TECH CRAFTSMAN CAREER BUILDING TRADE SCHOOL

CURRICULUM GUIDE for

Large Over-The-Road 10 Wheel Diesel Truck

And

Diesel Automobiles

DIESEL ENGINE and TRANSMISSION Technology

TECHNOLOGY

2016

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INTRODUCTION

All of Tech Craftsman Career Building curriculum's was development through research on the web, the process was undertaken to attempt to develop a hands-on-curriculum for TCCBTS apprentices working not only in the classroom setting but to work in the Trade School learning the occupation of diesel mechanics technician through on-the-job-hands-on-training.

TCCBTS's education program involves the active use of industry personnel to develop a Assigned Task Lists for the program.

TCCBTS Assigned Task Lists will reflect the current trends and skills necessary for an employee to:

1) Obtain a job in the field of Diesel Mechanics Technician industry nation wide

2) Once leaving the 24 month program the former Interns/Apprentices will retain a job once hired, being a master in their chosen field

3) To advance in the Diesel Mechanic Technician field.

TCCBTS's Assigned Task Lists are grouped according to on the job activity areas generally used in industry settings. TCCBTS's duty areas of work/studies are used at different levels, starting:

- Intermediate apprentices
- Advanced Apprentice
- Higher Apprentice

TCCBTS is using two different terms, "Internship" and "Apprenticeship" those two terms fit the many different programs we offer

✓ Internship: An internship is (a job) training for white-collar and professional careers. Internships for professional careers are similar in some ways to apprenticeships for trade and vocational jobs.

The Internship's lack of standardization and oversight leaves the term open to broad interpretation.

✓ Apprenticeship: A person who works for another in order to learn a trade

An applicant must have a high school education with a grade C or above or have completed an Intermediate Apprenticeship. Higher apprentices work towards work-based learning qualifications such as an NVQ Level 4 and, in some cases, a knowledge-based qualification such as a Foundation degree.

TCCBTS's goal is to turn out the best diesel technicians to be the pride of any industry they are employed.

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Tech Craftsman Career Building Trade School (TCCBTS)
24 Month Program Designed For Both, Internships and Apprenticeships

COURSE DESCRIPTION

DIESEL ENGINE and TRANSMISSION COURSE DESCRIPTION:

- Engine and transmissions course offering training in the testing and repairing of diesel engines/transmissions and related systems. The course introduces fundamental principles of large diesel truck engine/transmission operations, such as Cummings, Detroit, and Caterpillar.
- TCCBTS Interns/Apprentices will learn to perform inspections, tests, and measurements for diagnosis and to perform needed repairs, main course; remanufacture both the trucks engines and transmissions.
- Course content prepares TCCBTS Interns/Apprentices to lean through hands-on-training in Tech Craftsman Career Building Trade School 24 month program for advanced training in diesel service technology, TCCBTS Interns/Apprentices starting at low-level and advancing to Top-level making those masters and professionals for employment in diesel engine repair/remanufacturing and to take the ASE written test for Diesel Engine.

Recommended: How Diesel Electronics, Algebra I or Technical Math, applies to heavy truck diesel engine

NOTE: Tech Craftsman Career Building Trade School will develop training tapes/videos with instruction of how algebra and/or technical math applies to gas and diesel engines.

Number of Competencies: 64 Non-NATEF programs (P-1) Priority 1 Tasks
115 NATEF certified programs
95% of P-1
70% of P-2
25% of P-3

Required: A minimum of 24 month must be dedicated to diesel engines to meet minimum standards set by NATEF.

Recommended Credits:
TCCBTS Program, 8 hour days, 5 days a week, 24 months

Notes: Course is aligned with NATEF tasks list for medium/heavy trucks curriculum

DIESEL: ENGINE STANDARDS

1.0 Interns/Apprentices will perform safety examinations and maintain safety records.

2.0 Interns/Apprentices will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

3.0 Interns/Apprentices will integrate reading, writing, math, and science skills and understand the impact of academic achievement in the workplace.

4.0 Interns/Apprentices will properly perform general engine diagnosis.

5.0 Interns/Apprentices will properly inspect and diagnose cylinder heads and valve trains.

6.0 Interns/Apprentices will properly diagnose and repair the diesel engine block.

7.0 Interns/Apprentices will properly diagnose and repair lubrication systems.

8.0 Interns/Apprentices will properly diagnose and repair cooling system.

9.0 Interns/Apprentices will properly diagnose and repair air induction and exhaust system.

10.0 Interns/Apprentices will properly diagnose and repair fuel supply systems.

11.0 Interns/Apprentices will properly diagnose and repair electronic fuel management system.

12.0 Interns/Apprentices will properly diagnose and repair engine brake system.

STANDARD 1.0

Perform safety examinations and maintain safety records.

LEARNING EXPECTATIONS

Interns/Apprentices will:

1-1 Demonstrate a positive attitude regarding safety practices and issues.

1-2 Use and inspect personal protective equipment.

1-3 Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.

1-4 Demonstrate continuous awareness of potential hazards to self and others and respond appropriately.

1-5 Assume responsibilities under HazCom (Hazard Communication) regulations

1-6 Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies to protect coworkers and bystanders from hazards.

1-7 Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies regarding reporting of accidents and observed hazards, and regarding emergency response procedures.

1-8 Demonstrate appropriate related safety procedures.

1-9 Pass with 100 % accuracy a written examination relating to safety issues

1-10 Pass with 100% accuracy a performance examination relating to safety.

1-11 Maintain a portfolio record of written safety examinations and equipment examinations for which the Interns/Apprentices has passed an operational checkout by the instructor.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The Interns/Apprentices/Apprentices:

1.1A Is attentive during safety discussions.

1.1B Actively seeks information about safe procedures.

1.1C Responds positively to instruction, advice, and correction regarding safety issues.

1.1D Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.

1 .1E Reports to school or work physically ready to perform to professional standards, such as rested, or not impaired by medications, drugs, alcohol, etc.

1.2 Selects, inspects, and uses the correct personal protective equipment for the assigned task.

1.3A Inspects power tools for intact guards, shields, insulation, and other protective devices.

1.3B Inspects extension cords for the presence of a functional ground connection, prior to use.

1.3C Operates and maintains tools in accordance with manufacturer's instructions and as required by regulation or company policy.

1.3D Properly places and secures ladders and scaffolding prior to use.

1.4A Is observant of personnel and activities in the vicinity of the work area.

1 .4B Warns nearby personnel, prior to starting potentially hazardous actions.

1.5A When asked to use a new hazardous material, retrieves MSDSs (material safety data sheets), and identifies the health hazards associated with the new material.

1.5B Reports hazards found on the job site to the supervisor.

1.6A Erects shields, barriers, and signage to protect coworkers and bystanders prior to starting potentially hazardous tasks.

1.6B Provides and activates adequate ventilation equipment as required by the task.

1.7A Reports all injuries to self to the immediate supervisor.

1.7B Reports observed unguarded hazards to their immediate supervisor.

1.8A Complies with personal assignments regarding emergency assignments.

1.9A Passes with 100% accuracy a written examination relating specifically to content area.

1.10A Passes with 100% accuracy a performance examination relating specifically to welding tools, equipment and supplies.

1.11A Maintains a portfolio record of written safety examinations and equipment examinations for which the Interns/Apprentices has passed an operational checkout by the instructor.

EASY PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Instructor will conduct a practice drill simulating a hazardous solvent spill in which an emergency action plan is to be implemented.
- Instruct a visitor to obviously approach the vicinity of an intern conducting a hazardous activity and note the level of awareness demonstrated by the intern.
- Instructors will prepare for a project requiring the use of ladders and/or scaffolding, note the proper placement and securing procedures followed by Interns/Apprentices.

STANDARD 2.0

Interns/Apprentices/ will demonstrate leadership, citizenship, and teamwork skills required for success in the trade school, community, and workplace.

LEARNING EXPECTATIONS

The Interns/Apprentices will:

2.1 Cultivate positive leadership skills.

2.2 Participate in the Interns/Apprentices organization directly related to their program of study as an integral part of classroom instruction.

2.3 Assess situations; apply problem-solving techniques and decision-making skills within the trade school, community, and workplace.

2.4 Participate as a team member in a learning environment.

2.5 Respect the opinions, customs, and individual differences of others.

2.6 Build personal career development by identifying career interests, strengths, and pportunities.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The Interns/Apprentices:

2.1A Demonstrates character and leadership using creative-and critical-thinking skills.

2.1B Uses creative thought process by "thinking outside the box."

2.2A Relates the creed, purposes, motto, and emblem of their Interns/Apprentices organization, directly related to personal and professional development.

2.2B Plans and conducts meetings and other business according to accepted rules of parliamentary procedure.

2.3A Makes decisions and assumes responsibilities.

2.3B Analyzes a situation and uses the Professional Development Program or career technical Interns/Apprentices organization materials directly related to the Interns/Apprentices' program of study to resolve it.

2.3C Understands the importance of learning new information for both current and future problem solving and decision making.

2.4A Organizes committees and participates in functions.

2.4B Cooperates with peers to select and organize a community service project.

2.5A Researches different customs and individual differences of others.

2.5B Interacts respectfully with individuals of different cultures, genders, and backgrounds.

2.5C Resolves conflicts and differences to maintain a smooth workflow and classroom environment.

2.6A Creates personal career development by identifying career interests, strengths, and opportunities.

2.6B Identifies opportunities for career development and certification requirements.

2.6C Plans personal educational paths based on available courses and current career goals.

2.6D Creates a résumé that reflects intern's skills, abilities, and interests.

SAMPLE PERFORMANCE TASKS

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various career technical Interns/Apprentices organizations' programs and/or competitive events.
- Implement an annual program of work.
- Prepare a meeting agenda for a specific career technical Interns/Apprentices organization monthly meeting.

- Attend a professional organization meeting.
- Develop a program of study within their career opportunities.

STANDARD 3.0

Interns/Apprentices will integrate reading, writing, math, and science skills and understand the impact of academic achievement in the work place.

LEARNING EXPECTATIONS

The Interns/Apprentices will:

3.1 Assume responsibility for accomplishing classroom assignments and workplace goals within accepted time frames.

3.2 Develop advanced study skills.

3.3 Demonstrate and use written and verbal communication skills.

3.4 Read and understand technical documents such as regulations, manuals, reports, forms, graphs, charts, and tables.

3.5 Apply the foundations of mathematical principles such as algebra, geometry, and advanced math to solve problems.

NOTE: Tech Craftsman Career Building Trade School will develop training tapes/videos with instruction of how algebra and/or technical math applies to gas and diesel engines.

3.6 Apply basic scientific principles and methods to solve problems and complete tasks. 3.7 Understand computer operations and related applications to input, store, retrieve, and output information as it relates to the course.

3.8 Research, recognize, and understand the interactions of the environment and green issues as they relate to the course work and to a global economy.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The Interns/Apprentices:

3.1A Uses appropriate time management to achieve goals.

3.1B Arrives at school on time each day.

3.1C Completes assignments and meets deadlines.

3.2A Assesses current personal study skills.

3.2B Demonstrates advanced note-taking ability.

3.2C Formulates appropriate study strategies for given tasks.

3.3A Communicates ideas, information, and messages in a logical manner

3.3B Fills out forms, reports, logs, and documents to comply with class and project requirements.

3.4A Reads and understands technical documents and uses industry jargons, acronyms, and terminology appropriately

3.4B Recognizes the meaning of specialized words or phrases unique to the career and industry.

3.5A Utilizes computation in adding, subtracting, multiplying, and dividing of whole numbers, fractions, decimals, and percent's

3.5B Chooses the right mathematical method or formula to solve a problem.

3.5C Performs math operations accurately to complete classroom and lab tasks on engine/transmission remanufacturing

3.6A Understands scientific principles critical to the course.

3.6B Applies scientific principles and technology to solve problems and complete tasks.

3.6C Has knowledge of the scientific method (e.g., identifies the problem, collects information, forms opinions, and draws conclusions).

3.7A Uses basic computer hardware (e.g., PCs, printers) and software to perform tasks as required for the course work.

3.7B Understands capabilities of computers and common computer terminology (e.g., program, operating system)

3.7C Applies the appropriate technical solution to complete tasks.

3.7D Inputs data and information accurately for the course requirements.

3.8A Researches and recognizes green trends in career area and industry.

3.8B Examines current environmentally-friendly trends.

SAMPLE PERFORMANCE TASKS

- Examine and compile different learning styles for portfolios.
- Create calendars containing all activities and obligations for one month. Discusses how to handle conflicting or competing obligations then complete daily and weekly plans showing tasks, priorities, and scheduling.
- Complete self-assessments of study habits.
- Compute precise and exact measurements.
- Explore study strategies for different subjects and tasks then analyze two homework assignments and select the best strategies for completing them.
- Create “life maps” showing necessary steps or “landmarks” along the path to personal, financial, educational, and career goals.
- Take notes during counselor classroom visits and work in small groups to create flow charts of the path options.
- List attitudes that lead to success then rate individually in these areas. Work together to suggest strategies for overcoming the weaknesses identified own and partners’ self-assessments then share with the class the strategies developed.
- Research the Internet and other technology to collect and analyze data concerning climate change.
- Keep a data file of alternative energy sources and the sources’ impact on the environment.
- Develop a recycling project at home or for the school environment.

STANDARD 4.0

Interns/Apprentices will properly perform general engine diagnosis.

LEARNING EXPECTATIONS

Number of Competencies: 64 Non-NATEF programs (P-1) Priority 1 Tasks
115 NATEF certified programs
95% of P-1
70% of P-2
25% of P-3

The Interns/Apprentices will:

4.1 Inspect diesel engine fuel, oil, and coolant levels and condition; determine needed action. P-1

4.2 Identify causes of engine fuel, oil, coolant, air, and other leaks; determine needed action. P-1

4.3 Listen for diesel engines noises; determine needed action. P-2

4.4 Observe diesel engine exhaust smoke color and quantity; determine needed action. P-3

4.5 Identify causes of no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action. P-1

4.6 Identify causes of surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action. P-1

4.7 Identify diesel engine vibration problems; determine needed action. P-2

4.8 Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; verify customer programmable parameters; clear codes; determine further diagnosis. P-1

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The Interns/Apprentices:

4.1 Inspects fuel, oil, and coolant levels and condition; determines needed action.

4.2 Identifies causes of engine fuel, oil, coolant, air, and other leaks; determines needed action.

4.3 Listens for engines noises; determines needed action.

4.4 Observes engine exhaust smoke color and quantity; determines needed action.

4.5 Identifies causes of no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determines needed action.

4.6 Identifies causes of surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determines needed action.

4.7 Identifies engine vibration problems; determines needed action.

4.8 Checks and records electronic diagnostic codes and trip/operational data; monitors electronic data; verifies customer programmable parameters; clears codes; determines further diagnosis.

- Inspect engine oil and water levels.
- Inspect engine and engine components for water and oil leaks
- Diagnose a customer complaint about engine vibration.
- Test crank pressure and determine needed action.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

STANDARD 5.0

Interns/Apprentices will properly inspect and diagnose cylinder heads and valve trains.

LEARNING EXPECTATIONS

The Interns/Apprentices will:

5.1 Remove, clean, and inspect for visible damage and replace cylinder head(s) assembly. P-1

5.2 Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action. P-1

5.3 Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action. P-1

5.4 Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action. P-3

5.5 Measure valve head height relative to deck and valve face-to-seat contact; determine needed action. P-3

5.6 Inspect injector sleeves and seals; measure injector tip or nozzle protrusion; determine needed action. P-3

5.7 Inspect valve train components; determine needed action. P-3

5.8 Disassemble cylinder head. P-3

5.9 Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and Backlash. P-2

5.10 Inspect cam followers; determine needed action. P-2

5.11 Adjust valve bridges (crossheads); adjust valve clearances and injector settings. P-1

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The Interns/Apprentices:

5.1 Removes, cleans, and inspects for visible damage and replaces cylinder head(s) assembly.

5.2 Cleans and inspects threaded holes, studs, and bolts for serviceability; determines needed action.

5.3 Inspects cylinder head for cracks/damage; checks mating surfaces for warpage; checks condition of passages; inspects core/expansion and gallery plugs; determines needed action.

5.4 Disassembles head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determines needed action.

5.5 Measures valve head height relative to deck and valve face-to-seat contact; determines needed action.

5.6 Inspects injector sleeves and seals; measures injector tip or nozzle protrusion; determines needed action.

5.7 Inspects valve train components; determines needed action.

5.8 Disassembles cylinder head.

5.9 Inspects, measures, and replaces/reinstalls overhead camshaft; measures/adjusts end play and backlash.

5.10 Inspects cam followers; determines needed action.

5.11 Adjusts valve bridges (crossheads); adjusts valve clearances and injector settings.

Observe and determine necessary action for a cracked cylinder head.

- Remove, clean, inspect, and replace the cylinder head(s) assembly.

- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order.
- Calculate manufacturer labor operation time used in the diagnostic process.

STANDARD 6.0

Interns/Apprentices will properly diagnose and repair the diesel engine block.

LEARNING EXPECTATIONS

The Interns/Apprentices will:

6.1 Perform crankcase pressure test; determine needed action. P-1

6.2 Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components. P-2.

6.3 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. P-2

6.4 Inspect cylinder sleeve counter-bore and lower bore; check bore distortion; determine needed action P-2

6.5 Clean, inspect and measure cylinder walls and liners for wear and damage; determine needed action. P-2

6.6 Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion) P-2

6.7 Inspect in-block camshaft bearings for wear and damage; determine needed action. P-3

6.8 Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play. P-3

6.9 Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action. P¬2

6.10 Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play. P-2

6.11 Inspect, install, and time gear backlash; determine needed action. P-2

6.12 Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action. P-2

6.13 Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on piston. P-3

6.14 Assemble pistons and connecting rods; install in block; install rod bearings and check clearances. P-2

6.15 Check condition of piston cooling jets (nozzles); determine needed action. P-2

6.16 Inspect and measure crankshaft vibration damper; determine needed action. P-3

6.17 Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action. P-3

6.18 Inspect flywheel/flex plate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The Interns/Apprentices:

6.1 Performs crankcase pressure test; determines needed action.

6.2 Removes, inspects, services, and installs pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.

6.3 Disassembles, cleans, and inspects engine block for cracks/damage; measures mating surfaces for warpage; checks condition of passages; core/expansion and gallery plugs; inspects threaded holes; studs, dowel pins, and bolts for serviceability; determines needed action.

6.4 Inspects cylinder sleeve counter bore and lower bore; checks bore distortion; determines needed action

6.5 Cleans, inspects, and measures cylinder walls and liners for wear and damage; determines needed action.

6.6 Replaces/re-installs cylinder liners and seals; checks and adjusts liner height (protrusion)

6.7 Inspects in-block camshaft bearings for wear and damage; determines needed action.

6.8 Inspects, measures, and replaces/re-installs in-block camshaft; measures/adjusts end play.

6.9 Cleans and inspects crankshaft for surface cracks and journal damage; checks condition of oil passages; checks passage plugs; measures journal diameter; determines needed action.

6.10 Inspects main bearings for wear patterns and damage; replaces as needed; checks bearing clearances; checks and corrects crankshaft end play.

6.11 Inspects, installs, and times gear backlash; determines needed action.

6.12 Inspects connecting rod and bearings for wear patterns; measures pistons, pins, retainers, and bushings; performs needed action.

6.13 Determines piston-to-cylinder wall clearance; checks ring-to-groove fit and end gap; installs rings on piston.

6.14 Assembles pistons and connecting rods; installs in block; installs rod bearings and checks clearances.

6.15 Checks condition of piston cooling jets (nozzles); determines needed action.

6.16 Inspects and measures crankshaft vibration damper; determines needed action.

6.17 Installs and aligns flywheel housing; inspects flywheel housing(s) to transmission housing/engine mating surface(s) and measures flywheel housing face and bore runout; determines needed action.

6.18 Inspects flywheel/flex plate (including ring gear) and mounting surfaces for cracks and wear; measures runout; determines needed action.

SAMPLE PERFORMANCE TASKS

- Remove pan and determine and perform required service.
- Diagram the components of an engine block.
- Clean cylinder liners and determine if repair is needed. Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using

technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

STANDARD 7.0

Interns/Apprentices will properly diagnose and repair lubrication systems.

LEARNING EXPECTATIONS

Number of Competencies:

64 Non-NATEF programs (P-1)
Priority 1 Tasks
115 NATEF certified programs
95% of P-1
70% of P-2
25% of P-3

The Interns/Apprentices will:

7.1 Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature and check operation of temperature sensor; determine needed action. P-1

7.2 Check engine oil level and condition; determine needed action. P-1

7.3 Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check gear drive clearances; determine needed action. P-3

7.4 Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action. P-3

7.5 Inspect, clean, and test oil cooler and components; determine needed action. P-3

7.6 Inspect turbocharger lubrication and cooling system; determine needed action. P-2

7.7 Determine proper lubricant and perform oil and filter change. P-1

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The Interns/Apprentices:

7.1 Tests engine oil pressure and checks operation of pressure sensor, gauge, and/or sending unit; tests engine oil temperature and checks operation of temperature sensor; determines needed action.

7.2 Checks engine oil level and condition; determines needed action.

7.3 Inspects and measures oil pump, drives, inlet pipes, and pick-up screens; checks gear drive clearances; determines needed action.

7.4 Inspects oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determines needed action.

7.5 Inspects, cleans, and tests oil cooler and components; determines needed action.

7.6 Inspects turbocharger lubrication and cooling system; determines needed action.

7.7 Determines proper lubricant and performs oil and filter change.

SAMPLE PERFORMANCE TASKS

- Change oil filter.
- Diagram an engine lubrication system.
- Check engine oil and add or change as indicated.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

STANDARD 8.0

Interns/Apprentices will properly diagnose and repair cooling systems.

LEARNING

EXPECTATIONS

Number of Competencies: 64 Non-NATEF programs (P-1)
Priority 1 Tasks
115 NATEF certified programs
95% of P-1
70% of P-2
25% of P-3

The Interns/Apprentices will:

8.1 Check engine coolant type, level, condition, and consumption; test coolant for freeze protection and additive package concentration; determine needed action. P-1

8.2 Test coolant temperature and check operation of temperature and level sensors, gauge, and /or sending unit; determine needed action. P-1

8.3 Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment. P-1

8.4 Inspect thermostat(s), by-pass housing(s), and seals; replace as needed. P-2

8.5 Recover, flush, and refill with recommended coolant/additive package; bleed cooling system. P-1

8.6 Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. P-1

8.7 Inspect water pump and hoses; replace as needed. P-1

8.8 Inspect, clean, and pressure test radiator, pressure cap, tank(s), and recovery systems; determine needed action. P-1

8.9 Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed. P-1

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The Interns/Apprentices:

8.1 Checks engine coolant type, level, condition, and consumption; tests coolant for freeze protection and additive package concentration; determines needed action.

8.2 Tests coolant temperature and checks operation of temperature and level sensors, gauge, and /or sending unit; determines needed action.

8.3 Inspects and re-installs/replaces pulleys, tensioners, and drive belts; adjusts drive belts and checks alignment.

8.4 Inspects thermostat(s), by-pass housing(s), and seals; replaces as needed.

8.5 Recovers, flushes, and refills with recommended coolant/additive package; bleeds cooling system.

8.6 Inspects coolant conditioner/filter assembly for leaks; inspects valves, lines, and fittings; replaces as needed.

8.7 Inspects water pump and hoses; replaces as needed.

8.8 Inspects, cleans, and pressure tests radiator, pressure cap, tank(s), and recovery systems; determines needed action.

8.9 Inspects thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replaces as needed.

- Diagram the engine cooling system.
- Check coolant and performs any service indicated.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order.

- Calculate manufacturer labor operation time used in the diagnostic process.

STANDARD 9.0

Interns/Apprentices will properly diagnose and repair air induction and exhaust system.

LEARNING EXPECTATIONS

Number of Competencies: 64 Non-NATEF programs (P-1)
Priority 1 Tasks
115 NATEF certified programs
95% of P-1
70% of P-2
25% of P-3

The Interns/Apprentices will:

9.1 Perform air intake system restriction and leakage tests; determine needed action. P-1

9.2 Perform intake manifold pressure (boost) test; determine needed action. P-1

9.3 Perform exhaust back pressure test; determine needed action. P-2

9.4 Inspect turbocharger(s), wastegate, and piping systems; determine needed action. P-2

9.5 Inspect and test turbocharger(s) (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators. P-3

9.6 Check air induction system: piping, hoses, clamps, and mounting; service or replace air filter as needed. P-1

9.7 Remove and reinstall turbocharger/wastegate assembly. P-3

9.8 Inspect intake manifold, gaskets, and connections; replace as needed. P-3

9.9 Inspect, clean, and test charge air cooler assemblies; inspect after-cooler assemblies; replace as needed. P-2

9.10 Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed. P-2

9.11 Inspect exhaust after treatment devices; determine necessary action. P-3

9.12 Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action. P-2

9.13 Inspect and test exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

9.1 Performs air intake system restriction and leakage tests; determines needed action.

9.2 Performs intake manifold pressure (boost) test; determines needed action.

9.3 Performs exhaust back pressure test; determines needed action.

9.4 Inspects turbocharger(s), waste gate, and piping systems; determines needed action.

9.5 Inspects and tests turbocharger(s) (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators.

9.6 Checks air induction system: piping, hoses, clamps, and mounting; services or replaces air filter as needed.

9.7 Removes and reinstalls turbocharger/wastegate assembly.

9.8 Inspects intake manifold, gaskets, and connections; replaces as needed.

9.9 Inspects, cleans, and tests charge air cooler assemblies; inspects aftercooler assemblies; replaces as needed.

9.10 Inspects exhaust manifold, piping, mufflers, and mounting hardware; repairs or replaces as needed.

9.11 Inspects exhaust after treatment devices; determines necessary action.

9.12 Inspects and tests preheater/inlet air heater, or glow plug system and controls; performs needed action.

9.13 Inspects and tests exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determines needed action.

- Diagram the engine exhaust system.
- Check turbocharger operation and perform any service indicated.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order.
- Calculate manufacturer labor operation time used in the diagnostic process.

STANDARD 10.0

Apprentices will properly diagnose and repair fuel supply system.

LEARNING EXPECTATIONS

Number of Competencies: 64 Non-NATEF programs (P-1)
Priority 1 Tasks
115 NATEF certified programs
95% of P-1
70% of P-2
25% of P-3

The Interns/Apprentices will:

10.1 Check fuel level and condition; determine needed action. P-1

10.2 Perform fuel supply and return system tests; determine needed action. P-1

10.3 Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, and supply and return lines and fittings; determine needed action. P-1

10.4 Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, and fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action. P-1

10.5 Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action. P-1

10.6 Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump. P-1

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The Interns/Apprentices:

10.1 Checks fuel level and condition; determines needed action.

10.2 Performs fuel supply and return system tests; determines needed action.

10.3 Inspects fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determines needed action.

10.4 Inspects, cleans, and tests fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determines needed action.

10.5 Inspects and tests low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determines needed action.

10.6 Checks fuel system for air; determines needed action; primes and bleeds fuel system; checks primer pump.

SAMPLE PERFORMANCE TASKS

- Diagnose problem with fuel system and perform indicated action.
- Change fuel filter.
- Use appropriate service information to properly diagnose electronic fuel management system.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order.
- Calculate manufacturer labor operation time used in the diagnostic process.

STANDARD 11 .0

Students will properly diagnose and repair fuel supply system.

Number of Competencies: 64 Non-NATEF programs (P-1)
Priority 1 Tasks
115 NATEF certified programs
95% of P-1
70% of P-2
25% of P-3

Interns/Apprentices will:

Properly diagnose and repair electronic fuel management system. LEARNING EXPECTATIONS
The Interns/Apprentices will:

11.1 Inspect and test power and ground circuits and connections; measure and interpret voltage drop, ampere, and resistance readings using a digital multimeter (DMM); determine needed action. P-1

11.2 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. P-1

11.3 Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes; determine further diagnosis. P-1

11.4 Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams). P-1

11.5 Inspect and replace electrical connector terminals, seals, and locks. P-1

11.6 Inspect and test sensors, controls, actuator components, and circuits; adjust or replace as needed. P-1

11.7 Using recommended electronic diagnostic tools (to include PC based software and/or data scan tools), access and interpret customer programmable parameters. P-1

11.8 Inspect, test, and adjust electronic unit injectors (EUI); determine needed action. P-2

11.9 Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM if (applicable). P-2

11.10 Perform cylinder contribution test utilizing recommended electronic diagnostic tool. P-1

11.11 Perform on-engine inspections and tests on hydraulic electronic unit injectors and system electronic controls; determine needed action. P-2

11.12 Perform on-engine inspections and tests on hydraulic electronic unit injector high pressure oil supply and control systems; determine needed action. P-2

11.13 Perform on-engine inspections and tests on common rail type injection system; determine needed action. P-3

11.14 Inspect high pressure injection lines, hold downs, fittings and seals; determine needed action. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The Interns/Apprentices:

11.1 Inspects and tests power and ground circuits and connections; measures and interprets voltage drop, ampere, and resistance readings using a digital multimeter (DMM); determines needed action.

11.2 Interfaces with vehicle's on-board computer; performs diagnostic procedures using recommended electronic diagnostic equipment and tools (to include PC based software and/or data scan tools); determines needed action.

11.3 Checks and records electronic diagnostic codes and trip/operational data; monitors electronic data; clears codes; determines further diagnosis.

11.4 Locates and uses relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).

11.5 Inspects and replaces electrical connector terminals, seals, and locks.

11.6 Inspects and tests sensors, controls, actuator components, and circuits; adjusts or replaces as needed.

11.7 Using recommended electronic diagnostic tools (to include PC based software and/or data scan tools), accesses and interprets customer programmable parameters.

11.8 Inspects, tests, and adjusts electronic unit injectors (EUI); determines needed action.

11.9 Removes and installs electronic unit injectors (EUI) and related components; recalibrates ECM if (applicable).

11.10 Performs cylinder contribution test utilizing recommended electronic diagnostic tool.

11.11 Performs on-engine inspections and tests on hydraulic electronic unit injectors and system electronic controls; determines needed action.

11.12 Performs on-engine inspections and tests on hydraulic electronic unit injector high pressure oil supply and control systems; determines needed action.

11.13 Performs on-engine inspections and tests on common rail type injection system; determines needed action.

11.14 Inspects high pressure injection lines, hold downs, fittings and seals; determines needed action.

SAMPLE PERFORMANCE TASKS

- Complete a diesel engine repair order and calculate salary based on manufacture labor operation time.
- Use reference materials to determine procedures for diagnosing and testing engines.
- Work as a team member to develop a diagnostic strategy.
- Use schematics and diagrams to execute a task.

STANDARD 12.0

Properly diagnose and repair engine brake system.

LEARNING EXPECTATIONS

Number of Competencies: 64 Non-NATEF programs (P-1)
Priority 1 Tasks
115 NATEF certified programs
95% of P-1
70% of P-2
25% of P-3
The Interns/Apprentices will:

12.1 Inspect and adjust engine compression/exhaust brakes; determine needed action. P-3

12.2 Inspect, test, and adjust engine compression/exhaust brake control circuits, switches, and solenoids; repair or replace as needed. P-3

12.3 Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings; repair or replace as needed. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The Interns/Apprentices:

12.1 Inspects and adjusts engine compression/exhaust brakes; determines needed action.

12.2 Inspects, tests, and adjusts engine compression/exhaust brake control circuits, switches, and solenoids; repairs or replaces as needed.

12.3 Inspects engine compression/exhaust brake housing, valves, seals, lines, and fittings; repairs or replaces as needed.

SAMPLE PERFORMANCE TASKS

- Complete a diesel engine repair order and calculate salary based on manufacture labor operation time.
- Use reference materials to determine procedures for diagnosing and testing engines.
- Work as a team member to develop a diagnostic strategy.
- Use schematics and diagrams to execute a task.

SAMPLING OF AVAILABLE RESOURCES

T2 Diesel Engine Curriculum Module, AYES Corporation, www.ayes.org

2001 Medium/Heavy Duty Truck Task List,
National Automotive Technicians Education Foundation (NATEF), www.natef.org

Curriculum Integrator, CORD Communications, Waco, Texas 110108 Diesel Technology,
Goodheart-Willcox, 2001
http://www.cordcommunications.com/