Machine Guarding
SafetyNet #: 115

Under California state law, employers must protect employees from all hazards associated with the operation of industrial machines by the use of guards, safeguarding devices, awareness devices, or safeguarding methods. Machine safeguarding requirements are addressed in the California Code of Regulations, Title 8 sections 3940-4647 and ANSI B11.19. Machines requiring safeguarding may be found in academic departments, maintenance shops, HVAC equipment, print shops, machine tool and woodworking shops, agricultural machinery, dining service kitchens, meat cutting shops, and any other areas where mechanical equipment is used.

The following information is provided to assist in enhancing machine safety through hazard identification and evaluation, safeguarding, training, and safe operation.

How do you identify safety hazards associated with machine operation?
You must be able to recognize the contributing factors, such as the mechanical components of machinery, the mechanical motion that occurs at or near these components, and the specific worker activities performed with the mechanical operation. Typically, the following areas on machinery are dangerous and can be a risk to anyone near the machine:

<table>
<thead>
<tr>
<th>Parts that move or transmit power:</th>
<th>Parts that do the work:</th>
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<tbody>
<tr>
<td>- Belts and pulleys</td>
<td>- Tools and dies</td>
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<td>- Flywheels and gear wheels</td>
<td>- Guillotine blades</td>
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<td>- Shafts and spindles</td>
<td>- Milling cutters</td>
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<td>- Slides and cams</td>
<td>- Circular saws</td>
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<td>- Chain and sprockets gears</td>
<td>- Drills and chucks</td>
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<td>- Hydraulics</td>
<td>- Plasma arcs</td>
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<td>- Pneumatics/Compressed gases</td>
<td>- Water jets</td>
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<td>- Lasers</td>
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To help identify dangerous machine parts, look for:

- ‘Drawing in’ points
- Shear points
- Impact and crushing points
- Cutting areas
- Entanglement areas
- Stabbing points
- Abrasion areas
- Flying particles
- Radiation
- Any protrusions which could cause injury
Mechanisms of injury created by unsafe machinery:

- Contact or entanglement with machinery
- Being trapped between the machine and material or fixed structure
- Contact with live electrical equipment or material in motion
- Being struck by ejected parts of machinery
- Being struck by material ejected from machine
- Release of potential energy

How can you control potential hazards?
Machine safeguarding is the primary way to protect employees from hazards when working with machinery. The following list outlines the most common safeguarding methods:

- Distance
- Emergency Stops
- Presence Sensing Devices
- Guards (interlocked, fixed or movable)
- Barrier Devices
- Two Handed Controls
- Light Curtains
- Awareness Signs

Work practices, employee training, and administrative controls also play an important role in preventing and controlling these workplace hazards. Anyone working around machinery should be able to identify potential hazards. Understanding the mechanical components of machinery, the mechanical motion at or near these components, and the specific worker activities performed in conjunction with machinery operation will help workers avoid injury. Contact EH&S at shopsafety@ucadvis.edu [2] for any assistance needed in controlling hazards.

Safeguarding requirements:
Safeguards must meet the following minimum requirements:

- Prevent contact: The safeguard must prevent hands, arms, and any other part of an operator’s body from making contact with dangerous moving parts.
- Secure attachment: Operators should not be able to easily remove or tamper with the safeguard.
- Protection from falling objects: The safeguard should ensure that no objects could fall into moving parts.
- Create no new hazards: A safeguard defeats its own purpose if it creates a hazard such as a shear point, a jagged edge, or an unfinished surface that could cause a laceration.
• Create no interference: Any safeguard that impedes an operator from performing the job quickly and comfortably might soon be overridden or disregarded.
• Allow safe lubrication: If possible, workers should be able to lubricate the machine without removing the safeguards.

**Training:**
Machine safeguarding training is available at UC Davis through the Learning Management System (LMS). [3] Thorough operator training should involve instruction and hands-on training in the following:

• A description and identification of the hazards associated with particular machines.
• The safeguards themselves, how they provide protection, and the hazards for which they are intended.
• How to use the safeguards and why.
• How and under what circumstances safeguards can be removed, and by whom (In most cases by repair or maintenance personnel only).
• What to do (e.g., contact the supervisor) if a safeguard is damaged, missing, or unable to provide adequate protection.
• **Lock out/tag out procedures** [4].
• All training must be documented.

In no cases should an employee (or student) operate machinery without having received training that includes both classroom and “hands-on” content. If LMS is used, it is the Department’s responsibility to provide the hands-on component.

**Information Resources**

3. Laboratory Safety [7]
4. Occupational Health [8]
5. Personal and Workplace Safety [9]
8. Workplace Safety [12]

**Contact**

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