

## CHAPTER

# Safety

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## Shop Manual Objectives

Upon completion and review of this chapter, you should be able to understand and describe:

- Explain how safety is a part of professionalism.
- List and describe personal safety responsibilities.
- List the different types of eye protection devices and explain the proper application of each.
- Lift heavy objects properly.
- Inspect power tools before use.
- Raise a vehicle using a floor jack and safety stands.
- Raise a vehicle using a hoist.
- Demonstrate the ability to properly run the engine in the shop.
- Classify fires and fire extinguishers.
- Locate, identify, and inspect fire extinguishers in the shop.
- Explain the proper use of the fire extinguisher.
- Define hazardous materials.
- Explain the right-to-know law or workplace hazardous materials information systems (WHMIS).
- Describe the responsibilities of the employer and the employee concerning hazardous materials.
- Determine what constitutes hazardous waste and how to dispose of it properly.
- Describe the basic safety rules of servicing electrical systems.
- Work around batteries safely.
- Explain the safety precautions associated with charging and starting systems.
- List the safety precautions associated with servicing the air bag system.
- Explain the safety precautions that are necessary when servicing the antilock brake system.
- Explain the safety precautions necessary when servicing hybrid electric vehicles (HEVs).

## Shop Manual Overview

This chapter discusses automotive shop safety. Practicing safety is a mark of professionalism. Safety aspects discussed are dress, tool and equipment maintenance, fire safety, shop inspections, and the safe handling of batteries. The safety concerns associated with servicing of some of the newer accessories, antilock brakes, and air bag systems are also covered.

## Reading Assignments

Shop Manual, pages 1-37

## Terms to Know

Air bag module  
Air bag system

Antilock brake system (ABS)  
Asbestos

BAT  
Carbon monoxide (CO)

Caustic  
Conductors  
Face shields  
Fire blanket  
Fire extinguishers  
Flammable  
Floor jacks  
Hand tools  
Hazard Communication  
Standard  
Hazardous material  
Hazardous waste

High-efficiency particulate-  
arresting (HEPA)  
High-voltage service plug  
Hoists  
Material Safety Data Sheets  
(MSDS)  
Occupational safety glasses  
One-hand rule  
Pneumatic tools  
Power tools  
Resource Conservation and  
Recovery Act (RCRA)

Right-to-know laws  
Safety goggles  
Vehicle lift point  
Safety stands  
Volatile  
Workplace Hazardous Materials  
Information Systems  
(WHMIS)

## Lecture Outline and Notes

### I. Objectives

- A. Review the chapter's objectives.

### II. Introduction

- A. Safety is the Mark of a Professional.

Discuss the possibility of personal injury, including the loss of eyesight and death. Also discuss the possibility of damage to customers' vehicles and the shop's property. Consider the possible loss of your career or termination due to unsafe practices.

- B. Life Examples

Provide any examples of loss caused by unsafe practices that you may have seen or heard about. Also visit the following web sites for current statistics.

<http://www.osha.gov>

<http://www.dol.gov>

### III. Personal Safety

- A. Dress and Appearance

- 1. Proper clothing

Discuss wearing of proper clothing.

- 2. Hair

Discuss safety concerns associated with long hair.

- 3. Jewelry

Discuss the dangers of wearing jewelry.

- 4. Shoes

Discuss proper footwear.

- B. Smoking, alcohol, and drugs in the shop

- C. Eye Protection

- 1. Discuss the need to protect your eyes. People have lost eyes through careless accidents.

- 2. Describe various glasses, side shields, and so on.

- a. Discuss safety glasses and their use.

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- b. Describe the purpose of safety goggles.

- c. Discuss face shields use where they are normally stored.

- D. Eye goggles and face shields should be used when working with chemicals.

- D. Eyewash Fountains

Discuss the purpose and operation of the eyewash fountain.

**E. First-aid Kits**

Discuss the purpose and contents of the first-aid kit.

**F. Hand Protection**

Discuss the need for protecting of the hands while performing many of the tasks required in the automotive repair industry. Also emphasize the use of proper protection when working with caustic solutions and other chemicals.

**G. Rotating Belts and Pulleys**

Explain that belts can break or throw something at you at a high rate of speed. Position yourself safely.

**H. Electric Cooling Fans**

Discuss the possibility that electric cooling fans may come on at any time, even when the engine is off. It is important to keep hands and tools away from the fan until it has been completely disabled.

**I. Lifting**

Demonstrate proper lifting to the class with the help of a student following your lead. Students should practice a few times.

**IV. Tools and Equipment Safety**

**A. Hand Tools**

Discuss proper tool usage and care.

1. Always pull on the handle of the wrench - never push.
2. Always use the correct size wrench for the fastener.
3. Use a socket or box-end wrench whenever possible.
4. If an adjustable wrench is used, pull on the handle so the force is on the non-adjustable jaw of the wrench.
5. Use impact sockets whenever using an impact wrench.
6. Use the proper tool for the job. Never use a wrench or pliers as a hammer, never use a screwdriver as a chisel, etc.
7. Wear proper eye protection when using a hammer and a chisel.

**B. Power Tool Safety**

1. Discuss proper tool usage and care.
2. Discuss proper procedures for inspecting power tools before using them.
3. Inspect electrically powered tools
4. Inspect air powered tools

**D. Compressed Air Safety**

1. Inspect all hoses for damages.
2. Describe problems ruptured air hoses can damage eyes or embed scale and rust in exposed skin.

**V. Lifting the Vehicle Safely**

**A. Floor Jack and Safety Stand Use**

1. Discuss and demonstrate proper floor jacks.
2. Discuss and demonstrate proper jack stand use.

**B. Hoist Safety**

1. Discuss and demonstrate proper hoist use.
2. Discuss vehicle lift points.

**VI. Running the Vehicle While in the Shop**

**A. Carbon Monoxide**

1. Proper ventilation
  - a. Carbon monoxide is a deadly, odorless, colorless gas.

- b. Health problems include asphyxiation because blood cannot absorb oxygen and the starving tissue cannot live long.
- 2. Procedure
  - a. Block the wheels so that both front and rear of the tire are not being raised.
  - b. Place the standard or automatic transmission in neutral or park.
  - c. Set the parking brake as a back up precaution.
  - d. Connect the exhaust system and describe different ways a vent system can work.

## **VII. Fire Hazards and Prevention**

- A. Classes of Fires
  - Describe Class A, B, C, and D fires.
- B. Types of Fire Extinguishers
  - Display various extinguishers and discuss their proper uses.
- C. Storage of Flammables
  - Discuss the fire hazards associated with each of the following and discuss proper storage:
    - 1. Gasoline
    - 2. Diesel fuel
    - 3. Solvents
    - 4. Rags
- D. Fire Extinguisher Use
  - Discuss and demonstrate the proper use of the fire extinguisher.
- E. Discuss Fire blankets

## **VIII. Hazardous Materials**

- A. Discuss what constitute a substance as being classified as a hazardous material.
- B. Discuss the difference between hazardous materials and hazardous waste.

## **IX. Right-To-Know Laws**

- A. Discuss the purpose of the Right-To-Know laws or the Workplace Hazardous Materials Information Systems (WHMIS). Explain the purpose of the MSDS and where it is located.
- B. Discuss what is hazardous waste and the types that may be generated in an automotive repair facility.
- C. Handling and disposing of shop wastes
  - Discuss disposal of oil and solvent disposal
- D. Discuss asbestos exposure and methods to contain asbestos.

## **X. Electrical System Safety**

- A. Battery Safety
  - Discuss safety concerns associated with the battery.
- B. Starting System Safety
  - Describe safety concerns associated with the starter system.
- C. Charging System Safety
  - Discuss safety concerns associated with the charging system.
- D. Air Bag Safety
  - 1. Describe the air bag trigger system and what happens to the air bag.
  - 2. Explain the precautions for removing and carrying air bags and other air bag service precautions.

## **XI. Antilock Brake System Safety**

- A. Describe the operation of the ABS and its major components.
- B. Describe the service precautions that need to be followed when working on the ABS.

**XII. General hybrid electric vehicle safety**

- A. Describe the general safety precautions of working with HEVs.
- B. Explain that voltages can range from 300 to over 600 volts
- C. Explain the one-hand rule.  
Using one hand for service helps prevent electric shock from passing through the body
- D. Insulated glove integrity test  
Demonstrate how to check high-voltage gloves
- E. High-voltage service plug  
Discuss the procedures for disabling the high-voltage system.

**XIII. Summary**

- A. Review the material covered, emphasizing the main points and key words.

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**Chapter 1 Shop Manual Answers to Review Questions**

SHOP MANUAL, PAGES 38

**ASE-Style Review Questions**

- 1. C
- 2. A
- 3. A
- 4. B
- 5. B
- 6. C
- 7. D
- 8. D
- 9. D
- 10. B