



FPST 2023 Industrial and Occupational Safety

Machine Guarding – Part 1

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Outline



1. Definitions
2. Mechanical Hazards
3. Be familiar with the regulatory requirements pertaining to machine guarding
4. Know the different types of safeguards
5. Know when to apply different types of safeguards

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Definitions




- Point of operation
 - that point where work is performed on the material, such as cutting, shaping, punching, stamping




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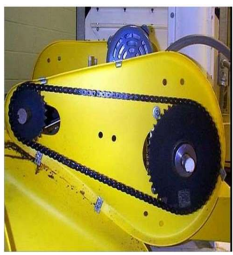





Definitions




- **Power transmission apparatus**
 - any components of a mechanical system that transmit energy to the parts of the machine performing the work
 - Belts
 - Gears
 - Cams





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Definitions




- other **moving parts**, all parts of the machine which move while the machine is working. Ex, reciprocating, rotating and transversely moving parts.



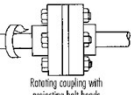
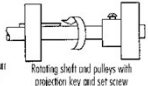
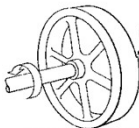
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Mechanical Hazards



- All mechanical motion or action is hazardous!
- Three types of motion:
 - Rotating
 - Reciprocating
 - Transverse



Rotating pulley with spokes and projecting burr on face of pulley


Burr

Rotating shaft and pulleys with projection key and set screw


Rotating coupling with projecting bolt heads

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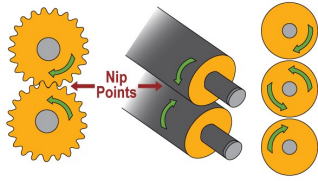





Rotating Motion




- In-running nip points
 - Parts with parallel axes can rotate in opposite directions




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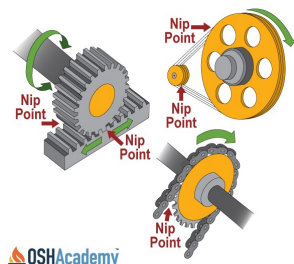
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Rotating Motion




- Nip points created between rotating and tangentially moving parts




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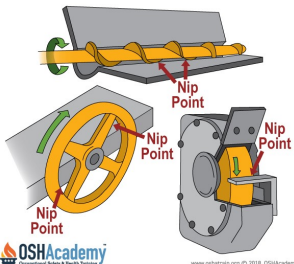
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Rotating Motion




- Nip points occur between rotating and fixed parts which create a shearing, crushing or abrading




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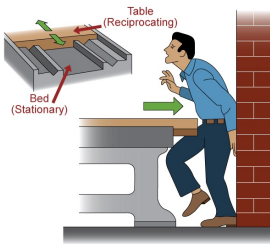





Reciprocating Motion




- During the back-and-forth or up-and-down motion, a worker may be struck by or caught between a moving part and a stationary part

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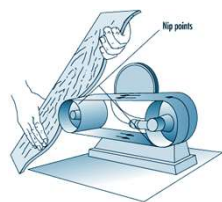
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Transverse Motion




- Movement in a straight continuous line around a moving part
- A worker may be struck or caught in a pinch or shear point by a moving part

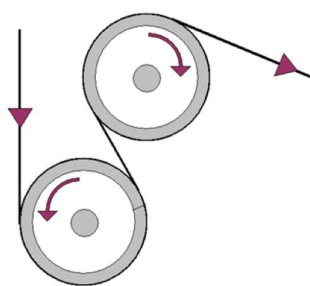


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Nip Points






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Actions




- Four types of action
 - Punching
 - Bending
 - Shearing
 - Cutting

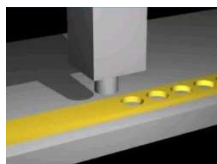
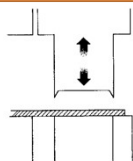
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Punching Action




- When power is applied to a slide for the purpose of blanking, drawing or stamping metal or other materials
- The danger of this type of action occurs at the point of operation where stock is inserted, held and withdrawn by hand



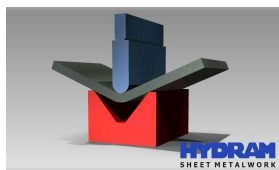
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Bending Action



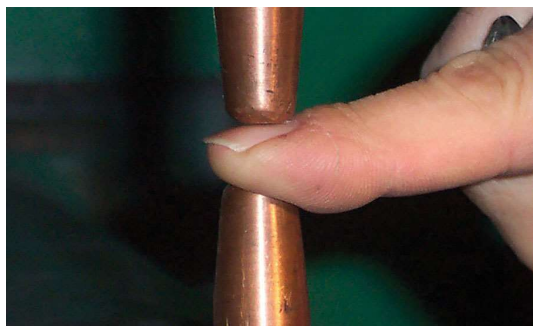
- When power is applied to a slide in order to shape, draw or stamp metal or other materials
- The hazard occurs at the point of operation where stock is inserted, held and withdrawn



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Pinch Points



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Pinch Points



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Pinch Points




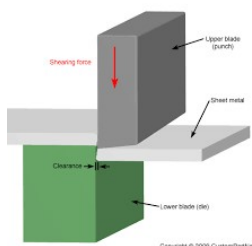
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Shearing Action






- Applying power to a slide or knife in order to trim or shear metal or other materials
- A hazard occurs where stock is actually inserted, held and withdrawn

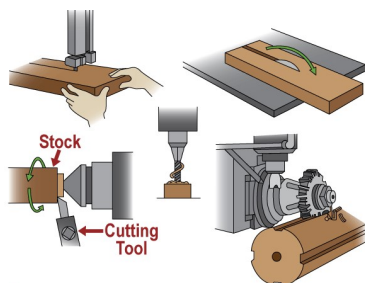
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Cutting Actions




- Many types




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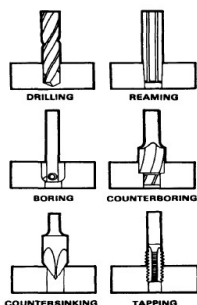
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Cutting Actions



- Drilling
- Reaming
- Boring
- Counter boring
- Countersinking
- Tapping



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Cutting Actions



- Drill press



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Cutting Actions



- Band saw



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Cutting Actions



- Table Saw



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Cutting Actions



- Lathe



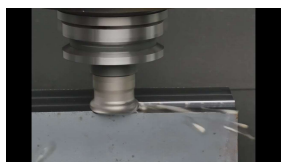
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Cutting Actions



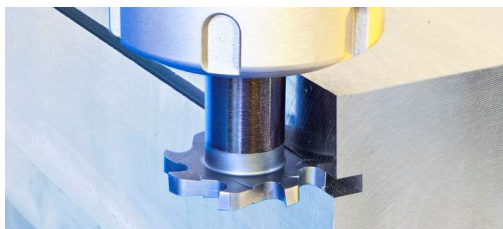
- Milling



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- Slot Cutting



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Bench/Pedestal Grinders



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OSHA



- Any opening exceeding 3/8 inch
- Requirement for all Safeguards
 - Prevent contact
 - Secure and durable
 - Protect against falling objects
 - Create no new hazards
 - Allow safe maintenance

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OSHA



- General Industry
 - Subpart O
 - **OR**
 - 29 CFR 1910.147
- Knowledge of a hazard is not a substitute for proper machine guarding

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Types of Safeguards



- Fixed
- Interlocked
- Adjustable
- Self-adjusting
- Presence-sensing
- Other

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Fixed Guards



- Characteristics
 - Permanent part of the machine
 - May be constructed of sheet metal, screen, wire cloth, bars, or plastic
- Safeguarding action
 - Provides a barrier
 - Allows for stock feeding but does not permit operator to reach danger area

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Fixed Guards



- Advantages
 - Can be constructed to suit many specific applications
 - In-plant construction is often possible
 - Can provide maximum protection
 - Usually requires minimum maintenance
 - Can be suitable to high production, repetitive operations
 - May interfere with visibility
- Limitations
 - Can be limited to specific operations
 - Machine adjustment and repair often require its removal, thereby necessitating other means of protection for maintenance personnel

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Fixed Guards



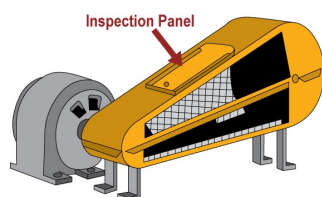
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Fixed Guards



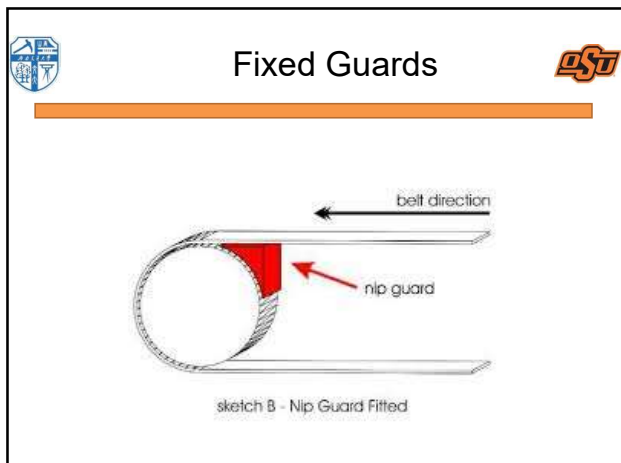
Fixed Guard Enclosing Belt & Pulleys



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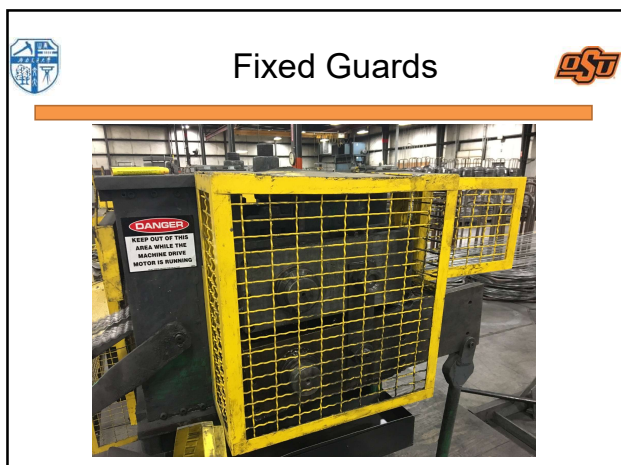
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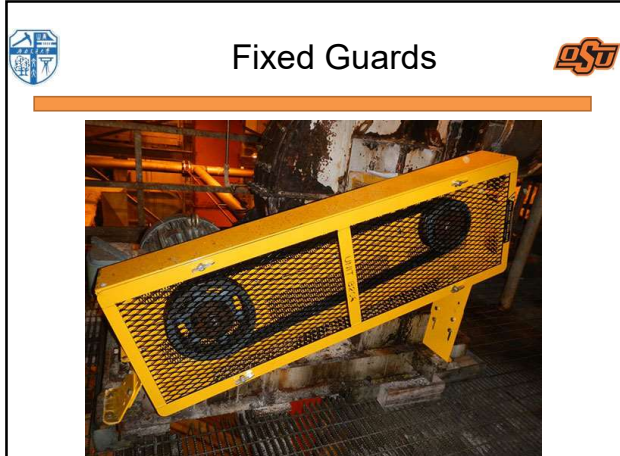
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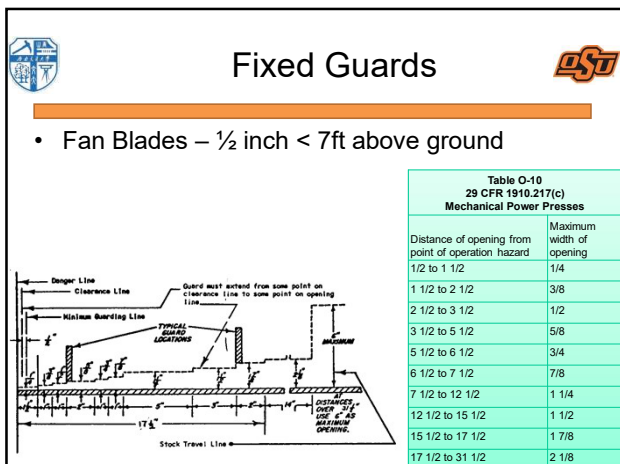
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Interlocked Guards



- Characteristics
 - When opened or removed, automatically shuts off machine
 - Stops all moving parts
 - Machine cannot cycle or be started until guard is back in place
- Safeguarding action
 - Shuts off or disengages power, stops the moving parts, and prevents the starting of the machine when the guard is open
 - Stops machine before worker can reach into the danger area

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Interlocked Guards



- Advantages
 - Can provide maximum protection
 - Allows access to the machine for removing jams without time consuming removal of the fixed guards
- Limitations
 - Requires careful adjustment and maintenance
 - May be easy to disengage

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Interlocked Guards



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Interlocked Guards



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Interlocked Guards



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Interlocked Guards



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Interlocked Guards



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Interlocked Guards



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