

Medium Heavy Vehicle–Safety and Foundation

Student/intern information:

Name _____ Date _____ Class _____

Vehicle used for this activity:

Year _____ Make _____ Model _____

Odometer _____ VIN _____

Learning Objective / Task–General Safety	2008 NATEF Priority Level
• Identify tools and their usage in automotive applications.	P-1
• Identify standard and metric designation.	P-1
• Demonstrate safe handling and use of appropriate tools.	P-1
• Utilize safe procedures for handling tools and equipment.	P-1
• Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	P-1

Time off _____

Time on _____

Total time _____

Recommended Resource Materials

- CDX Automotive program
- CDX eTextbook
- Class notes

Materials Required

- Program's shop policy and other safety information
- MSDS book
- Fire extinguisher(s) from the shop
- Material Safety Data Sheets for the products listed

For every task in Safety and Foundation, the following safety task must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

Some Safety Issues to Consider

- Always wear the correct protective eyewear and clothing and use the appropriate safety equipment, as well as fender covers, seat protectors, and floor mat protectors.
- Make sure you understand and observe all legislative and personal safety procedures when carrying out practical assignments. If you are unsure of what these are, ask your supervisor/instructor.
- Tools allow us to increase our productivity and effectiveness. However, they must be used according to the manufacturer's procedures. Failure to follow those procedures can result in serious injury or death.

Performance Standard

0–No exposure: No information or practice provided during the program; complete training required

1–Exposure only: General information provided with no practice time; close supervision needed; additional training required

2–Limited practice: Has practiced job during training program; additional training required to develop skill

3–Moderately skilled: Has performed job independently during training program; limited additional training may be required

4–Skilled: Can perform job independently with no additional training

► **TASK** Identify tools and their usage in automotive applications. _____

Time off _____

► **TASK** Identify standard and metric designation. _____

Time on _____

► **TASK** Demonstrate safe handling and use of appropriate tools. _____

Total time _____

► **TASK** Utilize safe procedures for handling tools and equipment. _____

Performance Rating

0 1 2 3 4

Supervisor/instructor signature _____ Date _____

Performance Rating

0 1 2 3 4

Supervisor/instructor signature _____ Date _____

Performance Rating

0 1 2 3 4

Supervisor/instructor signature _____ Date _____

Performance Rating

0 1 2 3 4

Supervisor/instructor signature _____ Date _____

▶ TASK Demonstrate proper cleaning, storage, and maintenance of tools and equipment.

1. This task will require observation of the student over a prolonged period after the initial check. Ask your instructor to give you a date for your evaluation.

a. Write that date here: _____

2. Using the following list, describe the specific function/purpose of each of the following tools:

a. Open end wrench:

b. Box end wrench:

c. Socket:

d. Ratchet:

e. Torque wrench:

f. Slotted screwdriver:

g. Phillips screwdriver:

h. Tap:

i. Die:

j. Feeler blade:

k. Line wrench/flare nut wrench:

l. Allen wrench:

m. Torx screwdriver or socket:

n. Hacksaw:

o. Oil filter wrench:

p. Compression gauge:

q. DVOM/DMM:

Time off _____

Time on _____

Total time _____

- r. Test light:

- s. Diagonal side cutters:

- t. Locking pliers:

- u. Needle-nose pliers:

- v. Brake spoon:

- w. Micrometer:

- x. Dial indicator:

- y. Antifreeze hydrometer:

- z. Snap ring pliers:

3. Continue with your other projects, demonstrating safe handling, proper cleaning, maintenance, and storage of the tools until the date of your evaluation.
4. On or after that date, have your instructor verify satisfactory completion of this task.
5. Using the following tables, continue with your other projects, demonstrating your understanding of the differences in the designations until the date of your final evaluation.
6. On or after that date, have your instructor verify satisfactory completion of this task.

Volume

Volume is the amount of space occupied by a three-dimensional object. The metric system uses liters (l) or cubic centimeters (cc or cm³). The Imperial system uses gallons and quarts for “wet” volume and cubic feet for “dry” volume. You’ll need to determine volume any time you fill a vehicle’s reservoir with liquid. This includes petrol/gasoline, coolant, oil, transmission fluid, or lubricant.

Volume Conversions	
Imperial-Imperial	4 US quarts = 1 US gallon 1 cubic foot = 7.48 US gallons 1 cubic foot = 6.22 UK gallons
Metric-Metric	1 liter = 1000 cc 1 cc = 0.001 liter
Imperial-Metric	1 cubic inch = 16.387 cc 1 US gallon = 3.78 liters 1 UK gallon = 4.54 liters 1 US quart = 0.95 liter

Volume Conversions	
Metric-Imperial	1 liter = 61.0237 cubic inches 1 liter = 0.035 cubic feet 1 liter = 0.26 US gallons 1 liter = 0.21 UK gallons 1 liter = 1.05 quarts

7. Knowledge Check: Convert the following:
- 3.0 liters = _____ cubic inches
 - 350 cubic inches = _____ liters
 - 3.0 gallons = _____ liters
 - 9 liters = _____ gallons

Mass

Mass is a unit or system of units by which a degree of heaviness is measured. The metric system uses grams (g), kilograms (kg), and tonnes (t). The Imperial system uses ounces (oz), pounds (lb), and tons (T). In the workshop, you will use these measurements to determine the lifting capacity of equipment like hydraulic and engine hoists and floor jacks.

Mass Conversions	
Imperial-Imperial	16 oz = 1 lb 2000 lb = 1 T
Metric-Metric	1000 g = 1 kg 1000 kg = 1 t
Imperial-Metric	1 oz = 28.3 g 1 lb = 453 g 2.2 lb = 1 kg 1 T = 0.907 t
Metric-Imperial	1 t = 1.10 T

8. Knowledge Check: Convert the following:
- 8 oz = _____ g
 - 475 g = _____ oz
 - 6.6 lb = _____ kg
 - 4500 kg = _____ lb

Torque

Torque is the twisting force applied to a shaft. The metric system uses the Newton meter (Nm). The Imperial system uses the inch-pound (in-lb) and the foot-pound (ft-lb). Vehicle manufacturers specify torque settings for key fasteners on the engine and wheels. You will need to follow the specifications or you could strip threads or break bolts. Torque is also an important concept when discussing engine performance. A foot-pound (ft-lb) is the twisting force applied to a shaft by a lever 1 foot long with a 1 pound mass on the end. A Newton meter (Nm) is the twisting force applied to a shaft by a lever 1 meter long with a force of 1 Newton applied to the end of the lever. (1N is equivalent to the force applied by a mass of 100.)

Torque Conversions	
Imperial-Imperial	112 in-lb = 1 ft-lb 1 in-lb = 0.08 ft-lb
Imperial-Metric	11 ft-lb = 1.34 Nm
Metric-Imperial	1 Nm = 0.74 ft-lb 1 Nm = 8.8 in-lb

9. Knowledge Check: Convert the following:

- a. 48 in-lb = _____ ft-lb
- b. 15 ft-lb = _____ in-lb
- c. 65 ft-lb = _____ Nm
- d. 142 Nm = _____ ft-lb

Pressure

Pressure is a measurement of force per unit area. The metric system uses kilopascals (kPa) and bar. The Imperial system uses pounds per square inch (psi) and atmospheres. Vacuum is a term given to a pressure that is less than atmospheric pressure. The Imperial system measures vacuum in inches of mercury ("Hg) or inches of water. The metric system measures vacuum in millimeters of mercury (mm Hg). You'll need to understand pressure conversions when filling tires and replacing air conditioning refrigerants or using a vacuum gauge.

Pressure Conversions	
Imperial-Imperial	14.7 psi = 1 atmosphere 1" Hg = 14"H2O 0" Hg = 1 atmosphere
Metric-Metric	100 kPa = 1 bar
Imperial-Metric	1 psi = 6.89 kPa 1 atmosphere = 101.3 kPa 1" Hg = 25.4 mm Hg 1 atmosphere = 1.013 bar

10. Knowledge Check: Convert the following:

- a. 14.7 psi = _____ kPa
- b. 650 kPa = _____ psi
- c. 22 psi = _____ bar
- d. 5.5 bar = _____ psi

11. Have your supervisor/instructor verify satisfactory completion of this procedure, any observations found, and any necessary action/s recommended.

Performance Rating

0

1

2

3

4

Supervisor/instructor signature _____ Date _____