

Diesel Technology: Preventive Maintenance

Instructional/Task Analysis

**Related Information: What
the Student Should Know**

**Application: What the
Student Should Be Able to Do**

Unit 1: Introduction to Preventive Maintenance

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| 1. Purposes of a preventive maintenance inspection | 1. Find information on recalls |
| 2. Basis for setting up a preventive maintenance inspection schedule | |
| 3. Types of preventive maintenance inspections | |
| 4. Federal regulatory agencies | |
| 5. Periodic maintenance inspections (PMI) | |
| 6. PMI recordkeeping requirements | |
| 7. Inspector qualifications | |
| 8. Lubricants used in preventive maintenance inspections | |
| 9. Walk around inspection | |
| 10. Shop/vehicle rules, and shop setup | |
| 11. Specialty tools | |
| 12. General guidelines for conducting PMI's | |

Unit 2: In-Cab Inspection

Key Off

1. Check floor mats and/or coverings
2. Check seat condition, operation, and mounting
3. Check seat belts and sleeper restraints
4. Check steering wheel play or bending; check operation of horn (electronically operated, if equipped)
5. Check windshield glass for cracks or discoloration; check sun visor(s)
6. Check on lighting of all gauges and operation of interior and bunk lights
7. Check operation of gear shift

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Unit 2: In-Cab Inspection (continued)

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| 8. Check door glass and operation of windows (manually operated windows) | 1. Perform and in-cab inspection |
| 9. Check clutch free travel | |
| 10. Check condition of spare fuses, triangles, fire extinguishers, and all required decals | |

Key On

1. Check key condition and operation of ignition switch
2. Check warning indicators
3. Check system voltage
4. Check operation of windshield wipers/washers
5. Check operation of all accessories and controls
6. Extract engine monitoring information

Engine On

1. Check starter operation
2. Check engine starting/operation; record idle and governed RPM
3. Check instruments; record oil pressure
4. Test air pressure build-up time
5. Check heater, ventilation, and air conditioning operation and controls in cab and sleeper
6. Check operation of air operated horn (if equipped), and backup warning devices
7. Check door glass and window operation (air operated, if equipped)
8. Check operation of parking brake
9. Check operation of the clutch and clutch brake
10. Check interaxle differential lock operation
11. Check range shift operation
12. Check mechanical, electronic, and emergency shutdown operation

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Unit 3: Exterior Inspection

1. Check door operation locks, latches, and hinges (both sides)
2. Check condition of grab handles, steps, and catwalks (cab and sleeper, both sides)
3. Check mirrors, mountings, brackets, and glass (both sides)
4. Check and record all physical (body) damage (all around)
5. Check fuel tanks, mounting, lines, caps, and vents
6. Check battery box(es), cover(s), and mounts
7. check battery hold-downs, connections, cables, and cable routing
8. Check/record battery(s) state-of-charge and capacity (load test)
9. Check coupling air line, holders, glad hands, and multi-wire connection
10. Check operation of air reservoir/tank drain valves, and check mountings, fittings, and connections
11. Check fifth wheel mounting bolts, air lines, and locks
12. Check operation of fifth wheel device
13. Check quarter fenders mud flaps and brackets (both sides)
14. Check pintle hook assembly and mounting
15. Check frame and frame members (all around)
16. Check and record suspension ride height
17. Check all exterior lights, lenses, reflectors, and conspicuity tape
18. Check license plate and bracket (front and back)
19. Check exhaust system for leaks, proper routing and damaged or missing components; check mountings for looseness and damage

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Unit 3: Exterior Inspection (continued)

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| 20. Check cab mounting, hinges, latches, linkages, and cables | 1. Make a battery state-of-charge test |
| 21. Check wiper blades, arms, and windshield washer | 2. Determine battery state-of-charge using an open circuit voltage test |
| 22. Check headlight alignment | 3. Make a battery capacity (load) test |
| 23. Lubricate all cab and hood grease fittings and lubricate door and hood hinges, latches, strikes, lock cylinders, safety latches, linkages, and cables | 4. Inspect, test, repair, and replace the components of tractor-to-trailer lights circuit |
| 24. Lubricate all fifth wheel grease fittings and plate. | 5. Inspect and test an air suspension system, replace the leveling valve, and adjust frame (ride) height |
| | 6. Inspect, replace, and aim headlights/bulbs |
| | 7. Perform an exterior inspection |

Unit 4: Brakes Inspection

Air Brakes

1. Check parking brake operation, and check for air leaks with the brakes applied and released
2. Check brake chambers and air lines for secure mounting and damage
3. Check air governor cut-in pressure, record air governor cut-out setting, and check air reservoir/tank drain valve operation
4. Check one-way and double-check valves, and tractor protection valve
5. Check low pressure warning devices and air pressure build-up time
6. Inspect and record condition of brake lining pads and brake drum/rotor, and check condition of camshaft and bushing
7. Check operation and adjustment of manual/automatic slack adjusters, and check and record push and stroke
8. Check condition and operation of hand brake (trailer control valve)
9. Perform antilock brake system (ABS) operational system self-test and check ABS wiring, connectors, seals, and harnesses for damage and proper routing

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Unit 4: Brakes Inspection (continued)

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| 10. Drain air tank; check for contamination and check condition of pressure relief (safety) valves | 1. Inspect, clean, and measure brake calipers, pads, and rotors (air brakes) |
| 11. Check spring brake inversion system | 2. Inspect, service, and adjust slack adjuster on front axle (air brakes) |

Hydraulic Brakes

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| 1. Check master cylinder fluid level and conditions | 3. Remove, clean, inspect, and measure a brake drum (hydraulic brakes) |
| 2. Check power brake assist system (booster), hoses, and check/control valves; check reservoir fluid level and condition | 4. Adjust hydraulic drum brakes |
| 3. Check wheel cylinders/calipers, brake lines, fittings, flexible hoses, and valves for leaks and damage | 5. Lubricate brake component grease fittings |
| 4. Check and record brake lining/pad condition and thickness | 6. Perform a brakes inspection |
| 5. Check and record conditions of front and rear brake rotors | |
| 6. Check parking brake operation, inspect parking brake application and holding devices | |
| 7. Check operation of hydraulic systems; pedal travel, pedal effort, and pedal free | |

Unit 5: Tires and Wheels Inspection

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| 1. Check tires for irregular wear patterns and proper mounting of directional tires | 10. Check tandem axle alignment and spacing |
| 2. Check tire matching (diameter and tread) on dual tire installations | 11. Check toe setting |
| 3. Check condition of tires | 12. Check wheel bearings for looseness and noise |
| 4. Check valve caps and stems | 1. Diagnose unusual tire wear patterns, check tire pressure, measure and match tires, and re-torque lugs |
| 5. Check and record tread depth, and probe for embedded debris | 2. Check toe; adjust as needed |
| 6. Check and record air pressure | 3. Remove, inspect, clean, replace, and adjust wheel bearings and seals |
| 7. Check lugs, spacers, wheels, and mounting hardware | 4. Perform a tires and wheels inspection |
| 8. Check dual mating with square | |
| 9. Check king pin wear | |

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Unit 5: Tires and Wheels Inspection (continued)

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| 10. Check tandem axle alignment and spacing | 1. Diagnose unusual tire wear patterns, check tire pressure, measure and match tires, and re-torque lugs |
| 11. Check toe setting | |
| 12. Check wheel bearings for looseness and noise | 2. Check toe; adjust as needed
3. Remove, inspect, clean, replace, and adjust wheel bearings and seals
4. Perform a tires and wheels inspection |

Unit 6: Under-Vehicle Inspection

1. Check frame and frame members for cracks and damages
2. Check engine mounts for looseness and deterioration
3. Check transmission wiring connectors, seals, and harnesses for damage and proper routing
4. Check exhaust system (under vehicle) for leaks, proper routing, and damaged or missing components; check mountings for looseness and damage
5. Check clutch linkage/cable for looseness or binding
6. Check transmission mounts
7. Check transmission case, seals, lines, cooler, and fittings for leaks and cracks; check breather
8. Check transmission oil level, type, and condition (standard transmission)
9. Check U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing
10. Check axle housings for cracks and leaks; check axle breather
11. Check drive axle(s) oil level, type, and condition
12. Check oil level and condition in non-drum hubs

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Unit 6: Under-Vehicle Inspection (continued)

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| 13. Check two-speed axle unit operation and oil level | 1. Change transmission oil and filter |
| 14. Check steering gear for leaks and secure mounting | 2. Check axle fluid level and condition; change oil and filter; clean magnetic plug(s) |
| 15. Check steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkage assist power steering cylinders | 3. Inspect and service driveshaft, slip joints, yokes, drive flanges, and U-joints; check phasing of all yokes |
| 16. Check springs, pins, hangers, shackles, spring U-bolts, and insulators | 4. Inspect front suspension components |
| 17. Check shock absorbers | 5. Inspect rear spring suspension components |
| 18. Check air suspension springs, mounts, hoses, valves, linkage, and fittings | 6. Perform drive train lubrication |
| 19. Check vibration damper | 7. Perform an under-vehicle inspection |

Unit 7: Engine Compartment Inspection

Engine Off

1. Check belts, tensioners, and pulleys
2. Check engine oil and condition; check dipstick seal
3. Check engine for oil, coolant, air, fuel, and exhaust leaks
4. Change engine oil and filters, inspect and clean magnetic drain plugs, and take an oil sample
5. Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing
6. Check starter mounting and connections
7. Check alternator mounting and connections
8. Check windshield washer fluid
9. Check brake master cylinder fluid level and condition
10. Check hydraulic clutch slave and master cylinder
11. Check brake assist system (booster), hoses, and control valves; check reservoir fluid level and condition

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Unit 7: Engine Compartment Inspection (continued)

12. Check power steering fluid and filter
13. Check power steering pump, mounting and hoses for leaks, condition, and routing; check fluid level
14. Check steering gear for leaks and secure mounting
15. Check steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages
16. Check A/C condenser/compressor and lines for mounting, condition, and leaks
17. Check fuel pump and fuel line mountings
18. Check water separator/fuel heater
19. Check air filter
20. Check turbocharger for leaks; check mountings and connections
21. Check radiator; service coolant filter
22. Check coolant recovery system, and coolant hoses and clamps
23. Check coolant for contamination, additive concentration, and protection levels
24. Pressure test cooling system and radiator cap
25. Check fan assembly and shroud
26. Inspect water pump for leaks and bearing play
27. Inspect and service crankshaft ventilation system

Engine On

1. Check engine for oil, coolant, air, fuel, and exhaust leaks
2. Check air induction system
3. Check transmission oil level, type, and condition (automatic transmissions)
4. Check/record alternator current and voltage output
5. Check air conditioning system

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Unit 7: Engine Compartment Inspection (continued)

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| 6. Check operation of engine compression/exhaust brake | 1. Inspect and adjust drive belts and tensioners |
| 7. Check operation of fan clutch | 2. Take oil sample, and change oil and filter(s) |
| 8. Check HVAC inlet filters and ducts | 3. Inspect engine coolant level and condition |
| 9. Check 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. Pressure test coolant system and radiator cap |
| | 5. Make a charging system output test; determine needed repairs |
| | 6. Perform an engine compartment inspection |

Unit 8: Cargo Handling Devices Inspection

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| 1. Check fluid levels | 1. Lubricate cargo handling devices |
| 2. Check all hydraulic components | 2. Perform a cargo handling devices inspection |
| 3. Check all electrical components | |
| 4. Check liftgate components | |
| 5. Lubricate ramp | |

Final Assessment

1. Perform a complete preventive maintenance inspection