

Chapter 8.3

Shop safety

This could be you . . .

A woodshop worker was cut by a band saw that was left running without supervision.

A paint shop worker felt dizzy while spray painting with poor ventilation.

1. Applicability of this chapter

You are required to follow this chapter if you work with general shop equipment in machine shops, model shops, woodworking shops, paint shops, sheet metal shops, and electronics fabrication shops and other areas where shop equipment may be used.

2. What this chapter covers

This chapter tells you the safe procedures to use when working with shop equipment, spray-painting equipment, and compressed-air equipment.

Requirements for working in machine shops

3. Machine safeguards to be aware of when using shop equipment

You shall make sure that the appropriate machine safeguards are properly in place and secured before operating power tools and follow these requirements (subparagraphs d–f provide options for safeguarding equipment):

- a. Never remove or disable machine safeguards or other safety devices while the equipment is in operation.
- b. Use the lockout/tagout practices in Chapter 8.2, “Lockout/tagout practices,” of this handbook when removing guards, except for minor adjustments and setup.
- c. Use the “buddy system” when working in a machine shop – it is best to have two people in the shop whenever work is being done.
- d. Use guards such as:
 1. Fixed
 2. Interlocked
 3. Adjustable
 4. Self-adjusting
- e. Use safeguarding devices such as:

Part 8, Safety and health practices for manufacturing, repair, and maintenance

1. Presence-sensing devices
 2. Pullbacks
 3. Restraints
 4. Safety trip controls
 5. Two-hand controls
 6. Two-hand trips
 7. Gates
- f. Safeguard machines by analyzing:
1. Best location for safe operation
 2. Distance traveled by the operator
 3. Part feeding and ejection requirements

4. Safety practices to follow when using grinding wheels

To use grinding wheels, you shall follow these requirements and those in OSHA 29 CFR 1910.215, "Abrasive Wheel Machinery:"

- a. Keep grinding wheel guards in place and well adjusted at all times. Only that portion of the grinding wheel used for grinding may be left unguarded.
- b. Secure grinding wheels to spindles by flange nuts, and firmly affix all mountings to the tool.
- c. Never operate a grinder without the wheel guards in place.
- d. Maintain a maximum of one-eighth-inch clearance for a *tool rest* from the abrasive wheel.
- e. Maintain a maximum of one-fourth-inch clearance for a *tongue guard* from the abrasive wheel.
- f. Mount abrasive wheels between flanges (with blotters) whose diameter is not less than one-third the diameter of the wheel, except those that contain a mounting device as an integral part of the assembly.
- g. Visually inspect the wheels before mounting them; look for defects and other deformities that would make the wheels unsafe for use.
- h. Never operate grinding wheels at speeds in excess of the manufacturer's safe maximum speed rating.
- i. Care for, use, and protect abrasive wheels for portable power tools in accordance with OSHA 29 CFR 1910.243, "Guarding of Portable Powered Tools."
- j. Keep combustible or flammable materials away from grinding wheels to prevent ignition from sparks.

5. When to anchor shop equipment

You shall securely anchor machines made for a fixed location. For example:

- a. Pedestal grinders and buffers
- b. Band saws
- c. Drill presses
- d. Mills
- e. Lathes
- f. Power cutters
- g. Tabletop and floor-mounted equipment
- h. Other similar equipment

6. Safety practices for doing maintenance work

You shall follow these requirements during maintenance work:

- a. Never repair machinery while it is in operation or while it has power applied.
- b. Always follow the LO/TO practices in Chapter 8.2, “Lockout/tagout practices,” of this handbook before any maintenance work starts.
- c. Don’t clean or lubricate machinery while in operation unless it has a remote oil receiver.

7. How to clean shop equipment

When at all possible, you shall use brushes or vacuum equipment to remove chips, burrs, and metal particles from machines. Don’t use your hands to remove debris from the equipment. You may use shop air to clean equipment and work surfaces only when these conditions are met:

- a. Air pressure at the nozzle is less than 30 psi.
- b. Protective guarding is in place for the operator and bystanders; to prevent injuries from projectiles and hazardous chemicals.
- c. You use appropriate PPE to include gloves and goggles.
- d. Bystanders use PPE or leave the danger area.

8. When to release energy sources in equipment

To prevent injury from the sudden release of energy, you shall:

- a. Release the energy that is built up in equipment when you are through working with the equipment. Typical energy sources are:

Part 8, Safety and health practices for manufacturing, repair, and maintenance

1. Hydraulic pressure
2. Pneumatic pressure (compressed air)
3. Spring energy
4. Potential energy in suspended parts of the machine
5. Mechanical movement that you don't expect

Note: This could occur during preparation to start up the machine, when hydraulic or pneumatic pressure is applied. Training and experience are the only safeguards.

- b. Always follow lockout/tagout practices and test to see whether there is any energy in the equipment before you start any maintenance work. See Chapter 8.2, "Lockout/tagout practices," of this handbook.

9. Securing your work

You shall secure work with jigs, clamps, or other devices made to secure work.

10. Safely adjusting machines

To safely adjust machines, you shall:

- a. Remove and properly stow chuck keys and wrenches before starting the machine. Spring-loaded chuck keys are commercially available for lathes and are recommended.
- b. Never attempt to make adjustments using these devices while the machinery is in motion or when the power source is on.

11. Supervising operating machinery

You shall always supervise operating machinery. Never leave machinery running while unattended. Computer numerical control (CNC) machinery that has enclosure guards with integrated safety locks may be left alone with minimal supervision.

12. Controlling combustible dusts or ignitable fibers or flyings

You shall follow these requirements:

- a. Make sure that machines producing combustible dusts, ignitable fibers, or flyings have exhaust hoods and an exhaust system that is effectively operating.
- b. This system shall prevent the accumulation of combustible dusts or ignitable fibers or flyings in the exhaust ducts.
- c. Electrical equipment shall meet National Fire Protection Association Standard 70, "National Electric Code," for area hazardous classification.

Requirements for using paint spray booths

13. Safely caring for paint-spraying equipment and paint containers

To prevent flammable or toxic vapors you shall:

- a. Tightly seal the lids on all paint, thinner, and solvent containers except when transferring the liquid from one container to another.
- b. Ground the dispensing container and bond the receiving container when dispensing flammable or combustible liquids from one metal container to another container. This will prevent sparks of static electricity from discharging that could ignite the vapors.
- c. Release the air pressure from spray paint pots before removing lids. Securely fasten the lids before pressurizing the containers.

14. Caring for exhaust duct filters

To care for filters you shall:

- a. Clean or change exhaust duct filters frequently to ensure proper airflow (normally an open-face velocity of 100 linear feet-per-minute). Determine the proper airflow by using flow manometers – either handheld or mounted on the booth.
- b. Remove the used filters to a safe place and properly dispose of them as hazardous waste.

15. Safely using cleaning solvents

If you use solvents with a flash point less than 100°F for cleaning or thinning, you shall use them in a paint spray booth. You may use solvents with a flash point of 100°F or greater outside of a paint spray booth. You can find the flash point on the MSDS.

16. Storing painter's clothing

Store painter's clothing in a clothing storage locker or container designed to store painter's clothing. Clothing that you store for future use shall be in good condition and reasonably free of undried paints or solvents (other than water). Dispose of wet or torn clothing in appropriate waste containers.

17. Smoking in a paint shop

You shall never smoke in a paint shop. **Note:** *NO SMOKING* signs must be visible in all spray-painting buildings or rooms and on the doors of paint storage rooms and cabinets.

18. Safety precautions for using spray booths

You shall conduct spray painting in a booth enclosure, if at all possible, and observe the following requirements:

- a. Follow Chapter 9.1, “Hazardous materials safety and health,” and Chapter 9.2, “Hazard communication,” of this handbook.
- b. Follow National Fire Protection Association Standard 33, National Fire Protection Association Standard 91, OSHA 29 CFR 1910.107, and the ACGIH “Industrial Ventilation Manual of Recommended Practices.”
- c. Turn on ventilation equipment before starting operations.
- d. Leave the ventilation equipment on for a sufficient length of time after operations are complete to prevent buildup of explosive mixtures in the booth and vent stack.
- e. Never point spray guns at other personnel.
- f. Always spray paint in the direction of air flow to minimize the buildup of harmful mists in the booth.
- g. Never allow your body to come between the ventilation exhaust and your work.
- h. Never use the same spray booth for different types of coating materials if their combination may cause spontaneous combustion.
- i. Never store more than one day’s worth of volatile (flammable) liquids in spraying rooms.
- j. Remove empty containers from spraying rooms immediately.
- k. Only use proper electrical equipment made for flammable atmospheres in spraying rooms or booths when working in hazardous locations as found in the National Fire Protection Association Standard 70, “National Electric Code,” Article 500, “Hazardous Locations.”

19. Storing paints and chemicals

You shall follow these requirements:

- a. Limit the amount of combustible paint you have outside of an approved paint storage room or cabinet to what you would anticipate using in 1 day or to 25 gallons, whichever is less.
- b. Never store more than 60 gallons of combustible paint in a paint storage cabinet. Always check the maximum capacity for the storage cabinet that you are using and never exceed its maximum rating.
- c. Never have more than two such paint storage cabinets in any paint shop.
- d. Locate paint storage cabinets at least 5 feet from doorways.
- e. Store chemicals in proper locations as required by JSC regulations and the manufacturer’s recommendations.

20. Where to locate fire extinguishers

You shall keep a suitable fire extinguisher near each door of each paint shop and keep clear access to the extinguisher.

21. Safety valves on compressed air equipment

You shall install a pressure-reducing valve on the air line between the compressor and the container on all spraying equipment and follow these requirements:

- a. Install an additional safety relief valve and pressure gauge between the reducing valve and the paint container.
- b. Set the safety relief valve for a safe maximum pressure.
- c. Check the relief valve setting annually.

22. Safe housekeeping practices

You shall follow these requirements:

- a. Keep all spraying areas clean and as free from deposits of combustible residues as practical. If necessary, you shall clean daily.
- b. Avoid the accumulation of paint residue on all safety devices. You shall protect sprinkler heads from paint residue with thin paper sacks loosely fitted and tied over them.
- c. Keep both clean and dirty rags, paper, paint, and other waste materials in covered metal cans. You shall:
 1. Label the cans to identify the contents of each container.
 2. Deposit rags with paint, thinner, or other flammable substances on them in the dirty rag container immediately after use.
 3. Dispose of the contents of the dirty rag container at the end of each shift, or more frequently if necessary.
- c. Use only an approved (UL and FM) metal container.

23. Protecting against static charges

You shall effectively ground or bond all metal- and fabric-covered objects that may produce static charges before spray painting and meet the following:

- a. The grounding or bonding shall be a metal-to-metal contact to be effective.
- b. Do continuity checks periodically on the bonding or grounding clamps and wire to make sure that they remain effective.

24. Controlling vapors

You shall dry painted or lacquered objects under conditions that minimize all risk of fire, explosion, and occupational illness. Evacuate, condense, or destroy vapors from drying objects. If you evacuate the vapors to an outside area, make sure no ignition sources are nearby.

Other requirements

25. Safety practices for using portable compressed air equipment

You shall use pressure vessels, regulators, valves, etc., that meet the American Society of Mechanical Engineers codes and standards and OSHA requirements and:

- a. Guard air hoses laid across aisles, floors, or doorways with a bridge or floor molding or by suspending them overhead.
- b. Visually inspect all equipment before use. Test pressure regulators, safety relief valves, and pressure vessels as described in JPR 1710.13, "Design, Inspection, and Certification of Pressure Vessels and Pressurized Systems" (current version). Tag damaged hoses "*Do Not Use*" and remove them from service.
- c. Use only manufacturer's approved connectors and hose attachments to ensure long life and reduce hose damage.
- d. *Never direct a jet of air at another person.* Never clean personal clothing with compressed air at any time. Never lock open air supply control valves at any time; they shall always be free for immediate hand control.
- e. Have enough personnel to safely operate large, heavy-duty compressed air tools.
- f. Turn air off at the base control valves and release pressure before changing or disconnecting any pneumatic tool. You shall:
 1. Turn off the main operating valves of the pneumatic tools before connecting compressed air supply lines to the tools.
 2. Connect safety chains to tool housings or between hose connectors on those tools using a one-half-inch or larger hose.
 3. Secure pneumatic power hand tools to the hose by some positive means to prevent accidental disconnect.
- g. Make sure that nearby personnel and passersby are clear of potential hazards before you start using compressed air equipment.
- h. Never operate air compressors at speeds greater than the manufacturer's recommendation. Do not allow the equipment to overheat. Install safety clips or retainers on pneumatic impact tools. Regulate shop air used for cleaning or drying purposes to 30 psi or less.
- i. Spray air only through air nozzles that contain a protective screen, and regulate the air to pressures no greater than 30 psi gauge.

26. Required safety analyses for operating shop equipment

You shall do a Job Hazard Analysis for all new and existing shop equipment. See Chapter 2.4, “Hazard analysis,” of this handbook for guidance and risk acceptance. Review and update all Job Hazard Analyses annually.

27. Training for operating shop equipment

You shall have the proper training and authorization specific to each piece of equipment to operate shop equipment. You may supervise other employees who don’t have the proper training or authority if you have the proper training and authorization. Be familiar with the Job Hazard Analysis for each machine you use. See Chapter 4.1, “Program description” (for safety and health training), of this handbook for more requirements on training.

28. Personal protective equipment

See Chapter 5.6, “Personal protective equipment,” of this handbook for more requirements on PPE. You shall:

- a. Wear face shields and goggles or safety glasses with side shields, when operating shop equipment. Your eye protection shall meet ANSI-Z87.1.
- b. Wear close-fitting apparel and avoid wearing loose clothing and jewelry.
- c. Qualify under your respiratory protection program if you must wear any type of respiratory protection. See Chapter 7.2, “Respiratory protection,” for information.

29. Other standards

In addition to the requirements of this section, you shall follow the applicable woodworking and machine shop standards of OSHA:

- a. 29 CFR 1910.211, “Definitions”
- b. 29 CFR 1910.212, “General Requirements for All Machines”
- c. 29 CFR 1910.213, “Woodworking Machinery Requirements”
- d. 29 CFR 1910.215, “Abrasive Wheel Machinery”
- e. 29 CFR 1910.217, “Mechanical Power Presses”
- f. 29 CFR 1910.219, “Mechanical Power Transmission Apparatus”
- g. 29 CFR 1910.107, “Spray Finishing Using Flammable and Combustible Materials”