

# **Subpart O - Machine Guarding**

**OTI 501**

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## **We Will Cover:**

- **Machine Guarding Principles**
- **Subpart O - Highlights**
- **Mock Plant Walk-Through**

## Why are machines not guarded?

- **No one would stick their arm, hand, finger, head, etc. in there.**
- **No one is supposed to be back there, in there, around it while it is running.**
- **The machine came that way; it never had a guard.**
- **I've been doing it this way for twenty years without any problems.**

## **Why are machines not guarded? (cont.)**

- **The guard is in the way**
- **The OSHA inspector didn't say anything about it.**
- **We'll put it back on if OSHA comes.**

# Machine Guarding Requirements

- **Prevent contact**
- **Be secure**
- **Protect from falling objects**
- **Create no new hazards**
- **No interference**
- **Maintainability and accessibility**

## Where machine hazards occur:

- **Point of operation**
- **Mechanical power transmission**
- **Other moving parts**

# Methods of machine safeguarding

- **Physical guards**
- **Devices**
- **Location/Distance**

# Guards

- **Fixed**
- **Interlocked**
- **Adjustable**
- **Self-adjusting**



# Safeguarding devices

- **Presence sensing**
- **Pullback**
- **Restraint**
- **Safety controls and trips**
- **Gates**

# Subpart O - Machinery and Machine Guarding

- **211 - Definitions**
- **212 - General requirements**
- **213 - Woodworking machinery**
- **215 - Abrasive wheel machinery**
- **216 - Mills and calendars**
- **217 - Mechanical power presses**
- **218 - Forging machines**
- **219 - Mechanical power transmission**

**1910.212**

**General Requirements for all  
Machines**

## 1910.212(a)(1)

- **One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by the point of operation, in-going nip points, rotating parts, flying chips and sparks.**

## 1910.212(a)(2)

- **The guard shall be such that it does not offer an accident hazard in itself**

## 1910.212(a)(3)(ii)

- **The point of operation of machines whose operation exposes an employee to injury, shall be guarded**

## 1910.212(a)(3)(iii)

- **Special hand tools for placing and removing material shall be such as to permit easy handling of material in the danger zone. Such tools shall not be in lieu of other guarding required by this section, but can only be used to supplement protection provided.**

## 1910.212(a)(3)(iv)

Usually require guarding:

- Guillotine cutters
- Shears (including alligator shears)
- Power presses
- Milling machines
- Power saws
- Jointers
- Portable power tools
- Forming rolls and calendars



## 1910.212(a)(5)

- **When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than 1/2 inch.**

## 1910.212(b)

- **Machines designed for a fixed location shall be securely anchored to prevent walking or moving.**



**1910.213**

**Woodworking Machinery  
Requirements**

## 1910.213(a)(9)

- **All belts, pulleys, gears, shafts, and moving parts shall be guarded in accordance with the specific requirements of 1910.219.**

## 1910.213(a)(10)

- **It is recommended that each power-driven woodworking machine be provided with a disconnect switch that can be locked in the off position.**

## 1910.213(a)(15)

- **Combs (featherboards) or suitable jigs shall be provided at the workplace for use when a standard guard cannot be used.**

## 1910.213(b)(1)

- **A mechanical or electrical power control shall be provided on each machine to make it possible for the operator to cut off the power from each machine without leaving his position at the point of operation.**

## 1910.213(b)(3)

- **On applications where injury to the operator might result if motors were to restart after power failures, provision shall be made to prevent machines from automatically restarting upon restoration of power.**



## 1910.213(c)(1)

- **Each circular hand-fed rip saw shall be guarded by a hood which shall completely enclose that portion of the saw above the table and that portion of the saw above the material being cut. The hood and mounting shall be arranged so that the hood will automatically adjust itself to the thickness of and remain in contact with the material being cut without considerable resistance.**

## 1910.213(c)(2)

- **Each hand-fed circular rip saw shall be furnished with a spreader to prevent material from squeezing the saw or being thrown back on the operator.**

## 1910.213(c)(3)

- **Each hand-fed circular rip saw shall be provided with non-kickback fingers or dogs so located as to oppose the thrust or tendency of the saw to pick up the material or throw it back toward the operator.**

## 1910.213(d)(1)

- **Each circular crosscut table saw shall be guarded by a hood which shall meet all the requirements of 1910.213(c)(1) for hoods for circular resaws.**

## 1910.213(h)(1)

- **The upper hood shall completely enclose the upper portion of the blade down to a point that will include the end of the saw arbor... The sides of the lower exposed portion of the blade shall be guarded to the full diameter of the blade by a device that will automatically adjust itself of the thickness of the stock and remain in contact with the stock.**

## 1910.213(h)(2)

- **Each radial saw used for ripping shall be provided with non kickback fingers or dogs located on both sides of the saw...**

## 1910.213(h)(3)

- **An adjustable stop shall be provided to prevent the forward travel of the blade beyond the position necessary to complete the cut in repetitive operations.**

## 1910.213(h)(4)

- **Installation shall be in such a manner that the front end of the unit will be slightly higher than the rear, so as to cause the cutting head to return gently to the starting position when released by the operator.**



## 1910.213(h)(5)

- **Ripping and ploughing shall be against the direction in which the saw turns. The direction of the saw rotation shall be conspicuously marked on the hood.**

## 1910.213(i)(1)

- **All portions of the saw blade (bandsaws) shall be enclosed or guarded, except for the working portion of the blade between the bottom of the guide rolls and the table.**

## 1910.213(j)(3)

- **Each hand-fed jointer with a horizontal cutting head shall have an automatic guard which will cover all the section of the head on the working side of the fence or gage.**

## 1910.213(j)(4)

- **Each hand-fed jointer with horizontal cutting head shall have a guard which will cover the section of the head back of the gage or fence.**

## 1910.213(m)(1)

- **The cutting heads of each wood shaper, hand-fed panel raiser, or other similar machine not automatically fed, shall be enclosed with a cage or adjustable guard so designed as to keep the operator's hand away from the cutting edge.**

## 1910.213(o)(2)

- **Cutting heads on wood-turning lathes, whether rotating or not, shall be covered as completely as possible by hoods or shields.**

## 1910.213(p)(4)

- **Belt sanding machines shall be provided with guards at each nip point where the sanding belt runs on to the pulley... The unused run of the sanding belt shall be guarded against accidental contact.**

## 1910.213(r)(4)

- **The mention of specific machines in paragraphs (a) thru (q) and this paragraph (r) of this section, inclusive, is not intended to exclude other woodworking machines from the requirements that suitable guards and exhaust hoods be provided to reduce to a minimum the hazard due to the point of operation of such machines.**



## 1910.213(s)(2)

- **All knives and cutting heads of woodworking machines shall be kept sharp, properly adjusted, and firmly secured. Where two or more knives are used, they shall be properly balanced.**

## 1910.213(s)(7)

- **All cracked saws shall be removed from service.**

**1910.215**

**Abrasive-Wheel Machinery**

## 1910.215(a)(4)

- **Work rests shall be adjusted closely to the wheel with a maximum opening of one-eighth inch to prevent the work from being jammed between the wheel and the rest, which may cause wheel breakage.**

## 1910.215(b)(9)

- **The distance between the wheel periphery and the adjustable tongue or the end of the peripheral member at the top shall never exceed one-fourth inch.**

## 1910.215(d)(1)

- **Immediately before mounting, all wheels shall be closely inspected and sounded by the user (ring test) to make sure they have not been damaged.**

**1910.216**

**Mills and Calendars in the Rubber  
and Plastics Industries**

## 1910.216(b)

- **A safety trip control must be provided in front and back of each mill. It must be accessible and operate readily on contact. It must be one of the following:**
  - **Pressure-sensitive body bar**
  - **Safety triprod**
  - **Safety tripwire cable or wire**



## 1910.216(c)

- **A safety triprod, cable or wire must be provided across each pair or in-running rolls extending the length of the face of the rolls. It must be readily accessible and operate whether pushed or pulled.**
- **On both sides of the calendar and near each end of the face of the roll, there must be a safety trip cable or wire.**

## 1910.216(f)

- Mills must stop within 1 1/2 percent of the peripheral no-load surface speed in feet per minute.
- Calendars must stop within 1 3/4 percent of the peripheral no-load surface speed in feet per minute. There is an exception for speeds above 250 feet per minute.

**1910.217**

**Mechanical Power Presses**

## 1910.217(a)(5)

- **Press brakes, hydraulic and pneumatic power presses, bulldozers, hot bending and hot metal presses, forging presses and hammers, riveting machines and similar types of fastener applicators are excluded from the requirements of this section.**

## 1910.217(b)(3)(i)

- **Machines using full revolution clutches shall incorporate a single-stroke mechanism.**

## 1910.217(b)(4)

- **The pedal mechanism shall be protected to prevent unintended operation.**
- **A pad with a nonslip contact area shall be firmly attached to the pedal.**

## 1910.217(b)(6)

- **A two-hand trip shall have the individual operator's hand controls protected against unintended operation and be arranged to require use of both hands.**
- **Two-hand trip systems on full revolution clutch machines shall incorporate an antirepeat feature.**
- **If two hand trip systems are used on multiple operator systems, each operator shall have a separate set of controls.**

## 1910.217(b)(7)

- **Two-hand controls must incorporate an anti repeat feature, require use of both hands, be protected against unintended operation, have one set of controls for each operator.**
- **If foot control is provided, the selection between hand and foot control must be supervised by the employer.**



## 1910.217(b)(8)(i)

- **A main power disconnect switch, capable of being locked only in the off position shall be provided with every power press control system.**

## 1910.217(b)(13)

- **When required by paragraph (c)(5), the control system shall be constructed so that a failure within the system does not prevent the normal stopping action but does prevent initiation of a successive stroke until the failure is corrected.**

## 190.217(b)(14)

- **When required by paragraph (c)(5), brake monitors must be constructed as to automatically prevent the activation of a successive stroke if the stopping time or braking distance deteriorates to a point where the safety distance requirements are not met.**

## 1910.217(c)(1)

- **It shall be the responsibility of the employer to provide and insure the use of point of operation guards or properly applied and adjusted point of operation devices on every operation performed on a mechanical power press. See Table O-10.**

## 1910.217

- **Safety distance will be greater than the distance determined by the following formula:**
  - **$D_s = 63 \text{ inches/second} \times T_s$  where  $T_s$  is the stopping time of the press measured at approximately 90 degree position of crankshaft rotation (seconds)**

## 1910.21(e)(1)

- **It shall be the responsibility of the employer to establish and follow a program of periodic and regular inspections of power presses.**

## 1910.217(e)(3)

- **It shall be the responsibility of the employer to insure the original and continuing competence of personnel caring for, inspecting, and maintaining power presses.**

## 1910.217(f)

- **The employer shall train and instruct the operator in the safe method of work before starting work on any operation covered by this section.**
- **The employer shall provide clearance between machines. Ample room for cleaning machines, handling material, work pieces, and scrap shall also be provided.**



## 1910.217(g)(1)

- **The employer shall, within 30 days, report all point of operation injuries to operators or other employees.**

**1910.218**

**Forging Machines**

**1910.219**

**Mechanical Power-Transmission  
Apparatus**

## 1910.219(a)

- **This section does not apply to the following belts operating at 250 fpm or less:**
  - **Flat belts 1 inch or less wide**
  - **Flat belts 2 inches wide or less with no fasteners or metal lacings**
  - **Round belts 1/2 inch or less in diameter**
  - **Single-strand v-belts 13/32 inches wide or less.**

## 1910.219(a)

- **Vertical and inclined belts if not more than 2 1/2 inches wide, traveling at less than 1000 fpm, if free from metal lacings or fastenings may be guarded with a nip point belt and pulley guard.**

## 1910.219(b)(1)

- **Flywheels located so that any part is 7 feet or less above the floor or platform shall be guarded.**
- **Wherever flywheels are above working areas, guards shall be installed having sufficient strength to hold the weight of the flywheel in the event of a shaft or wheel mounting failure.**

## 1910.219(c)

- **Horizontal, vertical, and inclined shafting must be enclosed.**
- **Projecting shaft ends shall present a smooth edge and end and shall not project more than 1/2 the diameter of the shaft unless guarded by non rotating cap or safety sleeves. Unused keyways shall be filled up or covered.**

## 1910.219(d)

- **Pulleys less than 7 feet above the floor or platform must be guarded.**
- **Pulleys with cracks or pieces broken out of rims shall not be used.**



## 1910.219(e)

- **With some exceptions, horizontal, vertical, and inclined belts must be guarded.**

## 1910.219(f)

- **Gears must be guarded.**
- **Guarding of hand operated gears is highly recommended.**
- **All sprocket and chains must be enclosed unless more than 7 feet above the floor or platform.**
- **When frequent oiling must be done, openings with hinged or sliding self-closing covers must be provided.**

## 1910.219(i)

- **Collars shall be cylindrical, and screws or bolts used in collars shall not project beyond the largest periphery of the collar.**
- **Couplings shall be constructed so as to present no hazard from bolts, nuts, setscrews, or revolving surfaces.**

## 1910.219(o)

- **Wood guards may be used in the woodworking and chemical industries or other industries where conditions would cause rapid deterioration or where its location outdoors would make metal guards and railings undesirable. In all other industries, wood guards must not be used.**