



## Shop Safety<sup>1</sup>

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Time, the proper tools and know-how are essential for safe servicing of tractors and farm equipment.

The safe equipment operator also maintains a hazard-free shop, uses service tools and equipment safely and guards against potential hazards. An efficient, hazard-free shop results from careful planning. Potential hazards can be recognized and eliminated or kept to a minimum when a shop is planned.

To determine size and arrangement of a shop, make a list of jobs and activities to be done in the shop and include the size of equipment you will work on in the facility.

### LOCATION

Locate the shop in a place accessible for farm service work and convenient for storing spare parts, tools and supplies. Provide adequate drainage to keep the shop floor dry at all times. Allow adequate space around the building and include a service door large enough for equipment to be maneuvered easily and safely. Provide a concrete apron outside for cleaning equipment and for welding that gives a solid foundation for hydraulic jacks and support stands.

### LIGHTING

Lighting is extremely important. Provide enough windows, skylights or overhead lights to insure good general lighting. Place additional lights over benches, stationary power tools and main work areas.

### HEAT SOURCE

Before selecting and installing heat units for work in cold weather, obtain the services of a heat specialist. His experience will help you obtain the most economical source of heat and insure a safe installation. If building a new structure, you may consider building solar collectors in the roof or walls and, perhaps, storing heat from solar energy. Consider retrofit collectors when adapting a machine shed or other building for a shop. During the winter months solar energy can be collected about 70 percent of the time.

### VENTILATION

Include enough doors and windows to vent smoke, fumes and vapors. Ideally, the total window area should equal about 25 percent of the floor area. During cold weather, use flexible metal tubing or pipe to carry engine exhaust fumes outside. Exhaust fans can be used to clear smoke and vapors from welding, cleaning and painting areas. Hoods equipped with exhaust fans usually are the most efficient.

### WIRING

The wiring system should meet five requirements:

1. Adequate capacity to handle lighting, heating and power tool requirements
2. Sufficient number of conveniently located outlets
3. Three-wire grounding system for 120-volt circuits
4. A 240-volt circuit for welding and motors of more than one-half horsepower

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## 5. Provisions for expansion to meet future needs

A shop planned to be as hazard-free as possible should be equipped to handle emergency situations such as fire and personal injury. To prevent personal injuries, keep all tools and service equipment in good condition. Use personal protective equipment, such as goggles, face shields and gloves. Keep guards and other safety devices on power tools in place and functioning. Have a firstaid kit handy.

## FIRE EXTINGUISHERS

Fire extinguishers should be checked annually. Replenish if the seal has been broken or if partially used. The dry chemical in a partially used extinguisher will cause the gas to leak away. If needed later, the fire extinguisher probably would not have pressure.

Shop fires can be any, or all, of three fire classes: Class A, ordinary combustibles; Class B, combustible liquids; and Class C, fires in live electrical equipment. To eliminate the need for extinguishers for all three classes, install at least one 20-pound ABC Class extinguisher in a convenient location, and possibly more, depending on the size of the shop.

## TOOLS AND EQUIPMENT USE

Don't take the use of handtools and service for granted. You're more likely to be injured when servicing equipment than when operating it. Power tools can inflict sudden, severe injury. Even small handtools can cause serious damage.

To follow all the rules necessary to insure farmshop safety requires more information than can be included in this MontGuide. Several publications on handtool and power tool safety are available from bookstores and libraries that describe the proper use and care of handtools. Study them and follow their recommendations.

The following principles for personal safety relate to handtools that are used most frequently for service work:

**Chisels and Punches.** Wear eye protection when hammering on chisels and punches or on metal objects. The hardened face of a hammer, or the end of a tool, may chip or shatter to send metal fragments flying. Grind off the "mushroomed" heads. Keep a smooth bevel on the heads of all punches and chisels. Hold the tool steadily but loosely. The best place to hold it is just below the head. If you miss and strike your hand, it is

much less likely to be caught between the hammer and the object being worked on.

**Files.** A file without a handle can be extremely dangerous. Keep a handle on every file to prevent the tang from piercing the palm or wrist if the file should slip or catch.

**Wrenches.** Wrenches are the cause of many cut and skinned knuckles. When possible, use the open palm of your hand to push on the wrench. When this is not possible, pull the wrench toward you. This may prevent the wrench from slipping to cut or skin your knuckles. Make sure that the wrench is the proper size for the bolt or nut. When using adjustable wrenches, keep the open jaw of the adjustable wrench facing toward you. This forces the movable jaw onto the nut to reduce its tendency to slip. It also prevents damage to the wrench.

**Hammers.** Keep your hammers in good repair. Check the fit and condition of the handles. Keep handles tightly, wedged into the heads to prevent injury to yourself and others nearby. Replace cracked or splintered handles. Select the right size for the job. A light hammer bounces off the work. One that's too heavy is hard to control.

**Power Tools.** Use power tools to get a job done quickly. But, take the necessary precautions to get it done safely. Read the power tool manual and observe all the precautions. Understand the equipment before you attempt to use it. Keep guards and shields in place. Keep the work area clean. Give the job your full attention. Let each tool work at its own speed without forcing it. Wear eye protection when recommended. Before making adjustments or changing bits or cutters, disconnect the power cord to avoid accidentally touching the switch and possible injury when the tool starts. Use power tools only, for their intended functions.

**Electric Shock.** There are three ways to prevent electric shock. Use three-conductor, grounding-type circuits and tools equipped with double insulation. Install ground-fault interrupters.

Three-conductor, ground-type circuits are of 120-volt circuits that use three conductors. The third one, called a grounding conductor, is connected to the grounded neutral in the service entrance box. In the event of a short circuit, this equipment will shunt the shorted electrical current to the ground.

The two-wire, 120-volt circuits do not provide shock protection from defective or inadequate insulation. Therefore, if leakage from an insulated conductor occurs, the grounding conductor is necessary to carry current directly and safely to ground.

Tools equipped with double insulation can be safely used on two-conductor circuits. These tools can be identified by, the words "double insulation" marked permanently on the tool housing or nameplate. Because many shops are not equipped with three-conductor grounding circuits, manufacturers of double-insulated tools equip their tools with two layers of insulation. If one layer becomes defective, the second layer provides the necessary protection from shock.

A ground-fault interrupter is a device that compares the amount of current flowing to a power tool through the ungrounded conductor with the amount returning to the grounded neutral. If the ground fault interrupter senses a difference as low as .005 amperes, the ground fault interrupter snaps off the current by opening the circuit to protect the operator from shock.

Always use a portable ground-fault interrupter when using power tools that are not insulated or if your circuits are not of the three-wire grounding type.

**Grinders.** There are three common hazards associated with grinders: if a grinding wheel shatters at high speed, pieces could fly into your face; if your hands touch the wheel you will lose skin and flesh; if the work piece gets very hot, your fingers could be burned.

To reduce these hazards, check for a defective wheel before installing a new one. Support the grinding wheel on your finger in an arbor hole and tap it gently with a light metal object. A clear ring indicates a sound wheel. No ring indicates a defective wheel and it should not be used. Use compression washers and phalanges on each side of the wheel. Make sure the hole in the wheel is of the same size as the arbor of the grinder.

Grinding wheels are designed for certain speeds. Make sure that when you buy a grinder wheel that it will match the speed of your grinding. When starting a grinder, stand to one side of the wheel and turn on the switch. Let it run for a minute before you do any grinding. Then grind gradually with a light pressure until the wheel warms up. Cold can cause a wheel to shatter.

Grind only on the face-not on the sides-of the wheel. Side pressure may break a wheel that is not specifically designed for side-pressure grinding.

**Portable Grinders.** Portable grinders and brushes are difficult to handle because of their size and weight. Extra care is needed to avoid injury and to protect the grinding wheel and brushes from damage. When using a portable grinder, hold it firmly with both hands. When finished, make sure that the grinder has completely stopped turning before you lay it down.

**Storage.** Develop a system of racks, bins and tool panels to make it easy to find the right tool or materials quickly. Don't store tools, supplies or spare parts in the aisle or on the floor where they become tripping hazards. Keep other flammable materials away from heaters and welding areas to prevent fire. Grease, oil, paint and solvents should be stored in a closed metal container, preferably in metal cabinets. Gasoline or other fuels should never be stored inside a shop. Supplies and equipment should be stored in an area designed specifically for them.