Automotive Technician Standards and Skills



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# Health & Safety Standards

**Standard 1: Health and Safety in the Automotive Field**

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| Students will prioritize safety by adhering to OSHA and EPA regulations, demonstrating proper use of personal protective equipment (PPE), and effectively identifying and mitigating workplace hazards. | OSHA10 – General Industry  SP/2 |

**Skills:**

1. Describe and demonstrate safety procedures related to lifts, jacks, jack stands, and lift points.
2. Describe and demonstrate safety procedures related to highly pressurized systems, including fuel systems, brakes, air conditioning, suspensions, and hydraulic systems.
3. Describe and demonstrate the safe use of oxygen/acetylene torches and electric welding equipment.
4. Describe and demonstrate safety procedures related to electrical circuits and systems, including procedures specific to electric or hybrid vehicles.
5. Demonstrate the safe disabling of Supplemental Restraint Systems (SRS) for repair.
6. Identify and describe safety procedures when dealing with different types of automotive lifts according to current industry standards.
7. Demonstrate procedures for safe lift operations.
8. Demonstrate safe use, placement, and storage of floor jacks and jack stands.
9. Demonstrate and describe safety procedures when dealing with high pressure systems, including necessary ventilation according to current industry standards.
10. Describe and demonstrate the importance of safety procedures to be used when servicing high pressurized systems (fuel systems, brakes, air conditioning, suspension, hydraulic systems, etc.).
11. Describe and demonstrate safe use of oxygen/acetylene torches and electric welding equipment.
12. Demonstrate ventilation procedures to be followed when working in the lab/shop area.
13. Identify and describe safety procedures when dealing with electrical circuits according to current industry standards.
14. Describe safety procedures to be followed when servicing supplemental restraint systems.
15. Demonstrate safety awareness of high voltage circuits of electric or hybrid electric vehicles and related safety precautions.

# Technical & Integrated Academic Standards

**Standard 2: Common Tools**

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| Students will be able to demonstrate the safe and appropriate use of hand tools and power tools commonly used by automotive technicians. | ASE Entry Level-All |

**Skills:**

1. Demonstrate the safe and effective us of corded and cordless electric tools, including the selection of appropriate speeds and bits for specific metals.
2. Describe appropriate maintenance and inspection protocols for electric and pneumatic tools.
3. Demonstrate the safe and effective use of impact wrenches, including the selection of appropriate types and sizes of sockets.
4. Identify and describe the use of bench grinders and drill presses.
5. Demonstrate the appropriate use of hand tools according to current industry and OSHA standards
6. Identify and describe various types of screwdrivers.
7. Identify and describe various types of pliers.
8. Identify and describe various types of combination wrenches.
9. Identify and describe various types of sockets and drive tools.
10. Identify and describe various types of hammering tools.
11. Identify and describe various types of metal working tools.
12. Identify and describe various types of surface prep tools.
13. Identify and describe various types of holding tools.
14. Demonstrate and explain the use of electric power tools according to current industry standards.
15. Describe safety procedures to be followed when using corded electric tools.
16. Describe safety procedures to be followed when using cordless electric tools.
17. Demonstrate and explain the use of pneumatic power tools according to current industry standards.
18. Identify and explain the purpose of industry standard pneumatic tools.
19. Describe the maintenance needs of industry standard pneumatic tools
20. Demonstrate and describe safety procedures to follow when using industry standard pneumatic tools.
21. Identify and explain the purpose of impact sockets.
22. Demonstrate and explain the use of electric automotive technology tools according to current industry standards.
23. Identify and explain the purpose of a bench grinder.
24. Demonstrate and describe safety procedures to follow when using a bench grinder.
25. Identify and explain the purpose of a drill press.
26. Demonstrate and describe the safety procedures to follow when using a drill press.

**Standard 3: Precision Measuring**

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| Students will be able to demonstrate the use of measuring tools commonly used by automotive technicians. | ASE Entry Level-All |

**Skills:**

1. Describe and demonstrate the use of common low precision measuring tools, including calipers, hole gauges, steel rules, measuring tapes, and combination squares.
2. Describe and demonstrate the use of common high precision measuring tools, including micrometers and dial indicators.
3. Describe and demonstrate the use of commonly used low precision measuring tools.
4. Identify and demonstrate the use of inside and outside calipers.
5. Identify and demonstrate the use of a hole gauge.
6. Identify and demonstrate the use of a steel rule, measuring tape, and combination square.
7. Describe commonly used high precision measuring tools.
8. Identify and demonstrate the use of an outside and inside micrometer.
9. Identify and demonstrate the use of a depth micrometer.
10. Identify and demonstrate the use of a dial indicator.

**Standard 4: Fasteners and Fastener Torque**

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| Students will be able to identify, select and use common fasteners and explain the concept of fastener torque. | ASE Entry Level-All |

**Skills:**

1. Identify, select, and use common fasteners, including SAE and metric dimensional fasteners.
2. Explain basic concepts and protocols related to fastener torque, including torque charts, torque sequence, torque wrenches, and torque yield fasteners.
3. Demonstrate the process of torquing wheel fasteners to manufacturers’ specifications.
4. Identify and demonstrate the use of commonly used fasteners.
5. Identify bolt head markings and bolt grading.
6. Explain the concept of fastener torque.
7. Explain how to find fastener torque specifications.
8. Explain how to use a general fastener torque chart.
9. Explain what torque sequence refers to.
10. Explain and demonstrate the basic rules to follow when using a torque wrench.
11. Explain the concept of torque yield fasteners.

**Standard 5: Vehicle Service Information**

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| Students will be able to identify, access and apply vehicle service information to perform accurate and effective diagnosis and repair. | ASE Entry Level-All |

**Skills:**

1. Locate and interpret significant identification numbers, including Vehicle Identification Numbers (VIN), vehicle certification labels, and calibration decals.
2. Research appropriate vehicle and service information, including manufacturer system specifications, vehicle service history, technical service bulletins, and recalls.
3. Access and use service information to perform step-to-step diagnosis and repair.
4. Research applicable vehicle and service information, such as suspension, steering system operation, vehicle service history, service precautions, technical service bulletins, and recalls.
5. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).

**Standard 6: Wheel and Tire Systems and Alignment**

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| Students will be able to describe key automotive systems, diagnose issues and perform safe and effective repairs including wheel and tire alignment and systems. | ASE Entry Level-Engine Performance  ASE Entry Level-Suspension and Steering |

**Skills:**

* 1. Perform appropriate wheel and tire inspection, mounting, balancing and rotation, including the use of a dynamic wheel balancer and Tire Pressure Monitoring System (TPMS), and perform appropriate services.
  2. Inspect and evaluate wheel alignment, including key system components, perform appropriate services to manufacturer specifications and perform post alignment calibration procedures.
  3. Inspect, lubricate, replace, and install suspension systems and components
  4. Identify and diagnose power steering concerns and perform necessary service to pumps, belts, hoses fittings, and mechanical steering components.
  5. Identify and interpret brake system concerns and leverage applicable vehicle service information to diagnose issues.
  6. Inspect short and long arm suspension systems, leaf spring suspension systems and strut suspensions for noises, body sway, and uneven ride height concerns.
  7. Lubricate suspension and steering systems per manufacturer`s recommendations.
  8. Remove, inspect, and install suspension components:
     + Upper and lower control arms.
     + Bushings.
     + Shafts.
     + Rebound bumpers.
     + Strut rods (compression/tension).
     + Upper and/or lower ball joints.
     + Steering knuckle assemblies.
     + Long arm suspension system coil springs and spring insulators.
     + Torsion bars.
     + Stabilizer bar bushings, brackets, and links.
     + Mounts.
     + Strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearings/mounts.
     + Transverse links.
     + Leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.
     + Shock absorbers.
  9. Diagnose wheel bearing noise, wheel shimmy, and vibration concerns; determine and perform necessary action.
  10. Identify and diagnose power steering concerns, including gear binding, uneven turning effort, looseness, hard steering, and fluid leakage, and perform appropriate service for both electric and mechanical components.
      + Manual or power rack and pinion steering gear inner tie rod ends and bellows boot.
      + Pitman arm, center link/intermediate rod, idler arm, mountings, and steering linkage dampener.
      + Tie rod ends, tie rod sleeves, and clamps.
      + Supplemental restraint system.

**Standard 7: Brake Systems**

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| Students will be able to describe key diagnose issues and perform safe and effective repairs of brakes and brake systems. | ASE Entry Level-Brakes  ASE Entry Level-Suspension and Steering |

**Skills:**

1. Research brake system concerns and vehicle information.
2. Identify and interpret brake system concern; determine necessary action.
3. Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins.
4. Diagnose poor stopping, noise, pulling, grabbing, dragging, or pedal pulsation concerns; determine necessary action.
5. Diagnose and identify pressure concerns in the brake system using hydraulic principles (Pascal’s Law).
6. Measure brake pedal height; determine necessary action.
7. Check master cylinder for internal and external leaks and proper operations; determine necessary action.
8. Remove, bench bleed, and reinstall master cylinder.
9. Identify poor stopping, pulling, or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action.
10. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust cracks, bulging, or wear; tighten loose fittings and supports; determine necessary action.
11. Perform appropriate maintenance and repair of hydraulic brake systems.
12. Fabricate and/or install brake lines (double flare and ISO types); replace hoses, fittings, and supports, as needed.
13. Identify, handle, store, and fill brake fluids to proper level.
14. Inspect, test, and/or replace components of brake warning light system.
15. Bleed (gravity, manual, pressure, vacuum) brake system.
16. Flush and fill hydraulic braking system.
17. Remove and inspect brake drums; determine necessary action.
18. Refinish brake drum.
19. Remove and inspect brake shoes and drum brake components; determine necessary action.
20. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware and backing support plates; lubricate and reassemble.
21. Remove, inspect, and install wheel cylinders.
22. Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings.
23. Install wheel, torque wheel fasteners, and make final checks and adjustments.
24. Remove and inspect brake caliper assembly; determine necessary action.
25. Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing; determine necessary action.
26. Clean and inspect caliper mounting, slides, and pins for wear and damage; determine necessary action.
27. Remove, clean, and inspect pads and retaining hardware; measure brake pad thickness, compare to manufacturer’s specifications, determine necessary action.
28. Retract caliper piston on vehicles equipped with an integrated parking brake system.
29. Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.
30. Install wheel, torque wheel fasteners, and make final checks and adjustments.
31. Remove and inspect brake rotors; determine necessary action.
32. Inspect and measure rotor with a dial indicator and a micrometer and compare readings to manufacturer’s specifications; determine necessary action.
33. Remove and refinish rotor according to manufacturer’s recommendations.
34. Prep hub mating service and reinstall brake rotor.
35. Identify and describe the operation of a vacuum brake assist unit.
36. Test pedal free travel with and without engine running; check power assist operation.
37. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
38. Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action.
39. Identify and describe the operation of a brake hydraulic assist unit.
40. Test pedal free travel with and without engine running; check power assist operation.
41. Inspect and test hydro-boost system and accumulator for leaks and proper operation; determine necessary action.
42. Diagnose and repair parking brake failures and concerns.
43. Check parking brake operation; determine necessary action.
44. Check parking brake cables and components for wear, rusting, binding, and corrosion; clean, lubricate, or replace as needed.
45. Diagnose and repair electrical brake circuit failures and concerns.
46. Identify and check operation of parking brake indicator light system and perform repairs as needed.
47. Identify and check operation of electric parking brake system and perform repairs as needed.
48. Identify, inspect, and diagnose antilock brake system (ABS) components.
49. Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment.
50. Diagnose and repair wheel speed sensors using scan tool.
51. Service antilock brake system high pressure hydraulic system to manufacturer`s specifications.
52. Depressurize high-pressure components of the antilock brake systems (ABS).
53. Bleed the antilock brake system (ABS) front and rear hydraulic circuits.

**Standard 8: Automotive HVAC, Electrical Systems, and Accessories**

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| Students will be able to describe, diagnose issues and perform safe and effective repairs of Automotive HVAC, Electrical Systems and Accessories. | ASE Entry Level-Electrical/Electronic Systems  ASE Entry Level-HVAC |

**Skills:**

* 1. Use vehicle service information, wiring diagrams, digital multimeters, and other diagnostic equipment to evaluate and repair common electrical circuits and automotive batteries.
  2. Diagnose and repair electrical accessories, including lighting systems, driver information systems, horns, wiper/washer systems, motor-driven accessories, heated glass, electric locks, cruise control and keyless entry/remote start systems.
  3. Inspect and test key system components, including relays, solenoids, fly wheels, ring gear, switches, connectors, and coils, and diagnose and repair issues as needed, up to and including replacing a starter.
  4. Inspect, test, evaluate, and repair or replace charging system components, including drive belts, pulleys and tensioners, and alternators.
  5. Identify, diagnose, and repair common causes of positive crankcase ventilation and evaporative emissions system concerns and common causes of catalytic converter, secondary air, and exhaust gas recirculation system concerns.
  6. Describe and perform appropriate automotive refrigerant handling according to current industry standards.
  7. Follow EPA regulations for refrigerant handling.
  8. Identify refrigerant.
  9. Recover, evacuate, and recharge refrigerant.
  10. Recycle, label and store refrigerant.
  11. Describe HVAC operation and general repair.
  12. Research applicable vehicle service information, vehicle service history, service precautions, and technical service bulletins.
  13. Follow EPA regulations for refrigerant handling.
  14. Identify heating, ventilation, and air conditioning (HVAC) components and configuration.
  15. Identify and interpret HVAC issues, determine necessary action.
  16. Research and identify electrical system concern; determine necessary action.
  17. Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins.
  18. Identify electrical integrity for series, parallel, and series-parallel circuits using principles of electricity (Ohm`s Law).
  19. Use wiring diagrams during diagnosis of electrical circuit problems.
  20. Research and identify electrical system concern; determine necessary action.
  21. Check electrical circuits with a test light; determine necessary action.
  22. Measure source voltage and perform voltage drop tests in electrical circuits using the voltmeter scale on a digital multimeter (DMM); determine necessary action.
  23. Measure current flow in electrical circuits and components using the ammeter scale on a DMM; determine necessary action.
  24. Check continuity and measure resistance in electrical circuits and components using an ohmmeter scale on a DMM; determine necessary action.
  25. Check electrical circuits using fused jumper wires; determine necessary action.
  26. Locate shorts, grounds, opens, and resistance problems in electrical; determine necessary action.
  27. Repair common electrical circuits.
  28. Inspect and test fusible links, circuit breakers and fuses; wiring, harnesses, and connectors, determine necessary action.
  29. Perform solder repair of electrical wiring.
  30. Inspect and test switches, connectors, relays, devices, and wires of electrical circuits; perform necessary action.
  31. Identify, maintain, and service the various types of commonly used automotive batteries.
  32. Perform battery state-of-charge test; determine necessary action.
  33. Measure and identify the possible cause(s) of excessive key-off battery drain (parasitic draw).
  34. Maintain or restore electronic memory functions.
  35. Inspect, clean, fill and repair/replace battery, battery cables, connectors, clamps, and hold downs.
  36. Identify battery type, perform applicable battery charge procedures.
  37. Start a vehicle using jumper cables or auxiliary power supply.
  38. Diagnose and repair starting systems.
  39. Perform starter current draw tests; determine necessary action.
  40. Perform starter circuit voltage drop tests; determine necessary action.
  41. Inspect and test starter relays and solenoids; determine necessary action.
  42. Remove and install starter in a vehicle.
  43. Inspect fly wheel and ring gear for wear and cracks.
  44. Inspect and test switches, connectors and wires of starter control circuits; perform necessary action.
  45. Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition.
  46. Demonstrate knowledge of an automatic start-stop system.
  47. Diagnose and repair charging systems.
  48. Perform charging system output test; determine necessary action.
  49. Diagnose charging system for the cause of undercharge, no-charge and overcharge conditions.
  50. Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment.
  51. Remove, inspect, and install generator (alternator).
  52. Perform charging circuit voltage drop tests; determine necessary action.
  53. Diagnose and repair lighting systems.
  54. Inspect, replace, and aim headlights and bulbs.
  55. Identify system voltage and safety precautions associated with high intensity discharge headlights.
  56. Inspect, diagnose, and repair all exterior lamps (i.e., headlight, brake, turn, or signal, reverse, fogs, etc.); perform necessary action.
  57. Diagnose and repair gauges, warning devices, and driver information systems.
  58. Diagnose the cause of incorrect operation of warning devices and other driver information systems; determine necessary action.
  59. Inspect and test sensors, connectors, and wires of electronic instrument circuits; determine necessary action.
  60. Diagnose and repair horn and wiper/washer systems.
  61. Diagnose incorrect horn operation; perform necessary action.
  62. Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.
  63. Diagnose incorrect washer operation; perform necessary action.
  64. Diagnose and repair accessories.
  65. Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action.
  66. Diagnose incorrect heated glass operation; determine necessary action.
  67. Diagnose incorrect electric lock operation; determine necessary action.
  68. Diagnose incorrect operation of cruise control systems; determine necessary action.
  69. Activate bi-directional controls when applicable using a scan tool.
  70. Describe the operation of keyless entry/remote-start systems.
  71. Identify and diagnose common causes of positive crankcase ventilation and evaporative emissions system concerns.
  72. Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.
  73. Diagnose test and repair components and hoses of evaporative emissions control system; perform necessary action.
  74. Identify and diagnose common causes of catalytic converter, secondary air, and exhaust gas recirculation system concerns.
  75. Inspect and test catalytic converter performance.
  76. Diagnose, test, and repair components of secondary air injection systems; perform necessary action.
  77. Identify emission and drivability problems caused by malfunctions in the exhaust gas recirculation (EGR) system.
  78. Inspect, test, service, and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action.
  79. Inspect and test heater control valve(s); perform necessary action.
  80. Inspect heater blend door for proper operation.
  81. Inspect, diagnose, and repair air conditioning systems.
  82. Identify abnormal operating noises in the A/C system; determine necessary action.
  83. Select and connect gauge set; record temperature and pressure readings according to current industry standards.
  84. Conduct performance A/C system testing; identify problems.
  85. Leak test A/C system; determine necessary action.
  86. Inspect condition of refrigerant oil removed from A/C system; determine necessary action.
  87. Identify the source of A/C system odors.
  88. Inspect, diagnose, and repair heating and air conditioning controls.
  89. Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.
  90. Diagnose A/C compressor clutch control systems; determine necessary action.

**Standard 9: Transmissions, Transaxles, Drivetrains, and Drive Axles**

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| Students will be able to describe diagnose issues and perform safe and effective repairs for Transmissions, Transaxles, Drivetrains, and Drive Axles. | ASE Entry Level-Automatic Transmission and Transaxle  ASE Entry Level-Manual Drive Train and Axles |

**Skills:**

1. Perform appropriate out-of-vehicle service techniques.
2. Demonstrate appropriate hub, joint, shaft, and yolk techniques.
3. Demonstrate appropriate differential repair and service techniques.
4. Perform appropriate axle shaft service techniques.
5. Inspect, evaluate, adjust, and repair transfer cases and locking hubs.
6. Assess and repair manual transmissions/transaxles and clutch assemblies.
7. Inspect, remove, and replace constant velocity (CV) axles.
8. Inspect, remove, or replace power train mounts.
9. Diagnose universal joint noise and vibration concerns; perform necessary action.
10. Inspect fly wheel and ring gear for wear and cracks.
11. Inspect and lubricate shift linkage bushings.
12. Clean and inspect differential housing vents.
13. Demonstrate appropriate engine repair techniques.
14. Perform appropriate vehicle service techniques, tests, and evaluations to determine necessary actions.
15. Perform appropriate cylinder head repair.
16. Diagnose, remove, and replace cylinder head(s).
17. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition; determine necessary action.
18. Demonstrate appropriate valve, valve train, and camshafts service techniques.
19. Identify overhead cam, dual overhead cam, and overhead valve engines.
20. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action.
21. Check drive gear wear and backlash, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing.
22. Inspect and replace camshaft and drive belt/chain.
23. Establish camshaft position sensor indexing.
24. Identify, assess, and repair cylinder block and internal components.
25. Identify block cylinder arrangement.
26. Remove, inspect, or replace crankshaft vibration damper (harmonic balancer).
27. Measure crankshaft end play, compare to specification; determine necessary action.
28. Inspect auxiliary coolers; determine necessary action.
29. Inspect, test, and replace oil temperature and pressure switches and sensors.
30. Demonstrate appropriate vehicle service techniques. (A+)
31. Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action.
32. Research applicable vehicle and service information fluid type, vehicle service history, service precautions, and technical service bulletins.
33. Diagnose fluid loss condition concerns; determine necessary action.
34. Check fluid level in a transmission or a transaxle not equipped with a dipstick.
35. Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action.
36. Diagnose noise and vibration concerns; determine necessary action.
37. Perform stall test; determine necessary action.
38. Perform lock-up converter system tests; determine necessary action.
39. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.
40. Diagnose electronic transmission/transaxle control systems using appropriate test.
41. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal`s Law).
42. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
43. Inspect for leakage; replace external seals, gaskets, and bushings.
44. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses.
45. Demonstrate appropriate out of vehicle service techniques.
46. Remove and reinstall transmissions/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces.
47. Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings.
48. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot.
49. Describe the operational characteristics of a continuously variable transmission (CVT).
50. Demonstrate appropriate hub, joint, shaft, and yolk techniques.
51. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action.
52. Diagnose universal joint noise and vibration concerns; perform necessary action.
53. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals.
54. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.
55. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.
56. Demonstrate appropriate differential repair and service techniques.
57. Clean and inspect differential housing; check for leaks; inspect housing vent.
58. Diagnose noise and vibration concerns; determine necessary action.
59. Inspect and replace companion flange and pinion seal; measure companion flange run out.
60. Perform appropriate axle shaft service techniques.
61. Remove and replace drive axle shafts.
62. Inspect and replace drive axle shaft seals, bearings, and retainers.
63. Measure drive axle flange runout and shaft end play; determine necessary action.
64. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action.
65. Inspect, adjust, and repair transfer cases and locking hubs.
66. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.
67. Inspect locking hubs; perform necessary action(s).
68. Check for leaks at drive assembly seals; check vents; check lube level.
69. Identify concerns related to variations in tire circumference and/or final drive ratios.
70. Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems.
71. Assess and repair manual transmissions/transaxles.
72. Identify and interpret manual drive train concerns; determine necessary action.
73. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.
74. Inspect, remove, or replace manual transmission/transaxle.
75. Describe the operational characteristics of an electronically controlled manual transmission/transaxle.
76. Diagnose noise concerns through the application of transmission/transaxle power flow principles.
77. Diagnose hard shifting and jumping out of gear concerns; determine necessary action.
78. Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action.
79. Inspect, diagnose, and repair clutch assembly.
80. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action.
81. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action.
82. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing.
83. Bleed clutch hydraulic system.
84. Check and adjust clutch master cylinder fluid level; check for leaks.
85. Measure flywheel run-out and crankshaft end play; determine necessary action.

**Standard 10: Engine Problems**

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| Students will be able to inspect, evaluate, test, and diagnose malfunctions and performance issues in automotive engines, both with and without Diagnostic Trouble Codes (DTC), and perform appropriate repairs. | ASE Entry Level-Engine Repair |

**Skills:**

1. Identify, test, and repair leaks, sounds, and odors associated with engine malfunctions.
2. Perform general engine diagnostic procedures, including manifold pressure tests, mechanical and electrical fuel system components tests, camshaft timing verification, cylinder power balance and compression tests, and evaluation of On Board Diagnostics (OBD) trouble codes.
3. Verify proper operation of forced induction system.
4. Inspect, diagnose, and repair cooling systems.
5. Inspect, diagnose, and repair forced induction systems.
6. Perform appropriate cylinder head repair.
7. Perform appropriate valve, valve train, and camshaft service techniques.
8. Identify, inspect, evaluate, and repair cylinder block and internal components.
9. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
10. Identify abnormal engine noise or vibration concerns; determine necessary action.
11. Identify abnormal exhaust color, odor, and sound; determine necessary action.
12. Perform oil pressure tests; determine necessary action.
13. Perform general engine diagnostic procedures.
14. Interpret engine performance concern; determine necessary action.
15. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.
16. Inspect and test mechanical and electrical fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.
17. Inspect the integrity and test the catalytic converter and heat shield(s); perform necessary action.
18. Verify accurate camshaft timing.
19. Perform cylinder power balance test; determine necessary action.
20. Perform cylinder compression tests; determine necessary action.
21. Perform cylinder leakage test; determine necessary action.
22. Identify engine mechanical, electrical, fuel, and ignition concerns with engine diagnostic equipment.
23. Retrieve and record stored On Board Diagnostics II (OBD II) diagnostic trouble codes; clear codes.
24. Inspect, diagnose, and repair cooling system concerns.
25. Verify engine operating temperature; determine necessary action.
26. Remove and replace thermostat, radiator, and water pump.
27. Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank and hoses; perform necessary action.
28. Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.
29. Identify causes of engine overheating.
30. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.
31. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.
32. Forced induction systems.
33. Research applicable vehicle service information, vehicle service history, service precautions, and technical service bulletins.
34. Identify components and configuration of forced air induction system.
35. Diagnose and repair engine performance concerns relative to the ignition primary circuit.
36. Inspect and test ignition primary circuit wiring and components; perform necessary action.
37. Inspect and test ignition system pick-up sensor or triggering devices; perform necessary action.
38. Inspect, and test ignition coil(s); perform necessary action.
39. Inspect, diagnose, and replace spark plugs.
40. Identify ignition system related problems such as no-starting engine misfire, spark knock, power loss, and concerns on vehicles with electronic ignition (i.e. distributor-less and distributor) systems.
41. Diagnose and repair engine performance concerns relative to the ignition secondary circuit.
42. Inspect and test ignition system secondary circuit wiring and components; perform necessary action.
43. Inspect, diagnose, and repair performance issues with no Diagnostic Trouble Codes (DTC).
44. Diagnose hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles.
45. Inspect throttle body, air induction system, intake manifold, and gaskets for vacuum leaks and/or unmetered air.
46. Perform exhaust system back-pressure test; determine necessary action.
47. Inspect, diagnose, and repair performance issues with Diagnostic Trouble Codes (DTC).
48. Check for module communication errors using a scan tool.
49. Obtain and interpret scan tool data., stalling, poor mileage, dieseling, and emissions problems on vehicles.
50. Diagnose the causes of emissions or drivability concerns resulting from malfunctions in the computerized engine control system with stored diagnostic trouble codes.

**Standard 11: Maintenance Services**

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| Students will be able to perform appropriate basic maintenance services. | ASE Entry Level-Engine Repair |

**Skills:**

1. Oil and filter changes.
2. Inspection and evaluation of relevant fluid levels.
3. Lubricate suspension and steering system components as appropriate.
4. Perform appropriate basic maintenance service skills.
5. Perform oil/filter change, reset maintenance reminder light where applicable.
6. Inspect all fluids and determine necessary action.
7. Inspect air and cabin filters; determine necessary action.
8. Replace a serviceable fuel filter.
9. Inspect exhaust system and undercarriage; determine necessary action.
10. Inspect transmission/transaxle, front and rear differential fluids; determine necessary action.
11. Inspect automotive drive belts and cooling system hoses; determine necessary action.
12. Lubricate suspension and steering systems per manufacturer’s recommendations.

**Standard 12: Basic Hybrid/Electric Vehicle Theory**

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| Students will be able to identify and describe the unique electrical, braking, and safety technologies of hybrid and electric vehicles. | ASE Entry Level-Engine Repair |

**Skills:**

1. Identify and describe high-voltage circuits and demonstrate appropriate related safety protocols.
2. Describe test procedures for hybrid/EV batteries, regenerative braking systems, and power steering system components.
3. Identify and describe hybrid/EV electrical circuits.
4. Identify and describe high-voltage circuits of hybrid/EV vehicle and related safety precautions.
5. Identify and describe hybrid/EV vehicle auxiliary (12v) battery service, repair, and test procedures.
6. Describe the operation of a regenerative braking system.
7. Identify and describe hybrid/EV vehicle power steering system electrical circuits and safety precautions.
8. Describe hybrid vehicle internal combustion engine service precautions.

**Standard 13: New and Emerging Technologies**

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| Students will be able to identify and describe the purposes, functions, and value propositions of new and emerging automotive technologies and describe their integration into longstanding automotive engineering. |  |

**Skills**

1. Identify driver assist technology systems.
2. Identify and describe autonomous systems.
3. Identify and describe adaptive cruise control.
4. Identify and describe lane departure systems.
5. Identify and describe blind spot monitoring systems.
6. Identify and describe autonomous braking system.
7. Identify and describe parking aid systems.
8. Identify and describe adaptive lighting systems.
9. Identify and describe in-vehicle Wi-Fi systems.

# Employability Standards

**Standard 14: Employability Skills**

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| Students will understand and demonstrate the roles of professional communication, critical thinking, problem solving, professionalism, teamwork, and collaboration within the context of automotive technology careers. |  |

**Skills:**

1. Demonstrate the impact of communication skills on the success of an automotive repair technician.
2. Describe appropriate methods of communication for internal and external stakeholders.
3. Evaluate the impact of poor communication by an automotive repair technician on the safety of an automotive repair shop.
4. Troubleshoot an automotive repair plan to find mistargeted or extraneous work that does not contribute to the ultimate objectives of the project.
5. Build a team-based plan that results in a successful automotive repair and that includes recruiting teammates and assigning roles for a project.
6. Examine the role of Automotive Collision repair in society, particularly in terms of its significance for employability and career opportunities.

# Entrepreneurship Standards

**Standard 15: Entrepreneurship**

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| Students will be able to describe opportunities for entrepreneurship and be able to evaluate the value proposition of business ownership in the automotive technology field. |  |

**Skills**

1. Understand and be able to explain the needs of startup automotive repair services company (including initial equipment and staffing needs, a marketing/business development plan, and a basic revenue management strategy).
2. Describe the concept of professional networking and demonstrate personal introductions and an “elevator speech” appropriate for other automotive repair technicians, dealership management, and other potential business partners.
3. Evaluate the licensing, regulatory, and tax implications of self-employment and business ownership as an automotive repair technician compared to W-2 employment.

# Digital Literacy & Computer Science Standards

**Standard 16: Digital Literacy and Computer Science**

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| Students will be able to demonstrate the use of common software and information technology in a modern automotive repair environment. |  |

**Skills:**

1. Describe the use of online resources in certification and professional development as an automotive repair technician.
2. Demonstrate the use of common ticketing, scheduling, resource management, and/or customer relationship management systems for automotive repair services.
3. Understand where to find online resources that support effective automotive repair work and how to be a safe and ethical consumer and creator of digital content.
4. Apply strategies for using digital tools and technology to drive business and commerce.

# Sample Performance Tasks

**Standard 1: Health and Safety in the Automotive Field**

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| Students will prioritize safety by adhering to OSHA and EPA regulations, demonstrating proper use of personal protective equipment (PPE), and effectively identifying and mitigating workplace hazards. | OSHA10 – General Industry  SP/2 |

**Sample Performance Tasks:**

* Student will set up lift using manufacturer’s suggested lift points.
* Student will relieve fuel system pressure to perform necessary repairs.
* Safely disable Supplemental Restraint System (SRS) air bag for repair using manufacturer’s recommendations.

**Standard 2: Common Tools**

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| Students will be able to demonstrate the safe and appropriate use of hand tools and power tools commonly used by automotive technicians. | ASE Entry Level-All |

**Sample Performance Tasks:**

* Student will select and use the appropriate hand tool for the task assigned.
* Student will drill a hole to given specification using appropriate speeds and bits for various metals.
* Student will remove wheel fasteners using an impact wrench, selecting appropriate size and type of socket.
* Student will operate a bench grinder according to current industry safety standards.

**Standard 3: Precision Measuring**

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| Students will be able to demonstrate the use of measuring tools commonly used by automotive technicians. | ASE Entry Level-All |

**Sample Performance Tasks:**

* Student will use a variety of measuring tools to verify accurate brake rotor dimensions.

**Standard 4: Fasteners and Fastener Torque**

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| Students will be able to identify, select and use common fasteners and explain the concept of fastener torque. | ASE Entry Level-All |

**Sample Performance Tasks:**

* Student will distinguish between SAE and metric dimensional fasteners.
* Student will torque wheel fasteners to manufacturer’s specifications using the vehicle’s specific tightening sequence.

**Standard 5: Vehicle Service Information**

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| Students will be able to identify, access and apply vehicle service information to perform accurate and effective diagnosis and repair. | ASE Entry Level-All |

**Sample Performance Tasks:**

* Student will research the vehicle identification number (VIN) of the vehicle being serviced to obtain correct engine size.

**Standard 6: Wheel and Tire Systems and Alignment**

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| Students will be able to describe key automotive systems, diagnose issues, and perform safe and effective repairs, including wheel and tire alignment and systems. | ASE Entry Level-Engine Performance  ASE Entry Level-Suspension and Steering |

**Sample Performance Tasks:**

* Student will inspect tire size, compare with manufacturer tire size recommendations and determine necessary action.
* Student will dismount and mount a tire on a wheel rim with tire pressure monitoring system (TPMS) and rotate according to manufacturer’s recommendations.
* Student will balance a wheel and tire assembly using different modes on a dynamic wheel balancer.
* Student will verify if there is a TPMS sensor, then dismount, mount, and balance a new tire on the rim.
* Student will verify correct curb ride height using a tape measure and follow manufacturer’s recommendations and specifications to determine necessary action.
* Student will inspect suspension components for wear, replace, and lubricate as necessary.
* Student will identify and lubricate all applicable suspension components.
* Student will remove and install a sealed wheel bearing assembly.
* Student will inspect steering system to locate source of binding.
* Student will inspect steering system for wear and identify faulty component.
* Student will disable and enable supplemental restraint system (SRS) according to manufacturer’s specification.
* Student will perform a pre-alignment inspection using a check list from either the vehicle manufacturer or the equipment manufacturer.
* Student will attach alignment measuring equipment and measure caster, camber, and toe.

**Standard 7: Brake Systems**

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| Students will be able to describe key diagnose issues and perform safe and effective repairs of brakes and brake systems. | ASE Entry Level-Brakes  ASE Entry Level-Suspension and Steering |

**Sample Performance Tasks:**

* Student selects the DOT rated brake fluid for the vehicle being serviced according to the vehicle manufacturer’s recommendations.
* Student uses automotive information system to research applicable brake-related technical service bulletins and report findings.
* Student measures brake pedal height using a tape measure and compare the measurement to specifications.
* Student de-adjusts, removes, and installs a brake drum, re-adjust as necessary.
* Student removes and installs brake shoes.
* Student removes the brake calipers and checks the caliper slides/pins for proper operation.
* Student removes the brake rotor and using a high precision measuring device measures the rotors brake surface in several locations comparing to factory specifications.
* Student will perform a test of the brake booster check valve and verify operation according to manufacturer’s specifications.
* Student will be able to identify hydraulic assist brake components.
* Student will apply and release parking brake and determine if cables are moving freely.
* Student will apply parking brake and check operation of brake warning lamp.
* Student will use the appropriate scan tool to retrieve possible ABS trouble codes.
* Student will bleed an ABS system according to the manufacturer’s recommendation.

**Standard 8: Automotive HVAC, Electrical Systems, and Accessories**

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| Students will be able to describe, diagnose issues, and perform safe and effective repairs of Automotive HVAC, Electrical Systems, and Accessories. | ASE Entry Level-Electrical/Electronic Systems  ASE Entry Level-HVAC |

**Sample Performance Tasks:**

* Student will identify the refrigerant type in a vehicle using service information.
* Student will research and report applicable service information to obtain correct wiring diagram.
* Student will measure circuit source voltage using a DMM.
* Student will repair a wire choosing the appropriate solder type and wire gauge necessary for the repair.
* Student will determine cold cranking amps of battery and perform a battery load capacity test.
* Student will test and replace starter in a vehicle.
* Student will perform various charging system tests to determine the cause of low alternator output.
* Student will replace a faulty headlight bulb and check for proper headlight aim.
* Student will test oil pressure gauge circuit and determine cause of failure.
* Student will replace horn assembly and recheck for proper operation.
* Student will remove and replace a window motor and confirm operation according to manufacturer’s specifications.
* Student will perform a leak test on evaporative emission system.
* Student will perform catalytic converter efficiency test.

**Standard 9: Transmissions, Transaxles, Drivetrains, and Drive Axles**

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| Students will be able to describe, diagnose issues, and perform safe and effective repairs for Transmissions, Transaxles, Drivetrains, and Drive Axles. | ASE Entry Level-Automatic Transmission and Transaxle  ASE Entry Level-Manual Drive Train and Axles |

**Sample Performance Tasks:**

* Students will inspect, evaluate, remove, and replace power train mounts, universal joints, CV axles, and other drivetrain components.
* Students will differentiate between engine performance and transmission/transaxle concerns.

**Standard 10: Engine Problems**

|  |  |
| --- | --- |
| Students will be able to inspect, evaluate, test, and diagnose malfunctions and performance issues in automotive engines, both with and without Diagnostic Trouble Codes (DTC) and perform appropriate repairs. | ASE Entry Level-Engine Repair |

**Sample Performance Tasks:**

* Student will remove and replace a valve cover gasket to repair an engine oil leak.
* Student will perform a fuel pressure test and determine necessary action.
* Student will inspect for torn or damage CV boot.
* Student will pressurize a cooling system to locate the source of a leak.
* Student will test for input voltage at ignition coil.
* Student will use a spark tester to determine secondary voltage output.

**Standard 11: Maintenance Services**

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| --- | --- |
| Students will be able to perform appropriate basic maintenance services. | ASE Entry Level-Engine Repair |

**Sample Performance Tasks:**

* Student will perform a multi-point inspection to include an oil and filter change, as well as an undercarriage inspection.

**Standard 12: Basic Hybrid/Electric Vehicle Theory**

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| --- | --- |
| Students will be able to identify and describe the unique electrical, braking, and safety technologies of hybrid and electric vehicles. | ASE Entry Level-Engine Repair |

**Sample Performance Tasks:**

* Student uses service information to determine the location of the (12v) battery.

# Credential References

**OSHA 10 – General Industry**

<https://www.osha.gov/general-industry>

**Section 608 Technician Certification by the Environmental Protection Agency (EPA)**

[Section 608 Technician Certification | US EPA](https://www.epa.gov/section608/section-608-technician-certification-0)

As part of the Federal Clean Air Act, the **EPA 608 Certification** is required for any technician who maintains, services, repairs, or disposes of appliances that contain regulated refrigerants. The good news about the EPA 608 certification is that it’s a one-time test, with no expiration and no requirement for renewal.

**ASE Entry Level Certifications**

<https://www.ase.com/dist/docs/Auto_Test_Specs_Individual-8_2022.pdf>

The National Institute for Automotive Service Excellence (ASE) Entry-Level certification tests are designed to indicate a satisfactory level of practical knowledge-based readiness for the workforce in candidates seeking a career in the automotive service industry.