Nevada CTE

Diesel Technology: High School

IDENTIFY AND UTILIZE SAFETY PROCEDURES AND PROPER TOOLS 1.0

PS 1.1 DEMONSTRATE GENERAL LAB SAFETY RULES AND PROCEDURES 1.1

- **1.1.1** Describe general shop safety rules and procedures (i.e., safety test) 1.1.1
- **1.1.2** Utilize safe procedures for handling of tools and equipment 1.1.2
- **1.1.3** Identify and use proper placement of floor jacks and jack stands 1.1.3
- **1.1.4** Identify and use proper lifting procedures and proper use of support equipment (e.g., lifts, hoists, rigging, etc.) 1.1.4
- **1.1.5** Utilize proper ventilation procedures for working within the lab/shop area 1.1.5
- **1.1.6** Identify marked safety areas 1.1.6
- **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 fire safety equipment 1.1.7
- **1.1.8** Identify the location and use of eye wash stations 1.1.8
- **1.1.9** Identify the location of the posted evacuation routes 1.1.9
- **1.1.10** Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities (i.e., personal protection equipment – PPE) 1.1.10
- **1.1.11** Identify and wear appropriate clothing for lab/shop activities 1.1.11
- **1.1.12** Secure hair and jewelry for lab/shop activities 1.1.12
- **1.1.13** Research safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits 1.1.13
- **1.1.14** Research safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, fuel injection systems, etc.) 1.1.14
- **1.1.15** Locate and interpret safety data sheets (SDS) 1.1.15
- **1.1.16** Prepare time or job cards, reports or records 1.1.16
- **1.1.17** Perform housekeeping duties 1.1.17
- **1.1.18** Follow verbal instructions to complete work assignments 1.1.18
- **1.1.19** Follow written instructions to complete work assignments 1.1.19

PS 1.2 IDENTIFY AND UTILIZE PROPER TOOLS 1.2

- 1.2.1 Identify appropriate tools and their usage in diesel service applications 1.2.1
- 1.2.2 Identify standard and metric designation 1.2.2
- 1.2.3 Demonstrate safe handling and use of appropriate tools 1.2.3
- 1.2.4 Demonstrate proper cleaning, storage, and maintenance of tools and equipment 1.2.4
- 1.2.5 Demonstrate proper use of precision measuring tools (i.e., micrometer, dial-indicator, dial-caliper) 1.2.5

PERFORM BASIC VEHICLE SERVICE 2.0

PS 2.1 IDENTIFY AND UTILIZE VEHICLE SERVICE INFORMATION 2.1

- 2.1.1 Locate and utilize paper and/or electronic service information 2.1.1
- 2.1.2 Locate and utilize technical service bulletins (TSBs) 2.1.2
- 2.1.3 Demonstrate knowledge of special service messages, quotes, service campaigns/recalls, vehicle/service warranty applications, and service interval recommendations 2.1.3
- 2.1.4 Locate vehicle identification number (VIN) and production date code 2.1.4
- 2.1.5 Analyze vehicle identification number (VIN) information 2.1.5
- 2.1.6 Research other vehicle information labels (such as tire, emissions, etc.) 2.1.6

PS 2.2 PREPARE A VEHICLE FOR SERVICE 2.2

- 2.2.1 Identify information needed and the service requested on a repair order 2.2.1
- 2.2.2 Identify purpose and demonstrate proper use of fender covers, seat covers, and floor mats 2.2.2
- 2.2.3 Demonstrate use of the three C's (concern, cause, and correction) 2.2.3
- 2.2.4 Review vehicle service history 2.2.4
- 2.2.5 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction 2.2.5

PS 2.3 PREPARE A VEHICLE FOR THE CUSTOMER 2.3

- 2.3.1 Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.) 2.3.1

APPLY CONCEPTS OF DIESEL ENGINE SERVICE 3.0

PS 3.1 PERFORM PRELIMINARY ENGINE INSPECTION 3.1

- 3.1.1 Inspect fuel, oil, diesel exhaust fluid (DEF) and coolant levels, and condition; determine needed action 3.1.1
- 3.1.2 Identify engine fuel, oil, coolant, air, and other leaks; determine needed action 3.1.2
- 3.1.3 Observe engine exhaust smoke color and quantity 3.1.3
- 3.1.4 Check and record electronic diagnostic codes 3.1.4

PS 3.2 PERFORM CYLINDER HEAD AND VALVE TRAIN SERVICE 3.2

- 3.2.1 Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action 3.2.1
- 3.2.2 Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action 3.2.2
- 3.2.3 Inspect valve train components; determine needed action 3.2.3
- 3.2.4 Reassemble cylinder head 3.2.4
- 3.2.5 Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash 3.2.5
- 3.2.6 Adjust valve bridges (crossheads); adjust valve clearances and injector settings 3.2.6

PS 3.3 PERFORM ENGINE BLOCK SERVICE AND REPAIR 3.3

- 3.3.1 Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components 3.3.1
- 3.3.2 Disassemble, clean, and inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action 3.3.2
- 3.3.3 Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action 3.3.3
- 3.3.4 Inspect in-block camshaft bearings for wear and damage; determine needed action 3.3.4
- 3.3.5 Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play 3.3.5
- 3.3.6 Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action 3.3.6
- 3.3.7 Inspect main bearings for wear and damage; check bearing clearances; check crankshaft end play 3.3.7
- 3.3.8 Inspect, install, and time gear train; measure gear backlash; determine needed action 3.3.8
- 3.3.9 Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings 3.3.9
- 3.3.10 Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons 3.3.10
- 3.3.11 Assemble pistons and connecting rods; install in block; install rod bearings and check clearances 3.3.11
- 3.3.12 Check condition of piston cooling jets (nozzles); determine needed action 3.3.12
- 3.3.13 Inspect crankshaft vibration damper; determine needed action 3.3.13
- 3.3.14 Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action 3.3.14

PS 3.4 PERFORM LUBRICATION SYSTEMS SERVICE AND REPAIR 3.4

- 3.4.1 Check engine oil level, condition, and consumption; determine needed action 3.4.1
- 3.4.2 Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action 3.4.2
- 3.4.3 Determine proper lubricant and filter requirements 3.4.3
- 3.4.4 Perform oil and filter change 3.4.4

PS 3.5 PERFORM COOLING SYSTEMS SERVICE AND REPAIR 3.5

- 3.5.1 Check engine coolant type, level, condition, and consumption; test coolant for freeze protection and additive package concentration; determine needed action 3.5.1
- 3.5.2 Test coolant temperature and check operation of temperature and level sensors, gauge, and/or sending unit; determine needed action 3.5.2
- 3.5.3 Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment 3.5.3
- 3.5.4 Recover coolant, refill with recommended coolant/additive package, and bleed cooling system per manufacturers specification 3.5.4
- 3.5.5 Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed 3.5.5
- 3.5.6 Inspect water pump and coolant hoses; replace as needed 3.5.6
- 3.5.7 Inspect, clean, and pressure test radiator. Pressure test cap, tank(s), and recovery systems; determine needed action 3.5.7
- 3.5.8 Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed 3.5.8

PS 3.6 INSPECT AIR INDUCTION AND EXHAUST SYSTEMS 3.6

- 3.6.1 Check air induction system: piping, hoses, clamps, and mounts; service or replace air filter as needed 3.6.1
- 3.6.2 Inspect intake manifold, gaskets, and connections; determine needed action 3.6.2
- 3.6.3 Inspect charge air cooler assemblies; determine needed action 3.6.3
- 3.6.4 Inspect exhaust manifold, piping, mufflers, and mounting hardware; determine needed action 3.6.4

PS 3.7 PERFORM FUEL SUPPLY SYSTEMS SERVICE 3.7

- 3.7.1 Check fuel level, and condition; determine needed action 3.7.1
- 3.7.2 Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action 3.7.2
- 3.7.3 Inspect primary fuel delivery system; determine needed action 3.7.3

PERFORM PREVENTATIVE MAINTENANCE INSPECTIONS 4.0

PS 4.1 ASSESS ENGINE SYSTEMS FOR SERVICE 4.1

- 4.1.1 Check engine starting/operation, record idle and governed rpm 4.1.1
- 4.1.2 Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment 4.1.2
- 4.1.3 Check engine oil level and condition; check dipstick seal 4.1.3
- 4.1.4 Inspect engine mounts for looseness and deterioration 4.1.4
- 4.1.5 Check engine for oil, coolant, air, fuel, and exhaust leaks (engine off and running) 4.1.5
- 4.1.6 Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing 4.1.6

PS 4.2 INVESTIGATE FUEL SYSTEMS FOR SERVICE 4.2

- 4.2.1 Check fuel tanks, mountings, lines, caps, and vents 4.2.1
- 4.2.2 Drain water from fuel system 4.2.2
- 4.2.3 Service water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system 4.2.3

PS 4.3 ASSESS AIR INDUCTION AND EXHAUST SYSTEMS FOR SERVICE 4.3

- 4.3.1 Check exhaust system mountings for looseness and damage 4.3.1
- 4.3.2 Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system and after treatment devices, if equipped 4.3.2
- 4.3.3 Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks 4.3.3
- 4.3.4 Inspect turbocharger for leaks; check mountings and connections 4.3.4
- 4.3.5 Service or replace air filter as needed; check and reset air filter restriction indicator 4.3.5
- 4.3.6 Inspect crankcase ventilation system 4.3.6
- 4.3.7 Inspect diesel exhaust fluid (DEF) system, to include tanks, lines, gauge, pump, and filter 4.3.7

PS 4.4 INVESTIGATE COOLING SYSTEMS FOR SERVICE 4.4

- 4.4.1 Check operation of fan clutch 4.4.1
- 4.4.2 Inspect radiator (including air flow restriction, leaks, and damage) and mountings 4.4.2
- 4.4.3 Inspect fan assembly and shroud 4.4.3
- 4.4.4 Pressure test cooling system and radiator cap 4.4.4
- 4.4.5 Inspect coolant hoses and clamps 4.4.5
- 4.4.6 Inspect coolant recovery system 4.4.6
- 4.4.7 Check coolant for contamination, additive package concentration, aeration, and protection level (freeze point) 4.4.7
- 4.4.8 Service coolant filter 4.4.8
- 4.4.9 Inspect water pump 4.4.9

PS 4.5 ANALYZE LUBRICATION SYSTEMS FOR SERVICE 4.5

- 4.5.1 Change engine oil and filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs 4.5.1

PS 4.6 INVESTIGATE CAB AND HOOD INSTRUMENTS AND CONTROLS FOR SERVICEABILITY 4.6

- 4.6.1 Inspect key condition and operation of ignition switch 4.6.1
- 4.6.2 Check warning indicators 4.6.2
- 4.6.3 Check instruments; record oil pressure and system voltage 4.6.3
- 4.6.4 Check heating ventilation and air conditioning (HVAC) controls 4.6.4
- 4.6.5 Check operation of all accessories 4.6.5
- 4.6.6 Using electronic service tool(s) or on-board diagnostic system; retrieve engine monitoring information; check and record diagnostic codes and trip/operational data (including engine, transmission, anti-lock brake system (ABS), and other systems) 4.6.6

PS 4.7 ASSESS CAB AND HOOD SAFETY EQUIPMENT FOR SERVICE 4.7

- 4.7.1 Check operation of electric/air horns and reverse warning devices 4.7.1
- 4.7.2 Check condition of spare fuses, safety triangles, fire extinguisher, and all required decals 4.7.2
- 4.7.3 Inspect seat belts and sleeper restraints 4.7.3
- 4.7.4 Inspect wiper blades and arms 4.7.4

PS 4.8 INSPECT CAB AND HOOD HARDWARE/ACCESSORIES FOR SERVICE 4.8

- 4.8.1 Check operation of wiper and washer 4.8.1
- 4.8.2 Inspect windshield glass for cracks or discoloration; check sun visor 4.8.2
- 4.8.3 Check seat condition, operation, and mounting 4.8.3
- 4.8.4 Check door glass and window operation 4.8.4
- 4.8.5 Inspect steps and grab handles 4.8.5
- 4.8.6 Inspect mirrors, mountings, brackets, and glass 4.8.6
- 4.8.7 Record all observed physical damage 4.8.7
- 4.8.8 Lubricate all cab and hood grease fittings 4.8.8
- 4.8.9 Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables 4.8.9

PS 4.9 EXAMINE HEATING, VENTILATION AND AIR CONDITIONING (HVAC) SYSTEMS FOR SERVICE 4.9

- 4.9.1 Inspect A/C condenser and lines for condition and visible leaks; check mountings 4.9.1
- 4.9.2 Inspect A/C compressor and lines for condition and visible leaks; check mountings 4.9.2
- 4.9.3 Check A/C system condition and operation; check A/C monitoring system, if applicable 4.9.3
- 4.9.4 Check HVAC air inlet filters and ducts; service as needed 4.9.4

PS 4.10 ASSESS BATTERY AND STARTING SYSTEMS 4.10

- 4.10.1 Inspect battery box(es), cover(s), and mountings 4.10.1
- 4.10.2 Inspect battery hold-downs, connections, cables, and cable routing; service as needed 4.10.2
- 4.10.3 Check/record battery state-of-charge (open circuit voltage) and condition 4.10.3
- 4.10.4 Perform battery test (load and/or capacitance) 4.10.4
- 4.10.5 Inspect starter, mounting, and connections 4.10.5
- 4.10.6 Engage starter; check for unusual noises, starter drag, and starting difficulty 4.10.6

PS 4.11 ASSESS CHARGING SYSTEMS 4.11

- 4.11.1 Inspect alternator, mountings, cable, wiring, and wiring routing; determine needed action 4.11.1
- 4.11.2 Perform alternator output tests 4.11.2

PS 4.12 INVESTIGATE LIGHTING SYSTEMS FOR SERVICE 4.12

- 4.12.1 Check operation of interior lights 4.12.1
- 4.12.2 Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment 4.12.2
- 4.12.3 Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s) 4.12.3

PS 4.13 EXAMINE AIR BRAKES FOR SERVICE 4.13

- 4.13.1 Check operation of parking brake 4.13.1
- 4.13.2 Record air governor cut-in and cut-out setting (psi) 4.13.2
- 4.13.3 Check operation of air reservoir/tank drain valves 4.13.3
- 4.13.4 Check air system for leaks (brakes released) 4.13.4
- 4.13.5 Check air system for leaks (brakes applied) 4.13.5
- 4.13.6 Test one-way and double-check valves 4.13.6
- 4.13.7 Check low air pressure warning devices 4.13.7
- 4.13.8 Check tractor protection valve 4.13.8
- 4.13.9 Test air pressure build-up time 4.13.9
- 4.13.10 Inspect coupling air lines, holders, and gladhands 4.13.10
- 4.13.11 Check brake chambers and air lines for secure mounting and damage 4.13.11
- 4.13.12 Check operation of air drier 4.13.12
- 4.13.13 Inspect and record brake shoe/pad condition, thickness, and contamination 4.13.13
- 4.13.14 Inspect and record condition of brake drums/rotors 4.13.14
- 4.13.15 Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing 4.13.15
- 4.13.16 Check operation and adjustment of brake automatic slack adjusters (ASA); check and record push rod stroke 4.13.16
- 4.13.17 Lubricate all brake component grease fittings 4.13.17
- 4.13.18 Check condition and operation of hand brake (trailer) control valve, if applicable 4.13.18
- 4.13.19 Drain air tanks and check for contamination 4.13.19
- 4.13.20 Check condition of pressure relief (safety) valves 4.13.20

PS 4.14 INVESTIGATE HYDRAULIC BRAKES FOR SERVICE 4.14

- 4.14.1 Check master cylinder fluid level and condition 4.14.1
- 4.14.2 Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage 4.14.2
- 4.14.3 Check parking brake operation; inspect parking brake application and holding devices; adjust as needed 4.14.3
- 4.14.4 Check operation of hydraulic system: pedal travel, pedal effort, pedal feel 4.14.4
- 4.14.5 Inspect calipers/wheel cylinders for leakage, binding and damage 4.14.5
- 4.14.6 Inspect brake assist system (booster), hoses and control valves; check reservoir fluid level and condition 4.14.6
- 4.14.7 Inspect and record brake pad/lining condition, thickness, and contamination 4.14.7
- 4.14.8 Inspect and record condition of brake rotors/drums 4.14.8
- 4.14.9 Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing 4.14.9

PS 4.15 ANALYZE DRIVE TRAIN FOR SERVICE 4.15

- 4.15.1 Check clutch linkage/cable and levers for looseness or binding, lubricate release/throwout bearing as required 4.15.1
- 4.15.2 Check hydraulic clutch slave and master cylinders, lines, fittings, hoses, and fluid level 4.15.2
- 4.15.3 Check transmission case, seals, filter, hoses, lines and cooler for cracks and leaks 4.15.3
- 4.15.4 Inspect transmission breather 4.15.4
- 4.15.5 Inspect transmission mounts 4.15.5
- 4.15.6 Check transmission oil level, type, and condition; add proper type of lubricant as needed 4.15.6
- 4.15.7 Inspect U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing 4.15.7
- 4.15.8 Inspect axle housing(s) for cracks and leaks 4.15.8
- 4.15.9 Inspect axle breather(s) 4.15.9
- 4.15.10 Lubricate all drive train grease fittings 4.15.10
- 4.15.11 Check drive axle(s) oil level, type, and condition; add proper type of lubricant as needed 4.15.11
- 4.15.12 Check transmission wiring, connectors, seals, and harnesses for damage and proper routing 4.15.12
- 4.15.13 Check pedal height and travel, inspect clutch safety switch 4.15.13
- 4.15.14 Measure driveline angles; determine necessary action 4.15.14

PS 4.16 INVESTIGATE SUSPENSION AND STEERING SYSTEMS FOR SERVICE 4.16

- 4.16.1 Check steering wheel operation for free play and binding 4.16.1
- 4.16.2 Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level 4.16.2
- 4.16.3 Inspect steering gear for leaks and secure mounting. 4.16.3
- 4.16.4 Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages 4.16.4
- 4.16.5 Check kingpins for wear 4.16.5
- 4.16.6 Check wheel bearings for looseness and noise 4.16.6
- 4.16.7 Check oil level and condition in all non-drive hubs; check for leaks. 4.16.7
- 4.16.8 Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators 4.16.8
- 4.16.9 Inspect shock absorbers for leaks and secure mounting 4.16.9
- 4.16.10 Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage 4.16.10
- 4.16.11 Check and record suspension ride height 4.16.11
- 4.16.12 Lubricate all suspension and steering grease fittings 4.16.12
- 4.16.13 Check axle locating components (radius, torque, and/or track rods) 4.16.13

PS 4.17 ASSESS TIRES AND WHEELS FOR SERVICE 4.17

- 4.17.1 Inspect tires for wear patterns and proper mounting 4.17.1
- 4.17.2 Inspect tires for cuts, cracks, bulges, and sidewall damage 4.17.2
- 4.17.3 Inspect valve caps and stems; determine needed action 4.17.3
- 4.17.4 Measure and record tread depth; probe for imbedded debris 4.17.4
- 4.17.5 Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications 4.17.5
- 4.17.6 Check wheel mounting hardware; determine needed action 4.17.6
- 4.17.7 Inspect wheels for cracks, damage and proper hand hold alignment 4.17.7
- 4.17.8 Check tire matching (diameter and tread) on single and dual tire applications 4.17.8

PS 4.18 ANALYZE FRAME AND FIFTH WHEEL FOR SERVICE 4.18

- 1.18.1 Inspect fifth wheel mounting, bolts, air lines, and locks 4.18.1
- 4.18.2 Test operation of fifth wheel locking device; adjust if necessary 4.18.2
- 4.18.3 Check quarter fenders, mud flaps, and brackets 4.18.3
- 4.18.4 Check pintle hook assembly and mounting, if applicable 4.18.4
- 4.18.5 Lubricate all fifth wheel grease fittings and plate, of applicable 4.18.5
- 4.18.6 Inspect frame and frame members for cracks and damage 4.18.6

ANALYZE HYDRAULIC SYSTEMS 5.0

PS 5.1 INVESTIGATE GENERAL SYSTEM OPERATION 5.1

- 5.1.1 Identify system type (closed and open) and verify proper operation 5.1.1
- 5.1.2 Read and interpret system diagrams and schematics 5.1.2

PS 5.2 ASSESS HYDRAULIC PUMPS 5.2

- 5.2.1 Identify system fluid type 5.2.1
- 5.2.2 Identify causes of pump failure, unusual pump noises, temperature, flow, and leakage problems 5.2.2
- 5.2.3 Determine pump type, rotation, and drive system 5.2.3

PS 5.3 PERFORM FILTRATION/RESERVOIRS (TANKS) SERVICE 5.3

- 5.3.1 Identify type of filtration system; verify filter application and flow direction 5.3.1
- 5.3.2 Service filters and breathers 5.3.2
- 5.3.3 Identify causes of system contamination; determine needed action 5.3.3
- 5.3.4 Check reservoir fluid level and condition; determine needed action 5.3.4
- 5.3.5 Inspect reservoir, sight glass, vents, caps, mounts, valves, screens, supply and return lines 5.3.5

PS 5.4 EXAMINE HOSES, FITTINGS, AND CONNECTIONS 5.4

- 5.4.1 Diagnose causes of component leakage, damage, and restriction; determine needed action 5.4.1
- 5.4.2 Inspect hoses and connections (length, size, routing, bend radii, and protection); repair or replace as needed 5.4.2
- 5.4.3 Inspect and replace fitting seals and sealants 5.4.3

PS 5.5 EVALUATE ACTUATORS FOR SERVICE 5.5

- 5.5.1 Identify actuator type (single/double acting, multi-stage/telescopic, and motors) 5.5.1
- 5.5.2 Identify the cause of seal failure; determine needed repairs 5.5.2
- 5.5.3 Identify the cause of incorrect actuator movement and leakage (internal and external); determine needed repairs 5.5.3
- 5.5.4 Inspect actuator mounting, frame components, and hardware for looseness, cracks, and damage; determine needed action 5.5.4
- 5.5.5 Inspect actuators for dents, cracks, damage, and leakage; determine needed action 5.5.5
- 5.5.6 Purge and/or bleed system in accordance with manufacturers' recommended procedures 5.5.6

ANALYZE BRAKE SYSTEMS 6.0

PS 6.1 ASSESS AIR BRAKES – AIR SUPPLY AND SERVICE SYSTEMS 6.1

- 6.1.1 Identify poor stopping, air leaks, premature wear, pulling, grabbing, dragging, or balance problems caused by supply and service system malfunctions; determine needed action 6.1.1
- 6.1.2 Check air system build-up time; determine needed action 6.1.2
- 6.1.3 Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action 6.1.3
- 6.1.4 Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed 6.1.4
- 6.1.5 Inspect and test air tank relief (safety) valves, one-way (single) check valves 6.1.5
- 6.1.6 Inspect and test brake application (foot/treadle) valve, fittings, and mounts; check pedal operation; determine needed action 6.1.6
- 6.1.7 Inspect and test stop light circuit switches, wiring, and connectors; determine needed action 6.1.7
- 6.1.8 Inspect and test emergency (spring) brake control valve(s) 6.1.8
- 6.1.9 Inspect and test low pressure warning devices, wiring, and connectors; determine needed action 6.1.9
- 6.1.10 Inspect and test air pressure gauges, lines, and fittings; determine needed action 6.1.10

PS 6.2 ASSESS AIR BRAKES – MECHANICAL/FOUNDATION BRAKES 6.2

- 6.2.1 Identify poor stopping, brake noise, premature wear, pulling, grabbing, or dragging problems caused by the foundation brake, slack adjuster, and brake chamber problems; determine needed action 6.2.1
- 6.2.2 Inspect service brake chambers, pushrod, clevis, and mounting brackets 6.2.2
- 6.2.3 Identify type and inspect slack adjusters 6.2.3
- 6.2.4 Inspect camshafts, tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; determine needed action 6.2.4
- 6.2.5 Inspect and measure brake shoes or pads; determine needed action 6.2.5
- 6.2.6 Inspect and measure brake drums or rotors; determine needed action 6.2.6

PS 6.3 ASSESS AIR BRAKES – PARKING BRAKES 6.3

- 6.3.1 Inspect parking (spring) brake check valves, lines, hoses, and fittings 6.3.1
- 6.3.2 Inspect and test parking (spring) brake application and release valve 6.3.2
- 6.3.3 Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations 6.3.3

PS 6.4 ASSESS HYDRAULIC BRAKES – HYDRAULIC SYSTEM 6.4

- 6.4.1 Identify poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system; determine needed action 6.4.1
- 6.4.2 Inspect and test master cylinder for internal/external leaks and damage; determine needed action 6.4.2
- 6.4.3 Inspect hydraulic system brake lines, flexible hoses, and fittings for leaks and damage; determine needed action 6.4.3
- 6.4.4 Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; determine needed action 6.4.4
- 6.4.5 Inspect and test brake pressure differential valve and warning light circuit switch, bulbs/LEDs, wiring, and connectors; determine needed action 6.4.5
- 6.4.6 Inspect disc brake caliper assemblies; determine needed action 6.4.6
- 6.4.7 Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type 6.4.7

PS 6.5 ASSESS HYDRAULIC BRAKES – MECHANICAL/FOUNDATION BRAKES 6.5

- 6.5.1 Identify poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems caused by mechanical components; determine needed action 6.5.1
- 6.5.2 Inspect and measure rotors; determine needed action 6.5.2
- 6.5.3 Inspect and measure disc brake pads; inspect mounting hardware; determine needed action 6.5.3
- 6.5.4 Check parking brake operation; inspect parking brake application and holding devices; determine needed action 6.5.4

PS 6.6 ASSESS HYDRAULIC BRAKES – POWER ASSIST UNITS 6.6

- 6.6.1 Identify stopping problems caused by the brake assist (booster) system; determine needed action 6.6.1
- 6.6.2 Inspect, test, repair, or replace hydraulic brake assist (booster), hoses, and control valves; determine proper fluid type 6.6.2
- 6.6.3 Check emergency (back-up, reserve) brake assist system 6.6.3

PS 6.7 DIAGNOSE AIR AND HYDRAULIC ANTI-LOCK BRAKING SYSTEMS (ABS) AND AUTOMATIC TRACTION CONTROL (ATC) SYSTEMS 6.7

- 6.7.1 Observe anti-lock braking system (ABS) warning light operation (includes trailer and dash mounted trailer ABS warning light); determine needed action 6.7.1
- 6.7.2 Diagnose anti-lock braking system (ABS) electronic control(s) and components; determine needed action 6.7.2
- 6.7.3 Identify poor stopping and wheel lock-up problems caused by failure of the anti-lock braking system (ABS); determine needed action 6.7.3
- 6.7.4 Test and check operation of anti-lock braking system (ABS) components; determine needed action 6.7.4
- 6.7.5 Test anti-lock braking system (ABS) wheel speed sensors and circuits; determine needed action 6.7.5
- 6.7.6 Bleed the anti-lock braking system ABS hydraulic circuits 6.7.6

PS 6.8 PERFORM WHEEL BEARING SERVICE AND REPAIR 6.8

- 6.8.1 Inspect and service wheel bearings according to manufactures specifications 6.8.1
- 6.8.2 Identify, inspect or replace unitized/preset hub bearing assemblies 6.8.2

PERFORM SUSPENSION AND STEERING SERVICE 7.0

PS 7.1 ASSESS STEERING SYSTEMS - COLUMN 7.1

- 7.1.1 Identify causes of fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action 7.1.1
- 7.1.2 Inspect steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft; determine needed action 7.1.2
- 7.1.3 Remove the steering wheel (includes steering wheels equipped with electrical/electronic controls and components); install and center the steering wheel. Inspect, test, replace and calibrate steering angle sensor 7.1.3
- 7.1.4 Disable and enable supplemental restraint system (SRS) in accordance with manufacturers' procedures 7.1.4

PS 7.2 ASSESS STEERING SYSTEMS - UNITS 7.2

- 7.2.1 Identify causes of power steering system noise, steering binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recovery, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems; determine needed action 7.2.1
- 7.2.2 Determine recommended type of power steering fluid; check level and condition; determine needed action 7.2.2
- 7.2.3 Flush and refill power steering system; purge air from system. 7.2.3

PS 7.3 ASSESS STEERING SYSTEMS - LINKAGE 7.3

- 7.3.1 Inspect steering linkage components 7.3.1
- 7.3.2 Check and adjust steering (wheel) stops 7.3.2

PS 7.4 INVESTIGATE SUSPENSION SYSTEMS 7.4

- 7.4.1 Inspect front axles and attaching hardware; determine needed action 7.4.1
- 7.4.2 Inspect kingpins, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action 7.4.2
- 7.4.3 Inspect shock absorbers, bushings, brackets, and mounts; determine needed action 7.4.3
- 7.4.4 Inspect leaf springs, center bolts, clips, pins and bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action 7.4.4
- 7.4.5 Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, torque arms, related bushings, mounts, shims, and cams; determine needed action 7.4.5
- 7.4.6 Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; determine needed action 7.4.6
- 7.4.7 Inspect air springs, mounting plates, springs, suspension arms, and bushings 7.4.7
- 7.4.8 Measure and adjust ride height; determine needed action 7.4.8

PS 7.5 PERFORM WHEEL ALIGNMENT DIAGNOSIS, ADJUSTMENT, AND REPAIR 7.5

- 7.5.1 Identify causes of vehicle wandering, pulling, shimmy, hard steering, and off-center steering wheel problems; adjust or repair as needed 7.5.1
- 7.5.2 Check and adjust camber 7.5.2
- 7.5.3 Check and adjust caster 7.5.3
- 7.5.4 Check and adjust toe settings 7.5.4
- 7.5.5 Check rear axle(s) alignment (thrustline/centerline) and tracking; adjust or repair as needed 7.5.5
- 7.5.6 Identify turning/Ackerman angle (toe-out-on-turns) problems; determine needed action 7.5.6
- 7.5.7 Check front axle alignment (centerline); adjust or repair as needed 7.5.7

PS 7.6 EVALUATE WHEELS AND TIRES 7.6

- 7.6.1 Identify tire wear patterns; check tread depth and pressure determine needed action 7.6.1
- 7.6.2 Identify wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action 7.6.2
- 7.6.3 Remove and install steering and drive axle wheel/tire assemblies; torque mounting hardware to specifications with torque wrench 7.6.3
- 7.6.4 Inspect tire for proper application, (size, load range, position, and tread design); determine needed action 7.6.4
- 7.6.5 Inspect wheel/rims for proper application, load range, size, and design; determine needed action 7.6.5
- 7.6.6 Check operation of tire pressure monitoring system (TPMS); determine needed action 7.6.6

ANALYZE ELECTRIC/ELECTRONIC SYSTEMS 8.0

PS 8.1 PERFORM GENERAL ELECTRICAL SYSTEMS SERVICE 8.1

- 8.1.1 Read and interpret electrical/electronic circuits using wiring diagrams 8.1.1
- 8.1.2 Check continuity in electrical/electronic circuits using appropriate test equipment 8.1.2
- 8.1.3 Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment 8.1.3
- 8.1.4 Check current flow in electrical/electronic circuits and components using appropriate test equipment 8.1.4
- 8.1.5 Check resistance in electrical/electronic circuits and components using appropriate test equipment 8.1.5
- 8.1.6 Locate shorts, grounds, and opens in electrical/electronic circuits 8.1.6
- 8.1.7 Identify parasitic (key-off) battery drain problems; perform tests; determine needed action 8.1.7
- 8.1.8 Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed 8.1.8
- 8.1.9 Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment 8.1.9

PS 8.2 PERFORM BATTERY SERVICE 8.2

- 8.2.1 Identify battery type; perform appropriate battery load test; determine needed action 8.2.1
- 8.2.2 Determine battery state of charge using an open circuit voltage test 8.2.2
- 8.2.3 Inspect, clean, and service battery; replace as needed 8.2.3
- 8.2.4 Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed 8.2.4
- 8.2.5 Charge battery using appropriate method for battery type 8.2.5
- 8.2.6 Inspect, test, and clean battery cables and connectors; repair or replace as needed 8.2.6
- 8.2.7 Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures 8.2.7
- 8.2.8 Perform battery capacitance test; determine needed action 8.2.8

PS 8.3 PERFORM STARTING SYSTEM SERVICE 8.3

- 8.3.1 Perform starter circuit cranking voltage and voltage drop tests; determine needed action 8.3.1
- 8.3.2 Inspect and test components (key switch, push button and/or magnetic switch) and wires and harnesses in the starter control circuit; replace as needed 8.3.2
- 8.3.3 Inspect and test, starter relays and solenoids/switches; replace as needed 8.3.3
- 8.3.4 Remove and replace starter; inspect flywheel ring gear or flex plate 8.3.4
- 8.3.5 Perform starter current draw test; determine needed action 8.3.5

PS 8.4 PERFORM CHARGING SYSTEM DIAGNOSIS AND REPAIR 8.4

- 8.4.1 Test instrument panel mounted volt meters and/or indicator lamps; determine needed action 8.4.1
- 8.4.2 Identify causes of a no charge, low charge, or overcharge problems; determine needed action 8.4.2
- 8.4.3 Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment 8.4.3
- 8.4.4 Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action 8.4.4
- 8.4.5 Perform charging circuit voltage drop tests; determine needed action 8.4.5
- 8.4.6 Remove and replace alternator 8.4.6
- 8.4.7 Inspect, repair, or replace cables, wires, and connectors in the charging circuit 8.4.7

PS 8.5 PERFORM LIGHTING SYSTEMS DIAGNOSIS AND REPAIR 8.5

- 8.5.1 Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation 8.5.1
- 8.5.2 Test, replace, and aim headlights 8.5.2
- 8.5.3 Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed 8.5.3
- 8.5.4 Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays, wires, and control components/modules of parking, clearance, and taillight circuits; repair or replace as needed 8.5.4
- 8.5.5 Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed 8.5.5
- 8.5.6 Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed 8.5.6
- 8.5.7 Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed 8.5.7
- 8.5.8 Inspect and test reverse lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, wires and control components/modules; repair or replace as needed 8.5.8

INVESTIGATE TRANSPORTATION SYSTEMS 9.0

PS 9.1 ASSESS TRANSPORTATION SYSTEMS 9.1

- 9.1.1 Describe the history of the automobile and the effects on society 9.1.1
- 9.1.2 Research the different career opportunities in the transportation career path 9.1.2
- 9.1.3 Investigate new and emerging technologies 9.1.3
- 9.1.4 Analyze workplace situations and use problem-solving techniques to improve the workplace environment 9.1.4