

Monroe Career & Technical Institute

Course: Diesel Technology

Unit Name: 100 ORIENTATION AND SAFETY

Number: 100 **Hours:** 44.00

Dates: Spring 2025

Description/Objectives:

Student will know and be able to complete all required forms, tool safety requirements, classroom rules, and use the proper procedures for shop tools, equipment, chemicals, and paints.

Student will understand what the job opportunities are in the trucking world, be able to use online service manuals, and follow OSHA standards.

Tasks:

PA102 - Research diesel occupations and certification programs.

PA103 - Identify truck classifications and configurations.

PA104 - Use service manuals and online service information.

PA105 - Follow safety procedures and safe equipment operation.

PA107 - Follow Environmental Protection Agency (EPA) standards for cleaning and disposal of waste and fluids.

PA108 - Exhibit professional and personal standards and work habits and ethics in a diesel shop.

PA109 - Comply with Occupational Safety and Health Administration (OSHA) regulations.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12

Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12

Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10

Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12

Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12

Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

TEXT TYPES AND PURPOSE GRADES 9-10-11-12

Standard CC.3.6.9-10.A Standard CC.3.6.11-12.A Write arguments focused on discipline specific content.

Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

PRODUCTION & DISTRIBUTION OF WRITING GRADES 9-10-11-12

Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

Standard CC.3.6.9-10 D Standard CC.3.6.11-12.D Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12

Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

Standard CC.3.6.9-10.G. Standard CC.3.6.11-12.G Gather relevant information from multiple authoritative print and digital sources, following a standard format for citation.

Standard CC.3.6.9-10.H. Standard CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

RANGE OF WRITING GRADES 9-10-11-12

Standard CC.3.5.9-10.I & Standard CC.3.5.11-12.I. Write routinely over extended time frames and shorter time frames for a range of tasks, purposes and audiences...etc.

Connecting Anchor/Standard:

- Career Education and Work Academic Standards
Standard 13.1 Career Awareness and Preparation

Supporting Anchor/Standards:

Standard 13.18.D Explain the relationship of career training programs to employment opportunities.

Instructional Activities:

Knowledge:

Complete assignments related to the textbook

Participate in lecture and discussion and respond to questions

Participate in group discussions

Fill out personal forms

Complete reading assignments

Complete written assignments

Participate with the group activities

Complete Task Sheet Assignment

Explain basic truck classifications
 Define gross vehicle weight
 Classify a truck by the number of axles it has
 Identify an on-highway truck's major systems and their related components
 Identify various career opportunities in the heavy-duty trucking industry
 Explain the special notations in the text labeled Shop Talk, Caution, and warning
 Identify the basic procedures for lifting and carrying heavy objects and materials
 Explain the role of personal protective equipment
 Describe safety warnings as they relate to work area safety
 Identify the different classifications of fires and the proper procedures for extinguishing each
 Identify the four categories of hazardous waste and their respective hazards to health and the environment
 Explain laws regulating hazardous materials, including the "right-to-know" and employee/employer obligations
 Identify which types of records are required by law to be maintained on trucks involved in interstate shipping
 Discuss the role of computers in the administration, logistics, and maintenance management of heavy-duty truck operations
 Explain how these standards are mandatory in industry

Skill:

Complete all forms required by Diesel Technology and MCTI
 Demonstrate safety standards as they apply to the transportation, construction, and farming industry
 Locate and interpret information gathered from maintenance manuals via paper manuals and computer generated manuals
 Demonstrate proper safety procedures for chemical and paint handling and disposal
 Demonstrate safe usage of shop equipment
 Demonstrate safe lifting and carrying of heavy objects
 Operate the various types of fire extinguishers based on the type of extinguishing agent each uses

Remediation:

Re-teach major concepts
 Review with teacher assistance
 Study group
 Worksheets
 Individual tutoring when needed
 Reading comprehension packets
 Placing events in a time line/ordinal steps
 Retest
 Study guides
 Checklists

Enrichment:

Assist other students with projects or remediation
 Leadership activities such as Shop Foreman
 Complete a special project to benefit the class

Special Adaptations:

Extended Time (assignments and/or testing)
 Graphic Organizer
 Study Guide
 Adapted Tests and/or Assignments
 Drill and Practice (Repetition of Material)
 Use of Computer (Access to)
 Highly Structured Classroom
 Opportunities for Repeated Practice of MATH Skills
 Provide Verbal and Written Directions
 Multiplication Chart
 All Vocabulary to be Defined Before Testing

Safety:

Student must:

- Pass safety test with 100% for tools and equipment
- Locate, read, and interpret MSDS sheet
- Demonstrate fire safety procedures
- Use proper safety precautions when using hand tools and operating equipment
- Follow proper safety procedures for chemical and paint handling and disposal
- Handle material in a safe and workmanlike manner
- Use protective clothing and equipment
- Use hand tools in a safe manner
- Use adequate ventilation when working in enclosed areas
- Follow manufacturer's directions when using any product, tool, equipment, etc
- Use proper safety precautions when using /operating hand tools
- Use tools and equipment in a professional work like manner according to OSHA standards
- Know and follow the established safety rules at all times

Assessment:

- Worksheets
- Quizzes
- Post Tests
- Summaries
- Log/Journal
- Time Cards
- Writing Activities
- Video/DVD Worksheets
- Portfolio
- Checklist
- Rubrics

Resources/Equipment:

Bennett, S. & Norman, I. A. (2020). Heavy Duty Truck Systems (7th ed.). Sean Bennett (2021) Medium/Heavy Duty Truck Engines, Fuel & Computerized Management Systems (6th ed.).Tasksheet Manual for NATEF Proficiency. Burlington, MA. Jones & Bartlett Learning. Student forms: Time Cards Journals Math ATB Worksheet "Safety Rules for Power Tools" packet of worksheets Fasteners packet worksheets Measuring tools worksheets: Tapes Rulers Levels Precision Measuring Tool Worksheets: Micrometers Calipers Dial Indicator Bore Gage Plastic Gage Air Pressure Gage Multimeter's AVR Battery Testers Diagnostic Equipment Chemical and Paint Worksheets: Parts Washer Brake Parts Cleaner Liquid Penetrants Liquid Lubricants Coolants Battery Acid Fuels Gases Paint General Shop Tools and Supplies: Tie Downs Anchors Bolts Rivets Bushings Chain Collars Hooks Keys Links Nuts O-Rings Pins Rods Screws Springs Studs Stock Washers Air Chucks Tire Fillers Battery Chargers Blow Guns Brake Tools Compressors Extractors Grinders Power Tool Accessories Hammers Heat Gun Impact Drivers Leak Detectors Lift Equipment Lighting Pliers Cutters Power Tools Pressure Equipment Prybars Pullers Presses Ratchets Sanders Scrapers Screw Drivers Sockets Striking Tools Threading Tools Tire Changers Torque Wrenches Welders OXY-Acetylene Cutters Wheel Alignment WrenchesHyperlinks:

Monroe Career & Technical Institute

Course: Diesel Technology

Unit Name: 200 TOOLS AND FASTENERS/HARDWARE

Number: 200 **Hours:** 76.00

Dates: Spring 2025

Description/Objectives:

Student will know and be able to identify and safely use all tools, fasteners, hardware, standard and precision measuring tools, oxy-acetylene torch, and SMAW electric welder according to OSHA and industry standards.

Tasks:

PA201 - Use basic hand tools and power tools.

PA202 - Use fasteners, fittings and hardware.

PA203 - Drill and use threading tools and extractors.

PA204 - Use precision measuring tools.

PA206 - Set up/Shut down, cut and heat with oxy-acetylene torch.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

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Connecting Anchor/Standard:

- Pennsylvania Core Standards for Mathematics Standard 2.0

Supporting Anchor/Standards:

ALGEBRA

Standard 2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

Instructional Activities:

Knowledge:

Complete assignments related to the textbook

Participate in lecture and discussion and respond to questions

Participate in group discussions

Fill out personal forms

Complete reading assignments

Complete written assignments

Participate with the group activities

Complete Task Sheet Assignment

Explain how fasteners are graded

Describe what a Huck faster is and where it is used in truck assembly

Explain why proper torque is essential

List three groups that twist drill are divided into

Skill:

Demonstrate the proper use of Hand tools, Power tools, Shop equipment

Demonstrate how to read and use accurately standard easuring tools, and precise measuring instruments

Identify all required fasteners used in the transportation industry
 Demonstrate the proper use regarding:
 Set up, shut down, and demonstrate safe SMAW electric welding procedures
 Set up, shut down, and demonstrate safe oxy-acetylene torch
 Demonstrate oxy-acetylene proficiency
 Demonstrate electric welding proficiency
 Outline the safety procedures required to work with oxy-acetylene cutting and welding equipment and how to safely use arc-welding stations
 List and describe the use of common hand tool used in heavy duty truck shops
 Describe how to use common pneumatic, electrical, and hydraulic power tools used in heavy-duty truck shops
 Identify the mechanical and electronic measuring tools used the heavy duty truck shops
 Demonstrate an accurate measurement with a micrometer
 Demonstrate the proper use of a torque wrench
 Demonstrate how to check a drill bit for proper cutting angle and lip length
 Describe how threads may be repaired
 Describe ways in which broken studs or fasteners may be extracted
 Explain procedures for using thread locking compounds
 List procedures for performing buck riveting

Remediation:

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 Use protective clothing and equipment

Use hand tools in a safe manner
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Monroe Career & Technical Institute

Course: Diesel Technology

Unit Name: 300 SUSPENSION AND STEERING SYSTEMS

Number: 300 **Hours:** 115.00

Dates: Spring 2025

Description/Objectives:

Student will know and be able to describe the principles of suspension and steering systems for medium and heavy trucks, and be able to apply the principles to the inspection, diagnosing, and repair procedures of the suspension-air and leaf spring, king pins, tie rod ends, and all other parts of the steering system.

Tasks:

PA301 - Inspect and repair or replace steering linkage.

PA302 - Inspect and adjust basic wheel alignment and inspect tires.

PA304 - Inspect and test/service a power steering system.

PA305 - Service wheel bearings and hubs according to Transportation Motor Control (TMC) guidelines.

PA306 - Inspect and replace shock absorbers.

PA307 - Inspect and replace king pins.

PA308 - Inspect and replace leaf springs.

PA309 - Inspect and repair or replace air suspension components.

PA310 - Inspect and service wheel assemblies.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12

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Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

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CRAFT & STRUCTURE GRADES 9-10-11-12

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INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12

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Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12

Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Connecting Anchor/Standard:

- Pennsylvania Core Standards for Mathematics Standard 2.0

Supporting Anchor/Standards:**NUMBERS AND OPERATIONS**

Standard 2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

Standard 2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multistep problems.

Standard 2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Standard 2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

ALGEBRA

Standard 2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

GEOMETRY

Standard 2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.

Standard 2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.

Standard 2.3.HS.A.13 Analyze relationships between two dimensional and three dimensional objects.

Instructional Activities:

Knowledge:

Complete assignments related to the textbook

Participate in lecture and discussion and respond to questions

Participate in group discussions

Fill out personal forms

Complete reading assignments

Complete written assignments

Participate with the group activities

Complete Task Sheet Assignment

Describe a fiber composite spring

Explain the difference between standard and wide-base wheel systems and stud- and hub-piloted mountings

Explain how toe, camber, caster, axle inclination, turning radius, and axle alignment affect tire wear, directional stability, and handling

Explain the relationship between axle alignment and suspension system alignment

Explain the importance of proper matching and assembly of tire and rim hardware

Explain the elements of frame construction

Define the terms yield strength, section modulus (SM), and resist bend moment (RBM)

List the materials from which frame rails are made and describe the characteristics of each

Understand the importance of correctly locating the fifth wheel on the tractor

Define high hitch and outline what is required to avoid it

Outline the function of the kingpin and upper coupler assembly

Skill:

Complete all forms required by Diesel Technology and MCTI

Demonstrate safety standards as they apply to the transportation, construction, and farming industry

Understand how these standards are mandatory in industry

Read and interpret information gathered from maintenance manuals via paper manuals and computer generated manuals

Demonstrate the proper use of hand, power tools, and shop equipment

Demonstrate proper safety procedures for chemical and paint handling and disposal

Read and use accurately precise measuring instruments

Identify all required fasteners used in the transportation industry

Identify the components of the steering system of a heavy-duty truck

Describe the procedure for inspecting front axle components for wear

Describe the components and operation of a worm and sector shaft and a recalculating ball-type steering gear

Explain how to check and adjust a manual steering gear preload and backlash

Identify the components of a power steering gear and pump and explain the operation of a power steering system

Describe the components and operation of a pneumatic steering system

Describe the components and operation of an electronically variable power steering system

Describe the components and operation of a load sensing power assist steering system

Identify and describe the types of suspension systems used on current trucks

List the components used on leaf and multileaf spring suspension systems and explain how they work

Identify equalizing beam suspension system components and explain how they function

Identify torsion bar suspension system components and explain how they function

Identify air spring suspension system components and explain how they function

Troubleshoot suspensions and locate defective suspension system components

Outline suspension system repair and replacement procedures

Perform full chassis suspension system alignments

Describe the operation of the cab air suspension system

Identify the wheel configurations used on heavy-duty trucks

Identify the common types of tire-to-rim hardware and describe their functions

Outline the safety procedure for handling and servicing wheels and tires

Describe brake drum mounting configurations

Perform wheel run out checks and adjustments

Properly match tires in dual and tandem mountings

List the major components of both grease- and oil-lubricated wheel hubs

Perform bearing and seal service on grease-lubricated front and rear wheel hubs

Perform bearing and seal service on oil-lubricated front and rear wheel hubs

Perform front and rear bearing adjustment

Describe TMC wheel-end procedure

Outline the procedure for installing pre-set bearing wheels

Describe the chassis frame of a heavy-duty truck

Describe the different ways frame damage can occur as a result of impact and overloading

Perform some basic chassis frame alignment checks

Describe the various categories of frame damage including diamond, twist, sideways, sag and bow

Explain how the chassis frame, side rails, and cross-members can be repaired

List some guidelines to follow when using frame repair hardware

Outline some basic frame welding techniques

Describe the different types of fifth wheels used on tractors

Outline the operating principles of the Holland, Fontaine, and ConMet fifth wheels

Describe the locking principles of each type of fifth wheel

Outline the procedure required to couple and uncouple a fifth wheel

Service the common types of fifth wheels

Describe the procedure required to overhaul a fifth wheel

Identify the overhaul procedure required of some common fifth wheels

Describe the operating principle of a pintle hook and draw bar

Remediation:

Re-teach major concepts

Review with teacher assistance

Study group

Worksheets

Individual tutoring when needed
 Reading comprehension packets
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Enrichment:

Assist other students with projects or remediation
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Monroe Career & Technical Institute

Course: Diesel Technology

Unit Name: 400 PREVENTIVE MAINTENANCE

Number: 400 **Hours:** 125.00

Dates: Spring 2025

Description/Objectives:

Student will know and be able to identify the proper procedures and practices for preventive maintenance inspections and be able to perform servicing/repair tasks of medium/heavy trucks.

Tasks:

PA401 - Determine preventive maintenance intervals and procedures.

PA402 - Perform preventive maintenance inspection.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12

Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12

Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10

Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12

Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12

Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Supporting Anchor/Standards:

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Instructional Activities:

Knowledge:

- Complete assignments related to the textbook
- Participate in lecture and discussion and respond to questions
- Participate in group discussions
- Fill out personal forms
- Complete reading assignments
- Complete written assignments
- Participate with the group activities
- Complete Task Sheet Assignment
- Explain in detail the positives aspects of a well implemented preventative maintenance program
- Explain the differences between an A,B,C,D, and L inspection
- Follow through the steps to perform a pre-trip inspection
- Describe maintenance issues that would require deadlining a vehicle and an out of service (OSS) sticker applied
- Apply a policy of preventative maintenance scheduling that conforms to federal inspection regulations
- Explain the responsibilities of the inspecting person and record-keeping requirements
- List the three types of antifreeze used in today's diesel engines and the advantages and disadvantages of each
- Describe the need for a supplemental cooling additive package
- Explain the function of and oil filter
- Explain the function of a fuel filter
- Explain the function and need for a water separator
- Explain how to service and water separator
- Explain how to prime a fuel system
- Explain how to check a harmonic balancer and why they should be replaced at OEM intervals
- List other checks that should be preformed in the engine compartment while Explain the effects if mixing lubricants
- Explain the function of the drive shaft and U-joints
- Outline the procedures for installing pre-set bearing wheels
- List the different types of tires used in the trucking industry based upon construction
- Describe how to change brake fluid in a hydraulic braking system
- Explain how to inspect and service a typical master cylinder
- Describe how to inspect and service drum brakes
- Explain how to inspect and check rotor runout
- Describe the inspection process for brake lines and hoses
- Explain how to inspect brake linings and pads and take accurate measurements of pad and lining thickness to determine serviceability
- List and explain three different methods of bleeding a hydraulic brake system
- Explain how to test the operation of the parking brakes
- Describe how to test a trucks service brakes
- List some of the out-of-service criteria for hydraulic braking systems
- Explain some of the safety precautions when working with air brake systems
- Describe the procedures to service a trucks air supply system
- Explain service and inspection procedures for a typical air dryer
- Explain how the air dryer operates and how to perform a leakage test
- List and explain is sequential order the procedures for testing the components of a typical air brake system
- Describe how to perform a check or the manual parking brakes or emergency parking brakes
- Explain the inspection and testing procedure for checking the foundation brakes
- List some of the out-of-service criteria for air brake systems
- List the various components that should be checked within the cab of the vehicle during a vehicle service
- Explain how to make the actual determination as to weather an item within the cab requires maintenance
- Explain how to test the HVAC system
- List the safety items within the cab that must be inspected and account for any mandatory safety equipment
- List and explain how to maintain cab hardware
- Explain 2 different methods of maintaining the vehicle by preventing premature corrosion
- Explain how to performance test on an air conditioning system

List the different methods for finding potential refrigerant leaks in an air conditioning system
 List the components of the steering system and explain their function
 Explain some of the basic steering geometry
 List the importance of a suspension system
 Explain some of the basic terminology used when discussing suspensions
 Explain the different types of suspension systems used in the heavy-duty truck industry
 Explain the importance and list the consequences of correctly locating the fifth wheel on the tractor
 Describe the locking principles of each type of fifth wheel
 Explain how to couple and uncouple a tractor trailer
 Explain the term high hitch and how it can be avoided
 Describe the operating principle of a pintle hook/couplers and draw bars
 Describe the benefits of cushioning to a coupling system
 Outline prescribed maintenance for pintle hooks/couplers and drawbars
 Outline the function of the kingpin and upper coupler assembly

Skill:

Complete all forms required by Diesel Technology and MCTI
 Demonstrate safety standards as they apply to the transportation, construction, and farming industry
 Understand how these standards are mandatory in industry
 Read and interpret information gathered from maintenance manuals via paper manuals and computer generated manuals
 Demonstrate the proper use of hand, power tools, and shop equipment
 Demonstrate proper safety procedures for chemical and paint handling and disposal
 Read and use accurately precise measuring instruments
 Identify all required fasteners used in the transportation industry
 Determine the freezing and boiling point of a coolant mixture based on antifreeze and water ratios
 Properly mix coolant using the correct proportions of water, antifreeze and supplemental coolant additives (SCAs) according to the OEMs recommendations and ambient temperature conditions
 Measure the coolant strength (freeze level) using the appropriate instrument
 Test the SCA level and maintain it at the desired level
 Test coolant for contamination
 Remove and replace a coolant filter and check it for leaks
 Pressure test a radiator cap and determine its serviceability
 Test a cooling system thermostat and determine its serviceability
 Check the condition of the water pump and drive belt tension and condition
 Test the various forms of cooling fans
 Diagnose basic cooling system malfunctions
 Inspect the radiator condition and mounting as well as pressure test the cooling system for leaks and restrictions to proper air flow
 Inspect coolant lines, hoses, and clamps
 Inspect the coolant recovery system and determine its serviceability
 Choose the correct engine oil viscosity for the climatic conditions that the vehicle will be subjected to
 Perform an engine oil change
 Perform an oil filter change
 Perform a fuel filter change
 Demonstrate the use of a hand primer pump
 Service an engine air filter and check restriction indicator
 Perform a PM engine service
 Perform a drive axle lube service
 Perform a check of the fluid level on a drive axle
 Service the drive shaft and U-joints
 Check the oil level in a manual transmission
 Perform a service and inspection on a manual transmission
 Perform adjustments on various styles of clutches
 Perform service and inspection on various types of clutch linkages
 Perform serviced and inspection on an automatic transmission
 Identify the different wheel configurations used in the trucking industry
 Perform wheel inspections on the different wheel configurations used in heavy duty trucks
 Explain the difference between standard and wide-base wheel systems and stud-and hub-piloted mountings
 Explain the importance of proper matching and assembly of tire and rim hardware
 Describe brake drum mounting configurations
 Explain the proper mounting procedures for the wheel configurations used on heavy-duty trucks

Perform wheel runout checks and adjustments
 Explain the proper techniques for front and rear wheel bearing adjustment
 Properly match tires in dual and tandem mounting
 Explain inspection procedures for tires
 Identify tire wear conditions and causes
 Explain the importance of changing brake fluid at manufactures specified time
 Perform and inspection of the air conditioning system
 Perform a steering axle inspection
 Verify a steering complaint
 Perform a completer steering knuckle inspection
 Explain how to perform a tie-rod inspection
 Perform a wheel bearing inspection
 Perform service inspections on the various types of suspensions
 Explain how to identify and maintain U-bolts
 Perform inspection procedures of air spring suspensions
 Explain and perform servicing procedures for height control valves
 Demonstrate safe working procedures around batteries
 Explain the role of the battery in a trucks electrical system
 Verify the condition of a battery using a voltmeter, hydrometer, refratometer, and carbon pile tester
 Describe battery maintenance procedures
 Describe and demonstrate safe charging procedure for batteries
 Jump start a vehicle with a flat battery
 Explain the role of the charging system
 Verify the performance f and alternator
 Explain what full fielding and alternator will accomplish
 Demonstrate how to test a starter to ensuring a starter is in good condition
 Explain the purpose of a lift gate
 Describe maintenance procedures that must be preformed on a lift gate
 Troubleshoot for problems with a hydraulic lift gate
 Describe some of the different styles and types of fifth wheels available in the trucking industry
 Outline the operation of the Holland, Fontaine, and ConMet fifth wheels
 Perform general service procedures to common fifth wheels
 Describe the procedure required to overhaul a fifth wheel

Remediation:

Re-teach major concepts
 Review with teacher assistance
 Study group
 Worksheets
 Individual tutoring when needed
 Reading comprehension packets
 Placing events in a time line/ordinal steps
 Retest
 Study guides
 Checklists

Enrichment:

Assist other students with projects or remediation
 Leadership activities such as Shop Foreman
 Complete a special project to benefit the class

Special Adaptations:

Extended Time (assignments and/or testing)
 Graphic Organizer
 Study Guide
 Adapted Tests and/or Assignments
 Drill and Practice (Repetition of Material)
 Use of Computer (Access to)
 Highly Structured Classroom
 Opportunities for Repeated Practice of MATH Skills

Provide Verbal and Written Directions
Multiplication Chart
All Vocabulary to be Defined Before Testing

Safety:

Pass safety test with 100% for tools and equipment
Locate, read, and interpret MSDS sheet
Demonstrate fire safety procedures
Use proper safety precautions when using hand tools and operating equipment
Follow proper safety procedures for chemical and paint handling and disposal
Handle material in a safe and workmanlike manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Worksheets
Quizzes
Post Tests
Summaries
Log/Journal
Time Cards
Writing Activities
Video/DVD Worksheets
Portfolio
Checklist
Rubrics

Resources/Equipment:

Heavy Duty Truck Systems 7th Edition - ISBN 9781337787161 Copyright 2020
Medium/Heavy Duty Truck Engines, Fuel and Computerized Management Systems, 5th Edition - ISBN 9781305578555 Copyright 2017
Hyperlinks:

Monroe Career & Technical Institute

Course: Diesel Technology

Unit Name: 500 BRAKE SYSTEM

Number: 500 **Hours:** 211.00

Dates: Spring 2025

Description/Objectives:

Student will know and be able to describe the diagnosis, repair and/or service of the medium/heavy truck air, hydraulic, and antilock brake systems and be able to perform such tasks to original equipment manufacture's specifications.

Student will know and understand the proper operation of the air system, how to test it, maintain and repair it.

Tasks:

PA501 - Inspect and repair or replace hydraulic disc brakes components.

PA503 - Inspect and repair or replace S-cam drum brakes components.

PA506 - Inspect and replace or adjust air governors.

PA507 - Replace hydraulic brake lines and bleed brakes.

PA508 - Inspect and repair or replace air brake lines.

PA509 - Inspect and diagnose and replace air brake chambers.

PA510 - Inspect and diagnose and replace master cylinder and hydraulic system components.

PA511 - Diagnose and repair or replace anti-lock brake system (ABS) components.

PA512 - Inspect and repair or replace air brake valves.

PA513 - Inspect and repair or replace air dryers.

PA514 - Inspect and repair or replace air disc brake components.

PA517 - Inspect and replace and adjust slack adjusters.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12

Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12

Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts

in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10

Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12

Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12

Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Mathematics-Standard CC.2.1. Numbers and Operations

Supporting Anchor/Standards:

Standard CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems

Instructional Activities:

Knowledge:

Complete assignments related to the textbook

Participate in lecture and discussion and respond to questions

Participate in group discussions

Fill out personal forms

Complete reading assignments

Complete written assignments

Participate with the group activities

Complete Task Sheet Assignment

Understand what is meant by pneumatic and torque imbalance

Discuss the effects of the Federal Motor Vehicle Safety Standard No. 121 (FMVSS No. 121) on present-day air brake systems

Describe the operation of desiccant and aftercooler-type air dryers

Outline the operating principles of the valves and controls used in an air brake system

Explain the operation of an air brake chamber

Outline the functions of the hold-off and service circuits in truck and trailer brake systems

Describe the operation of S-cam and wedge-actuated drum brakes

Describe the operating principles of manual and automatic slack adjusters

List the components and describe the operating principles of an air disc brake system

Describe the major components and operation of parking and emergency braking systems

Define the principles of brake balance

Describe the principles of operation of a hydraulic brake system

Describe the operation of drum and brakes in a hydraulic braking system

List the major components of a master cylinder

Describe the use and operation of wheel cylinders and calipers

Explain the operation of a hydraulic power booster

Outline the role of the ABS module when managing antiskid mode

Explain how the ABS module controls the service modulator valves

Explain what is meant by the number of channels of an ABS system

Describe how trailer ABS is managed

Explain how an electronic brake system (EBS) manages service brake applications

Outline the reasons why an EBS system has to meet current FMVSS No. 121 requirements

Understand the safety requirements of working on an air brake system

Skill:

Complete all forms required by Diesel Technology and MCTI
 Demonstrate safety standards as they apply to the transportation, construction, and farming industry
 Understand how these standards are mandatory in industry
 Read and interpret information gathered from maintenance manuals via paper manuals and computer generated manuals
 Demonstrate the proper use of hand, power tools, and shop equipment
 Demonstrate proper safety procedures for chemical and paint handling and disposal
 Read and use accurately precise measuring instruments
 Identify all required fasteners used in the transportation industry
 Identify the components of a truck air brake system
 Explain the operation of a dual-circuit air brake system
 Identify the major components of an air compressor
 Identify the major components in a truck hydraulic brake system
 Explain the operation of a hydraulic brake system
 Identify the hydraulic valves and controls used in hydraulic brake systems
 List the major components of an air-over-hydraulic braking system
 Outline some typical maintenance and service procedures performed on hydraulic and air-over-hydraulic brake systems
 Describe the operation of a typical hydraulic ABS system
 Describe how an antilock brake system (ABS) works to prevent wheel lock-up during braking
 List the major components of a truck ABS system
 Describe the operation of ABS input circuit components
 Outline the procedure for diagnosing ABS system faults
 Describe the procedure required to set up and adjust a wheel speed sensor
 Perform basic maintenance on an air brake system
 Diagnose common compressor problems
 Describe the procedure required to service an air dryer
 Performance test an air dryer
 Check out the service brakes on a truck
 Test the emergency and parking brake systems
 Verify the operation of the trailer brakes
 Understand the OOS criteria used by safety inspection officers
 Diagnose some brake valve failures
 Describe the procedure required to overhaul foundation brakes
 Determine brake free-stroke and identify when an adjustment is required
 Outline some common service procedures used on air disc brake systems

Remediation:

Re-teach major concepts
 Review with teacher assistance
 Study group
 Worksheets
 Individual tutoring when needed
 Reading comprehension packets
 Placing events in a time line/ordinal steps
 Retest
 Study guides
 Checklists

Enrichment:

Assist other students with projects or remediation
 Leadership activities such as Shop Foreman
 Complete a special project to benefit the class

Special Adaptations:

Extended Time (assignments and/or testing)
 Graphic Organizer
 Study Guide
 Adapted Tests and/or Assignments

Drill and Practice (Repetition of Material)
 Use of Computer (Access to)
 Highly Structured Classroom
 Opportunities for Repeated Practice of MATH Skills
 Provide Verbal and Written Directions
 Multiplication Chart
 All Vocabulary to be Defined Before Testing

Safety:

Student must:

Pass safety test with 100% for tools and equipment
 Locate, read, and interpret MSDS sheet
 Demonstrate fire safety procedures
 Use proper safety precautions when using hand tools and operating equipment
 Follow proper safety procedures for chemical and paint handling and disposal
 Handle material in a safe and workmanlike manner
 Use protective clothing and equipment
 Use hand tools in a safe manner
 Use adequate ventilation when working in enclosed areas
 Follow manufacturer's directions when using any product, tool, equipment, etc
 Use proper safety precautions when using /operating hand tools

Use tools and equipment in a professional work like manner according to OSHA standards
 Know and follow the established safety rules at all times

Assessment:

Worksheets
 Quizzes
 Post Tests
 Summaries
 Log/Journal
 Time Cards
 Writing Activities
 Video/DVD Worksheets
 Portfolio
 Checklist
 Rubrics

Resources/Equipment:

Bennett, S. & Norman, I. A. (2020). Heavy Duty Truck Systems (7th ed.). Clifton Park: NY. Thomson Delmar Learning. Sean Bennett (2021)Medium/Heavy Duty Truck Engines, Fuel & Computerized Management Systems (6th ed.).Tasksheet Manual for NATEF Proficiency. Burlington, MA. Jones & Bartlett Learning. Student forms: Time Cards Journals Math ATB Worksheet Tapes Rulers Levels Micrometers Calipers Dial Indicator Multimeters Diagnostic Equipment Parts Washer Brake Parts Cleaner Liquid Penetrants Liquid Lubricants General Shop Tools and Supplies: Bolts Rivets Bushings Nuts Pins Rods Screws Springs Studs Washers Blow Guns Brake Tools Compressors Extractors Grinders Power Tool Accessories Hammers Impact Drivers Lift Equipment Lighting Pliers Cutters Power Tools Pressure Equipment Prybars Pullers Presses Ratchets Scrapers Screw Drivers Sockets Striking Tools Threading Tools Torque Wrenches Welders WrenchesHyperlinks:

Monroe Career & Technical Institute

Course: Diesel Technology

Unit Name: 600 DIESEL ENGINES

Number: 600 **Hours:** 70.00

Dates: Spring 2025

Description/Objectives:

Student will know and be able to remove and install diesel engines. Inspect components, diagnose problems, and repair as needed.

Tasks:

PA601 - Explain diesel engine operation and identify parts.

PA602 - Remove, inspect, and install camshaft, and valve train components.

PA603 - Remove, inspect, and install piston, connecting rod, and liner.

PA604 - Remove, inspect, and install crankshaft and bearings (mains and rods).

PA605 - Replace engine oil seal.

PA606 - Perform diesel tune-up (set overhead).

PA607 - Remove, inspect, and install cylinder head and gasket.

PA608 - Remove, inspect, and install oil pump.

PA609 - Remove, inspect, and install vibration dampener and flywheel.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12

Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12

Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10

Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12

Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12

Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Connecting Anchor/Standard:

- Pennsylvania Core Standards for Mathematics Standard 2.0

Supporting Anchor/Standards:**ALGEBRA**

Standard 2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

Instructional Activities:**Knowledge:**

Complete assignments related to the textbook
 Participate in lecture and discussion and respond to questions
 Participate in group discussions
 Fill out personal forms
 Complete reading assignments
 Complete written assignments
 Participate with the group activities
 Complete Task Sheet Assignment
 Interpret basic engine terminology.
 Calculate engine displacement.
 Define the term mean effective pressure.
 Describe the differences naturally-aspirated and manifold-boosted engine.
 Explain how volumetric efficiency affects cylinder breathing.
 Define rejected heat and explain thermal efficiency in diesel engines.
 Outline the operation of a diesel four-stroke cycle.
 Outline the operation of a diesel two-stroke cycle.
 Calculate engine displacement
 Outline the forces a crankshaft is subjected to under normal operation.
 Outline the roles played by vibration dampers and flywheel assemblies.
 Describe how vibration dampers function.
 Define the role of the camshaft in a typical diesel engine.
 Interpret camshaft terminology.

Skill:

Complete all forms required by Diesel Technology and MCTI
 Demonstrate safety standards as they apply to the transportation, construction, and farming industry
 Understand how these standards are mandatory in industry
 Read and interpret information gathered from maintenance manuals via paper manuals and computer generated manuals
 Demonstrate the proper use of hand, power tools, and shop equipment
 Demonstrate proper safety procedures for chemical and paint handling and disposal
 Read and use accurately precise measuring instruments
 Identify all required fasteners used in the transportation industry
 Identify the subsystems that make up a diesel engine.
 Identify the engine power train components.
 Define the roles of piston assemblies, crankshafts, flywheels, and dampers.
 Identify the different types of pistons used in current diesel engines.
 Describe the combustion chamber designs used in diesel engines.

Explain the function of piston rings.
 Classify piston wrist pins by type.
 Describe the role of connecting rods and outline the stresses they are subject to.
 Identify common crankshaft throw arrangements.
 Identify some typical crankshaft failures and their causes.
 Outline the procedure for an in-chassis, rod and main bearing rollover.
 Measure friction bearing clearance using Plastigage.
 Identify the engine timing gear train components.
 Outline the procedure required to time an engine gear train.
 Perform a camshaft inspection.
 Identify the role valve train components play in running an engine.
 List the types of tappet/cam follower used in diesel engines.
 Inspect a set of push tubes or rods.
 Describe the function of rockers.
 Define the role played by cylinder head valves.
 Outline the procedure required to recondition cylinder head valves.
 Describe how valve rotators operate.
 Perform a valve lash adjustment.
 Outline the consequences of either too much or too little valve lash
 Identify the components classified as engine housing components.
 Identify the types of cylinder block used in diesel engines.
 Outline the procedure required to inspect a cylinder block.
 Measure an engine block to specifications using service literature.
 Identify the types of cylinder liners used in diesel engines.
 Explain the procedure required to remove dry, wet, and midstop liners.
 Perform selective fitting of a set of dry liners to a cylinder block.
 Explain how cavitation erosion occurs on wet liners.
 Identify the types of cylinder heads used in diesel engines.
 Describe the component parts of a cylinder head.
 Explain the procedure required to measure, test, and recondition a cylinder head.
 Describe the role of the intake and exhaust manifolds.
 Describe the function of the oil pan in the engine.
 Identify some of the different types of engine brake used on highway diesel engines.
 Describe the operating principles of each type of engine brake.
 Outline the controls used to manage engine brakes.
 Describe how the hydraulic actuation of internal engine compression brakes is managed and timed

Remediation:

Re-teach major concepts
 Review with teacher assistance
 Study group
 Worksheets
 Individual tutoring when needed
 Reading comprehension packets
 Placing events in a time line/ordinal steps
 Retest
 Study guides
 Checklists

Enrichment:

Assist other students with projects or remediation
 Leadership activities such as Shop Foreman
 Complete a special project to benefit the class

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 Adapted Tests and/or Assignments
 Drill and Practice (Repetition of Material)

Use of Computer (Access to)
 Highly Structured Classroom
 Opportunities for Repeated Practice of MATH Skills
 Provide Verbal and Written Directions
 Multiplication Chart
 All Vocabulary to be Defined Before Testing

Safety:

Student must:

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 Use protective clothing and equipment
 Use hand tools in a safe manner
 Use adequate ventilation when working in enclosed areas
 Follow manufacturer's directions when using any product, tool, equipment, etc
 Use proper safety precautions when using /operating hand tools
 Use tools and equipment in a professional work like manner according to OSHA standards
 Know and follow the established safety rules at all times

Assessment:

Worksheets
 Quizzes
 Post Tests
 Summaries
 Log/Journal
 Time Cards
 Writing Activities
 Video/DVD Worksheets
 Portfolio
 Checklist
 Rubrics

Resources/Equipment:

Bennett, S. (2020). Medium/Heavy Duty Truck Engines, Fuel & Computerized Management Systems (7th ed.). Clifton Park: NY. Sean Bennett (2021) Medium Heavy Duty Truck Engines, Fuel & Computerized Management Systems (6th ed.). Tasksheet Manual for NATEF Proficiency. Burlington, MA. Jones & Bartlett Learning. Student forms: Time Cards Journals Math ATB Worksheet Tapes Rulers Micrometers Calipers Dial Indicator Parts Washer Brake Parts Cleaner Liquid Penetrants Liquid Lubricants General Shop Tools and Supplies: Bolts Nuts Screws Studs Washers Blow Guns Compressors Extractors Power Tool Accessories Hammers Impact Drivers Lighting Pliers Cutters Power Tools Pressure Equipment Prybars Ratchets Scrapers Screw Drivers Sockets Striking Tools Threading Tools Torque Wrenches Wrenches
 Hyperlinks:

Monroe Career & Technical Institute

Course: Diesel Technology

Unit Name: 700 AIR INTAKE AND EXHAUST SYSTEMS

Number: 700 **Hours:** 30.00

Dates: Spring 2025

Description/Objectives:

Student will know and be able to demonstrate knowledge of the diesel engine air intake and exhaust system and be able to follow proper procedures for removal, inspection, or installation of components as per original equipment manufacturer's specifications.

Tasks:

PA701 - Inspect and repair or replace air induction system components.

PA702 - Inspect and repair or replace exhaust system and components.

PA703 - Inspect and repair or replace charge air coolers and after coolers.

PA704 - Inspect and repair or replace turbocharger.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12

Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12

Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10

Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12

Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12

Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and

comprehend technical texts independently and proficiently.

Instructional Activities:**Knowledge:**

- Complete assignments related to the textbook
- Participate in lecture and discussion and respond to questions
- Participate in group discussions
- Fill out personal forms
- Complete reading assignments
- Complete written assignments
- Participate with the group activities
- Complete Task Sheet assignment
- Describe the role of the intake and exhaust manifolds
- Define the term positive filtration
- Outline the operating principle of an air precleaner
- Define constant and variable geometry turbochargers
- Outline the operating principles of turbochargers
- Define the role of a charge air cooler in the intake circuit
- Outline the role of a diesel engine muffler device

Skill:

- Complete all forms required by Diesel Technology and MCTI
- Demonstrate safety standards as they apply to the transportation, construction, and farming industry
- Understand how these standards are mandatory in industry
- Read and interpret information gathered from maintenance manuals via paper manuals and computer generated manuals
- Demonstrate the proper use of hand, power tools, and shop equipment
- Demonstrate proper safety procedures for chemical and paint handling and disposal
- Read and use accurately precise measuring instruments
- Identify all required fasteners used in the transportation industry
- Identify the intake and exhaust system components
- Describe how intake air is routed to the engine's cylinders
- Describe how exhaust gases are routed out to aftertreatment devices
- Service a dry, positive air cleaner
- Perform an inlet restriction test
- Identify the subcomponents on a truck diesel engine turbocharger
- Troubleshoot common turbocharger problems
- Define the role of a charge air cooler in the intake circuit
- Troubleshoot common turbocharger problems
- Test a charge air heat exchanger for leaks
- Test a charge air heat exchanger for leaks
- Identify the different types of catalytic converters used on current diesels
- Describe the operation of EGR and DPF systems

Remediation:

- Re-teach major concepts
- Review with teacher assistance
- Individual tutoring when needed
- Study groups
- Placing events in a time line/ordinal steps
- Retest
- Study guides
- Checklists

Enrichment:

- Assist other students with projects or remediation
- Leadership activities such as Shop Foreman
- Complete a special project

Special Adaptations:

Extended Time (assignments and/or testing)
 Adapted Tests and/or Assignments
 Drill and Practice (Repetition of Material)
 Provide Verbal and Written Directions
 Multiplication Chart

Safety:

Student must:
 Pass safety test with 100% for tools and equipment
 Locate, read, and interpret MSDS sheet
 Demonstrate fire safety procedures
 Use proper safety precautions when using hand tools and operating equipment
 Follow proper safety procedures for chemical and paint handling and disposal
 Handle material in a safe and workmanlike manner
 Use protective clothing and equipment
 Use hand tools in a safe manner
 Use adequate ventilation when working in enclosed areas
 Follow manufacturer's directions when using any product, tool, equipment, etc
 Use proper safety precautions when using /operating hand tools
 Use tools and equipment in a professional work like manner according to OSHA standards
 Know and follow the established safety rules at all times

Assessment:

Worksheets
 Quizzes
 Pre/Post Tests
 Summaries
 Log/Journal
 Time Cards
 Writing Activities
 Video/DVD Worksheets
 Diagrams
 Individual Projects
 Group Projects
 Research Papers
 Any content related assessment
 Portfolio

Resources/Equipment:

Bennett, S. (2020). Medium/Heavy Duty Truck Engines, Fuel & Computerized Management Systems (7th ed.). Sean Bennett Medium/Heavy Duty Truck Engines, Fuel & Computerized Management Systems (6th ed.). Tasksheet Manual for NATEF Proficiency. Burlington, MA. Jones & Bartlett Learning. Student forms: Time Cards Journals Math ATB Worksheet Tapes Rulers Micrometers Calipers Dial Indicator Parts Washer Brake Parts Cleaner Liquid Penetrants Liquid Lubricants General Shop Tools and Supplies: Bolts Nuts Screws Studs Washers Blow Guns Compressors Extractors Power Tool Accessories Hammers Impact Drivers Lighting Pliers Cutters Power Tools Pressure Equipment Prybars Ratchets Scrapers Screw Drivers Sockets Striking Tools Threading Tools Torque Wrenches Wrenches Hyperlinks:

Monroe Career & Technical Institute

Course: Diesel Technology

Unit Name: 800 COOLING SYSTEMS

Number: 800 **Hours:** 70.00

Dates: Spring 2025

Description/Objectives:

Student will know and be able to perform the removal, inspection, and installation of heavy truck diesel engine cooling system components - water pump, thermostat, radiator, etc. and perform such tasks to original equipment manufacturer's specifications.

Tasks:

PA801 - Inspect and replace belts and pulleys.

PA802 - Inspect and replace hoses and clamps.

PA803 - Test and replace thermostat.

PA804 - Drain, flush, refill and bleed cooling system.

PA805 - Test anti-freeze and supplemental coolant additives.

PA807 - Inspect and replace water pump.

PA808 - Inspect fan drives.

PA809 - Inspect and pressure test cooling system components.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12

Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12

Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10

Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12

Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12

Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Science, Technology & Engineering, and Environmental Literacy & Sustainability Standards
3.5.9-12.1 Strand: Nature and Characteristics of Technology and Engineering

Supporting Anchor/Standards:

3.5.9-12.OO Use project management tools, strategies, and processes in planning, organizing, and controlling work.

3.5.9-12.QQ Implement quality control as a planned process to ensure that a product, service, or system meets established criteria.

3.5.9-12.MM Troubleshoot and improve a flawed system embedded within a larger technological, social, or environmental system.

3.5.9-12.HH Analyze how the Industrial Revolution resulted in the development of mass production, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.

Instructional Activities:

Knowledge:

Complete assignments related to the textbook

Participate in lecture and discussion and respond to questions

Participate in group discussions

Fill out personal forms

Complete reading assignments

Complete written assignments

Participate with the group activities

Complete Task Sheet Assignment

Define the terms conduction, convection, and radiation.

Outline the properties of a heavy-duty antifreeze.

List the advantages claimed for extended life coolants

Outline the causes of wet liner cavitation and the steps required to minimize it

Define the role of the coolant filters and their servicing requirements

List the types of temperature gages used in highway diesel engines

Describe how a coolant level warning indicator operates

Define the roles played by the shutters and engine fan in managing engine temperatures

Outline the operation of an actively pressurized cooling system (APCS)

Skill:

Complete all forms required by Diesel Technology and MCTI

Demonstrate safety standards as they apply to the transportation, construction, and farming industry

Understand how these standards are mandatory in industry

Read and interpret information gathered from maintenance manuals via paper manuals and computer generated manuals

Demonstrate the proper use of hand, power tools, and shop equipment

Demonstrate proper safety procedures for chemical and paint handling and disposal

Read and use accurately precise measuring instruments

Identify all required fasteners used in the transportation industry

Identify diesel engine cooling system components and their principles of operation

Identify the three types of coolant used in current highway diesel engines

Calculate the boil and freeze points of a coolant mixture

Mix coolant using the correct proportions of water, antifreeze, and SCAs
 Perform standard SCA tests and measure antifreeze protection
 Identify the problems scale build-up can create in an engine cooling system
 Identify the types of heavy-duty radiators including down flow, cross flow, and counter flow
 Test a radiator for external leakage using a standard cooling system pressure tester
 Test a radiator cap
 Identify the different types of thermostats in use and describe their principle of operation
 Describe the role of the coolant pump
 Diagnose basic cooling system malfunctions

Remediation:

Re-teach major concepts
 Review with teacher assistance
 Study group
 Worksheets
 Individual tutoring when needed
 Reading comprehension packets
 Placing events in a time line/ordinal steps
 Retest
 Study guides
 Checklists

Enrichment:

Assist other students with projects or remediation
 Leadership activities such as Shop Foreman
 Complete a special project to benefit the class

Special Adaptations:

Extended Time (assignments and/or testing)
 Graphic Organizer
 Study Guide
 Adapted Tests and/or Assignments
 Drill and Practice (Repetition of Material)
 Use of Computer (Access to)
 Highly Structured Classroom
 Opportunities for Repeated Practice of MATH Skills
 Provide Verbal and Written Directions
 Multiplication Chart
 All Vocabulary to be Defined Before Testing

Safety:

Student must:
 Pass safety test with 100% for tools and equipment
 Locate, read, and interpret MSDS sheet
 Demonstrate fire safety procedures
 Use proper safety precautions when using hand tools and operating equipment
 Follow proper safety procedures for chemical and paint handling and disposal
 Handle material in a safe and workmanlike manner
 Use protective clothing and equipment
 Use hand tools in a safe manner
 Use adequate ventilation when working in enclosed areas
 Follow manufacturer's directions when using any product, tool, equipment, etc
 Use proper safety precautions when using /operating hand tools
 Use tools and equipment in a professional work like manner according to OSHA standards
 Know and follow the established safety rules at all times

Assessment:

Worksheets
Quizzes
Post Tests
Summaries
Log/Journal
Time Cards
Writing Activities
Video/DVD Worksheets
Portfolio
Checklist
Rubrics

Resources/Equipment:

Bennett, S. (2020). Medium/Heavy Duty Truck Engines, Fuel & Computerized Management Systems (7th. ed.). Sean Bennett (2021) Medium/Heavy Duty Truck Engines, Fuel & Computerized Management Systems (6th). .Tasksheet Manual for NATEF Proficiency. Burlington, MA. Jones & Bartlett Learning.
Student forms: Time Cards Journals Math ATB Worksheet Tapes Rulers Micrometers Calipers Dial Indicator Coolant Pressure Tester Refractometer Belt Tension Gage Temperature Gage Parts Washer Brake Parts Cleaner Liquid Penetrants Liquid Lubricants General Shop Tools and Supplies: Bolts Nuts Screws Studs Washers Blow Guns Compressors Extractors Power Tool Accessories Hammers Impact Drivers Lighting Pliers Cutters Power Tools Pressure Equipment Pry bars Ratchets Scrapers Screw Drivers Sockets Striking Tools Threading Tools Torque Wrenches WrenchesHyperlinks:

Monroe Career & Technical Institute

Course: Diesel Technology

Unit Name: 900 FUEL SYSTEM

Number: 900 **Hours:** 48.00

Dates: Spring 2025

Description/Objectives:

Student will know and be able to diagnose, inspect, test, service, and install components of the fuel system on the heavy truck diesel engine-fuel pressure tests, remove and install injectors, etc. and be able to perform such tasks to original equipment manufacturer's specifications.

Tasks:

PA901 - Replace fuel filters and strainers.

PA902 - Inspect and replace fuel lines, tank, cap, and fittings.

PA903 - Prime and bleed fuel system.

PA905 - Perform fuel supply and return system tests.

PA906 - Remove and install injector/nozzle.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12

Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12

Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10

Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12

Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12

Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Standard CC.3.5 Reading Informational Text

Supporting Anchor/Standards:

Standard CC.3.5.6-8.C Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Instructional Activities:

Knowledge:

Complete assignments related to the textbook
 Participate in lecture and discussion and respond to questions
 Participate in group discussions
 Fill out personal forms
 Complete reading assignments
 Complete written assignments
 Participate with the group activities
 Complete Task Sheet Assignment
 Describe the injector nozzle's role in system pressure management
 Identify two types of injector nozzles
 Describe the principles of operation of multiple-orifice and electrohydraulic nozzles
 Define nozzle differential ratio
 Describe a valve closes orifice (VCO) nozzle
 Understand how rail pressures are managed in electronically managed, common rail diesel fuel system
 Identify some of the characteristics of different OEM common rail diesel fuel injection systems

Skill:

Complete all forms required by Diesel Technology and MCTI
 Demonstrate safety standards as they apply to the transportation, construction, and farming industry
 Understand how these standards are mandatory in industry
 Read and interpret information gathered from maintenance manuals via paper manuals and computer generated manuals
 Demonstrate the proper use of hand, power tools, and shop equipment
 Demonstrate proper safety procedures for chemical and paint handling and disposal
 Read and use accurately precise measuring instruments
 Identify all required fasteners used in the transportation industry
 Identify fuel subsystem components on a typical diesel engine
 Describe the construction of a fuel tank
 Explain the operation of and troubleshoot a fuel sending unit
 Define the role of primary and secondary fuel filters
 Service primary and secondary fuel filters
 Explain how a water separator functions
 Service a water separator
 Define the operating principles of a transfer pump
 Prime a fuel subsystem
 Test the low pressure side of the fuel subsystem for inlet restriction
 Test the charge side of the fuel subsystem for charging pressure
 Identify the some typical sensors used in diesel fuel subsystems
 Identify the subcomponents of a nozzle assembly
 Bench (pop) test a hydraulic injector nozzle
 Test a nozzle for forward leakage
 Test nozzle back leakage
 Outline the procedure required to remove, inspect, and reconnect high-pressure lines
 Describe the system layout and the primary components in current full authority, electronic fuel management systems
 Identify the key features of electronic unit injector (EUI) and common rail (CR) diesel fuel injection systems
 Outline the role the four primary subsystems play in managing an EUI-fueled engine

Identify common rail (CR) diesel fuel systems
 Identify some of the diesel engines currently using common rail diesel fuel injection
 Trace fuel flow routing from tank to injector on common rail, diesel fueled engines
 Describe the electronic management circuit components used in common rail fuel systems

Remediation:

Re-teach major concepts
 Review with teacher assistance
 Study group
 Worksheets
 Individual tutoring when needed
 Reading comprehension packets
 Placing events in a time line/ordinal steps
 Retest
 Study guides
 Checklists

Enrichment:

Assist other students with projects or remediation
 Leadership activities such as Shop Foreman
 Complete a special project to benefit the class

Special Adaptations:

Drill and Practice (Repetition of Material)
 Use of Computer (Access to)
 Highly Structured Classroom
 Opportunities for Repeated Practice of MATH Skills
 Provide Verbal and Written Directions

Safety:

Student must:
 Pass safety test with 100% for tools and equipment
 Locate, read, and interpret MSDS sheet
 Demonstrate fire safety procedures
 Use proper safety precautions when using hand tools and operating equipment
 Follow proper safety procedures for chemical and paint handling and disposal
 Handle material in a safe and workmanlike manner
 Use protective clothing and equipment
 Use hand tools in a safe manner
 Use adequate ventilation when working in enclosed areas
 Follow manufacturer's directions when using any product, tool, equipment, etc
 Use proper safety precautions when using /operating hand tools
 Use tools and equipment in a professional work like manner according to OSHA standards
 Know and follow the established safety rules at all times

Assessment:

Worksheets
 Quizzes
 Post Tests
 Summaries
 Log/Journal
 Time Cards
 Writing Activities
 Video/DVD Worksheets
 Portfolio
 Checklist
 Rubrics

Resources/Equipment:

Heavy Duty Truck Systems 7th Edition - ISBN 9781337787161 Copyright 2020

Medium/Heavy Duty Truck Engines, Fuel and Computerized Management Systems 5th Edition - ISBN 9781305578647 Copyright 2017

Hyperlinks:

Monroe Career & Technical Institute

Course: Diesel Technology

Unit Name: 1000 ELECTRICAL/ELECTRONIC SYSTEM

Number: 1000 **Hours:** 125.00

Dates: Spring 2025

Description/Objectives:

Student will know and be able to identify and apply the principles of electricity and electronics to the medium/heavy truck, test batteries, charging system output, starter draw test, etc. and be able to perform these tasks to original equipment manufacturer's specification.

Tasks:

PA1001 - Test and service battery.

PA1002 - Test, replace and adjust bulbs and lamps.

PA1003 - Diagnose and repair or replace electrical circuits and components.

PA1004 - Test starting system and replace component assemblies.

PA1005 - Test charging system output and replace component assemblies.

PA1006 - Analyze and interpret wiring diagrams.

PA1007 - Perform computer systems tests and analyze codes.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12

Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12

Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10

Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12

Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical

text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12

Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- 3.5.9-12.2 Strand: Applying, Maintaining, and Assessing Technological Products and Systems

Supporting Anchor/Standards:

3.5.9-12.A Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.

3.5.9-12.J Synthesize data and analyze trends to make decisions about technological products, systems, or processes.

3.5.9-12.K (ETS) Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

3.5.9-12.K (ETS) Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Instructional Activities:

Knowledge:

Complete assignments related to the textbook

Participate in lecture and discussion and respond to questions

Participate in group discussions

Fill out personal forms

Complete reading assignments

Complete written assignments

Participate with the group activities

Complete Task Sheet assignment

Define the terms electricity and electronics

Describe the atomic structure

Outline how some of the chemical and electrical properties of atoms are defined by the number of electrons in their outer shells

Outline the properties of conductors, insulators, and semiconductors

Describe the characteristics of static electricity

Define what is meant by the conventional and electron theories of current flow

Describe the characteristics of magnetism and the relationship between electricity and magnetism

Describe how electromagnetic field strength is measured in common electromagnetic devices

Define what is meant by an electrical circuit and the terms voltage, resistance, and current flow

Outline the components required to construct a typical electrical circuit

Perform electrical circuit calculations using Ohm's law

Identify the characteristics of DC and AC

Describe some methods of generating a current flow in an electrical circuit

Describe and apply Kirschhoff's first and second laws

Define the role of a battery in a vehicle electrical system

Outline the construction of standard, maintenance-free, and gelled electrolyte batteries

Describe the chemical action within the battery during the charging and discharging cycles

Describe how a light bulb functions

Explain the operating principles of halogen and high-intensity discharge (HID) lamps

Describe the function of the reflector and lens in a headlamp assembly

Skill:

Outline how batteries are arranged in multiple battery banks in truck chassis

Verify the performance of a lead-acid battery using a voltmeter, hydrometer, refractometer, and carbon pile tester

Analyze maintenance-free battery condition using an integral hydrometer sight glass

Describe the procedure required to charge different types of batteries

Jump-start vehicles with dead batteries using another vehicle and generator methods

Outline how batteries should be safely stored out of chassis

Identify charging circuit components

Navigate a charging circuit schematic

Voltage drop-test charging circuit wiring and components

Describe the construction of an alternator

Explain full-wave rectification

Full-field an alternator

Measure AC leakage in the charging circuit

Verify the performance of an alternator

Use Intelli-check to assess charging circuit performance

Disassemble and reassemble a Delcotron 40SI alternator

Identify the components in a truck cranking system

Explain the operating principles of magnetic switches, solenoids, and starter motors

Describe the operating principles of lightweight, planetary gear reduction starter motors

Test and troubleshoot a cranking circuit using voltage drop testing

Disassemble a heavy-duty truck starter motor

Test an armature for shorts using a growler

Test an armature for grounds and opens

Use a test light to check out field coils

Outline the procedure required to rebuild a Delco-Remy 42MT starter motor

Aim truck headlights

Troubleshoot lighting circuit malfunctions

Describe the operation of typical truck auxiliary equipment

Explain how a trailer electrical plug and connector are connected

Outline the operating principles of truck instrument cluster components

Diagnose and repair some typical truck instrument cluster failures

Explain the function and operation of warning and shutdown systems

Identify the types of circuit protection used in truck electrical systems including fuses and cycling and non-cycling circuit breakers

Describe the procedure and material required to solder a pair of copper wires

Outline the procedure required to quickly check out a truck electrical system

Remediation:

Re-teach major concepts

Review with teacher assistance

Worksheets

Individual tutoring when needed

Study group

Placing events in a timeline/oridinal steps

Retest or alternative assessment

Reading comprehension packets

Study guides

Computer assisted instruction

Checklists

Enrichment:

Assist other students with projects or remediation

Leadership activities such as Shop Foreman

Complete a special project

Special Adaptations:

Drill and Practice (Repetition of Material)

Use of Computer (Access to)

Highly Structured Classroom

Opportunities for Repeated Practice of MATH Skills
Provide Verbal and Written Directions

Safety:

Student must:

- Pass safety test with 100% for tools and equipment
- Locate, read, and interpret MSDS sheet
- Demonstrate fire safety procedures
- Use proper safety precautions when using hand tools and operating equipment
- Follow proper safety procedures for chemical and paint handling and disposal
- Handle material in a safe and workmanlike manner
- Use protective clothing and equipment
- Use hand tools in a safe manner
- Use adequate ventilation when working in enclosed areas
- Follow manufacturer's directions when using any product, tool, equipment, etc
- Use proper safety precautions when using /operating hand tools
- Use tools and equipment in a professional work like manner according to OSHA standards
- Know and follow the established safety rules at all times

Assessment:

- Worksheets
- Quizzes
- Pre/Post Tests
- Summaries
- Log/Journal
- Time Cards
- Writing Activities
- Video/DVD Worksheets
- Check Lists
- Diagrams
- Individual Projects
- Group Projects
- Research Papers
- Portfolio

Resources/Equipment:

Bennett, S. & Norman, I. A. (2020). Heavy Duty Truck Systems (7th ed.). Sean Bennett (2021) Medium/Heavy Duty Truck Engines, Fuel & Computerized Management Systems (6th). Tasksheet Manual for NATEF Proficiency. Burlington, MA. Jones & Bartlett Learning. Bennett, S. (2010). Medium/Heavy Duty Truck Engines, Fuel & Computerized Management Systems (3rd ed.). Clifton Park: NY. Thomson Delmar Learning. Student forms: Time Cards Journals Math ATB Worksheet Chemical and Paint Worksheets: Multimeters AVR Battery Testers Diagnostic Equipment Electrical Parts Cleaner Liquid Penetrants Liquid Lubricants Battery Acid Gases Tie Downs Bolts Screws Springs Battery Chargers Power Tool Accessories Hammers Heat Gun Lighting Pliers Cutters Power Tools Prybars Ratchets Screw Drivers Sockets Torque Wrenches WrenchesHyperlinks:

Monroe Career & Technical Institute

Course: Diesel Technology

Unit Name: 1100 DRIVE LINE

Number: 1100 **Hours:** 30.00

Dates: Spring 2025

Description/Objectives:

Student will know and be able to diagnose, inspect, and replace components in the heavy truck driver line - remove and install clutch, inspect clutch components, remove and install transmission, remove and install drive shaft and u-joints, etc. and be able to perform such tasks to original equipment manufacturer's specifications.

Tasks:

1101 Diagnosis, replace and adjust drive-line components.

1102 Perform clutch/clutch brake maintenance and adjustment.

1103 Remove and install clutch assembly.

Instructional Activities:

Knowledge:

Complete assignments related to the textbook

Participate in lecture and discussion and respond to questions

Participate in group discussions

Fill out personal forms

Complete reading assignments

Complete written assignments

Participate with the group activities

Complete Task Sheet Assignment

Outline the operating principles of a clutch

Describe the function of a clutch brake

Define and explain the importance of phasing

Explain the importance of driveline working angles and how to calculate them

Define the terms dead axle, live axle, pusher axle, and tag axle

Outline the construction of a drive axle carrier assembly

Explain how a pinion and crown gearset change the direction of powerflow

Describe differential action and list the reasons it is required

Define the term spinout and explain how it is caused

Trace the powerflow path through different types of differential carriers

Skill:

Complete all forms required by Diesel Technology and MCTI

Demonstrate safety standards as they apply to the transportation, construction, and farming industry

Understand how these standards are mandatory in industry

Read and interpret information gathered from maintenance manuals via paper manuals and computer generated manuals

Demonstrate the proper use of hand, power tools, and shop equipment

Demonstrate proper safety procedures for chemical and paint handling and disposal

Read and use accurately precise measuring instruments

Identify all required fasteners used in the transportation industry

Identify the components of a clutch assembly

Explain the differences between pull-type and push-type clutches

Describe the procedure for adjusting manual and self-adjusting clutches

Explain how to adjust the external clutch linkage

Troubleshoot a clutch for wear and damage

Outline typical clutch defects and explain how to repair them.

Outline the procedure for removing and replacing a clutch
 Identify the components in a truck driveline
 Explain the procedures for inspecting, lubricating, and replacing a universal joint
 Describe the various types of wear a universal joint might experience
 Outline the procedure for sourcing chassis vibration
 Troubleshoot some typical driveline complaints
 Describe the procedure for balancing a driveshaft
 Identify the types of axles used on trucks and trailers
 Identify the components required to create differential action
 Describe the operation of the various drive axle configurations
 Identify the components used in an interaxle differential or power divider
 Explain how an interaxle differential lock functions

Remediation:

Re-teach major concepts
 Review with teacher assistance
 Study group
 Worksheets
 Individual tutoring when needed
 Reading comprehension packets
 Placing events in a time line/ordinal steps
 Retest
 Study guides
 Checklists

Enrichment:

Assist other students with projects or remediation
 Leadership activities such as Shop Foreman
 Complete a special project to benefit the class

Special Adaptations:

- Extended Time (assignments and/or testing)
- Directions/Comprehension Check (frequent checks for understanding)
- Study Guide
- Directions and/or Tests Read Aloud
- Taking Tests in Alternate Setting (or if requested)
- Teacher Modeling

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- Post Tests
- Summaries
- Log/Journal
- Time Cards
- Writing Activities
- Video/DVD Worksheets
- Portfolio
- Checklist
- Rubrics

Resources/Equipment:

- Heavy Duty Truck Systems 7th Edition - ISBN 9781337787161 Copyright 2020
 - Medium/Heavy Duty Truck Engines, Fuel and Computerized Management Systems 5th Edition - ISBN 9781305578647 Copyright 2017
- Hyperlinks: