

# STRANDS AND STANDARDS

## ASE DIESEL IMMR



### Course Description

This course is the first in a group that prepares individuals to apply technical knowledge and skills to the specialized maintenance and repair of trucks, buses, and other commercial and industrial vehicles. Instruction covers training in the following areas of inspection, maintenance, and minor repair: safety, diesel engine mechanics, drive trains, and electrical/electronic systems. Work ethics and productivity are an integral part of the classroom and lab activities of these courses.

<b>Intended Grade Level</b>	10-12
Units of Credit	1.0
Core Code	40-09-00-00-060
Concurrent Enrollment Core Code	40-09-00-13-060
Prerequisite	None
Skill Certification Test Number	907, 908, 909, 910
Test Weight	
<b>License Area of Concentration</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Diesel Technician
Endorsement 2	
Endorsement 3	

## STRAND 1

Student will participate in personal and leadership development activities through SkillsUSA or another appropriate career and technical student organization.

### Standard 1

Student will use communication skills to effectively communicate with others.

- Understand when it is appropriate to listen and to speak.
- Understand and follow verbal and written instructions for classroom and laboratory activities.

### Standard 2

Student will effectively use teamwork to respectfully work with others.

- Identify and understand different roles in working with a team.

### Standard 3

Student will use critical thinking and problem-solving skills.

- Analyze the cause of the problem.
- Develop a solution to address the problem.
- Implement the plan.
- Evaluate the effectiveness of the plan.

### Standard 4

Student will be dependable, reliable, steady, trustworthy, and consistent in performance and behavior.

- Set and meet goals on attendance and punctuality.
- Prioritize, plan, and manage work to complete assignments and projects on time.

### Standard 5

Student will be accountable for results.

- Use an achievement chart for activities and behaviors in class that encourages a personal evaluation of classroom performance.
- File a regular written report on progress toward completion of assignments and projects.

### Standard 6

Be familiar with the legal requirements and expectations of the course.

- Be familiar with the course disclosure statement and all requirements for successful completion of the course.
- Demonstrate workplace ethics, e.g. fair, honest, disciplined.

## STRAND 2

Student will participate in work-place readiness activities.

### Standard 1

Student will demonstrate employability skills.

- Use a career search network to find career choices.
- Write a resume including a list of demonstrated skills.
- Write a letter of application.

- Complete a job application.
- Participate in an actual or simulated job interview.

## **Standard 2**

Student will participate in a work-based learning experience outside the classroom.

- Student will plan and implement a work-based learning experience aligned with their career goal.

## **STRAND 3**

**Students will understand general shop safety.**

### **Standard 1**

Learn safe working habits and procedures. Pass a safety test with 100 percent.

### **Standard 2**

Review the different types and hazards of solvents used.

### **Standard 3**

Review the different types, purposes, and hazards of automotive greases, oils, and additives.

### **Standard 4**

Review precautions in the use, handling, and storage of various solvents, cleaners, oils, greases, and additives.

### **Standard 5**

Review the gasses encountered in the diesel field and the hazards they present.

### **Standard 6**

Review the hazards and control of asbestos dust.

### **Standard 7**

Comply with safety rules for working with automotive chemicals (SDS).

## **Performance Skills**

- Pass safety test with 100%
- Identify different types of solvents used and hazards associated with them
- Identify the different types, purposes, and hazards of automotive greases, oils, and additives.
- Identify precautions in the use, handling, and storage of various solvents, cleaners, oils, greases, and additives.
- Identify the gasses encountered in the diesel field and the hazards they present.
- Identify the hazards and control of asbestos dust.
- Comply with safety rules for working with automotive chemicals (SDS).

## **STRAND 4**

**Students will understand basic hand tools, fasteners, and shop equipment.**

**Standard 1**

Identify and measure metric and standard fasteners.

**Standard 2**

Use the pressure washer to prepare projects to be worked on.

**Standard 3**

Correctly identify and use basic hand tools.

**Standard 4**

Identify and demonstrate use of basic and precision measuring tools.

**Standard 5**

Use reference manuals or information systems to find R/R procedures and specifications.

**Standard 6**

Properly raise and support vehicles using jack stands and a frame contact hoist. Identify other shop equipment.

**Standard 7**

Properly use cutting tools (i.e. acetylene torch, induction cutters, plasma cutters)

**Standard 8**

Correctly identify and use torque wrenches.

**Performance Skills**

- Identify and measure metric and standard fasteners.
- Use the pressure washer to prepare projects to be worked on
- Correctly identify and use basic hand tools.
- Identify and demonstrate use of basic and precision measuring tools.
- Use reference manuals or information systems to find R/R procedures and specifications.
- Properly raise and support vehicles using jack stands and a frame contact hoist.
- Properly use cutting tools
- Correctly identify and use torque wrenches.

**STRAND 5**

**Students will understand power tools.**

**Standard 1**

Correctly identify and use electric power tools.

- Bench grinder
- Drill press
- Lathe

**Standard 2**

Correctly identify and use pneumatic power tools.

- Drill
- Ratchet
- Impact

- Hammer
- Blow gun

### **Standard 3**

Correctly identify and use hydraulic tools.

- Porta powers
- Presses
- Pullers

### **Performance Skills**

- Correctly identify and use electric power tools.
- Correctly identify and use pneumatic power tools.
- Correctly identify and use hydraulic tools

## **STRAND 6**

**Students will understand basic and precision measuring tools.**

### **Standard 1**

Identify and demonstrate use of dial calipers.

### **Standard 2**

Identify and demonstrate use of micrometers.

### **Standard 3**

Identify and demonstrate use of thickness gauge.

## **STRAND 7**

**Students will inspect the Lubrication Systems.**

### **Standard 1**

Correctly identify and use lifts and hoists.

- Jack stands
- Bridge crane
- Jib crane
- Lifting
  - Spreader bar
  - Lifting eyes
  - Slings
  - Chains
- Safety
  - Cribbing
  - Securing chains
- Come-a-longs

**Standard 2**

Correctly identify and use media blasting equipment.

- Glass bead
- Sand
- Media

**Standard 3**

Correctly identify and use fluid pressure testing.

- Transducers
- Flow rating equipment
- Hydraulic cylinder test
- Hydraulic pump and motor tester
- Nozzle tester

**Performance Skills**

- Identify and demonstrate use of dial calipers.
- Correctly identify and use media blasting equipment.
- Correctly identify and use fluid pressure testing.

**STRAND 8**

**Students will inspect the Basic Engine Systems.**

**Standard 1**

Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

- Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
- Inspect level and condition of fuel, oil, diesel exhaust fluid (DEF), and coolant.
- Inspect engine assembly for fuel, oil, coolant, air, and other leaks.
- Check engine operation (starting and running) including: noise, vibration, smoke, etc.
- Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings.
- Identify system components, configurations, and types of the following: cylinder head(s), valve train, engine block, engine lubrication, engine cooling, air induction, exhaust, fuel, and engine braking.

**Standard 2**

Inspect cylinder head and valve train.

- Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness

**Standard 3**

Inspect the Engine Block

- Inspect crankshaft vibration damper; inspect engine mounts.

**Standard 4**

Inspect Lubrication Systems

- Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; test

engine oil temperature and check operation of temperature sensor.

- Check engine oil level, condition, and consumption; take engine oil sample.
- Determine proper lubricant; perform oil and filter service.

### Standard 5

Inspect the Cooling System

- Check engine coolant type, level, condition, and test coolant for freeze protection and additive package concentration.
- Verify coolant temperature; check operation of temperature and level sensors, gauge, and/or sending unit.
- Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.
- Recover coolant, flush, and refill with recommended coolant/additive package; bleed cooling system.
- Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.
- Inspect water pump, hoses, and clamps.
- Inspect, and pressure test cooling system(s); pressure test cap, tank(s), and recovery systems; inspect radiator and mountings.
- Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud.
- Identify engine block heater(s).

### Standard 6

Inspect Air Induction and Exhaust Systems

- Inspect turbocharger(s), wastegate(s), and piping systems.
- Check air induction system including: cooler assembly, piping, hoses, clamps, and mountings; replace air filter as needed; reset restriction indicator (if applicable).
- Inspect intake manifold, gaskets, and connections.
- Inspect engine exhaust system, exhaust gas recirculation (EGR) system, and exhaust aftertreatment system for leaks, mounting, proper routing, and damaged or missing components.
- Inspect crankcase ventilation system; service as needed.

### Standard 7

Inspect Fuel System.

- Check fuel level and condition.
- Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, hoses, lines, and fittings.
- Inspect low pressure fuel system components (fuel pump, pump drives, screens, fuel/water separators/indicators, hoses, lines, filters, heaters, coolers, ECM cooling plates, check valves, pressure regulator valves, restrictive fittings, and mounting hardware).
- Replace fuel filter; prime and bleed fuel system.
- Inspect high pressure fuel system components (fuel pump, pump drives, hoses, injection lines, filters, hold-downs, fittings, seals, and mounting hardware).

### Standard 8

Inspect Engine Brakes.

- Inspect engine compression and/or exhaust brake housing, valves, seals, lines, and fittings

## Performance Skills

- Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.
- Inspect cylinder head and valve train.
- Inspect the Engine Block.
- Inspect Lubrication Systems.
- Inspect the Cooling System.
- Inspect Air Induction and Exhaust Systems.
- Inspect Fuel System.
- Inspect Engine Brakes.

## STRAND 9

### Students will Inspect the Drive Train.

#### Standard 1

Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

- Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
- Identify drive train components, transmission type, and configuration.

#### Standard 2

Inspect the Clutch

- Inspect and adjust clutch, clutch brake, linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push-type and pull-type); check pedal height and travel; determine needed action.
- Inspect clutch master cylinder fluid level; check clutch master cylinder, slave cylinder, lines, and hoses for leaks and damage; determine needed action.

#### Standard 3

Inspect the Transmission.

- Inspect transmission shifter and linkage; inspect transmission mounts, insulators, and mounting bolts.
- Inspect transmission for leakage; determine needed action.
- Replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; determine needed action.
- Check transmission fluid level and condition; determine needed action.
- Inspect transmission breather; inspect transmission oil filters, coolers, and related components; determine needed action.
- Inspect speedometer components.
- Inspect and test function of REVERSE light, neutral start, and warning device circuits.

#### Standard 4

Inspect the Driveshaft and Universal Joints.

- Inspect, service, and/or replace driveshafts, slip joints, yokes, drive flanges, support bearings, universal joints, boots, seals, and retaining/mounting hardware; check phasing of all shafts.



## Standard 5

Inspect the Drive Axles.

- Check for fluid leaks; inspect drive axle housing assembly, cover plates, gaskets, seals, vent/breather, and magnetic plugs.
- Check drive axle fluid level and condition; check drive axle filter; determine needed action.
- Inspect air-operated power divider (inter-axle differential) assembly including: diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls.
- Inspect drive axle shafts; determine needed action.
- Remove and replace wheel assembly; check rear wheel seal and axle flange for leaks; determine needed action.

## Performance Skills

- Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.
- Inspect the Clutch.
- Inspect the Transmission.
- Inspect the Driveshaft and Universal Joints.
- Inspect the Drive Axles.

## STRAND 10

**Students will inspect the Brake Systems.**

### Standard 1

Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

- Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
- Identify brake system components and configurations (including air and hydraulic systems, parking brake, power assist, and vehicle dynamic brake systems).
- Identify brake performance problems caused by the mechanical/foundation brake system (air and hydraulic).

### Standard 2

Inspect the Air Brakes Air Supply and Service Systems

- Inspect air supply system components such as compressor, governor, air drier, tanks, and lines; inspect service system components such as lines, fittings, mountings, and valves (hand brake/trailer control, brake relay, quick release, tractor protection, emergency/spring brake control/modulator, pressure relief/safety).
- Verify proper gauge operation and readings; verify low pressure warning alarm operation; perform air supply system tests such as pressure build-up, governor settings, and leakage; drain air tanks and check for contamination.

**Standard 3**

Inspect the Air Brakes Mechanical or Foundation Brake System.

- Inspect service brake chambers, diaphragms, clamps, springs, pushrods, clevises, and mounting brackets; determine needed action.
- Identify slack adjuster type; inspect slack adjusters; determine needed action.
- Check camshafts (S-cams), tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; determine needed action.
- Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.
- Inspect, clean, and adjust air disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; perform needed action.
- Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; determine needed action.

**Standard 4**

Inspect the Air Brakes Parking Brake System.

- Inspect and check parking (spring) brake chamber for leaks; determine needed action.
- Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; determine needed action.
- Inspect and test parking (spring) brake application and release valve; determine needed action.
- Manually release (cage) and reset (uncage) parking (spring) brakes.

**Standard 5**

Inspect the Hydraulic Brakes Hydraulic System.

- Check master cylinder fluid level and condition; determine proper fluid type for application.
- Inspect hydraulic brake system components for leaks and damage.
- Check hydraulic brake system operation including pedal travel, pedal effort, and pedal feel.

**Standard 6**

Inspect the Hydraulic Brakes Mechanical or Foundation Brake System.

- Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.
- Inspect and clean disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; determine needed action.
- Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; inspect wheel cylinders; determine needed action.

**Standard 7**

Inspect the Hydraulic Brakes Parking Brake System.

- Check parking brake operation; inspect parking brake application and holding devices.

**Standard 8**

Inspect the Power Assist Systems.

- Check brake assist/booster system (vacuum or hydraulic) hoses and control valves; check fluid level and condition (if applicable).
- Check operation of emergency (back-up/reserve) brake assist system.

**Standard 9**

Inspect the Vehicle Dynamic Brake Systems (Air and Hydraulic): Antilock Brake System (ABS), Automatic Traction Control (ATC) System, and Electronic Stability Control (ESC) System.

- Observe antilock brake system (ABS) warning light operation including trailer and dash mounted trailer ABS warning light.
- Observe automatic traction control (ATC) and electronic stability control (ESC) warning light operation.

**Standard 10**

Inspect the Wheel Bearings.

- Clean, inspect, lubricate, and/or replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings; check hub assembly fluid level and condition; verify end play with dial indicator method.
- Identify, inspect, and/or replace unitized/preset hub bearing assemblies.

**Performance Skills**

- Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.
- Inspect the Air Brakes Air Supply and Service Systems.
- Inspect the Air Brakes Mechanical or Foundation Brake System.
- Inspect the Air Brakes Parking Brake System.
- Inspect the Hydraulic Brakes Hydraulic System.
- Inspect the Hydraulic Brakes Mechanical or Foundation Brake System.
- Inspect the Hydraulic Brakes Parking Brake System.
- Inspect the Power Assist Systems.
- Inspect the Vehicle Dynamic Brake Systems (Air and Hydraulic).
- Inspect the Wheel Bearings

**STRAND 11**

**Students will inspect the Suspension and Steering Systems.**

**Standard 1**

Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

- Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
- Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.
- Identify suspension and steering system components and configurations.

**Standard 2**

Inspect the Steering Column.

- Check steering wheel for free play, binding, and proper centering; inspect and service steering shaft U-joint(s), slip joint(s), bearings, bushings, and seals; phase steering shaft.
- Check operation of tilt and telescoping steering column.
- Check cab mounting.

### Standard 3

Inspect the Steering Pump and Gear Units.

- Check power steering pump and gear operation, mountings, lines, and hoses; check fluid level and condition; service filter; inspect system for leaks.
- Flush and refill power steering system; purge air from system.

### Standard 4

Inspect the Steering Linkage.

- Inspect tie rod ends, ball joints, kingpins, pitman arms, idler arms, and other steering linkage components; lubricate as needed.

### Standard 5

Inspect the Suspension Systems.

- Inspect shock absorbers, bushings, brackets, and mounts; determine needed action.
- Inspect leaf springs, center bolts, clips, pins, bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action.
- Inspect axle and axle aligning devices such as: radius rods, track bars, stabilizer bars, and torque arms; inspect related bushings, mounts, and shims.
- Inspect tandem suspension equalizer components.
- Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; check and record ride height.
- Inspect air springs, mounting plates, springs, suspension arms, and bushings.

### Standard 6

Inspect the Wheel Alignment.

- Demonstrate understanding of alignment angles.

### Standard 7

Inspect the Wheels and Tires.

- Inspect tire condition; identify tire wear patterns; measure tread depth; verify tire matching (diameter and tread); inspect valve stem and cap; set tire pressure.
- Identify wheel/tire vibration, shimmy, pounding, and hop (tramp) problems.
- Check wheel mounting hardware; check wheel condition; remove and install wheel/tire assemblies (steering and drive axle); torque fasteners to manufacturer's specification using torque wrench.

### Standard 8

Inspect the Frame and Coupling Devices.

- Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, mounting hardware, air lines, and fittings.
- Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage.
- Inspect frame hangers, brackets, and cross members.
- Check pintle hook and mounting (if applicable).

## Performance Skills

- Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.
- Inspect the Steering Column.
- Inspect the Steering Pump and Gear Units.
- Inspect the Steering Linkage.
- Inspect the Suspension Systems.
- Inspect the Wheel Alignment.
- Inspect the Wheels and Tires.
- Inspect the Frame and Coupling Devices.

## STRAND 12

Students will inspect the Electrical and Electronic Systems.

### Standard 1

Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

- Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins.
- Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
- Demonstrate proper use of test equipment when measuring source voltage, voltage drop (including grounds), current flow, continuity, and resistance.
- Demonstrate knowledge of the causes and effects of shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
- Use wiring diagrams to trace electrical/electronic circuits.
- Measure parasitic (key-off) battery drain.
- Demonstrate knowledge of the function, operation, and testing of fusible links, circuit breakers, relays, solenoids, diodes, and fuses.
- Inspect, repair (including solder repair), and/or replace connectors, seals, terminal ends, and wiring; verify proper routing and securement.
- Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.
- Check for malfunctions caused by faults in the data bus communications network.
- Identify electrical/electronic system components and configuration.

### Standard 2

Inspect the Battery System.

- Identify battery type and system configuration.
- Confirm proper battery capacity for application; perform battery state-of-charge test; perform battery capacity test, determine needed action.
- Inspect battery, battery cables, connectors, battery boxes, mounts, and hold-downs; determine needed action.
- Charge battery using appropriate method for battery type.
- Jump-start vehicle using a booster battery and jumper cables or using an appropriate auxiliary power supply.
- Identify low voltage disconnect (LVD) systems.

**Standard 3**

Inspect the Starting System.

- Demonstrate understanding of starter system operation.
- Perform starter circuit cranking voltage and voltage drop tests.
- Inspect starter control circuit switches, relays, connectors, terminals, wires, and harnesses (including over-crank protection).

**Standard 4**

Inspect the Charging System.

- Identify and understand operation of the generator (alternator).
- Check instrument panel mounted voltmeters and/or indicator lamps.
- Inspect generator (alternator) drive belt condition; check pulleys and tensioners for wear; check fans and mounting brackets; verify proper belt alignment.
- Inspect cables, wires, and connectors in the charging circuit.
- Perform charging system voltage and amperage output tests; perform AC ripple test.

**Standard 5**

Inspect the Lighting Systems.

- Inspect for brighter-than-normal, intermittent, dim, or no-light operation; determine needed action.
- Test, replace, and aim headlights.
- Inspect cables, wires, and connectors in the lighting systems.
- Inspect tractor-to-trailer multi-wire connectors, cables, and holders.

**Standard 6**

Inspect the Instrument Cluster and Driver Information Systems.

- Check gauge and warning indicator operation.
- Identify the sensor/sending units, gauges, switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, printed circuits, and control components/modules of the instrument cluster, driver information system, and warning systems.

**Performance Skills**

- Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.
- Inspect the Battery System.
- Inspect the Starting System.
- Inspect the Charging System.
- Inspect the Lighting Systems.
- Inspect the Instrument Cluster and Driver Information Systems.

**STRAND 13**

**Students will inspect the Heating, Ventilation, and Air Conditioning Systems.**

**Standard 1**

Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

- Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.
- Identify heating, ventilation, and air conditioning (HVAC) components and configuration.
- Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.

### Standard 2

Inspect the Refrigeration System Components

- Inspect A/C compressor drive belts, pulleys, and tensioners; verify proper belt alignment.
- Check A/C system operation including system pressures; visually inspect A/C components for signs of leaks; check A/C monitoring system (if applicable).
- Inspect A/C condenser for airflow restrictions; determine needed action.

### Standard 3

Inspect the Heating, Ventilation, and Engine Cooling Systems.

- Inspect engine cooling system and heater system hoses and pipes; determine needed action.
- Inspect HVAC system-heater ducts, doors, hoses, cabin filters, and outlets; determine needed action.
- Identify the source of A/C system odors.

### Standard 4

Inspect the Operating Systems and Related Controls.

- Verify blower motor operation; confirm proper air distribution; confirm proper temperature control; determine needed action.

## Performance Skills

- Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.
- Inspect the Refrigeration System Components
- Inspect the Heating, Ventilation, and Engine Cooling Systems
- Inspect the Operating Systems and Related Controls

## STRAND 14

**Students will inspect the Cab Systems.**

### Standard 1

Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

- Research vehicle service information including, vehicle service history, service precautions, and technical service bulletins.
- Use appropriate electronic service tool(s) and procedures to check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings

### Standard 2

Inspect the Cab Instruments and Controls

- Inspect mechanical key condition; check operation of ignition switch; check operation of indicator lights, warning lights and/or alarms; check instruments; record oil pressure and system voltage;

- check operation of electronic power take-off (PTO) and engine idle speed controls (if applicable).
- Check operation of all accessories.
- Understand operation of auxiliary power unit (APU)/electric power unit (EPU).

### Standard 3

Inspect the Cab Safety Equipment.

- Check operation of horns (electric and air); check warning device operation (reverse, air pressure, etc.); check condition of spare fuses, safety triangles, fire extinguisher, and all required decals; inspect seat belts and sleeper restraints; inspect condition of wiper blades and arms.

### Standard 4

Inspect the Cab Hardware.

- Check operation of wipers and washer; inspect windshield glass for cracks or discoloration; check sun visor; check seat condition, operation, and mounting; check door glass and window operation; verify operation of door and cab locks; inspect steps and grab handles; inspect mirrors, mountings, brackets, and glass.
- Record all physical damage.
- Lubricate all cab grease fittings; inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.
- Inspect cab mountings, hinges, latches, linkages, and ride height.
- Inspect quarter fender, mud flaps, and brackets

### Performance Skills

- Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.
- Inspect the Cab Instruments and Controls.
- Inspect the Cab Safety Equipment.
- Inspect the Cab Hardware.

## STRAND 15

**Students will inspect the Hydraulic Systems.**

### Standard 1

Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

- Research vehicle service information, including vehicle service history, service precautions, fluid type, and technical service bulletins.
- Verify placement of equipment/component safety labels and placards; determine needed action.
- Identify hydraulic system components; locate filtration system components; service filters and breathers.
- Check fluid level and condition; take a hydraulic fluid sample for analysis.
- Inspect hoses and connections for leaks, proper routing, and proper protection; determine needed action.

### Performance Skills

- Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.