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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.

8.3.1 Applicability of this chapter

You are required to follow this chapter if you work with 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.

8.3.2 What this chapter covers

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

8.3.3 Machine safeguards to be aware of when using shop equipment

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

- a. Provide point of operation guarding and anchor fixed machinery as described in 29 CFR 1910.212.
- b. Never remove or disable machine safeguards or other safety devices while the equipment is in operation.
- c. Use the lockout/tagout practices in Chapter 8.2, “Lockout/Tagout Practices,” when removing guards, except for minor adjustments and setup.
- d. 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.
- e. Use guards such as:
 - (1) Fixed.
 - (2) Interlocked.
 - (3) Adjustable.
 - (4) Self-adjusting.
- f. Use safeguarding devices such as:
 - (1) Presence-sensing devices.
 - (2) Pullbacks.
 - (3) Restraints.

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(4) Safety trip controls.

(5) Two-hand controls.

(6) Two-hand trips.

(7) Gates.

g. Safeguard machines by analyzing:

(1) Best location for safe operation.

(2) Distance traveled by the operator.

(3) Part feeding and ejection requirements.

8.3.4 Safety practices to follow when using grinding wheels

8.3.4.1 Emplouyees using grinding wheels 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. Mount abrasive wheels and maintain clearances as described by 29 CFR 1910.215.
- e. Never operate grinding wheels at speeds in excess of the manufacturer's safe maximum speed rating.
- f. Care for, use, and protect abrasive wheels for portable power tools per OSHA 29 CFR 1910.243, "Guarding of Portable Powered Tools."
- g. Keep combustible or flammable materials away from grinding wheels to prevent ignition from sparks.

8.3.5 Safety practices for doing maintenance work

8.3.5.1 Employees who maintain shop equipment shall:

- 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," before any maintenance work starts.
- c. Never clean or lubricate machinery while in operation unless it has a remote oil receiver.

8.3.6 How to clean shop equipment

8.3.6.1 When at all possible, employees shall use brushes or vacuum equipment to remove chips, burrs, and metal particles from machines. Never use hands to remove debris from the equipment. Using shop air to clean equipment and work surfaces is allowed only when these conditions are met:

- a. Air pressure at the nozzle is less than 30 psi.

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- b. Protective guarding is in place for the operator and bystanders to prevent injuries from projectiles and hazardous chemicals.
- c. Employees use appropriate PPE to include gloves and goggles.
- d. Bystanders use PPE or leave the danger area.

8.3.7 When to release energy sources in equipment

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

- a. Release built up energy in equipment when finished working with the equipment. Typical energy sources are:
 - (1) Hydraulic pressure.
 - (2) Pneumatic pressure (compressed air).
 - (3) Spring energy.
 - (4) Potential energy in suspended parts of the machine.

NOTE: Unexpected mechanical movement from stored energy could occur during preparation to start up the machine, when hydraulic or pneumatic pressure is applied. Dilligence in releasing stored energy will prevent injuries.

- b. Always follow lockout/tagout practices and test to see whether there is any energy in the equipment before starting any maintenance work. See Chapter 8.2, "Lockout/Tagout Practices."

8.3.8 Securing your work

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

8.3.9 Safely adjusting machines

8.3.9.1 To safely adjust machines, employees 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.

8.3.10 ATTENDING operating machinery

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

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8.3.11 Controlling combustible dusts or ignitable fibers or flyings

8.3.11.1 Employees shall follow these requirements:

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

8.3.12 Safely caring for paint-spraying equipment and paint containers

8.3.12.1 To prevent flammable or toxic vapors employees 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 static electricity from discharging and igniting the vapors.
- c. Release the air pressure from spray paint pots before removing lids. Securely fasten the lids before pressurizing the containers.

8.3.13 Caring for exhaust duct filters

8.3.13.1 Employees shall care for filters as follows:

- a. Clean or change exhaust duct filters frequently to ensure proper airflow (normally an open-face velocity of 100 linear feet-per-minute). Determine airflow by using flow manometers – either handheld or mounted on the booth.
- b. Remove used filters to a safe place and properly dispose of them as hazardous waste, as referenced in JPR 8550.1A, Chapter 3.0.

8.3.14 Safely using cleaning solvents

Employees shall use solvents with a flash point less than 100°F for cleaning or thinning only in a paint spray booth. Solvents with a flash point of 100°F or greater may be used outside of a paint spray booth. (You can find the flash point on the Safety Data Sheet.)

8.3.15 Storing painter's clothing

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

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8.3.16 Smoking in a paint shop

Smoking is prohibited 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.

8.3.17 Safety precautions for using spray booths

8.3.17.1 Painters 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."
- b. Follow NFPA 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 NFPA 70, "National Electric Code," Article 500, "Hazardous Locations."

8.3.18 Storing paints and chemicals

8.3.18.1 Employees shall follow these requirements:

- a. Limit the amount of combustible paint 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 being used 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 requirements(Chapters 5.1, 9.1, and 9.2, as well as organizational requirements) and the manufacturer's recommendations.

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8.3.19 Where to locate fire extinguishers

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

8.3.20 Safety valves on compressed air equipment

8.3.20.1 Compressed air equipment shall have:

- a. A pressure-reducing valve on the air line between the compressor and the container on all spraying equipment.
- b. An additional safety relief valve and pressure gauge between the reducing valve and the paint container.
- c. The safety relief valve set for a safe maximum pressure.
- d. The relief valve setting checked annually.

8.3.21 Safe housekeeping practices

8.3.21.1 Employees shall follow these requirements:

- a. Keep all spraying areas clean and as free from deposits of combustible residues as practical. Clean daily if necessary.
- b. Avoid the accumulation of paint residue on all safety devices. 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 as follows:
 - (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.
- d. Use only an approved (UL and FM) metal container.

8.3.22 Protecting against static charges

8.3.22.1 Painters 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 they remain effective.

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8.3.23 Controlling vapors

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

8.3.24 Safety practices for using portable compressed air equipment

8.3.24.1 Portable compressed air equipment shall meet the American Society of Mechanical Engineers codes and standards and OSHA requirements. Employees using this equipment shall:

- 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 as follows:
 - (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 nearby personnel and passersby are clear of potential hazards before 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 with a protective screen, and regulate the air to pressures no greater than 30 psi gauge.

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8.3.25 Required safety analyses for operating shop equipment

Employees shall do a Job Hazard Analysis for all new and existing shop equipment. See Chapter 2.3, "Hazard Analysis," for guidance and risk acceptance. Review and update all Job Hazard Analyses annually.

8.3.26 Training for operating shop equipment

Employees shall have the proper training and authorization specific to each piece of equipment to operate shop equipment. Properly trained and authorized employees may supervise other employees who don't have the proper training or authority. Be familiar with the Job Hazard Analysis for each machine you use. See Chapter 4.1, "Safety and Health Training," for more requirements on training.

8.3.27 Personal protective equipment

8.3.27.1 See Chapter 5.6, "Personal Protective Equipment," for more requirements on PPE. You shall:

- a. Wear face shields and goggles or safety glasses with side shields when operating shop equipment. Eye protection must meet ANSI/ISEA Z87.1.
- b. Wear close-fitting apparel and avoid wearing loose clothing, hair, and jewelry.
- c. Qualify under a respiratory protection program if any type of respiratory protection is required. See Chapter 7.2, "Respiratory Protection," for information.

8.3.28 Other standards

8.3.28.1 In addition to the requirements of this section, employees 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"