

Course Title: Diesel Engine Service 1
Course Number: 8742010
Course Credit: 1

Course Description:

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

CTE Standards and Benchmarks	
04.0	Identify shop organization, management, and safety requirements--The student will be able to:
04.01	Identify basic shop organization and management regulations.
04.02	Identify and apply required shop-safety practices.
04.03	Identify and describe shop-maintenance procedures, including precautions for handling and storing work-related chemicals and hazardous materials.
05.0	Identify the basic diesel components and functions--The student will be able to:
05.01	Identify types of bearings and their uses.
05.02	Identify seals, gaskets, and fasteners.
05.03	Identify drive power train components and functions.
05.04	Identify threaded fasteners by size, type, thread series, thread classes, material hardness, and compatibility
06.0	Demonstrate the use of basic tools and equipment--The student will be able to:
06.01	Identify and use the following correctly and safely:
a.	Basic hand tools
b.	Basic welding tools and equipment
c.	Power tools
d.	Measuring and precision tools
e.	Read a digital multimeter
07.0	Demonstrate shop and occupational safety procedures--The student will be able to:
07.01	Assist in activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.

CTE Standards and Benchmarks	
07.02	Identify and comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, and the handling, storage, and disposal of chemicals and hazardous materials.
08.0	Identify principles, assemblies, and systems of engine operation--The student will be able to:
08.01	Explain the basic principles in the operation of the four-stroke-cycle diesel engine
08.02	Identify engine assemblies and systems.
08.03	Explain the operating principles of two-and-four-stroke-cycle engines.
08.04	Identify the equipment of two-and-four-stroke-cycle engines.
08.05	Identify governor types and their operating principles.
09.0	Demonstrate the qualifications for employment--The student will be able to:
09.01	Demonstrate the shop organization, management, and safety requirements for a diesel engine technician.
09.02	Demonstrate the use of tools and equipment required for a diesel engine technician.
09.03	Demonstrate workplace communications skills required by diesel engine technician.
09.04	Demonstrate the application of math and science principles required for a diesel engine technician's job tasks.
09.05	Demonstrate employability skills as a diesel engine technician.

Course Title: Diesel Engine Service 2
Course Number: 8742020
Course Credit: 1

Course Description:

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

CTE Standards and Benchmarks	
10.0	Diagnose and repair general electrical systems--The student will be able to:
10.01	Read, interpret, and diagnose electrical/electronic circuits using wiring diagrams.
10.02	Check continuity in electrical/electronic circuits using appropriate test equipment.
10.03	Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using a digital multimeter (DMM).
10.04	Check current flow in electrical/electronic circuits and components using a digital multimeter (DMM) and clamp-on ammeter.
10.05	Check resistance in electrical/electronic circuits and components using a digital multimeter (DMM).
10.06	Find shorts, grounds, and opens in electrical/electronic circuits.
10.07	Diagnose parasitic (key-off) battery drain problems.
10.08	Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed.
10.09	Inspect and test spike suppression diodes/resistors; replace as needed.
11.0	Diagnose and repair battery systems--The student will be able to:
11.01	Perform battery load test; determine needed action.
11.02	Determine battery state of charge using an open circuit voltage test.
11.03	Inspect, clean, and service battery; replace as needed.
11.04	Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed.
11.05	Charge battery using slow or fast charge method as appropriate.
11.06	Inspect, test, and clean battery cables and connectors; repair or replace as needed.
11.07	Jump start a vehicle using jumper cables and a booster battery or auxiliary power supply using proper safety procedures.
11.08	Perform battery capacitance test; determine needed action.

CTE Standards and Benchmarks

12.0 Diagnose and repair starting systems--The student will be able to:

12.01 Perform starter current draw test; determine needed action.

12.02 Perform starter circuit cranking voltage and voltage drop tests; determine needed action.

12.03 Inspect, test, and replace components (key switch, push button and/or magnetic switch) and wires in the starter control circuit.

12.04 Inspect, test, and replace starter relays and solenoids/switches.

12.05 Remove and replace starter; inspect flywheel ring gear or flex plate.

13.0 Diagnose and repair charging systems--The student will be able to:

13.01 Diagnose instrument panel mounted volt meters and/or indicator lamps that show a no charge, low charge, or overcharge condition; determine needed action.

13.02 Diagnose the cause of a no charge, low charge, or overcharge condition; determine needed action.

13.03 Inspect, adjust, and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment.

13.04 Perform charging system voltage and amperage output test; determine needed action.

13.05 Perform charging circuit voltage drop tests; determine needed action.

13.06 Remove and replace alternator.

13.07 Inspect, repair, or replace connectors and wires in the charging circuit.

13.08 Diagnose AC voltage leakage (failed rectifier) at alternator output; determine needed action.

Course Title: Diesel Engine Service 3
Course Number: 8742030
Course Credit: 1

Course Description:

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CTE Standards and Benchmarks	
17.0	Diagnose and repair lighting systems
17.01	Headlights, daytime running lights, parking, clearance, tail, cab, and instrument panel lights--The student will be able to:
17.01.1	Diagnose the cause of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation.
17.01.2	Test, aim, and replace headlights.
17.01.3	Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets and control components; repair or replace as needed.
17.01.4	Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays and wires of parking, clearance, and taillight circuits; repair or replace as needed.
17.01.5	Inspect and test instrument panel light circuit switches, relays, bulbs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed.
17.01.6	Inspect and test interior cab light circuit switches, bulbs, sockets, connectors, terminals, and wires; repair or replace as needed.
17.01.7	Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.
17.02	Stoplights, turn signals, hazard lights, and back-up lights--The student will be able to:
17.02.1	Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, and wires; repair or replace as needed.
17.02.2	Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, and wires; repair or replace as needed.
17.02.3	Inspect, test, and adjust backup lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, and wires; repair or replace as needed.
18.0	Diagnose and repair gauges and warning devices--The student will be able to:

CTE Standards and Benchmarks	
18.01	Interface with vehicle's on-board computer; perform diagnostic procedure using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action.
18.02	Diagnose the cause of intermittent, high, low, or no gauge readings; determine needed action.
18.03	Diagnose the cause of data bus-driven gauge malfunctions; determine needed action.
18.04	Inspect and test gauge circuit sending units, gauges, connectors, terminals, and wires; repair or replace as needed.
18.05	Inspect and test warning devices (lights and audible) circuit sending units, bulbs/LEDs, sockets, connectors, wires, and printed circuits/control modules; repair or replace as needed.
18.06	Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems.
19.0	Diagnose and repair related electrical systems--The student will be able to:
19.01	Diagnose the cause of constant, intermittent, or no horn operation; determine needed action.
19.02	Inspect and test horn circuit relays, horns, switches, connectors, and wires; repair or replace as needed.
19.03	Diagnose the cause of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action.
19.04	Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, and wires; repair or replace as needed.
19.05	Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed.
19.06	Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, and wires; repair or replace as needed.
19.07	Inspect and test sideview mirror motors, heater circuit grids, relays, switches, connectors, terminals, and wires; repair or replace as needed.
19.08	Inspect and test heater and A/C electrical components including: A/C clutches, motors, resistors, relays, switches, connectors, terminals, and wires; repair or replace as needed.
19.09	Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, and wires; repair or replace as needed.
19.10	Diagnose the cause of slow, intermittent, or no power side window operation; determine needed action.
19.11	Inspect and test motors, switches, relays, connectors, terminals, and wires of power side window circuits; repair or replace as needed.
19.12	Inspect block heaters; determine needed repairs.
19.13	Inspect and test cruise control electrical components; repair or replace as needed.
19.14	Inspect and test engine cooling fan electrical control components; repair or replace as needed.
19.15	Diagnose cause of data buss communication problems; determine needed action.

Course Title: Diesel Engine Service 4
Course Number: 8742040
Course Credit: 1

Course Description:

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CTE Standards and Benchmarks	
20.0	Diagnose and repair engine systems
20.01	Engine--The student will be able to:
20.01.1	Check engine starting/operation (including unusual noises, vibrations, exhaust smoke, etc.); record idle and governed.
20.01.2	Inspect vibration damper.
20.01.3	Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment.
20.01.4	Check engine oil level; check engine for oil, coolant, and fuel leaks (Engine Off).
20.01.5	Inspect engine mounts for looseness and deterioration.
20.01.6	Check engine for oil, coolant, air, fuel and exhaust leaks (Engine Running).
20.01.7	Check electrical wiring, routing, and hold-down clamps, including Engine Control Module/Powertrain Control Module (ECM/PCM).
20.02	Fuel system--The student will be able to:
20.02.1	Check fuel tanks, mountings, lines, caps, and vents.
20.02.2	Inspect throttle linkages and return springs.
20.02.3	Drain water from fuel system.
20.02.4	Inspect water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system.
20.03	Air induction and exhaust system--The student will be able to:
20.03.1	Check exhaust system mountings for looseness and damage.
20.03.2	Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system if equipped.
20.03.3	Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks.

CTE Standards and Benchmarks	
20.03.4	Inspect turbocharger for leaks; check mountings and connections.
20.03.5	Check operation of engine compression/exhaust brake.
20.03.6	Service or replace air filter as needed; check and reset air filter restriction indicator.
20.04	Cooling system--The student will be able to:
20.04.1	Check operation of fan clutch.
20.04.2	Inspect radiator (including air flow restriction, leaks, and damage) and mountings.
20.04.3	Inspect fan assembly and shroud.
20.04.4	Pressure test cooling system and radiator cap.
20.04.5	Inspect coolant hoses and clamps.
20.04.6	Inspect coolant recovery system.
20.04.7	Check coolant for contamination, supplemental coolant additives (SCA) concentration, and protection level (freeze point).
20.04.8	Service coolant filter/conditioner.
20.04.9	Inspect water pump for leaks and bearing play.
20.05	Lubrication system--The student will be able to:
20.05.1	Change engine oil and filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs.
20.05.2	Take an engine oil sample.
21.0	Diagnose and repair cab and hood systems
21.01	Instruments and controls--The student will be able to:
21.01.1	Inspect key condition and operation of ignition switch.
21.01.2	Check warning indicators.
21.01.3	Check instruments; record oil pressure and system voltage.
21.01.4	Check mechanical, electronic, and emergency shut down operation.
21.01.5	Check mechanical and electronic engine speed controls.

CTE Standards and Benchmarks

21.01.6	Check heater, ventilation, and air conditioning (HVAC) controls.
21.01.7	Check operation of all accessories.
21.01.8	Using diagnostic tool or on-board diagnostic system; extract engine monitoring information.
21.02	Safety equipment--The student will be able to:
21.02.1	Check operation of electric/air horns and back-up warning devices.
21.02.2	Check condition and documentation of safety flares, spare fuses, triangles, fire extinguisher, and all required decals.
21.02.3	Inspect seat belts and sleeper restraints.
21.02.4	Inspect wiper blades and arms.
21.03	Hardware--The student will be able to:
21.03.1	Check wiper and washer operation.
21.03.2	Inspect windshield glass for cracks or discoloration; check sun visor.
21.03.3	Check seat condition, operation, and mounting.
21.03.4	Check door glass and window operation.
21.03.5	Inspect steps and grab handles.
21.03.6	Inspect mirrors, mountings, brackets, and glass.
21.03.7	Record all observed physical damage.
21.03.8	Lubricate all cab and hood grease fittings.
21.03.9	Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.
21.03.10	Inspect cab mountings, hinges, latches, linkages and ride height; service as needed.
21.03.11	Inspect tilt cab hydraulic pump, lines, and cylinders for leakage; inspect safety devices; service as needed.
21.04	Heating, ventilation, and air conditioning (HVAC)--The student will be able to:
21.04.1	Inspect A/C condenser and lines for condition and visible leaks; check mountings.
21.04.2	Inspect A/C compressor and lines for condition and visible leaks; check mountings.

CTE Standards and Benchmarks	
21.04.3	Check A/C system condition and operation; check A/C monitoring system, if applicable.
21.04.4	Check HVAC air inlet filters and ducts; service as needed.
22.0 Diagnose and repair electrical/electronic systems	
22.01	Battery and starting systems--The student will be able to:
22.01.1	Inspect battery box(es), cover(s), and mountings.
22.01.2	Inspect battery hold-downs, connections, cables, and cable routing; service as needed.
22.01.3	Check/record battery state-of-charge (open circuit voltage) and condition.
22.01.4	Perform battery test (load and/or capacitance).
22.01.5	Inspect starter, mounting, and connections.
22.01.6	Engage starter; check for unusual noises, starter drag, and starting difficulty.
22.02	Charging system--The student will be able to:
22.02.1	Inspect alternator, mountings, wiring and wiring routing; determine needed action.
22.02.2	Perform alternator current output test.
22.02.3	Perform alternator voltage output test.
22.03	Lighting system--The student will be able to:
22.03.1	Check operation of interior lights; determine needed action.
22.03.2	Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; determine needed action.
22.03.3	Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action.
23.0 Diagnose and repair frame and chassis systems	
23.01	Air brakes--The student will be able to:
23.01.1	Check parking brake operation.
23.01.2	Record air governor cut-out setting (psi).
23.01.3	Check air drier drain valve operation.

CTE Standards and Benchmarks

23.01.4	Check air system for leaks (brakes released).
23.01.5	Check air system for leaks (brakes applied).
23.01.6	Test one-way and double-check valves.
23.01.7	Check low air pressure warning devices.
23.01.8	Check air governor cut-in pressure.
23.01.9	Check emergency (spring) brake control/modulator valve, if applicable.
23.01.10	Check tractor protection valve.
23.01.11	Test air pressure build-up time.
23.01.12	Inspect coupling air lines, holders, and gladhands.
23.01.13	Check brake chambers and air lines for secure mounting and damage.
23.01.14	Service air drier.
23.01.15	Inspect and record brake lining/pad condition, thickness, and contamination.
23.01.16	Inspect and record condition of brake drums/rotors.
23.01.17	Check operation of brake manual slack adjusters; adjust as needed.
23.01.18	Check operation and adjustment of brake automatic slack adjusters.
23.01.19	Lubricate all brake component grease fittings.
23.01.20	Check condition and operation of hand brake (trailer) control valve.
23.01.21	Perform antilock brake system (ABS) operational system self-test.
23.01.22	Drain air tanks and check for contamination.
23.01.23	Check condition of pressure relief (safety) valves.
23.02	Hydraulic brakes--The student will be able to:
23.02.1	Check master cylinder fluid level and condition.
23.02.2	Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.

CTE Standards and Benchmarks

23.02.3	Check parking brake operation; inspect parking brake application and holding devices; adjust as needed.
23.02.4	Check operation of hydraulic system: pedal travel, pedal effort, pedal feel (drift).
23.02.5	Inspect wheel cylinders/calipers for leakage and damage.
23.02.6	Inspect power brake booster(s), hoses; and check/control valves; check power brake booster, reservoir fluid level and condition.
23.02.7	Inspect and record brake lining/pad condition and thickness, and contamination.
23.02.8	Inspect and record condition of brake drums/rotors.
23.02.9	Adjust drum brakes.
23.03	Drivetrain--The student will be able to:
23.03.1	Check operation of clutch, clutch brake, and gearshift.
23.03.2	Check clutch linkage/cable for looseness or binding, if applicable.
23.03.3	Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.
23.03.4	Check clutch adjustment; adjust as needed.
23.03.5	Check transmission case, seals, filter, hoses, and cooler for cracks and leaks.
23.03.6	Inspect transmission breather.
23.03.7	Inspect transmission mounts.
23.03.8	Check transmission oil level, type, and condition.
23.03.9	Inspect U-joints, yokes, drive lines, and center bearings for looseness, damage, and proper phasing.
23.03.10	Inspect axle housing(s) for cracks and leaks.
23.03.11	Inspect axle breather(s).
23.03.12	Lubricate all drivetrain grease fittings.
23.03.13	Check drive axle(s) oil level, type, and condition.
23.03.14	Change drive axle(s) oil and filter; check and clean magnetic plugs.
23.03.15	Check two-speed axle unit operation and oil level.

CTE Standards and Benchmarks

23.03.16	Change transmission oil and filter; check and clean magnetic plugs.
23.03.17	Check interaxle differential lock operation.
23.03.18	Check range shift operation.
23.04	Suspension and steering systems--The student will be able to:
23.04.1	Check steering wheel operation for free play or binding.
23.04.2	Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level.
23.04.3	Change power steering fluid and filter.
23.04.4	Inspect steering gear for leaks and secure mounting.
23.04.5	Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, linkage, and linkage-assist power steering cylinders.
23.04.6	Check king pin wear.
23.04.7	Check wheel bearings for looseness and noise.
23.04.8	Check oil level and condition in all non-drive hubs; check for leaks.
23.04.9	Remove and inspect wheel bearings; reassemble and adjust.
23.04.10	Inspect springs, hangers, shackles, spring U-bolts, and insulators.
23.04.11	Inspect shock absorbers for leaks and secure mounting.
23.04.12	Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.
23.04.13	Check and record suspension ride height.
23.04.14	Lubricate all suspension and steering grease fittings.
23.04.15	Check toe adjustment.
23.04.16	Check tandem axle alignment and spacing.
23.04.17	Check axle locating components (radius, torque, and/or track rods).
23.05	Tires and wheels--The student will be able to:
23.05.1	Inspect tires for irregular wear patterns and proper mounting of directional tires.

CTE Standards and Benchmarks

23.05.2	Inspect tires for cuts, cracks, bulges, and sidewall damage.
23.05.3	Inspect valve caps and stems; replace as needed.
23.05.4	Measure and record tread depth; probe for imbedded debris.
23.05.5	Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications.
23.05.6	Check for loose lugs and/or slipped wheels; check mounting hardware condition; service as needed.
23.05.7	Retorque lugs in accordance with manufacturer's specifications.
23.05.8	Inspect wheels and spacers for cracks or damage.
23.05.9	Check tire matching (diameter and tread) on dual tire installations.
23.06	Frame and fifth wheel--The student will be able to:
23.06.1	Inspect fifth wheel mounting bolts, air lines, and locks.
23.06.2	Test operation of fifth wheel locking device; adjust if necessary.
23.06.3	Check mud flaps and brackets.
23.06.4	Check pintle hook assembly and mounting.
23.06.5	Lubricate all fifth wheel grease fittings and plate.
23.06.6	Inspect frame and frame members for cracks and damage.

Course Title: Diesel Engine Service 5
Course Number: 8742050
Course Credit: 1

Course Description:

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CTE Standards and Benchmarks	
24.0	General engine diagnosis--The student will be able to:
24.01	Inspect fuel, oil, and coolant levels and condition, and consumption; determine needed action.
24.02	Diagnose causes of engine fuel, oil, coolant, air, and other leaks; determine needed action.
24.03	Interpret engine noises; determine needed action.
24.04	Observe engine exhaust smoke color and quantity; determine needed action.
24.05	Perform air intake system restriction and leakage tests; determine needed action.
24.06	Perform intake manifold pressure (boost) test; determine needed action.
24.07	Perform exhaust back pressure test; determine needed action.
24.08	Perform crankcase pressure test; determine needed action.
24.09	Diagnose no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.
24.10	Diagnose surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action.
24.11	Diagnose engine vibration problems; determine needed action.
24.12	Check, record, and clear electronic diagnostic (fault) codes; monitor electronic data; determine needed action.
24.13	Perform cylinder compression test; determine needed action.
25.0	Cylinder head and valve train diagnosis and repair--The student will be able to:
25.01	Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.

CTE Standards and Benchmarks

25.02	Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.
25.03	Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.
25.04	Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.
25.05	Measure valve head height relative to deck, valve face-to-seat contact; determine needed action.
25.06	Inspect injector sleeves and seals; measure injector tip or nozzle protrusion; perform needed action.
25.07	Inspect and adjust valve bridges (crossheads) and guides; perform needed action.
25.08	Reassemble cylinder head.
25.09	Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.
25.10	Inspect pushrods, rocker arms, rocker arm shafts, electronic wiring harness, and brackets for wear, bending, cracks, looseness, and blocked oil passages; perform needed action.
25.11	Inspect cam followers; perform needed action.
25.12	Adjust valve clearance.
26.0	Engine block diagnosis and repair--The student will be able to:
26.01	Remove, inspect, service, and install pans, covers, vents, gaskets, seals, and wear rings.
26.02	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.
26.03	Inspect cylinder sleeve counterbore and lower bore; check bore distortion; determine needed action.
26.04	Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.
26.05	Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).
26.06	Inspect in-block camshaft bearings for wear and damage; determine needed action.
26.07	Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play.
26.08	Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action.
26.09	Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and adjust crankshaft end play.
26.10	Inspect, install, and time gear train; measure gear backlash; determine needed action.

CTE Standards and Benchmarks

26.11	Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.
26.12	Determine piston-to-cylinder wall clearance; check ring-to-groove clearance and end gap; install rings on pistons.
26.13	Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.
26.14	Check condition of piston cooling jets (nozzles); determine needed action.
26.15	Inspect and measure crankshaft vibration damper; determine needed action.
26.16	Inspect, install, and align flywheel housing.
26.17	Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.

Course Title: Diesel Engine Service 6
Course Number: 8742060
Course Credit: 1

Course Description:

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CTE Standards and Benchmarks	
27.0	Lubrication systems diagnosis and repair--The student will be able to:
27.01	Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; determine needed action.
27.02	Check engine oil level, condition, and consumption; determine needed action.
27.03	Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; determine needed action.
27.04	Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.
27.05	Inspect, clean, and test oil cooler and components; determine needed action.
27.06	Inspect turbocharger lubrication system; determine needed action.
27.07	Determine proper lubricant and perform oil and filter change.
28.0	Cooling system diagnosis and repair--The student will be able to:
28.01	Check engine coolant type, level, condition, and consumption; determine needed action.
28.02	Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit; determine needed action.
28.03	Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.
28.04	Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.
28.05	Test coolant for freeze protection and additive package concentration; adjust as needed.
28.06	Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.
28.07	Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.
28.08	Inspect water pump and hoses; replace as needed.
28.09	Inspect, clean, and pressure test radiator, pressure cap, tank(s), and recovery systems; determine needed action.

CTE Standards and Benchmarks

28.10	Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.
29.0	Air induction and exhaust systems diagnosis and repair--The student will be able to:
29.01	Inspect turbocharger(s), wastegate, and piping systems; determine needed action.
29.02	Check air induction system: piping, hoses, clamps, and mounting; check for air restrictions and leaks; service or replace air filter as needed.
29.03	Remove and reinstall turbocharger/wastegate assembly.
29.04	Inspect intake manifold, gaskets, and connections; replace as needed.
29.05	Inspect, clean, and test charge air cooler assemblies; replace as needed.
29.06	Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.
29.07	Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action.
30.0	Fuel system diagnosis and repair
30.01	Fuel supply system diagnosis and repair--The student will be able to:
30.01.1	Check fuel level, quality, and consumption; determine needed action.
30.01.2	Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action.
30.01.3	Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action.
30.01.4	Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action.
30.01.5	Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.
30.02	Mechanical fuel injection diagnosis and repair--The student will be able to:
30.02.1	Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time a distributor (rotary) type injection pump; determine needed action.
30.02.2	Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time an in-line type injection pump; determine needed action.
30.02.3	Inspect and adjust throttle control linkage; determine needed action.

CTE Standards and Benchmarks

30.02.4	Inspect air/fuel ratio control systems; determine needed action.
30.02.5	Inspect, test, and adjust engine fuel shut-down devices and controls; determine needed action.
30.02.6	Inspect high pressure injection lines, hold downs, fittings and seals; replace as needed.
30.03	Electronic fuel management system diagnosis and repair--The student will be able to:
30.03.1	Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter (DMM); determine needed action.
30.03.2	Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (to include PC based software and/or data scan tools); determine needed action.
30.03.3	Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).
30.03.4	Inspect and replace electrical connector terminals, seals, and locks.
30.03.5	Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.
30.03.6	Using recommended electronic diagnostic tools (to include PC based software and/or data scan tools), access and change customer parameters.
30.03.7	Inspect, test, and adjust electronic unit injectors (EUI); determine needed action.
30.03.8	Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).
30.03.9	Perform cylinder contribution test utilizing recommended electronic diagnostic tool.
30.03.10	Perform engine timing sensor calibration (if applicable).
30.03.11	Perform on-engine inspections and tests on hydraulic electronic unit injectors (HEUI) and system electronic controls; determine needed action.
30.03.12	Perform on-engine inspections and tests on hydraulic electronic unit injector (HEUI) high pressure oil supply and control system; determine needed action.
30.03.13	Perform on-engine inspections and tests on distributor-type injection pump electronic controls; determine needed action.
30.03.14	Perform on-engine inspections and tests on in-line type injection pump electronic controls; determine needed action.
30.03.15	Perform on-engine inspections and tests on common rail type injection systems; determine needed action.
31.0	Diagnose and repair engine brakes--The student will be able to:
31.01	Inspect and adjust engine compression/exhaust brakes; determine needed action.
31.02	Inspect, test, and adjust engine compression/exhaust brake control circuits, switches, and solenoids; repair or replace as needed.

CTE Standards and Benchmarks

31.03 Inspect engine compression/exhaust brake housing, valves, seals, screens, lines, and fittings; repair or replace as needed.

Course Title: Diesel Engine Service 7
Course Number: 8742070
Course Credit: 1

Course Description:

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

CTE Standards and Benchmarks	
Air Brakes Diagnosis and Repair	
32.0	Diagnose and repair air supply and service systems--The student will be able to:
32.01	Diagnose poor stopping, air leaks, premature wear, pulling, grabbing, or dragging problems caused by supply and service system malfunctions; determine needed action.
32.02	Check air system build-up time; determine needed action.
32.03	Drain air reservoir tanks; check for oil, water, and foreign material; determine needed action.
32.04	Inspect, adjust, and align compressor drive belts, pulleys, and tensioners; replace as needed.
32.05	Inspect compressor drive gear and coupling; replace as needed.
32.06	Inspect air compressor, air cleaner/supply; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.
32.07	Inspect and test system pressure controls: governor, unloader assembly valves, intake screens, filters, lines, hoses, and fittings; replace as needed.
32.08	Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed.
32.09	Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check-valves, manual and automatic drain valves; replace as needed.
32.10	Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed.
32.11	Inspect and test brake application (foot) valve, fittings, and mounts; adjust or replace as needed.
32.12	Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed.
32.13	Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed.
32.14	Inspect and test brake relay valve; replace as needed.
32.15	Inspect and test quick release valves; replace as needed.

CTE Standards and Benchmarks

32.16	Inspect and test front and rear axle limiting (proportioning) valves; replace as needed.
32.17	Inspect and test tractor protection valve; replace as needed.
32.18	Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed.
32.19	Inspect and test low pressure warning devices, wiring, and connectors; replace as needed.
32.20	Inspect and test air pressure gauges, lines, and fittings; replace as needed.
33.0	Diagnose and repair mechanical/foundation air brake systems--The student will be able to:
33.01	Diagnose 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.
33.02	Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed.
33.03	Inspect and service manual and automatic slack adjusters; perform needed action.
33.04	Inspect camshafts, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor spins, and springs; replace as needed.
33.05	Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs.
33.06	Inspect and measure brake shoes, linings, or pads; perform needed action.
33.07	Inspect and measure brake drums or rotors; perform needed action.
34.0	Diagnose and repair parking brakes--The student will be able to:
34.01	Inspect and test parking (spring) brake chamber diaphragm and seals; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations.
34.02	Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.
34.03	Inspect and test parking (spring) brake application and release valve; replace as needed.
34.04	Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations.

Course Title: Diesel Engine Service 8
Course Number: 8742080
Course Credit: 1

Course Description:

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

CTE Standards and Benchmarks	
Hydraulic Brakes Diagnosis and Repair	
35.0	Diagnose and repair hydraulic systems--The student will be able to:
35.01	Diagnose poor stopping, premature wear, pulling, dragging or pedal feel problems caused by the hydraulic system; determine needed action.
35.02	Check and adjust brake pedal pushrod length.
35.03	Inspect and test master cylinder for internal/external leaks and damage; replace as needed.
35.04	Inspect for leaks and damage, brake lines, flexible hoses, and fittings; replace as needed.
35.05	Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed.
35.06	Inspect and test brake pressure differential valve and warning light circuit switch, bulbs, wiring, and connectors; repair or replace as needed.
35.07	Inspect and clean wheel cylinders; replace as needed.
35.08	Inspect and clean disc brake caliper assemblies; replace as needed.
35.09	Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type.
35.10	Test and adjust brake stop light switch, bulbs, wiring, and connectors; repair or replace as needed.
36.0	Diagnose and repair mechanical/foundation hydraulic brake systems--The student will be able to:
36.01	Diagnose poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems; determine needed action.
36.02	Inspect and measure brake drums and rotors; perform needed action.
36.03	Inspect and measure drum brake shoes and linings; inspect mounting hardware, adjuster mechanisms, and backing plates; perform needed action.
36.04	Inspect and measure disc brake pads/linings; inspect mounting hardware; perform needed action.

CTE Standards and Benchmarks

36.05	Check parking brake operation; inspect parking brake applications and holding devices; adjust and replace as needed.
37.0	Diagnose and repair power assist units--The student will be able to:
37.01	Diagnose poor stopping problems caused by the brake assist (booster) system; determine needed action.
37.02	Inspect, test, repair, or replace power brake assist (booster), hoses, and control valves; determine proper fluid type.
37.03	Check emergency (back-up, reserve) brake assist system.
38.0	Diagnose and repair air and hydraulic antilock brake systems (ABS) and automatic traction control (ATC)--The student will be able to:
38.01	Observe antilock brake system (ABS) warning light operation (includes dash mounted trailer ABS warning light); determine needed action.
38.02	Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action.
38.03	Diagnose poor stopping and wheel lock-up caused by failure of the antilock brake system (ABS); determine needed action.
38.04	Inspect, test, and replace antilock brake system (ABS) air, hydraulic, electrical, and mechanical components; perform needed action.
38.05	Diagnose, service, and adjust antilock brake system (ABS) wheel speed sensors and circuits following manufacturers' recommended procedures (including voltage output, resistance, shorts to voltage/ground, and frequency data).
38.06	Bleed the ABS hydraulic circuits following manufacturers' procedures.
38.07	Observe automatic traction control (ATC) warning light operation; determine needed action.
38.08	Diagnose automatic traction control (ATC) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action.

Course Title: Diesel Engine Service 9
Course Number: 8742090
Course Credit: 1

Course Description:

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

CTE Standards and Benchmarks	
39.0	HVAC systems diagnosis, service, and repair--The student will be able to:
39.01	Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action.
39.02	Verify the need of service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action.
39.03	Identify system type and components (cycling clutch orifice tube - CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action.
40.0	A/C system and component diagnosis, service, and repair
40.01	A/C system - general--The student will be able to:
40.01.1	Diagnose the cause of temperature control problems in the A/C system; determine needed action.
40.01.2	Identify refrigerant type and check for contamination; determine needed action.
40.01.3	Diagnose A/C system problems indicated by pressure gauge and temperature readings; determine needed action.
40.01.4	Diagnose A/C system problems indicated by visual, audible, smell, and touch procedures; determine needed action.
40.01.5	Perform A/C system leak test; determine needed action.
40.01.6	Evacuate A/C system using appropriate equipment.
40.01.7	Internally clean contaminated A/C system components and hoses.
40.01.8	Charge A/C system with refrigerant.
40.01.9	Identify lubricant type needed for system application.
40.02	Compressor and clutch--The student will be able to:
40.02.1	Diagnose A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action.

CTE Standards and Benchmarks	
40.02.2	Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices.
40.02.3	Inspect, and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment.
40.02.4	Inspect, test, service, and replace A/C compressor clutch components or assembly.
40.02.5	Inspect and correct A/C compressor lubricant level (if applicable).
40.02.6	Inspect, test, and replace A/C compressor.
40.02.7	Inspect, repair, or replace A/C compressor mountings and hardware.
40.03	Evaporator, condenser, and related components--The student will be able to:
40.03.1	Correct system lubricant level when replacing the evaporator, condenser, receiver/drier or accumulator/drier, and hoses.
40.03.2	Inspect A/C system hoses, lines, filters, fittings, and seals; determine needed action.
40.03.3	Inspect A/C condenser for proper air flow.
40.03.4	Inspect and test A/C system condenser and mountings; determine needed action.
40.03.5	Inspect and replace receiver/drier or accumulator/drier.
40.03.6	Inspect and test cab/sleeper refrigerant solenoid, expansion valve(s); check placement of thermal bulb (capillary tube); determine needed action.
40.03.7	Inspect and replace orifice tube.
40.03.8	Inspect and test cab/sleeper evaporator core; determine needed action.
40.03.9	Inspect, clean, and repair evaporator housing and water drain; inspect and service/replace evaporator air filter.
40.03.10	Identify and inspect A/C system service ports (gauge connections); determine needed action.
40.03.11	Diagnose system failures resulting in refrigerant loss from the A/C system high pressure relief device; determine needed action.
40.04	Heating and engine cooling systems diagnosis, service, and repair--The student will be able to:
40.04.1	Diagnose the cause of outlet air temperature control problems in the HVAC system; determine needed action.
40.04.2	Diagnose window fogging problems; determine needed action.
40.04.3	Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action.

CTE Standards and Benchmarks	
40.04.4	Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action.
40.04.5	Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action.
40.04.6	Inspect water pump for leaks and bearing play; determine needed action.
40.04.7	Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs.
40.04.8	Recover, flush and refill with recommended coolant/additive package; bleed cooling system.
40.04.9	Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.
40.04.10	Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action.
40.04.11	Inspect and flush heater core; determine needed action.
41.0 Operating systems and related controls diagnosis and repair	
41.01 Electrical--The student will be able to:	
41.01.1	Diagnose the cause of failures in HVAC electrical control systems; determine needed action.
41.01.2	Inspect and test A/C heater blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action.
41.01.3	Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.
41.01.4	Inspect and test A/C-related electronic engine control systems; determine needed action.
41.01.5	Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors wiring, and protection devices; determine needed action.
41.01.6	Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.
41.01.7	Inspect and test HVAC system electrical control panel assemblies; determine needed action.
41.02 Air/vacuum/mechanical--The student will be able to:	
41.02.1	Diagnose the cause of failures in HVAC air, vacuum, and mechanical switches and controls; determine needed action.
41.02.2	Inspect and test HVAC system air/vacuum/mechanical control panel assemblies; determine needed action.
41.02.3	Inspect, test, and adjust HVAC system air/vacuum/mechanical control cables and linkages; determine needed action.
41.02.4	Inspect and test HVAC system vacuum actuators (diaphragms/motors) and hoses; determine needed action.

CTE Standards and Benchmarks

41.02.5	Inspect and test HVAC system vacuum reservoir(s), check valve(s), and restrictors; determine needed action.
41.02.6	Inspect, test, and adjust HVAC system ducts, doors, and outlets; determine needed action.
41.03	Refrigerant recovery, recycling, and handling--The student will be able to:
41.03.1	Maintain and verify correct operation of certified equipment.
41.03.2	Identify refrigerant types by label or use of a refrigerant identifier and recover A/C system refrigerant.
41.03.3	Recycle refrigerant.
41.03.4	Handle, label, and store refrigerant.
41.03.5	Test recycled refrigerant for non-condensable gases.

Course Title: Diesel Engine Service 10
Course Number: 8742091
Course Credit: 1

Course Description:

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

CTE Standards and Benchmarks	
42.0	Steering systems diagnosis and repair
42.01	Steering column--The student will be able to:
42.01.1	Diagnose fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action.
42.01.2	Inspect steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft U-joints; determine needed action.
42.01.3	Check and adjust cab mounting and ride height.
42.01.4	Center the steering wheel as needed.
42.01.5	Disable and enable supplemental restraint system (SRS) in accordance with manufacturers' procedures.
42.02	Steering units--The student will be able to:
42.02.1	Diagnose 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.
42.02.2	Determine recommended type of power steering fluid; check level and condition; determine needed action.
42.02.3	Flush and refill power steering system; purge air from system.
42.02.4	Perform power steering system pressure, temperature, and flow tests; determine needed action.
42.02.5	Inspect, service, or replace power steering reservoir including filter, seals, and gaskets.
42.02.6	Inspect, and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment.

CTE Standards and Benchmarks	
42.02.7	Inspect, replace as required, power steering pump drive gear and coupling.
42.02.8	Inspect, adjust, or replace power steering pump, mountings, and brackets.
42.02.9	Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings.
42.02.10	Inspect, adjust, or replace linkage-assist type power steering cylinder or gear (dual system).
42.02.11	Inspect, adjust, repair, or replace integral type power steering gear and mountings.
42.02.12	Adjust manual and automatic steering gear poppet/relief valves.
42.03	Steering linkage--The student will be able to:
42.03.1	Inspect and align pitman arm; replace as needed.
42.03.2	Inspect drag link (relay rod) and tie rod ends; adjust or replace as needed.
42.03.3	Inspect steering arm and levers, and linkage pivot joints; replace as needed.
42.03.4	Inspect clamps and retainers on cross tube/relay rod/centerline/tie rod; position or replace as needed.
42.03.5	Check and adjust wheel stops.
42.03.6	Lubricate steering linkage joints as needed.
43.0	Suspension systems diagnosis and repair--The student will be able to:
43.01	Inspect front axles, U-bolts, and nuts; determine needed action.
43.02	Inspect and service king pin, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action.
43.03	Inspect shock absorbers, bushings, brackets, and mounts; replace as needed.
43.04	Inspect leaf springs, center bolts, clips, eye bolts and bushings, shackles, slippers, insulators, brackets, and mounts; determine needed action.
43.05	Inspect torque arms, bushings, and mounts; determine needed action.
43.06	Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, and related bushings, mounts, shims, and cams; determine needed action.
43.07	Inspect walking beams, center (cross) tube, bushings, mounts, load pads, and saddles/caps; replace as needed.
43.08	Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; adjust, repair or replace as needed.

CTE Standards and Benchmarks	
43.09	Inspect and test air springs, mounting plates, springs, suspension arms, and bushings; replace as needed.
43.10	Measure vehicle ride height; determine needed action.
43.11	Diagnose rough ride problems; determine needed action.
44.0	Wheel alignment diagnosis, adjustment, and repair--The student will be able to:
44.01	Diagnose vehicle wandering, pulling, shimmy, hard steering and off-center steering wheel problem(s); adjust and repair as needed.
44.02	Check camber; determine needed action.
44.03	Check caster; adjust as needed.
44.04	Check toe; adjust as needed.
44.05	Check rear axle(s) alignment (thrust line/centerline) and tracking; adjust or repair as needed.
44.06	Diagnose turning/Ackerman angle (toe-out-on-turns) problems; determine needed action.
44.07	Check front axle alignment (centerline); adjust or repair as needed.
45.0	Wheels and tires diagnosis and repair--The student will be able to:
45.01	Diagnose unusual tire wear patterns, check tread depth, mismatched tread design; determine needed action.
45.02	Diagnose wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action.
46.0	Frame service and repair--The student will be able to:
46.01	Inspect and adjust fifth wheel, pivot pins, bushings, locking jaw mechanisms, and mounting bolts; determine needed action.
46.02	Inspect sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls.
46.03	Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs.
46.04	Inspect, install, or repair frame hangers, brackets, and crossmembers in accordance with manufacturers' recommended procedures.
46.05	Inspect, repair or replace pintle hooks and draw bars.

Course Title: Diesel Engine Service 11
Course Number: 8742092
Course Credit: 1

Course Description:

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

The first task in Drivetrain is to listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

CTE Standards and Benchmarks	
47.0	Clutch diagnosis and repair--The student will be able to:
47.01	Diagnose clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action.
47.02	Inspect and adjust clutch linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push and pull-type assemblies); check pedal height and travel; perform needed action.
47.03	Inspect, adjust, repair, or replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system.
47.04	Inspect, adjust, lubricate or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals.
47.05	Inspect, adjust, and replace single-disc clutch pressure plate and clutch disc.
47.06	Inspect, adjust, and replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs.
47.07	Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; perform needed action.
47.08	Inspect, adjust, and replace self-adjusting/continuous-adjusting clutch mechanisms.
47.09	Inspect and replace pilot bearing.
47.10	Inspect flywheel mounting area on crankshaft, rear main oil seal, and measure crankshaft end play; determine needed action.
47.11	Inspect flywheel, starter ring gear and measure flywheel face and pilot bore runout; determine needed action.
47.12	Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.
48.0	Transmission diagnosis and repair--The student will be able to:
48.01	Diagnose transmission noise, shifting, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed action.

CTE Standards and Benchmarks

48.02	Diagnose transmission component failure cause, both before and during disassembly procedures; determine needed action.
48.03	Inspect, adjust, service, repair, or replace transmission remote shift linkages, brackets, bushings, pivots, and levers.
48.04	Inspect, test, repair, or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies.
48.05	Inspect and replace transmission mounts, insulators, and mounting bolts; determine needed action.
48.06	Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; repair as needed.
48.07	Check transmission fluid level and condition; determine needed service; add proper type of lubricant.
48.08	Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires.
48.09	Remove and reinstall transmission.
48.10	Inspect input shaft, gear, spacers, bearings, retainers, and slingers; replace as needed.
48.11	Inspect and adjust main shaft, gears, sliding clutches, washers, spacers, bushings, bearings, auxiliary drive assemblies, retainers, and keys; replace as needed.
48.12	Inspect countershafts, gears, bearings, retainers, and keys; adjust bearing preload and time multiple countershaft gears; replace as needed.
48.13	Inspect output shafts, gears, washers, spacers, bearings, retainers, and keys; replace as needed.
48.14	Inspect and/or replace reverse idler shafts, gears, bushings, bearings, thrust washers, and retainers; check reverse idler gear end play (where applicable).
48.15	Inspect synchronizer hub, sleeve, keys (inserts), springs, blocking rings, synchronizer plates, blocker pins, and sliding clutches; replace as needed.
48.16	Inspect transmission cases including surfaces, bores, bushings, pins, studs, and magnets; replace as needed.
48.17	Inspect transmission lubrication system pumps, troughs, collectors, and slingers; service or replace as needed.
48.18	Inspect transmission oil filters and coolers; replace as needed.
48.19	Inspect mechanical and electronic speedometer components; determine needed action.
48.20	Inspect and adjust power take-off (PTO) assemblies, controls, and shafts; perform needed action.
48.21	Inspect and test function of backup light, neutral start, and warning device circuits; repair as needed.
48.22	Inspect and test transmission temperature gauge sending unit/sensor; determine needed action.

CTE Standards and Benchmarks	
48.23	Inspect, test operation, adjust, repair, or replace automated mechanical transmission and manual electronic shift controls, shift, range and splitter solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses.
48.24	Inspect, test operation, repair, or replace automated mechanical transmission electronic shift selectors, air and electrical switches, displays and indicators, wiring harnesses, and air lines.
48.25	Use appropriate diagnostic tools and procedures to diagnose automated mechanical transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed repairs.
48.26	Inspect, test operation, adjust, repair, or replace automatic transmission electronic and manual shift controls, shift solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCE) neutral/in gear and reverse switches and wiring harnesses.
48.27	Inspect, test operation, repair, or replace automated mechanical transmission electronic shift selectors, switches, displays and indicators, wiring harnesses.
48.28	Use appropriate diagnostic tools and procedures to diagnose automated transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed repairs.
49.0	Driveshaft and universal joint diagnosis and repair--The student will be able to:
49.01	Diagnose driveshaft and universal joint noise and vibration problems; determine needed action.
49.02	Inspect, service, or replace driveshaft, slip joints, yokes, drive flanges, and universal joints; check phasing of all yokes.
49.03	Inspect and replace driveshaft center support bearings and mounts; determine needed action.
49.04	Measure and adjust drive line angles.
50.0	Drive axle diagnosis and repair--The student will be able to:
50.01	Diagnose drive axle(s) drive unit noise and overheating problems; determine needed action.
50.02	Check and repair fluid leaks; inspect and replace drive axle housing cover plates, gaskets, sealants, vents, magnetic plugs, and seals.
50.03	Check drive axle fluid level and condition; determine needed service; add proper type of lubricant.
50.04	Remove and replace differential carrier assembly.
50.05	Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings.
50.06	Inspect and replace components of locking differential case assembly.
50.07	Inspect differential carrier case and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action.
50.08	Measure ring gear runout; determine needed action.

CTE Standards and Benchmarks

50.09	Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings.
50.10	Measure and adjust drive pinion bearing preload.
50.11	Measure and adjust drive pinion depth.
50.12	Measure and adjust side bearing preload and ring gear backlash.
50.13	Check and interpret ring gear and pinion tooth contact pattern; determine needed action.
50.14	Inspect, adjust, or replace ring gear thrust block/bolt.
50.15	Inspect, adjust, repair, or replace planetary gear-type 2-speed axle assembly including: case, idler pinion, pins, thrust washers, sliding clutch gear, shift fork, pivot, seals, cover, and springs.
50.16	Inspect, repair, or replace 2-speed axle shift control system, speedometer adapters, motors, axle shift units, wires, air lines, and connectors.
50.17	Inspect power divider (inter-axle differential) assembly; determine needed action.
50.18	Inspect, adjust, repair, or replace air operated power divider (inter-axle differential) lockout assembly including diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls.
50.19	Inspect, repair, or replace drive axle lubrication system: pump, troughs, collectors, slingers, tubes, and filters.
50.20	Inspect and replace drive axle shafts.
50.21	Remove and replace wheel assembly; check rear wheel seal and axle flange gasket for leaks; perform needed action.
50.22	Diagnose drive axle for wheel bearing noise and damage; perform needed action.
50.23	Inspect and test drive axle temperature gauge sending unit/sensor; determine needed action.
50.24	Clean, inspect, lubricate and replace wheel bearings; replace seals and wear rings; adjust drive axle wheel bearings.

Course Title: Diesel Engine Service 12
Course Number: 8742093
Course Credit: 1

Course Description:

The purpose of this course is to develop the competencies essential to the diesel technology industry. These competencies include demonstrating shop organization, management, and safety procedures; using tools and equipment; demonstrating workplace communication skills; applying math and science to diesel technology operations; and identifying basic employability and entrepreneurial skills.

CTE Standards and Benchmarks	
51.0	General hydraulic system diagnosis and repair--The student will be able to:
51.01	Identify system type (closed and open) and verify proper operation.
51.02	Read and interpret system diagrams and schematics.
51.03	Perform system temperature, pressure, flow, and cycle time tests; determine needed action.
51.04	Verify placement of equipment /component safety labels and placards; determine needed action.
52.0	Diagnose and repair hydraulic pumps--The student will be able to:
52.01	Identify system fluid type.
52.02	Identify causes of pump failure, unusual pump noises, and temperature, flow, and leakage problems; determine needed action.
52.03	Determine pump type, rotation, and drive system.
52.04	Remove and install pump; prime and/or bleed system.
52.05	Inspect pump inlet for restrictions and leaks; determine needed action.
52.06	Inspect pump outlet for restrictions and leaks; determine needed action.
53.0	Diagnose and repair hydraulic filtration/reservoirs (tanks)--The student will be able to:
53.01	Identify type of filtration system; verify filter application and flow direction.
53.02	Service filters and breathers.
53.03	Identify causes of system contamination; determine needed action.
53.04	Take a hydraulic oil sample.
53.05	Check reservoir fluid level and condition; determine needed action.

CTE Standards and Benchmarks

53.06	Inspect and repair or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply and return lines.
54.0	Diagnose and repair hydraulic hoses, fittings, and connections--The student will be able to:
54.01	Diagnose causes of component leakage, damage, and restriction; determine needed action.
54.02	Inspect hoses and connections (length, size, routing, bend radii, and protection); repair or replace as needed.
54.03	Assemble hoses, tubes, connectors, and fittings in accordance with manufacturers' specifications; use proper procedures to avoid contamination.P-2
54.04	Inspect and replace fitting seals and sealants.
55.0	Diagnose and repair hydraulic control valves--The student will be able to:
55.01	Pressure test system safety relief valve; determine needed action.
55.02	Perform control valve operating pressure and flow tests; determine needed action.
55.03	Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic).
55.04	Identify causes of control valve leakage problems (internal/external); determine needed action.
55.05	Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed.
56.0	Diagnose and repair hydraulic actuators--The student will be able to:
56.01	Identify actuator type (single/double acting, multi-stage/telescopic, and motors).
56.02	Identify the cause of seal failure; determine needed repairs.
56.03	Identify the cause of incorrect actuator movement and leakage (internal and external); determine needed repairs.
56.04	Inspect actuator mounting, frame components, and hardware for looseness, cracks, and damage; determine needed action.
56.05	Remove, repair, and/or replace actuators in accordance with manufacturers' recommended procedures.
56.06	Inspect actuators for dents, cracks, damage, and leakage; determine needed action.
56.07	Purge and/or bleed system in accordance with manufacturers' recommended procedures.