.

**Performance Standard 7.4: Perform Disc Brake Service and Repair**

- 7.4.1 Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.
- 7.4.2 Clean, inspect and lubricate clipper mounting and slides/pins for proper operation wear, and damage; determine necessary action.
- 7.4.3 Remove, inspect and replace pads and retaining hardware; determine necessary action.
- 7.4.4 Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.
- 7.4.5 Clean and inspect rotor, measure rotor thickness, thickness variation, and lateral run out; determine necessary action.
- 7.4.6 Remove and reinstall rotor.
- 7.4.7 Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.
- 7.4.8 Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.
- 7.4.9 Retract and readjust caliper piston on an integral parking brake system.
- 7.4.10 Check brake pad wear indicator; determine necessary action.
- 7.4.11 Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.

**Performance Standard 7.5: Analyze Power Assist Units**

- 7.5.1 Check brake pedal free-travel with, and without, engine running to verify proper power booster operation.
- 7.5.2 Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
- 7.5.3 Identify alternative power assist units.

**Performance Standard 7.6: Perform Miscellaneous Service and Repair (wheel bearings, parking brakes, electrical, etc.)**

- 7.6.1 Remove, clean, inspect, repack, and install wheel bearings, races, seals; install hub and adjust bearings.
- 7.6.2 Check parking brake cables and components for wear, binding, and corrosion; clean,

lubricate, adjust or replace as needed.

- 7.6.3 Check parking brake operation and parking brake indicator light system operation; determine necessary action.
- 7.6.4 Check operation of brake stop light system.

## CONTENT STANDARD 8.0: ANALYZE ELECTRICAL/ELECTRONIC SYSTEM (A6)

### Performance Standard 8.1: Perform General Electronic Systems Service

- 8.1.1 Research applicable vehicle and service information vehicle service history, service precautions, and technical service bulletins.
- 8.1.2 Demonstrate knowledge of electrical/electronic series, parallel and series-parallel circuits using principles of electricity (Ohm's and Watt's Law).
- 8.1.3 Use and interpret wiring diagrams to trace electrical/electronic circuits.
- 8.1.4 Demonstrate proper use of digital millimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
- 8.1.5 Research the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
- 8.1.6 Check operations of electrical circuits with a test light.
- 8.1.7 Check operation of electrical circuits using fused jumper wires.
- 8.1.8 Measure key-off battery drain (parasitic draw).
- 8.1.9 Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
- 8.1.10 Perform solder repair of electrical wiring.
- 8.1.11 Replace electrical connectors and terminal ends.

### Performance Standard 8.2: Perform Battery Service

- 8.2.1 Perform battery state-of-charge test; determine necessary action.
- 8.2.2 Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.
- 8.2.3 Maintain or restore electronic memory functions.
- 8.2.4 Inspect and clean battery; fill battery cells, clean battery cables, connectors, clamps, and hold-downs.
- 8.2.5 Perform slow/fast battery charge according to manufacturer recommendations.
- 8.2.6 Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
- 8.2.7 Identify high voltage circuits of electric or hybrid electric vehicle and related safety precautions.
- 8.2.8 Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
- 8.2.1 Perform battery state-of-charge test; determine necessary action.
- 8.2.2 Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.
- 8.2.3 Maintain or restore electronic memory functions.

**Performance Standard 8.3: Perform Starting System Service and Repair**

- 8.3.1 Perform starter current draw test; determine necessary action.
- 8.3.2 Perform starter circuit voltage drop tests; determine necessary action.
- 8.3.3 Inspect and test starter relays and solenoid; determine necessary action.
- 8.3.4 Remove and install starter in a vehicle.
- 8.3.5 Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.

**Performance Standard 8.4: Perform Charging System Service and Repair**

- 8.4.1 Perform charging system output test; determine necessary action.
- 8.4.2 Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.
- 8.4.3 Remove, inspect and reinstall generator (alternator).
- 8.4.4 Perform charging circuit voltage drop tests; determine necessary action.

**Performance Standard 8.5: Perform Lighting Systems Service and Repair**

- 8.5.1 Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
- 8.5.2 Aim headlights.
- 8.5.3 Identify system voltage and safety precautions associated with high intensity discharge headlights.

**Performance Standard 8.6: Perform Accessories Service and Repair**

- 8.6.1 Disable and enable the airbag system for vehicle service; verify indicator lamp operation.
- 8.6.2 Remove and reinstall door panel.
- 8.6.3 Describe the operation of keyless entry/remote-start system.
- 8.6.4 Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.
- 8.6.5 Verify windshield wiper and washer operation; replace wiper blades.

**CONTENT STANDARD 9.0: ANALYZE HEATING AND AIR CONDITIONING SYSTEMS (A7)**

**Performance Standard 9.1: Demonstrate Knowledge of A/C Systems**

- 9.1.1 Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 9.1.2 Identify A/C components on a vehicle.

**Performance Standard 9.2: Inspect Refrigeration System Components**

- 9.2.1 Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.
- 9.2.2 Research hybrid vehicle A/C system electrical circuits and the service/safety precautions.
- 9.2.3 Inspect A/C condenser for airflow restrictions; determine necessary action.

**Performance Standard 9.3: Inspect Heating, Ventilation, and Engine Cooling Systems**

- 9.3.1 Inspect engine cooling and heater system hoses; perform necessary action.

**Performance Standard 9.4: Inspect operating systems and related controls**

- 9.4.1 Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action.
- 9.4.2 Identify the source of A/C system odors.

**CONTENT STANDARD 10.0: ANALYZE ENGINE PERFORMANCE (A8)**

**Performance Standard 10.1: Perform General Engine Service**

- 10.1.1 Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 10.1.2 Demonstrate knowledge of 4-stroke engine.
- 10.1.3 Perform engine absolute (vacuum) manifold pressure tests; determine necessary action.
- 10.1.4 Perform cylinder cranking and running compressions tests; determine necessary action.
- 10.1.5 Perform cylinder leakage test; determine necessary action.
- 10.1.6 Verify engine operating temperature.
- 10.1.7 Remove and replace spark plugs; inspect secondary ignition components for wear and damage.

**Performance Standard 10.2: Analyze Computerized Engine Controls**

- Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data;
- 10.2.1 clear codes when applicable.
- 10.2.2 Describe the importance of operating all OBDII monitors for repair verification.

**Performance Standard 10.3: Perform Fuel, Air Induction, and Exhaust Systems Service and Repair**

- 10.3.1 Replace fuel filter(s).
- 10.3.2 Inspect, service, or replace air filters, filter housing and intake duct work.  
Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action.
- 10.3.3 Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed.
- 10.3.4 Describe diesel exhaust fluid (DEF).

**Performance Standard 10.4: Perform Emissions Control Systems Service and Repair**

- 10.4.1 Demonstrate knowledge of basic emission control components.