

**BUS MECHANIC
(Time-Based)**

APPENDIX A

O*NET-SOC CODE 49-3031.00

This training outline is a minimum standard for Work Processes and Related Instruction. Changes in technology and regulations may result in the need for additional on-the-job or classroom training.

WORK PROCESSES

Approximate Hours

A. Orientation

500

1. Workplace Knowledge and Safety
 - a. Follow all workplace policies and procedures; maintain compliance with all standards of the workplace.
 - b. Describe workplace organizational structure.
 - c. Adhere to all local, State, and Federal regulations (such as the Department of Transportation regulations, and Occupational Safety and Health Administration (OSHA) industry safety standards).
 - d. Demonstrate knowledge of safety practices and procedures.
 - e. Use appropriate safety equipment, such as proper clothing and personal protective equipment (PPE).
2. Service and Inspection Fundamentals
 - a. Recognize various types of buses (coach, motor coach, articulated, etc.), and their specifications; safely operate buses and conduct road tests (when appropriate).
 - b. Demonstrate understanding of general service and inspection methods.
 - c. Diagnose problem areas; discuss nature and extent of malfunctions or damage with supervisor (when applicable).
 - d. Perform proper checks of bus components, such as batteries, tires and tire pressure, lights, antifreeze, and windshield washer fluid.
 - e. Identify various oils and greases, and their uses in bus maintenance.

- f. Learn the proper procedures for: oiling engines and transmissions; changing motors, transmissions and differentials, fuel oils, and filters; and lubricating steering assemblies, connections, and universal joints.
3. Tools and Equipment
- a. Utilize maintenance and parts manuals and demonstrate familiarity with industry terminology.
 - b. Recognize and maintain the various types of equipment and components used by the industry.
 - c. Use appropriate fasteners, measuring instruments, and tools to service and inspect buses.
 - d. Properly raise and move vehicle parts using jacks and hoists, in accordance with safety procedures.
 - e. Safely operate auxiliary equipment, including wash rack, oil guns, and fuel pumps (if applicable).

B. Welding and Cutting

150

- 1. Adhere to the appropriate use of personal protective equipment and other safety procedures for welding.
- 2. Perform welding and cutting on buses, in support of service and maintenance; demonstrate various welding techniques and describe the appropriate application of each type, such as:
 - a. Oxy-acetylene: minor cutting, brazing and welding
 - b. Electric (Arc): minor cutting and welding
 - c. MIG: minor welding
- 3. Recognize common welding metals and their specific properties (as they relate to servicing and maintaining buses).

C. Brakes

800

- 1. Describe brake air supply and service systems.
- 2. Demonstrate familiarity with brake system construction and operation, and component parts (as applicable):
 - a. S-Cam system
 - b. Wedge system
 - c. Disk system
 - d. Anti-lock braking systems and automatic traction control
 - e. Heavy advanced braking systems

3. Inspect, adjust, and perform preventive and routine maintenance on brake system components, using appropriate test equipment:
 - a. Parking and service brake mechanisms (slack adjuster, camshaft, air chamber).
 - b. Hoses, valves, and connections (as necessary).
 - c. Brake valves.
 - d. Air compressors and air governors.
 - e. Rotors and hubs (including wheel bearing races and studs), as necessary.

D. Suspension and Chassis

600

1. Identify suspension and chassis components, and their functions.
2. Troubleshoot, diagnose, and perform general maintenance, as needed:
 - a. Inspect components for missing parts, rust, wear, and leaks.
 - b. Remove, repair and replace components (as necessary), including: air suspension systems; radius rods and mounts; bushings; stabilizer bars; bellows; air filters and dryers; leveling valves; shock absorbers; front and rear bumpers; frame; wheel stops; and kneeling systems.
 - c. Properly torque suspension and chassis fasteners.

E. Axle and Steering Systems

300

1. Identify axel and steering functions and component parts.
2. Troubleshoot, diagnose, and perform general maintenance, as needed:
 - a. Inspect for missing parts, rust, wear, and leaks.
 - b. Remove, repair, and replace components of steering systems, including: column; pump; transfer box; gear box; drag link; tie rod; king pins; steering linkage; spindles; universal joints; and steering hydraulic systems.
 - c. Install front/rear hubs and bearings; adjust bearings and check oil seals on hubs and front axles.
 - d. Inspect and repair tires and wheels.
3. Perform front-end, steering, axle, and wheel balancing and alignment.

F. Electrical Systems

700

1. Demonstrate knowledge of electrical systems, circuits, relays and switches, and starting and charging systems.
2. Understand electrical schematics.
3. Troubleshoot and test equipment using testing meters, load testers, and diagnostic equipment.
4. Test, maintain, and repair multiplex systems (I/O).
5. Inspect, repair, and install general electrical systems, devices, and accessories, such as: starting systems; generators, alternators, regulators; equalizers; and lighting systems.
6. Test and replace batteries and charging systems.

G. Heating and Air-Conditioning

400

1. Identify and describe heating and air conditioning systems on buses, and their component parts.
2. Describe inspection procedures and use of test equipment, including an electronic sniffer, multimeter (VOM), and pressure meter; demonstrate familiarity with maintenance tools, including gauges.
3. Perform preventive maintenance, inspection, diagnostics, and repairs, on heating and air condition systems on buses, including:
 - a. Auxiliary coolant heaters (Compressed Natural Gas (CNG), Diesel, and Electric).
 - b. Compressors; heater core; motors; and filters.
 - c. Inspect, adjust, and check for fault conditions; obtain status readings on microprocessors (if available).
4. Explain evaporator and condenser operation.
5. Recognize the use of gasses such as nitrogen and refrigerant 134A, 407, and 1234yf (as applicable); demonstrate safe and proper recovery of refrigerants in air-conditioning systems, including refrigerant recovery.

H. Engine and Fuel Systems

850

1. Recognize general concepts of engine and fuel systems (including gasoline-powered, if applicable); understand their operation, function, and component parts.
2. Diagnose, troubleshoot, and overhaul engine and fuel systems, and perform general maintenance:

- a. Test, remove, repair, and replace component parts, using diagnostic tools such as tachometers, manometers, engine analyzers, and computer -based software (if available).
 - b. Inspect, repair, rebuild, and install engine and fuel systems.
 - c. Test fuel injection systems, including pressure and voltages.
 - d. Perform engine tune-ups and examine parts for defects and excessive wear.
 - e. Recondition and replace parts such as pistons, rings, bearings, gears, valves, and bushings.
 - f. Overhaul cylinder head and valves; recondition cylinder, piston, crankshaft, rockers, rods, and oil pumps.
3. Demonstrate familiarity with electronic starting systems.
 4. Understand the operation, maintenance, and repair of CNG engine and fuel systems (if applicable):
 - a. Describe and demonstrate safety procedures for working with CNG systems.
 - b. Inspect CNG tanks and lines for leaks, corrosion, and damage.
 - c. Understand the proper procedures for depressurization of CNG systems for maintenance.

I. Cooling Systems

150

1. Describe the function and operation of cooling systems.
2. Install and perform preventive maintenance on cooling systems and component parts, such as: water pumps; fan blades, fan drives, and fan belts; radiators; and surge tanks.
3. Inspect, repair, and replace controls including thermostats, alarmstat, temperature sending unit, verna-therm valve (as available).
4. Inspect and maintain electric fan systems.
5. Use hydrometer to ensure proper mix of elements, such as coolant, rust inhibitor, nitrates, and water; recycle antifreeze (if applicable).

J. Drive Systems and Transmissions

800

1. Demonstrate understanding of the operation, maintenance, and repair of drive systems and transmissions.
2. Identify the different types of transmissions (automatic; hybrid; electric propulsion); describe the transmission system and how it networks with other components.
3. Perform inspections, repairs, adjustments, and preventative maintenance:
 - a. Troubleshoot and diagnose issues using proper tools and equipment, and computer-based diagnostic software (if available).
 - b. Use pressure gauges to take pressure readings.
 - c. Remove and replace transmissions.
 - d. Demonstrate removal, repair, and replacement of drive line components.
 - e. Repair and reassemble valve body.

K. Exhaust and Emission Systems

250

1. Demonstrate familiarity with exhaust and emission systems; understand their operation, function, and component parts.
2. Inspect, troubleshoot, and perform preventative maintenance on exhaust and emission components:
 - a. Manifold and heat controls.
 - b. Exhaust gas recirculation systems.
 - c. Inspect and replace: mufflers; exhaust pipes; diesel particulate filters; diesel exhaust fluid; catalytic converters; and selective catalytic reduction systems.

L. Hydraulic Systems

250

1. Explain basic hydraulic principles and identify components (such as valves, pumps/hydraulic pumps; hoses; filters; etc.).
2. Inspect, diagnose, repair, and rebuild electric, mechanical, and hydraulic systems:
 - a. Select and use proper fluids.
 - b. Clean and flush systems.
 - c. Inspect, repair, and replace hydraulic steering components.
 - d. Inspect pipes and reservoir oil system.

- e. Maintain and repair hydraulic components of accessibility systems and equipment (such as wheelchair lifts and ramps).

M. Body (Interior and Exterior)

250

1. Inspect, adjust, and perform preventive and routine maintenance on bus body systems, using appropriate tools and equipment:
 - a. Inspect glazing for cracks, fogging, or other defects, and replace as necessary; inspect rivets and bolts.
 - b. Repair and replace driver-area controls; windshield wiper motors; control valves; and wiper arms and blades.
 - c. Adjust and replace interior and exterior lights and mirrors.
 - d. Repair dials and signals, such as speedometer and tachometer.
 - e. Inspect, adjust, and repairing driver seat; passenger seats; passenger assists; flooring; seat tracks; sidewall panels; and fare box (if applicable).
 - f. Inspect and repair passenger signals; ensure proper door operation, including sensitive edges and interlock system (as available).
 - g. Inspect required safety devices, such as triangles, fire extinguishers, and fire suppression and methane detection systems.
 - h. Remove, repair, and replace body systems such as wheelchair lifts and kneeling mechanisms.

Approximate Total Hours

6,000

Apprenticeship work processes are applicable only to training curricula for apprentices in approved programs. Apprenticeship work processes have no impact on classification determinations under Article 8 or 9 of the Labor Law. For guidance regarding classification for purposes of Article 8 or 9 of the Labor Law, please refer to <https://dol.ny.gov/public-work-and-prevailing-wage>.

BUS MECHANIC
APPENDIX B
RELATED INSTRUCTION

Safety and Health

1. General Workplace Safety and Policies
2. Trade Safety
3. All Applicable Local, State, and Federal Regulations
4. Agency-specific Laws and Regulations
5. Use of Personal Protective Equipment (PPE)
6. Right-to-Know/Material Safety Data Sheets (MSDS)
7. First Aid & CPR (minimum 6.5 hours every 3 years)
8. Bloodborne Pathogen Training
9. Automated External Defibrillator (AED) Training
10. Sexual Harassment Prevention Training – must comply with Section 201-g of the Labor Law
11. Basic Industrial Safety or OSHA 10-Hour General Industry Course
12. HAZMAT (Hazardous Materials) and HAZCOM (Hazard Communication) Training (storage and disposal of hazardous substances)
13. Environmental Protection Agency (EPA) Technician Training (Section 609)
14. EPA Emission Standards

Mathematics

1. Arithmetic
2. Measurements
3. Metric System
4. Algebra (including fractions and decimals)

Trade Theory and Science

1. Machine Shop Fundamentals
2. Tools and Equipment
3. Equipment and Technical Training
4. Welding
5. Lubrication Systems

6. Air Brake and Pneumatic Systems (if applicable)
7. Air Suspension (if applicable)
8. Power Steering Systems
9. Front End Repairs and Alignment
10. Electrical Systems
11. Automotive Electronics
12. Heating and Air-Conditioning
13. Diesel Engine
14. Gasoline Engine (if applicable)
15. Compressed Natural Gas (CNG) Engines and Fuel Engagement Systems
16. Engine Repair/Overhaul
17. Tune-up/Service
18. Cooling Systems
19. Transmissions and Drivetrains
20. Electronic Propulsion Systems (if applicable)
21. Starting Systems
22. Automotive Electronic Ignition Systems (if applicable)
23. Hydraulics
24. Preventative Maintenance and Inspections
25. Fire/Methane Detection and Suppression Systems
26. Accessibility Systems and Equipment (in accordance with the Americans with Disabilities Act (ADA) standards/designs)

Other Workplace Skills

1. CDL "B" license from New York State Department of Motor Vehicles
2. Manuals and Blueprint Reading
3. Written and Oral Communication Skills
4. Basic Computer/Tablet Skills

Additional Topics as Required

A minimum of 144 hours of Related Instruction is required for each Apprentice, each year.

Appendix B topics are approved by New York State Education Department.