Diesel HVAC

This course is designed to provide students with in-depth knowledge and skills for servicing diesel HVAC systems. Safety and proper tool use are emphasized throughout this course. As part of this course, students participate in servicing activities associated with HVAC systems. This course must follow the guidelines and standards set forth by Automotive Service Excellence (ASE) and National Automotive Technicians Education Foundation (NATEF) minimum standards. Workplace Employability Skills Task lists should be incorporated into the diesel Program.

Career and technical student organizations are integral, co-curricular components of each career and technical education course. These organizations serve as a means to enhance classroom instruction while helping students develop leadership abilities, expand workplace-readiness skills, and broaden opportunities for personal and professional growth.

Safety

Students will:

1. Identify and practice general shop safety rules and procedures.
   - Utilizing safe procedures for handling of tools and equipment.
   - Identifying and using proper placement of floor jacks and jack stands.
   - Identifying and using proper procedures for safe lift operation.
   - Utilizing proper ventilation procedures for working within the lab/shop area.
   - Identifying marked safety areas.
   - Identifying the location and the types of fire extinguishers and other fire safety equipment.
   - Demonstrating knowledge of the procedures for using fire extinguishers and other fire safety equipment.
   - Identifying the location and use of eye wash stations.
   - Identifying the location of the posted evacuation routes.
   - Complying with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
   - Identifying and wearing appropriate clothing for lab/shop activities.
   - Securing hair and removing jewelry for lab/shop activities.
   - Demonstrating awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
   - Demonstrating awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).
   - Locating and demonstrating knowledge of material safety data sheets (MSDS).

Tools and Equipment

2. Identify tools and their usage in automotive applications.
   - Identifying standard and metric designation.
   - Demonstrating safe handling and use of appropriate tools.
- Demonstrating proper cleaning, storage, and maintenance of tools and equipment.
- Demonstrating proper use of precision measuring tools
  Examples: micrometer, dial-indicator, dial-caliper

**HVAC Systems**

3. Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action.

4. Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action.

5. Identify system type and components (cycling clutch orifice tube – CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action.

6. Retrieve diagnostic codes; determine needed action.

7. Identify causes of temperature control problems in the A/C system; determine needed action.

8. Identify refrigerant and lubricant types; check for contamination; determine needed action.

9. Identify A/C system problems indicated by pressure gauge and temperature readings; determine needed action.

10. Identify A/C system problems indicated by visual, audible, smell, and touch procedures; determine needed action.

11. Perform A/C system leak test; determine needed action.

12. Recover, evacuate, and recharge A/C system using appropriate equipment.

13. Identify contamination in the A/C system components; determine needed action.

14. Interface with vehicle’s on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.

**Compressor and Clutch**

15. Identify A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action.

16. Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices.

17. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment.

18. Inspect, test, adjust, service, or replace A/C compressor clutch components or assembly.
19. Inspect and correct A/C compressor lubricant level (if applicable).

20. Inspect, test, or replace A/C compressor.

21. Inspect, repair, or replace A/C compressor mountings and hardware.

**Evaporator, Condenser, and Related Components**

22. Correct system lubricant level when replacing the evaporator, condenser, receiver/drier or accumulator/drier, and hoses.

23. Inspect A/C system hoses, lines, filters, fittings, and seals; determine needed action.

24. Inspect and test A/C system condenser. Check for proper airflow and mountings; determine needed action.

25. Inspect and replace receiver/drier or accumulator/drier.

26. Inspect and test cab/sleeper refrigerant solenoid, expansion valve(s); check placement of thermal bulb (capillary tube); determine needed action.

27. Remove and replace orifice tube.

28. Inspect and test cab/sleeper evaporator core; determine needed action.

29. Inspect, clean, or repair evaporator housing and water drain; inspect and service/replace evaporator air filter.

30. Identify and inspect A/C system service ports (gauge connections); determine needed action.

31. Identify the cause of system failures resulting in refrigerant loss from the A/C system high pressure relief device; determine needed action.

**Heating and Engine Cooling Systems**

32. Identify causes of outlet air temperature control problems in the HVAC system; determine needed action.

33. Identify window fogging problems; determine needed action.

34. Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action.

35. Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action.

36. Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action.
37. Inspect water pump; determine needed action

38. Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs.

39. Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.

40. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.

41. Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action.

42. Inspect and flush heater core; determine needed action.

**Electrical Operating Systems and Related Controls**

43. Identify causes of HVAC electrical control system problems; determine needed action.

44. Inspect and test HVAC blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action.

45. Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.

46. Inspect and test A/C related electronic engine control systems; determine needed action.

47. Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action.

48. Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.

49. Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action.

50. Interface with vehicle’s on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.

**Mechanical Operating Systems and Related Controls**

51. Identify causes of HVAC air and mechanical control problems; determine needed action.

52. Inspect and test HVAC system air and mechanical control panel assemblies; determine needed action.

53. Inspect, test, and adjust HVAC system air and mechanical control cables and linkages; determine needed action.
54. Inspect and test HVAC system actuators and hoses; determine needed action.

55. Inspect, test, and adjust HVAC system ducts, doors, and outlets; determine needed action.

**Refrigerant Recovery, Recycling, and Handling**

56. Maintain and verify correct operation of certified equipment.

57. Identify and recover A/C system refrigerant.

58. Recycle or properly dispose of refrigerant.

59. Handle, label, and store refrigerant.

60. Test recycled refrigerant for non-condensable gases.