

PPPL	PRINCETON PLASMA PHYSICS LABORATORY ES&H DIRECTIVES		
	ES&HD 5008 SECTION 9, CHAPTER 6 Machine Guarding		
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CHAPTER 6 MACHINE GUARDING

6.1 INTRODUCTION

This chapter focuses on practices associated with design, modification, maintenance, and operation of guarded equipment.

6.2 SCOPE

This chapter pertains to any Laboratory employees engaged in the procurement, installation, use, or repair of machinery.

6.3 DEFINITIONS

ANSI - American National Standards Institute is a voluntary membership organization that develops consensus standards nationally for a wide variety of devices and procedures.

6.4 RESPONSIBILITIES

6.4.1 Department or Division Heads are responsible for ensuring implementation of this chapter.

6.4.2 Supervisors are responsible for:

- A. Ensuring that employees comply with this chapter
- B. Ensuring that employees do not use improperly guarded machinery.
- C. Providing training, **with the assistance of Industrial Hygiene (IH) and Human Resources & Training if necessary**, covering the following:
 1. Identifying hazards associated with particular machines.
 2. Explaining how safeguards provide protection for the hazards they are designed to protect against and any limitations that guards may have.
 3. How to use safeguards and why.
 4. How and under what circumstances safeguards may be removed.
 5. What to do if a safeguard is damaged, missing, or unable to provide adequate protection.
- D. **Reviewing all machine guards in their areas on an annual basis, at a minimum.**

6.4.3 Industrial Hygiene (IH) is responsible for:

- A. Assisting supervisors and employees in determining and documenting adequate means for guarding machinery, so that the likelihood of bodily injury and/or property damage can be minimized during operation of machinery. Guarding methods shall be in accordance with recognized, applicable industry standards (OSHA, ANSI, National Safety Council, etc.).

- B. Providing guidance and specifying work practices and precautions that may be necessary when conventional machine guarding methods are deemed impractical by both supervision and **IH**.

6.5 REQUIREMENTS

All Machine Guarding shall meet OSHA Regulations 29 CFR 1910, Subpart O.

6.6 PRACTICES/PROCEDURES

- 6.6.1 Machines having a shearing, punching, pressing, squeezing, drawing, cutting, rolling, or similar action shall be guarded at the point-of-operation. The following are some of the machines that usually require point-of-operation guarding:
- A. Guillotine cutters
 - B. Shears
 - C. Alligator shears
 - D. Power presses
 - E. Power saws
 - F. Jointers
 - G. Forming rolls and calenders
- 6.6.2 Where guards are required, they shall be of proper design and constructed of materials as per ANSI. Guards will be adequately secured in place and shall shield, fence, rail, enclose, or otherwise guard as required. Guards shall be provided with hinged or removable sections, where necessary, for repair, adjustment, or for maintenance.
- 6.6.3 Any part of a belt and pulley drive or fan blade located 7 feet or less above the floor or working level shall be guarded.
- 6.6.4 Any exposed part of a fly wheel 7 feet or less above the floor or working level shall be guarded.
- 6.6.5 Each process machine driven by an individual motor or power source shall be equipped with an emergency stopping device that can be safely actuated from the operator's position.
- 6.6.6 Each machine simultaneously attended or operated by more than one employee shall be equipped with a machine power control for each employee exposed to the point of operation. These controls shall be interlocked in a manner to prevent operation of the machine unless all controls are set in the run position.
- 6.6.7 Machine power controls shall be maintained, designed, installed, and/or located in such a manner that they are not likely to operate from accidental contact.
- 6.6.8 Hazardous, revolving, and reciprocating parts in any machine not guarded by the frame of the machine or by location shall be removed or guarded.
- 6.6.9 All exposed parts of line or counter shafting 7 feet or less above the floor or other working level shall be guarded.
- 6.6.10 Projecting shaft ends within 7 feet of floor or working level shall present a smooth, rounded edge and smooth end and shall not project a distance greater than one-half the diameter of the shaft beyond the end of the bearing unless guarded by non-rotating casing. Exposed, unused key-ways 7 feet or less above floor or working level shall be filled, covered, or guarded.

6.6.11 Machine components shall be designed, secured, or covered to minimize hazards caused by breaking, loosening, falling, or releasing mechanical energy (i.e., broken springs).

6.6.12 Full-revolution clutch power presses - A power press whose stroking cannot be interrupted (controlled) during the closing or opening of the stroke cannot use a press-controlling device, although a properly installed, two-hand trip can serve as both an actuating means and a safeguarding means. This is true of a press equipped with a full revolution clutch, which is simply "tripped" to initiate a stroke and must make a full revolution before it is forcibly disengaged through cam action. On such power presses, a selection must be made from the following list of safeguarding systems:

A. Guards

1. Die enclosure guard
2. Fixed barrier guard
3. Adjustable barrier guard

If hands can reach through, around, over, or under a "guard" to allow access to the point of operation, it is an inadequate enclosure and not acceptable by itself.

B. Devices (operator-controlling type)

1. Restraints (properly adjusted)
2. Pullbacks (properly adjusted)
3. Type A movable barrier (with an enclosure to prevent access through areas not protected by the movable barrier)
4. Two-hand trip (located at a distance exceeding the applicable safety distance for the particular press)

6.6.13 Part-revolution clutch power presses - On a press whose stroke can be interrupted during the closing or opening of the stroke, a press-controlling device can be used as well as an operator-controlling device. On such power presses, a selection must be made from the following list of safeguarding systems:

A. Guards

1. Die enclosure guard
2. Fixed barrier guard
3. Adjustable barrier guard
4. Interlocked press barrier guard

Again remember that if hands can reach through, around, over, or under a "guard" to allow access to the point of operation, it is an inadequate enclosure and not acceptable by itself.

B. Devices (operator-controlling type, single-stroke operations only)

1. Restraints (properly adjusted)
2. Pullbacks (properly adjusted)

- C. Devices (machine-controlling type)
 - 1. Presence sensing
- D. Devices (operator- and machine-controlling devices)
 - 1. Two-hand control
 - 2. Type A movable barrier
 - 3. Type B movable barrier

6.6.14 Foot pedals (treadle) - The pedal mechanism shall be guarded to prevent unintended operation from falling or moving objects or by accidental stepping onto the pedal. A pad with a non-slip contact area shall be firmly attached to the pedal. The pedal return spring(s) shall be of the compression type, operating on a rod or guided within a hold or tube, or designed to prevent interleaving of spring coils in the event of breakage. If pedal counterweights are provided, the path of travel of the weight shall be enclosed.

6.6.15 Hand-operated levers - Hand-lever operated power presses shall be equipped with a spring latch on the operating lever to prevent premature or accidental tripping. The operating levers on hand-tripped presses having more than one operating station shall be interlocked to prevent the tripping of the press except by the "concurrent" use of all levers.

6.6.16 Two-hand trips - A two-hand trip shall have the individual operator's hand controls protected against unintentional operation. A die enclosure guard shall be attached to the die shoe or stripper in a fixed position. A fixed-barrier guard shall be attached securely to the frame of the press or to the bolster plate.

6.6.17 Point-of-operation devices shall protect the operator by:

- A. Preventing and/or stopping normal stroking of the press if the operator's hands are inadvertently placed in the point of operation.
- B. Preventing operators from inadvertently reaching into the point of operation or withdrawing their hands if they are inadvertently located in the point of operation as the dies close.
- C. Preventing the operator from inadvertently reaching into the point of operation at all times.
- D. Requiring application of both of the operator's hands to machine operating controls during the die closing portion of the press stroke.

6.6.18 Hand-feeding tools - Hand-feeding tools are intended for placing and removing materials into and from the press. Hand-feeding tools are not a point-of-operation guard or protection device and shall not be used in lieu of the "guards" or devices required in this section.

6.6.19 Inspection, Maintenance, and Modification of Presses

- A. Inspection and maintenance records - It shall be the responsibility of cognizant engineers to establish and follow a program of periodic and regular inspections of their power presses to ensure that all parts, auxiliary equipment, and safeguards are in a safe operating condition and adjustment. Records of these inspections shall be maintained and the maintenance work performed.
- B. Modification - It shall be the responsibility of any person modifying a power press to furnish instructions to establish new or changed guidelines for use and care of the power press with the modification.

- C. Training of maintenance personnel - It shall be the responsibility of any person modifying a power press to furnish instructions to establish new or changed guidelines for use and care of the power press with the modification.
- D. Training of maintenance personnel - It shall be the responsibility of the supervisor to ensure the original and continuing competence of personnel caring for, inspecting, and maintaining power presses.

6.6.20 Operation of power presses - employment of minors. No one under 18 years of age shall be permitted to operate or assist in the operation of machinery covered in this section.

6.6.21 A guard shall be designed so that it does not offer an accident hazard in itself.

6.6.22 Machines designed for a fixed location shall be securely anchored to prevent walking or moving. Large machines (weighing several hundred pounds), such as lathes and milling machines, need not be secured as they are not likely to fall over.

6.6.23 Combs (featherboards) or suitable jigs shall be provided at the workplace for use when a standard guard cannot be used, as in dadoing, grooving, jointing, moulding, and rabbeting.

6.6.24 On machines where injury to the operator may result if motors were to activate after power failures, anti-restart protection shall be provided.

6.7 REFERENCES

OSHA Regulations 29 CFR 1910.

National Safety Council, Accident Prevention Manual for Industrial Operations, current edition.