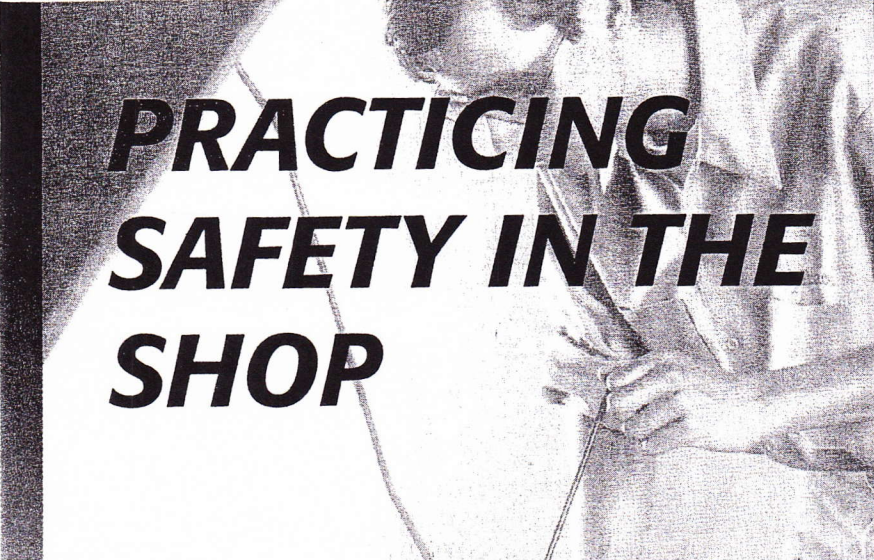


Practicing Safety in the Shop



PRACTICING SAFETY IN THE SHOP

2

OBJECTIVES

- ◆ *Understand the importance of safety and accident prevention in an automotive shop.*
- ◆ *Explain the basic principles of personal safety, including protective eye wear, clothing, gloves, shoes, and hearing protection.*
- ◆ *Explain the procedures and precautions for safely using tools and equipment.*
- ◆ *Explain what should be done to maintain a safe work area, including handling vehicles in the shop and venting carbon monoxide gases.*
- ◆ *Describe the purpose of the laws concerning hazardous wastes and materials, including the right-to-know laws.*

Safety and accident prevention must be a priority in all automotive shops. There is great potential for serious accidents, simply because of the nature of the business and the equipment used. In fact, the automotive repair industry is rated as one of the most dangerous occupations in the country.

Vehicles, equipment, and many parts are very heavy; and parts often fit tightly together. Many components become hot during operation and high fluid pressures can build up inside the cooling system, fuel system, or battery. Batteries contain highly corrosive and potentially explosive acids. Fuels and cleaning solvents are flammable. Exhaust fumes are poisonous. During some repairs, technicians can be exposed to harmful dust particles and vapors.

Good safety practices eliminate these potential dangers. A careless attitude and poor work habits invite disaster. Shop accidents can cause serious injury, temporary or permanent disability, and death.

Safety is a very serious matter. Both the employer and employees must work together to protect the health and welfare of all who work in the shop.

This chapter contains many safety guidelines concerning personal, work area, tool and equipment, and hazardous material safety. In addition to these rules, special warnings have been used throughout this book to alert you to situations in which carelessness could result in personal injury. Finally, when working on cars, always follow safety guidelines given in service manuals and other technical literature. They are there for your protection.

PERSONAL SAFETY

Personal safety simply involves those precautions you take to protect yourself from injury. This includes wearing protective gear, dressing for safety, and correctly handling tools and equipment.

EYE PROTECTION Your eyes can become infected or permanently damaged by many things in a shop.

Some repair procedures, such as grinding, result in tiny particles of metal and dust that are thrown off at very high speeds. These metal and dirt particles can easily get into your eyes, causing scratches or cuts on your eyeball. Pressurized gases and liquids escaping a ruptured hose or fuel line fitting can spray a great distance. If these chemicals get into your eyes, they can cause blindness. Dirt and sharp bits of corroded metal can easily fall down into your eyes while you are working under a vehicle.

Eye protection should be worn whenever you are exposed to these risks. To be safe, you should wear **safety glasses** whenever you are working in the shop. There are many types of eye protection available (Figure 2-1). To provide adequate eye protection, safety glasses have lenses made of safety glass. They also offer some sort of side protection. Regular prescription glasses do not offer sufficient protection and, therefore, should not be worn as a substitute for safety glasses.

Wearing safety glasses at all times is a good habit to get into. To help develop this habit, wear safety glasses that fit well and feel comfortable.

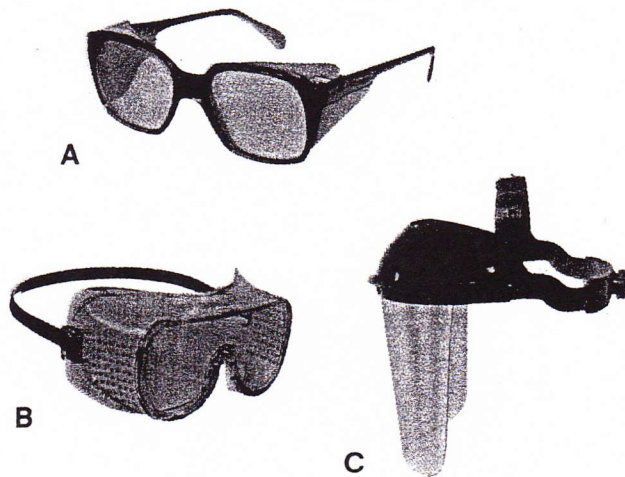


FIGURE 2-1 (A) Safety glasses; (B) splash goggles; (C) face shield. *Courtesy of Goodson Shop Supplies*

If chemicals such as battery acid, fuel, or solvents get into your eyes, flush them continuously with clean water. Have someone call a doctor and get medical help immediately.

CLOTHING Your clothing should be well-fitted and comfortable but made with strong material. Loose, baggy clothing can easily get caught by moving parts and machinery. Neckties should not be worn. Some technicians prefer to wear coveralls or shop coats to protect their personal clothing. Cutoffs and short pants are inappropriate for shop work.

SHOES Automotive work involves the handling of many heavy objects, which can be accidentally dropped on your feet or toes. Always wear leather or similar material shoes or boots with nonslip soles. Steel-tipped safety shoes can give added protection to your feet. Jogging or basketball shoes, street shoes, and sandals are inappropriate in the shop.

GLOVES Good hand protection is often overlooked. A scrape, cut, or burn can limit your effectiveness at work for many days. A well-fitted pair of heavy work gloves should be worn during operations such as grinding and welding or when handling high-temperature components. Always wear approved rubber gloves when handling strong and dangerous caustic chemicals. They can easily burn your skin. Be very careful when handling these types of chemicals.

EAR PROTECTION Exposure to very loud noise levels for extended periods of time can lead to a loss of hearing. Air wrenches, engines running under a load, and vehicles running in enclosed areas can all generate annoying and harmful levels of noise. Simple earplugs or earphone-type protectors (Figure 2-2) should be worn in environments that are constantly noisy.

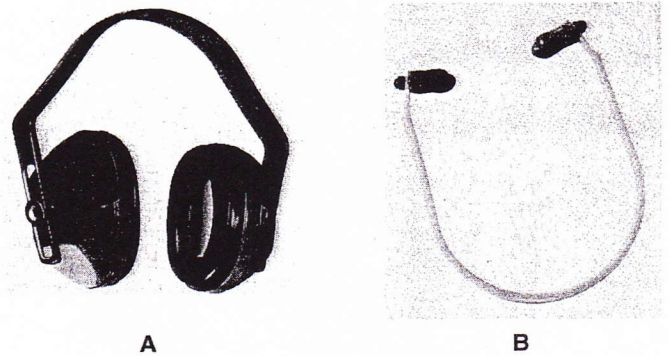


FIGURE 2-2 Typical (A) earmuffs and (B) earplugs. *Courtesy of Willson Safety Products, Inc.*

HAIR AND JEWELRY Long hair and loose, hanging jewelry can create the same type of hazard as loose-fitting clothing. They can become caught in moving engine parts and machinery. If you have long hair, tie it back or cover it with a cap.

Never wear rings, watches, bracelets, and neck chains. These can easily get caught in moving parts and cause serious injury.

LIFTING AND CARRYING Knowing the proper way to lift heavy objects is important. You should also use back-protection devices when you are lifting a heavy object. Always lift and work within your ability and ask others to help when you are not sure whether or not you can handle the size or weight of an object. Even small, compact parts can be surprisingly heavy or unbalanced. Think about how you are going to lift something before beginning. When lifting any object, follow these steps.

1. Place your feet close to the object. Position your feet so you will be able to maintain a good balance.
2. Keep your back and elbows as straight as possible. Bend your knees until your hands reach the best place to get a strong grip on the object (Figure 2-3).
3. If the part is in a cardboard box, make sure the box is in good condition. Old, damp, or poorly sealed boxes will tear and the part will fall out.
4. Firmly grasp the object or container. Never try to change your grip as you move the load.
5. Keep the object close to your body, and lift it up by straightening your legs. Use your leg muscles, not your back muscles.
6. If you must change your direction of travel, never twist your body. Turn your whole body, including your feet.
7. When placing the object on a shelf or counter, do not bend forward. Place the edge of the load on

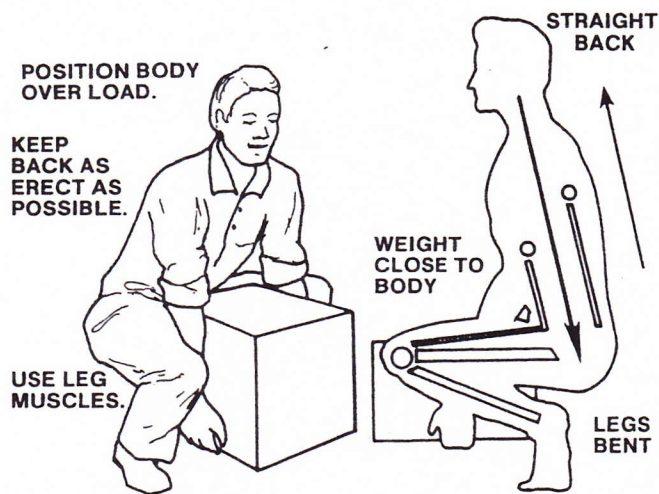


FIGURE 2-3 Use your leg muscles—never your back—when lifting any heavy load.

the shelf and slide it forward. Be careful not to pinch your fingers.

8. When setting down a load, bend your knees and keep your back straight. Never bend forward. This strains the back muscles.
9. When lowering something heavy to the floor, set the object on blocks of wood to protect your fingers.

OTHER PERSONAL SAFETY WARNINGS Never smoke while working on a vehicle or while working with any machine in the shop.

Playing around or “horseplay” is not fun when it sends someone to the hospital. Such things as air nozzle fights, creeper races, and practical jokes have no place in the shop.

To prevent serious burns, keep your skin away from hot metal parts such as the radiator, exhaust manifold, tailpipe, catalytic converter, and muffler.

When working with a hydraulic press, make sure the pressure is applied in a safe manner. It is generally wise to stand to the side when operating the press. Always wear safety glasses.

Properly store all parts and tools by putting them away in a place where people will not trip over them. This practice not only cuts down on injuries, it also reduces time wasted looking for a misplaced part or tool.

TOOL AND EQUIPMENT SAFETY

An automotive technician must follow these shop safety guidelines.

HAND TOOL SAFETY Careless use of simple hand tools such as wrenches, screwdrivers, and hammers causes many shop accidents that could be prevented.

Keep all hand tools grease-free and in good condition. Tools that slip can cause cuts and bruises. If a tool slips and falls into a moving part, it can fly out and cause serious injury.

Use the proper tool for the job. Make sure the tool is of professional quality. Using poorly made tools or the wrong tools can damage parts or the tool itself, or could cause injury. Do not use broken or damaged tools.

Be careful when using sharp or pointed tools. Do not place sharp tools or other sharp objects into your pockets. They can stab or cut your skin, ruin automotive upholstery, or scratch a painted surface. If a tool is supposed to be sharp, make sure it is sharp. Dull tools can be more dangerous than sharp tools.

POWER TOOL SAFETY Power tools are operated by an outside source of power, such as electricity, compressed air, or hydraulic pressure. Safety around power tools is very important. Serious injury can result from carelessness. Always wear safety glasses when using power tools.

If the tool is electrically powered, make sure it is properly grounded. Check the wiring for cracks in the insulation, as well as for bare wires, before using it. Also, when using electrical power tools, never stand on a wet or damp floor. Disconnect the power source before performing any service on the machine or tool. Before plugging in any electric tool, make sure the switch is off to prevent serious injury. When you are done using the tool, turn it off and unplug it. Never leave a running power tool unattended. When you leave, turn it off.

When using power equipment on a small part, never hold the part in your hand. Always mount the part in a bench vise or use vise grip pliers. Never try to use a machine or tool beyond its stated capacity or for operations requiring more than the rated power of the tool.

When working with larger power tools, such as bench or floor equipment, check the machines for signs of damage before using them. Place all safety guards in position (Figure 2-4). A safety guard is a protective cover over a moving part. It is designed to prevent injury. Wear safety glasses or a face shield. Make sure there are no people or parts around the machine before starting it. Keep your hands and clothing away from the moving parts. Maintain a balanced stance while using the machine.

COMPRESSED AIR EQUIPMENT SAFETY Tools that use compressed air are called **pneumatic tools**. Compressed air is used to inflate tires, apply paint, and drive tools. Compressed air can be dangerous when it is not used properly.

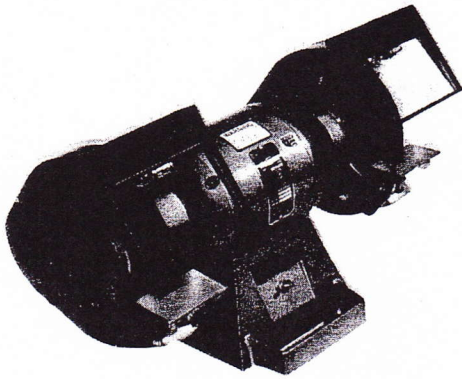


FIGURE 2-4 Safety guards in position on a bench grinder. Courtesy of Snap-on Tools Corporation

When using compressed air, safety glasses or a face shield should be worn. Particles of dirt and pieces of metal, blown by the high-pressure air, can penetrate your skin or get into your eyes.

Before using a compressed air tool, check all hose connections. Always hold an air nozzle or air control device securely when starting or shutting off the compressed air. A loose nozzle can whip suddenly and cause serious injury. Never point an air nozzle at anyone. Never use compressed air to blow dirt from your clothes or hair. Never use compressed air to clean the floor or workbench.

Never spin bearings with compressed air. If the bearing is damaged, one of the steel balls or rollers might fly out and cause serious injury.

Finally, pneumatic tools must always be operated at the pressure recommended by the manufacturer.

LIFT SAFETY Always be careful when raising a vehicle on a lift or a hoist. Adapters and hoist plates must be positioned correctly on twin post and rail-type lifts to prevent damage to the underbody of the vehicle. There are specific lift points. These points allow the weight of the vehicle to be evenly supported by the adapters or hoist plates. The correct lift points can be found in the vehicle's service manual. Figure 2-5 shows typical locations for unibody and frame cars. These diagrams are for illustration only. Always follow the manufacturer's instructions. Before operating any lift or hoist, carefully read the operating manual and follow the operating instructions.



WARNING!

Never use a lift or jack to move something heavier than it is designed for. Always check the rating before using a lift or jack. If a jack is rated for 2 tons, do not attempt to use it for a job requiring 5 tons. It is dangerous for you and the vehicle. ■

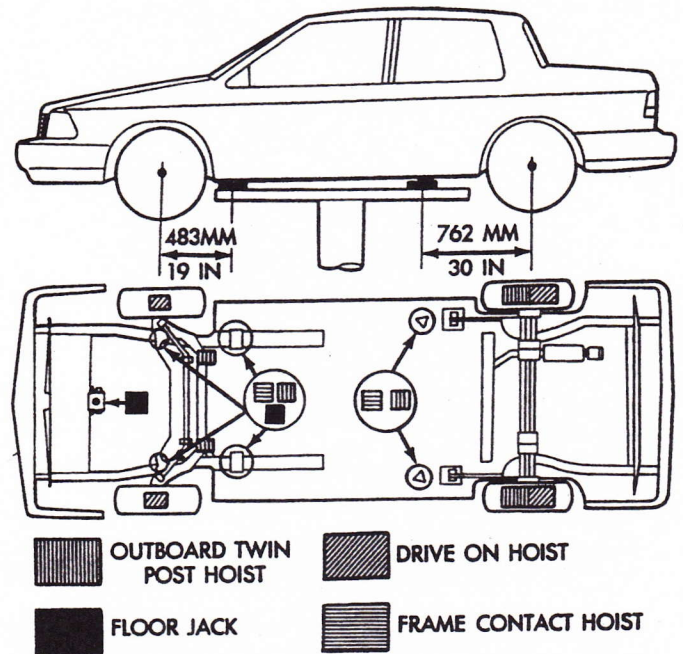


FIGURE 2-5 Hoisting and lifting points for a typical unibody vehicle. Courtesy of Chrysler Corporation

Before driving a vehicle over a lift, position the arms and supports to provide an unobstructed clearance. Do not hit or run over lift arms, adapters, or axle supports. This could damage the lift, vehicle, or tires.

Position the lift supports to contact the vehicle at its lifting points. Raise the lift until the supports contact the vehicle. Then, check the supports to make sure they are in full contact with the vehicle. Raise the lift to the desired working height.

Make sure the vehicle's doors, hood, and trunk are closed before raising the vehicle. Never raise a car with someone inside.



WARNING!

Before working under a car, make sure the lift's locking device is engaged. ■

After lifting a vehicle to the desired height, always lower it onto its mechanical safeties. On some vehicles, the removal (or installation) of components can cause a critical shift of the vehicle's weight, which may cause the vehicle to be unstable on the lift. Refer to the vehicle's service manual for the recommended procedures to prevent this from happening.

Make sure tool trays, stands, and other equipment are removed from under the vehicle. Release the lift's locking devices according to the instructions before attempting to lower the lift.

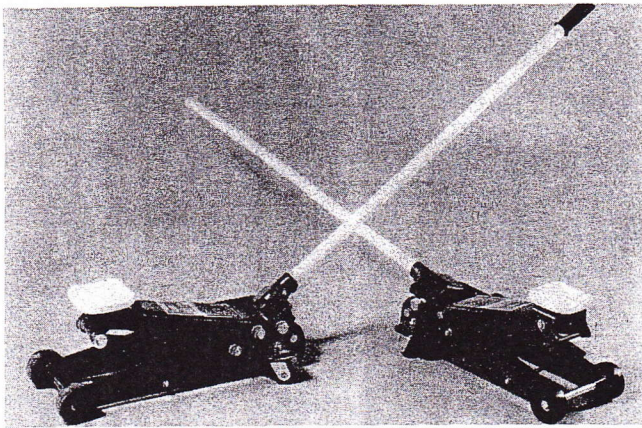


FIGURE 2-6 Typical hydraulic jacks. *Courtesy of Blackhawk Automotive, Inc.*

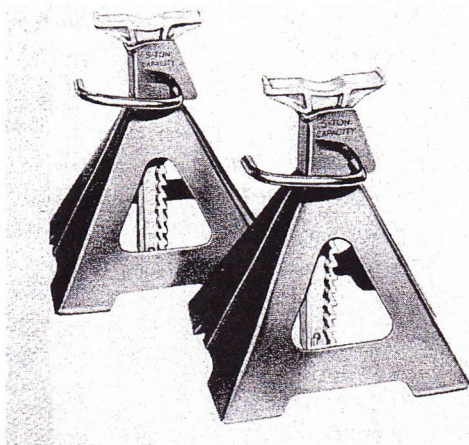


FIGURE 2-7 Jack stands are used in combination with jacks and hoists. *Courtesy of Lincoln, St. Louis*

JACK AND JACK STAND SAFETY An automobile can be raised off the ground by a hydraulic jack (Figure 2-6). **Jack stands**, also called **safety stands** (Figure 2-7), are supports of different heights that sit on the floor. They are placed under a sturdy chassis member, such as the frame or axle housing, to support the vehicle. Like jacks, jack stands also have a capacity rating. Always use the correct rating of jack stand.

The jack should be removed after the jack stands are set in place. This eliminates a hazard, such as a jack handle sticking out into a walkway. A jack handle that is bumped or kicked can cause a tripping accident or cause the vehicle to fall. Never use a jack by itself to support an automobile. Always use a jack stand with the jack as a safety precaution. Make sure the jack stands are properly placed under the vehicle.

CHAIN HOIST AND CRANE SAFETY Heavy parts of the automobile, such as engines, are removed by using chain hoists (Figure 2-8) or cranes. Another term for a chain hoist is chain fall. Cranes often are called cherry pickers.

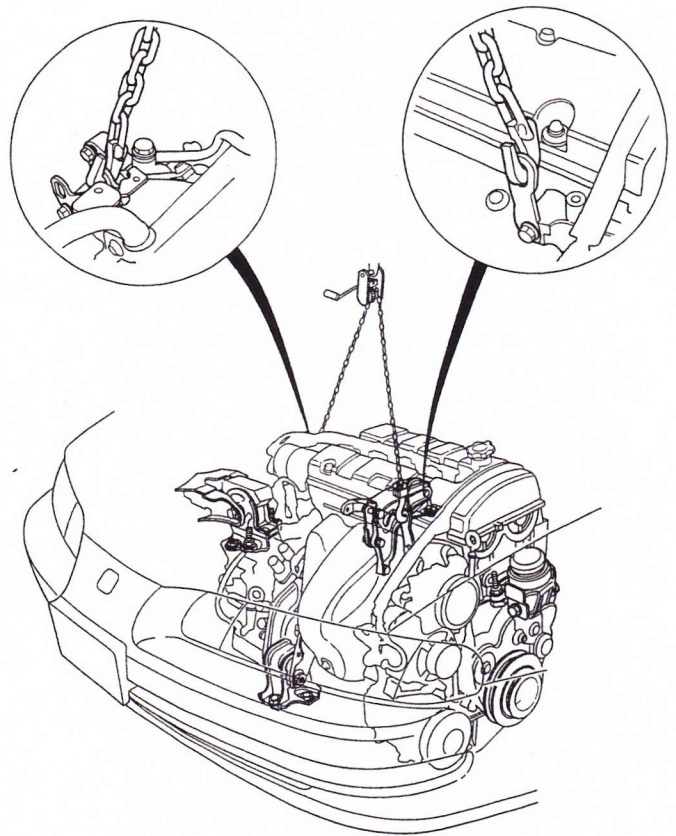


FIGURE 2-8 Using a chain hoist to lift an engine. *Courtesy of American Honda Motor Company, Inc.*

To prevent serious injury, chain hoists and cranes must be properly attached to the parts being lifted. Always use bolts with enough strength to support the object being lifted. After you have attached the lifting chain or cable to the part that is being removed, have your instructor check it. Place the chain hoist or crane directly over the assembly. Then, attach the chain or cable to the hoist.

CLEANING EQUIPMENT SAFETY Parts cleaning is a necessary step in most repair procedures. Cleaning automotive parts can be divided into four basic categories.

Chemical cleaning relies primarily on some type of chemical action to remove dirt, grease, scale, paint, or rust (Figure 2-9). A combination of heat, agitation, mechanical scrubbing, or washing may be used to help remove dirt. Chemical cleaning equipment includes small parts washers, hot/cold tanks, pressure washers, spray washers, and salt baths.

Thermal cleaning relies on heat, which bakes off or oxidizes the dirt (Figure 2-10). Thermal cleaning leaves an ash residue on the surface that must be removed by an additional cleaning process, such as airless shot blasting or spray washing.

Abrasive cleaning relies on physical abrasion to clean the surface. This includes everything from a

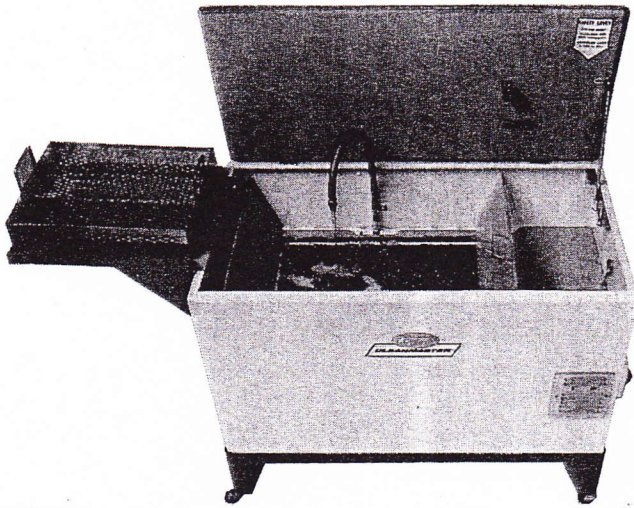


FIGURE 2-9 Automotive parts washer. *Courtesy of Broadhead-Garrett*

wire brush to glass bead blasting, airless steel shot blasting, abrasive tumbling, and vibratory cleaning (Figure 2-11). Chemical in-tank solution sonic cleaning might also be included here because it relies on the scrubbing action of ultrasonic sound waves to loosen surface contaminants.

Steam cleaning uses hot water vapor mixed with chemical cleaning agents to clean dirt from an object (Figure 2-12). After steam cleaning, the object should be thoroughly hosed down with clean water, then air dried.

There are several reasons why steam cleaning has rapidly declined in recent years. Concerns about our environment have led to mandates that a closed loop system must be used for steam cleaning. This means that the runoff from the cleaning process must be collected by and contained within the steam cleaning system. The runoff can not flow into a public sewage system.

Steam cleaning is normally done in an uncluttered portion of the shop or in a separate building. Care

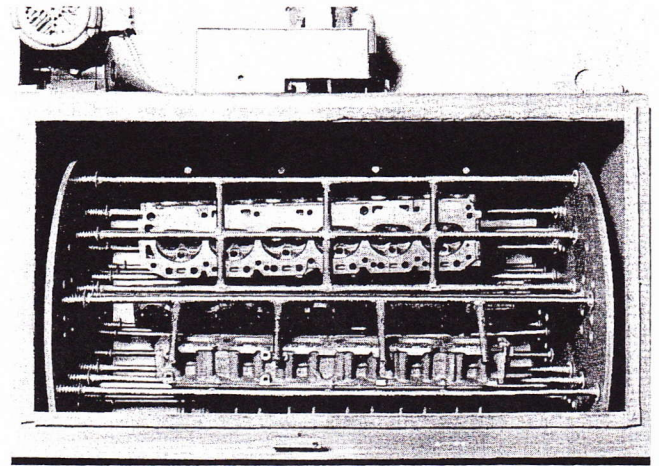


FIGURE 2-11 Heads undergoing abrasive cleaning in a steel shot blaster. *Courtesy of Kansas Instruments, Inc.*



FIGURE 2-12 Open steam cleaning was once a popular means of cleaning engines.

must be taken to protect all painted surfaces and exposed skin from contact with the steam's heat and chemicals. Injury or damage would result. In addition, care must also be taken when working on the slippery floor that this process creates.

Before using a steam cleaning machine, check the electrical cords. Pay special attention to the ground-

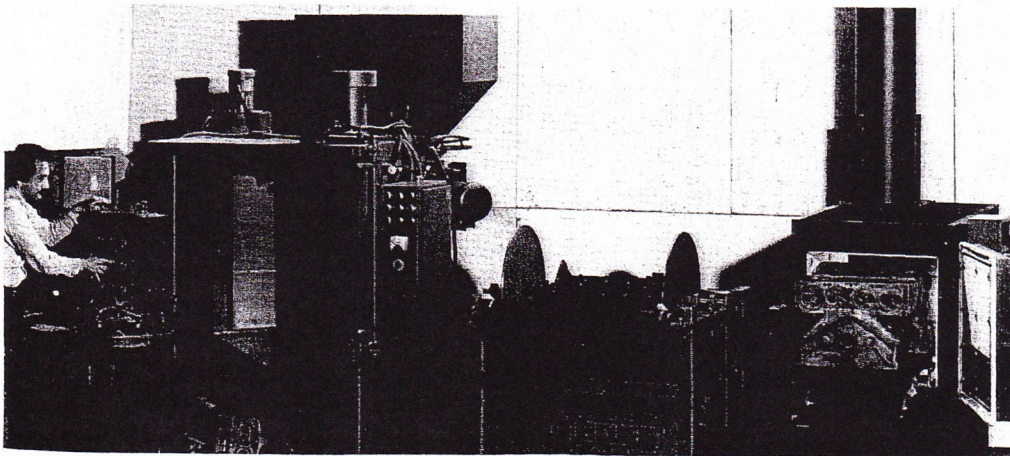


FIGURE 2-10 Complete thermal cleaning system. *Courtesy of Bayco, Inc.*

ing connector at the plug. If the machine is not properly grounded, there is a great possibility of getting an electrical shock.

Finally, steam cleaning takes a lot of time and work. Most shops cannot justify the labor cost for using an open steam cleaning system.

VEHICLE OPERATION When the customer brings a vehicle in for service, certain shop safety guidelines should be followed. For example, when moving a car into the shop, check the brakes before beginning. Then, buckle the safety belt. Drive carefully in and around the shop. Make sure no one is near, the way is clear, and there are no tools or parts under the car before you start the engine.

When road testing the car, obey all traffic laws. Drive only as far as is necessary to check the automobile. Never make excessively quick starts, turn corners too quickly, or drive faster than conditions allow.

If the engine must be running while working on the car, block the wheels to prevent the car from moving. Place the transmission into park for automatic transmissions or in neutral for manual transmissions. Set the emergency brake. Never stand directly in front of or behind a running vehicle.

Run the engine only in a well-ventilated area to avoid the danger of poisonous carbon monoxide (CO) in the engine exhaust. If the shop is equipped with an exhaust ventilation system (Figure 2-13), use it. If not, use a hose to direct the exhaust out of the building.

WORK AREA SAFETY

Your work area should be kept clean and safe. The floor and bench tops should be kept clean, dry, and orderly. Any oil, coolant, or grease on the floor can make it slippery. Slips can result in serious injuries. To clean up oil, use a commercial oil absorbent. Keep all water off the floor. Water is slippery on smooth floors, and electricity flows well through water. Aisles and walkways should be kept clean and wide enough to easily move through. Make sure the work areas around machines are large enough to safely operate the machine.

Proper ventilation of space heaters, used in some shops, is necessary to reduce the CO levels in the shop. Also, proper ventilation is very important in areas where volatile solvents and chemicals are used. A volatile liquid is one that vaporizes very quickly.

Keep an up-to-date list of emergency telephone numbers clearly posted next to the telephone. These numbers should include a doctor, hospital, and fire and police departments. Also, the work area should have a first-aid kit for treating minor injuries and eye-flushing kits readily available.

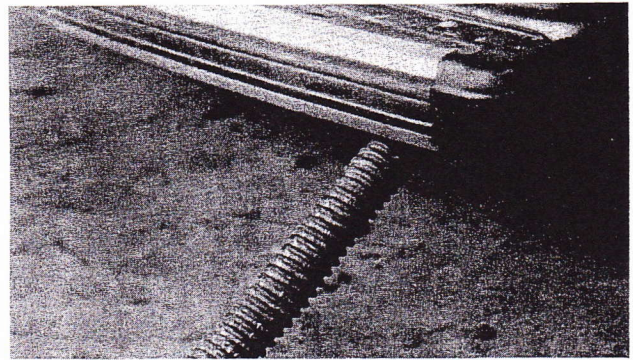


FIGURE 2-13 Removing carbon monoxide.

Gasoline is a highly flammable volatile liquid. Always keep gasoline or diesel fuel in an approved safety can, and never use it to clean your hands or tools. Oily rags should also be stored in an approved metal container. When these oily, greasy, or paint-soaked rags are left lying about or are not stored properly, they can cause spontaneous combustion. Spontaneous combustion results in a fire that starts by itself, without a match.

Make sure all drain covers are snugly in place. Open drains or covers that are not flush to the floor can cause toe, ankle, and leg injuries.

Handle all solvents (or any liquids) with care to avoid spillage. Keep all solvent containers closed, except when pouring. Be extra careful when transferring flammable materials from bulk storage (Figure 2-14). Static electricity can build up enough to create a spark that could cause an explosion. Discard or clean all empty solvent containers. Solvent fumes in the bottom of these containers are very flammable. Never light matches or smoke near flammable solvents and chemicals, including battery acids. Solvent and other combustible materials must be stored in approved and designated storage cabinets or rooms (Figure 2-15). Storage rooms should have adequate ventilation.



FIGURE 2-14 Flammable liquids should be stored in safety-approved containers. *Courtesy of Gutman Advertising Agency*


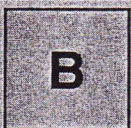




FIGURE 2-15
Store combustible materials in approved safety cabinets. Courtesy of Sherwin-Williams Company

Know where the fire extinguishers are and what types of fires they put out (Table 2-1). A multipurpose dry chemical fire extinguisher will put out ordinary combustibles, flammable liquids, and electrical fires. Never put water on a gasoline fire. The water will just spread the fire. Use a fire extinguisher to smother the flames. Remember, during a fire, never open doors or windows unless it is absolutely necessary; the extra draft will only make the fire worse. A good rule is to call the fire department first and then attempt to extinguish the fire.

To extinguish a fire, stand 6 to 10 feet from the fire. Hold the extinguisher firmly in an upright posi-

TABLE 2-1 GUIDE TO EXTINGUISHER SELECTION

	Class of Fire	Typical Fuel Involved	Type of Extinguisher
Class  Fires (green)	For Ordinary Combustibles Put out a class A fire by lowering its temperature or by coating the burning combustibles.	Wood Paper Cloth Rubber Plastics Rubbish Upholstery	Water ¹ Foam ¹ Multipurpose dry chemical ⁴
Class  Fires (red)	For Flammable Liquids Put out a class B fire by smothering it. Use an extinguisher that gives a blanketing, flame-interrupting effect; cover whole flaming liquid surface.	Gasoline Oil Grease Paint Lighter fluid	Foam ¹ Carbon dioxide ⁵ Halogenated agent ⁶ Standard dry chemical ² Purple K dry chemical ³ Multipurpose dry chemical ⁴
Class  Fires (blue)	For Electrical Equipment Put out a class C fire by shutting off power as quickly as possible and by always using a nonconducting extinguishing agent to prevent electric shock.	Motors Appliances Wiring Fuse boxes Switchboards	Carbon dioxide ⁵ Halogenated agent ⁶ Standard dry chemical ² Purple K dry chemical ³ Multipurpose dry chemical ⁴
Class  Fires (yellow)	For Combustible Metals Put out a class D fire of metal chips, turnings, or shavings by smothering or coating with a specially designed extinguishing agent.	Aluminum Magnesium Potassium Sodium Titanium Zirconium	Dry powder extinguishers and agents only

*Cartridge-operated water, foam, and soda-acid types of extinguishers are no longer manufactured. These extinguishers should be removed from service when they become due for their next hydrostatic pressure test.

Notes:

(1) Freezes in low temperatures unless treated with antifreeze solution, usually weighs over 20 pounds, and is heavier than any other extinguisher mentioned.

(2) Also called ordinary or regular dry chemical. (sodium bicarbonate)

(3) Has the greatest initial fire-stopping power of the extinguishers mentioned for class B fires. Be sure to clean residue immediately after using the extinguisher so sprayed surfaces will not be damaged. (potassium bicarbonate)

(4) The only extinguishers that fight A, B, and C classes of fires. However, they should not be used on fires in liquefied fat or oil of appreciable depth. Be sure to clean residue immediately after using the extinguisher so sprayed surfaces will not be damaged. (ammonium phosphates)

(5) Use with caution in unventilated, confined spaces.

(6) May cause injury to the operator if the extinguishing agent (a gas) or the gases produced when the agent is applied to a fire is inhaled.



FIGURE 2-17 Wear proper safety equipment when handling hazardous waste. *Courtesy of DuPont Company*



WARNING!

When handling any hazardous waste material, be sure to wear the proper safety equipment (Figure 2-17) covered under the right-to-know law. Follow all required procedures correctly. This includes the use of approved respirator equipment. ■

Something is classified as a hazardous waste by the Environmental Protection Agency if it is on the EPA list of known harmful materials or has one or more of the following characteristics.

- ◆ **Ignitability.** If it is a liquid with a flash point below 140°F or a solid that can spontaneously ignite.
- ◆ **Corrosivity.** If it dissolves metals and other materials or burns the skin.
- ◆ **Reactivity.** Any material that reacts violently with water or other materials or releases cyanide gas, hydrogen sulfide gas, or similar gases when exposed to low pH acid solutions. This also includes material that generates toxic mists, fumes, vapors, and flammable gases.
- ◆ **EP toxicity.** Materials that leach one or more of eight heavy metals in concentrations greater than 100 times primary drinking water standard concentrations.

Complete EPA lists of hazardous wastes can be found in the Code of Federal Regulations. It should be noted that no material is considered hazardous waste until the shop is finished using it and ready to dispose of it.



WARNING!

The shop is ultimately responsible for the safe disposal of hazardous wastes, even after the waste leaves the shop. Only licensed waste removal companies should be used to dispose of the waste. Make sure you know what the company is planning to do with the waste. Make sure you have a written contract stating what is supposed to happen with the waste. Leave nothing to chance. In the event of an emergency hazardous waste spill, contact the National Response Center (1-800-424-8802) immediately. Failure to do so can result in a \$10,000 fine, a year in jail, or both. ■

Many shops use full-service haulers to remove hazardous waste from the property (Figure 2-18). Besides hauling the hazardous waste away, the hauler will also take care of all the paperwork, deal with the various government agencies, and advise the shop on how to recover the disposal costs.

Asbestos had been used as a lining for many auto parts. However, it is used very seldom now. This is because asbestos has been identified as a health hazard. When working with asbestos materials, such as brake pads, clutch discs, and some engine gaskets, there are certain guidelines you should follow. All asbestos waste must be disposed of in accordance with OSHA and EPA asbestos regulations. An industrial vacuum equipped with multiple-stage, high-efficiency filters and housing must be used when doing brake work. These machines are used to remove any accumulation of asbestos dust on the brake parts. The dust is collected in a vacuum bag. These bags must be disposed of properly. When you remove one of these vacuum bags, an approved respirator should

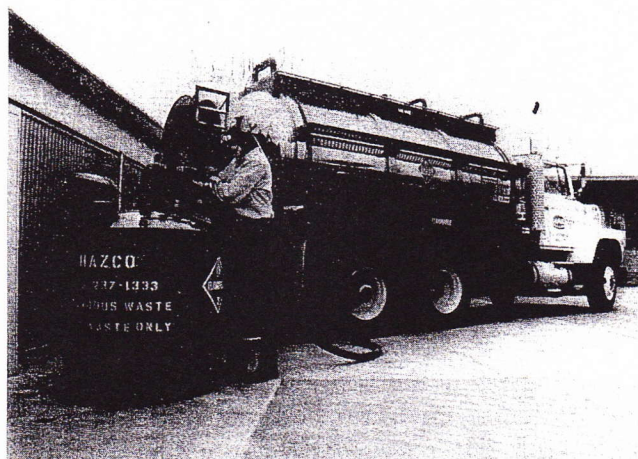


FIGURE 2-18 Many automotive shops hire full-service and certified companies to remove hazardous waste from their area. *Courtesy of DuPont Company*

be worn. Never use compressed air or dry sweeping for cleaning up asbestos dust. Water or another dust suppressant should be applied to the floor if brooms are going to be used to clean it.

To minimize the risks of working around asbestos, follow these simple personal hygiene guidelines.

- ◆ Do not smoke while or after working with the materials.
- ◆ Thoroughly wash yourself before eating.
- ◆ Shower after work.
- ◆ Change into work clothes when you arrive at work, and change from your work clothes after work. Work clothing should not be taken home.

OSHA and the EPA have other strict rules and regulations that help to promote safety in the auto shop. These are described throughout this text whenever they are applicable.

KEY TERMS

Abrasive cleaning
Chemical cleaning
CO
Corrosivity
EP toxicity
Hazardous waste
Ignitability
Jack stands
MSDS

OSHA
Pneumatic tools
Power tools
Reactivity
Right-to-know laws
Safety glasses
Safety stands
Thermal cleaning
WHMIS

SUMMARY

- ◆ Dressing safely for work is very important. This includes snug-fitting clothing, eye and ear protection, protective gloves, strong shoes, and caps to cover long hair.
- ◆ When choosing eye protection, make sure it has safety glass and offers side protection.
- ◆ When shop noise exceeds safe levels, protect your ears by wearing earplugs or earmuffs.
- ◆ Safety while using any tool is a must, particularly power tools. Before plugging in a power tool, make sure the power switch is off. Disconnect the power before servicing the tool.
- ◆ Always observe all relevant safety rules when operating a vehicle lift or hoist. Jacks, jack stands, chain hoists, and cranes can also cause injury if not operated safely.
- ◆ Steam cleaning must be done in an uncongested area. Due to environmental considerations and because it is so labor intensive, its use has declined.
- ◆ Use care whenever it is necessary to remove a vehicle in the shop. Carelessness and playing around can lead to a damaged vehicle and serious injury.

- ◆ Carbon monoxide gas is a poisonous gas present in engine exhaust fumes. It must be properly vented from the shop using tailpipe hoses or other reliable methods.
- ◆ Adequate ventilation is also necessary when working with any volatile solvent or material.
- ◆ Gasoline and diesel fuel are highly flammable and should be kept in approved safety cans. Never light matches near any combustible materials.
- ◆ It is important to know when to use each of the various types of fire extinguishers. When fighting a fire, aim the nozzle at the base and use a side-to-side sweeping motion.
- ◆ Right-to-know laws began in 1983 and are designed to protect employees who must handle hazardous materials and wastes on the job. The EPA lists many materials as hazardous, provided they have one or more of the following characteristics: ignitability, corrosivity, reactivity, and EP toxicity.
- ◆ Material safety data sheets contain important chemical information and must be furnished to all employees annually. New employees should be given the sheets as part of their job orientation.
- ◆ All asbestos waste should be disposed of according to OSHA and EPA regulations.



REVIEW QUESTIONS

1. At what point is a material considered hazardous?
2. Where in the shop should a list of emergency telephone numbers be posted?
3. When should eye protection be worn?
4. How should a class B fire be extinguished?
5. Where can complete EPA lists of hazardous wastes be found?
6. Safety glasses should have _____.
 - a. side protection
 - b. shatterproof lenses
 - c. comfortable fit
 - d. all of the above
7. Gasoline is _____.
 - a. highly volatile
 - b. highly flammable
 - c. dangerous especially in vapor form
 - d. all of the above
8. Technician A says it is recommended that you wear shoes with nonslip soles in the shop. Technician B says steel-toed shoes offer the best foot protection. Who is correct?
 - a. Technician A
 - b. Technician B
 - c. Both A and B
 - d. Neither A nor B

