29 CFR 1910.212- General Requirements for all Machines, **29 CFR 1910.213**- Woodworking Machinery, **29 CFR 1910.215**- Abrasive Wheels, **29 CFR 1910.217**- Power Presses, **29 CFR 1910.219**- Power Transmission.

Machine Hazards & Safety

Preparation

1. Read Applicable Background information and related Company Policy Chapter.
2. Make _____ Copies of this Lesson Plan for Personnel
3. Make Transparency, procure transparency pens, etc.
4. Coffee, tea, snacks

Material

1. Types of machines the employee is expected to operate
2. Personal Protective Equipment

Objective

By the end of this session, personnel shall be able to describe:

1. Machine Hazards to include:
   - Shear Points
   - Pinch Points
   - Wrap Points
   - Crush Points
   - Free Wheeling parts
   - Springs
   - Hydraulic Systems
2. Personal Training Requirements
3. Personal Protective Equipment
4. Environmental Considerations Regarding Machine Placement
5. Housekeeping Rules
6. Discuss Machine Usage Practices, to include:
   - Electrical Safeguards
   - Machine Controls
   - Machine Guarding

Background

All mechanical motion is potentially hazardous. Motion hazards, such as rotating devices, cutting or shearing blades, in-running nip points, reciprocating parts, linear moving belts and pulleys, meshing gears, and uncontrolled movement of failing parts, are examples of motion and peculiar to any one machine or job operation.

Notes

Lesson

Machine Hazards

Most accidents with machinery are the result of human error. The operator either forgets something, took a short cut , ignored a warning, wasn't paying close attention, or failed to follow safety rules.

There are many different kinds of machinery and equipment, but they all have similar characteristics and hazards. People can be cut, crushed, pilled into or struck by objects thrown by these machines. Machines have cutting edges, gears, chains, revolving shafts, rotating blades, levers, hot surfaces, and similar hazards.

Another problem associated with machines is that some machine parts cannot be totally shielded and still do their job. An example is a cutting blade ~ it cannot be totally enclosed or it could not cut. Also, guards can be removed for maintenance and are not replaced. People also are notorious for-by passing guards and automatic shut-off devices to make their job quicker and "easier".

Shear Points-

Shear points are created when the edges of two objects are moved closely enough together to cut softer material, as in the case of a pair of scissors or an auger. Cutting points are created when a single object moves forcefully or rapidly enough to cut through materials.

Both shear and cutting points are created on machinery designed to cut and on those that are not designed to cut, as in an auger. They are hazards because of their cutting forces, and because they often move so rapidly that they may not be visible- it is easy to forget that it is operating.

Because some cutting and shearing points cannot be guarded, it is important to be aware of their hazards and to be especially alert when they are operating. There is also a danger of thrown objects while operating cutting type equipment.

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Pinch Points-

Another hazard of machinery is the pinch point. Pinch points are formed when two rotating objects move together and at least one of them moves in a circle. For example, the point at which a belt runs *onto* a pulley is a pinch point. Belt drives, chain drives and gear drives are other sources of pinch points in power transmission devices.

Fingers, hands and feet can be caught directly in pinch points, or they may be drawn into the pinch points by loose clothing that becomes entangled. Contact may be made by simply brushing against unshielded parts or by falling against them. Personnel can become entangled in pinch points if they take chances and reach or work near rotating parts. Machines move too fast for personnel to get out of a pinch point once they become caught in it.

To avoid injury from pinch points, individuals should be aware of the areas where pinch points occur and to avoid them. They should wear clothing that fits well and is not loose or floppy. Never reach over or work near rotating or revolving parts. Personnel shall turn off and Lockout machinery in order to work on it. Personnel shall always replace shields and guards if they must remove them for maintenance.

Wrap Points-

Rotating shafts are the most common source of wrap point accidents, although any exposed machine part that rotates can be a wrap point. Long hair, pony tail, or a cuff, sleeve, pant leg or just a thread can catch on a rotating part and result in serious injury. Entanglement with a wrap point can pull personnel into the machine, or clothing may be so tightly wrapped that an individual can be crushed or suffocated. In other cases, a person could be thrown off balance and fall into other parts of the machine.

Even a perfectly smooth and round shaft can be a hazard if there is enough pressure to hold clothing against the shaft. Long hair or clothing is more likely to catch if there is a little dirt or dried material, or a nick on the shaft. Ends of shafts which protrude beyond bearings are also dangerous. Universal joints, keys and fastening devices can also snag clothing

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Wrap Points- (continued)

Management and personnel shall check all equipment for potential wrap points, and shall shield those that can be shielded. Management shall also place warning signs on those areas that cannot be covered or shielded, and paint the rotating shaft bright colors.

Crush Points-

Crush points are created when two objects move toward one another or one object moves toward a stationary one. For example, moving levers and raised equipment create a potential crush point.

Failure to block up equipment safely can result in a fatal crushing injury. A car jack can slip, a hose or overhead support may break, or the equipment may roll. Personnel shall take extra precautions when working with machinery that is raised for any reason.

To prevent being crushed or pinned, personnel must recognize the potentiality of the dangerous situation. Personnel shall always block all machinery securely if they must work beneath it. They shall also block its wheels if it has wheels so that it cannot roll.

Free-Wheeling Parts-

Many machine parts continue to spin after the power is hut off; for instance, rotary mower blades, fans, flywheels, drill presses, grinders, garbage disposals, etc. Personnel shall never touch these moving parts until the part has come to a complete rest.

Springs-

Springs under compression will expand with great force when released, and springs that are stretched will contract rapidly when released. Personnel shall observe and recognize which direction the spring will move and how it will affect other machine parts when released, and shall stay out of its path.

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Hydraulic Systems-

Hydraulic systems contain fluid under very high pressure. Before loosening, tightening, removing or otherwise working with any fittings or parts, personnel shall relieve this pressure. Jet streams from even pin-hole leaks can penetrate flesh. In addition, the hydraulic fluid is often extremely hot. Before attempting any service on hydraulic systems, personnel shall shut off the engine which powers the hydraulic pump and relieve the pressure. Personnel shall follow the instructions in the machines operator's manual, because procedures can vary from machine to machine.

Personnel Training Requirements

Personnel will be trained to:

1. Safely operate each machine they will be required to use
2. To recognize potential accident producing situations, and
3. To know what to do when hazards are discovered.

Only personnel who have been thoroughly trained, or those who are undergoing supervised on-the-job training on the equipment, will be permitted to operate machinery.

Personal Protective Equipment

Eye protection or face shields will be worn by all personnel within areas where machines are operated.

Loose fitting clothing, neckties, rings, bracelets, or other apparel that may become entangled in moving machinery will not be worn by machine operators or their helpers.

Hair nets or caps will be worn to keep long hair away from moving machinery.

Gloves will not be worn where there is a chance of them being caught in machinery.

Ear plugs or muffs will be used when required for worker protection.

The Safety and Health Manager should be contacted to assist Supervisors and personnel in determining personnel protective equipment needs.

Notes

Environmental Considerations Regarding Machine

Machines designed for fixed locations will normally be securely fastened to the floor or other suitable foundation to eliminate all movement or "walking." Machines equipped with rubber feet, non-skid foot pads, or similar vibration dampening materials will be installed according to the manufacturer's recommendations.

Machines that have the potential of tipping or falling over will be firmly secured.

Machines that develop fine dust and fumes will be equipped with effective exhaust hoods, connected to an effective exhaust system. An interlocking device should be installed to link the machine's power supply and the exhaust system to prevent the operation of machines without the exhaust system operating.

Machines will never be left unattended with the power on unless the worker is operating more than one machine in a battery of machines. In this latter instance, the clear zone will be appropriately marked to include all machines in the group.

No attempt will be made to clean any part of a machine until the moving parts have come to a complete stop. Chips will not be removed from machinery by hand. Hand brushes should be used but compressed air may be used when reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment.

Brushes, swabs, lubricating rolls, and automatic or manual pressure guns will be used by operators to lubricate material, punches, or dies. This equipment will be used so that operators are not required to reach into the point of operation or other hazardous area.

Housekeeping Rules

Floors will be kept in good repair and free of chips, dust, metal scraps, and other slipping and tripping hazards.

Waste containers will be emptied daily or more often, if necessary, to prevent excessive waste accumulations.

All materials, including usable scrap, will be stored so that they will not present a hazard.

Drip pans will be used whenever equipment must be oiled.

Machinery will not be in motion when being lubricated.

Notes

Machine Usage

Machines will be used only for work within the rated capacity specified by the machine manufacturer.

Machines will be maintained so that while running at full or idle speed, with the largest cutting tool attached, they are free of excessive vibration.

Machines will be completely stopped before attempting to clear jammed work or debris.

No saw blade, cutter head, or tool collar will be placed or mounted on a machine arbor, unless it has been accurately sized and shaped to fit the arbor.

Electrical Safeguards

The motor "START" button will be protected against accidental & inadvertent operation. "START" buttons will not be wedged for continuous operation.

The wiring and grounding of machinery will be in accordance with the National Electric Code.

Each machine will have a positive electrical disconnect or isolation switch which can be locked out.

Electrically driven machines will be equipped with under-voltage protective systems to preclude automatic restart after either a power failure or other under-voltage condition.

Machine Controls

Foot pedal mechanisms will be located and guarded so that they cannot be activated by falling objects or other accidental means. A pad with a non-slip contact area will be firmly attached to the pedal.

Controls will be available to the workers at their operating positions so that they do not reach over moving parts of the equipment. Control functions will be identified by printed words & color coding. Controls will not be wedged for continuous operation.

Power controls must have a way of locking out electrical power. Disconnecting or isolating switches will be mounted on a visible side of, or near, the machine and will be used to lock out power to the machine during repairs or adjustments. When the power is locked out, the isolating switch will be tagged.

Notes

Machine Guards

Many accidents are caused by machinery that is improperly guarded or not guarded at all. Important factor that must be kept in mind relative to machinery guarding is that no mechanical motion that threatens a worker's safety should be left without a safeguard.

The following areas of machinery will be provided with barriers and/or enclosures that will effectively prevent personnel from coming in contact with moving components:

a) Point of operation exposures such as blades, knives and cutting heads.
b) Power transmission exposures such as belts, pulleys, shaft, gears, etc.
c) Top, bottom and backside exposures, such as the underside of table saws and the wheels on band saws.
d) When a point-of-operation guard cannot be used because of unusual shapes or cuts, jigs or fixtures which will provide equal safety for the operator will be used.
e) Upon completion of an unusual operation, the guard will be immediately replaced.

Whenever a guard is removed for other than an operational requirement, the machine will be shut down and the control switch(es) locked and tagged in the "OFF" position.

Guards will be affixed to the machine. Where possible, the guards will be of the hinged type to enhance maintenance or adjustments.

Employees should not be able to easily remove or tamper with guards. Guards and safety devices should be made of durable material that will withstand the conditions of normal use and must be firmly secured to the machine.

- Guard should ensure that no objects can fall into moving parts. An example would be a small tool which is dropped into a cycling machine could easily become a projectile that could and injure others.

- Guard edges should be rolled or bolted in such a way to eliminate sharp or jagged edges.

Guard should not create interference which would hamper Employees from performing their assigned tasks quickly and comfortably.

Notes

7. Rotating Motions an exposed mechanism are dangerous unless guarded. Even a smooth, slowly rotating shaft or coupling can grasp clothing or hair upon contact with the skin and force an arm or hand into a dangerous position. Affixed or hinged guard enclosure protects against this exposure.

8. Reciprocating: Reciprocating motions are produced by the back and fourth movements of certain machine or equipment parts. This motion is hazardous, when exposed, offering pinch or shear points to an Employee. A fixed enclosure such as a barrier guard is an effective method against this exposure.

9. Transverse Motions: Transverse motions are hazardous due to straight line action and in-running nip points. Pinch and shear points also are created with exposed machinery and equipment parts operating between a fixed or other moving object. A fixed or hinged guard enclosure provides protection against this exposure.

10. Cutting Actions: Cutting action results when rotating, reciprocating, or transverse motion is imparted to a tool so that material being removed is in the form of chips. Exposed points of operation must be guarded to protect the operator from contact with cutting hazards, being caught between the operating parts and from flying particles and sparks.

11. Shearing Action: The danger of this type of action lies at the point of operation where materials are actually inserted, maintained and withdrawn. Guarding is accomplished through fixed barriers, interlocks, remote control placement (2 hand controls), feeding or ejection.

Closure

Personnel working within areas where they are exposed to machinery or equipment hazards must be aware of the potential for accidents. Machine operators and others are exposed to moving parts and can get clothing or body parts caught in the machinery.

In many cases, accidents with machinery are very serious, even fatal. It is important to recognize and be alert for machine hazards and to take precautions to avoid injury.

What questions do you have?

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