ARKANSAS TECH UNIVERSITY

HEALTH & SAFETY POLICY

Subject: Machine Guarding

Introduction:

Moving machine parts have the potential to cause severe workplace injuries. Safeguards are essential for protecting workers from these preventable injuries. Any machine part, function, or process that may cause injury must be safeguarded. When the operation of a machine or accidental contact injure the operator or others in the vicinity, the hazards must be eliminated or controlled. The Occupational Safety and Health Administration (OSHA) regulates machinery, equipment, and mechanical power transmission apparatus that are commonly used in machine shops, maintenance operations, and other repair work environments.

Purpose:

This program is developed to protect employees from the hazards associated with machinery by establishing requirements for machine guarding at Arkansas Tech University. The purpose of machine guarding is to protect the machine operator and other employees in the work area from hazards created by in running nip point, rotating parts, flying chips, and sparks. Safeguards are essential for protecting workers from needless injuries.

Scope:

This program applies to all University employees working in areas where there is the potential for machine operation injuries or

accidental contact causing injury for employees working on, near, or around the machine.

Responsibilities:

The occupational safety officer has the primary responsibility for the implementation and enforcement of the Machine Guarding Program and is responsible for the following:

• Developing, reviewing, and updating the Machine Guarding Program.

• Reviewing that machinery have appropriate guards installed as deemed necessary, and are in good working order, suitable for the task, and do not pose a hazard to the operator.

• Assisting departments with the selection of proper machine guards and personal protection equipment (PPE) for the work.

• Developing and assisting as necessary with safety training.

Supervisors:

Supervisors are responsible for providing the necessary direction and support to ensure the effective implementation of the Machine Guarding Program for their work area. Supervisors are responsible for the following:

• Ensuring that all machines are properly guarded in accordance with this program.

• Providing adequate guarding solutions for machines.

• Providing personal protective equipment to employees.

• Ensuring that unguarded machines are removed from service until all necessary guards are in place.

• Ensuring that all employees have received training so employees understand the purpose and function of the program.

• Ensure operators and nearby employees comply with the requirements of the program.

Employees:

• Comply with the program and all requirements of machine guarding.

• Wear appropriate personal protection equipment (PPE) for the work task.

• Notify your supervisor of any machine that does not have appropriate guards in place.

• Refrain from using machines that do not have all necessary guards in place.

• Notify your supervisor of any machine that is damaged or malfunctioning.

• Wear appropriate attire that won't cause entanglement around the machines and machinery.

Definitions:

Employee-Driven Machines: Machines that have a "point of operation", or area on or near the machine in which work is performed by an employee.

Enclosures: Mounted physical barriers which prevent access to moving parts of machinery or equipment.

Nip Points: In-running machine or equipment parts, which rotate towards each other, or where one part rotates toward a stationary object.

Point-of-Operation: The area on a machine or item of equipment, where work is being done and material is positioned for processing or change by the machine.

Power Transmission: Any mechanical parts which transmit energy and motion from a power source to the point-of-operation. Example: Gear and chain drives, cams, shafts, belt and pulley drives and rods.

Safeguards: Barriers or mechanisms that prevent employees from contact with moving portions or parts of exposed machinery or equipment which could cause physical harm to the employees.

Self-Driven Machines: Machines that do not have a specific “point of operation” and which do not have an operator during normal operation.

Training:

Supervisors are responsible for ensuring that employees understand the requirements of this program, and that employees are trained to recognize general machine-guarding hazards. Training shall include at a minimum:

• A description and identification of the specific hazard(s) associated with particular machines.

• The safeguards on the particular machines including, but not limited to: how they provide protection; the hazards for which they are intended; and how to use them.

• How and under what circumstances safeguards can be removed, and

• What to do when a safeguard is damaged, missing, or unable to perform adequate protection.

• Maintenance personnel must be trained in knowing which machines can be serviced while running and which ones need to be de-energized.

Training shall be provided to all new operators or when any new or altered safeguards are put in service for equipment-driven machines, or the process presents a new hazard or change in procedures.

Program Elements

Types of Machines:

For the purposes of the program, machines are divided into two different categories based on how the employee interacts with the machine. Machines that have a “point of operation” as the point where the work is being performed on materials by an operator are considered “employee-driven” machines. Employee-driven machines include portable power tools, power saws, wood-working equipment, presses, etc.

Machines that do not have a specific point of operation and which do not have an operator during normal operation are considered “self-driven”. Self-driven machines can include elevators, pumps, exhaust fans, etc.

Types of Guards:

Guards are barriers which prevent access to dangerous areas. There are four general types of guards:

• Fixed guard: is a permanent part of the machine. It provides a barrier between the operator and the point of operation or moving parts.

• Interlocked guard: When this guard is open or removed, the tripping mechanism and/or automatic shut off engages, and the moving parts of the machine are stopped. The machine cannot cycle or be started again until the guard is back in place.

• Adjustable guard: provides a barrier that may be adjusted to facilitate a variety of production operations.

• Self-adjusting guard: Provides a barrier that moves according to the size of the material entering the danger area. The guard returns to its normal position when no material is entering through.

General Requirements:

• Guards shall be affixed to the machine where possible. The guard(s) shall be secured elsewhere if for any reason attachment to the machine is not possible. The guard(s) shall be designed and attached in such a way so that it does not present an accident hazard in itself. Where mechanical hazards occur, it is required that those areas on the equipment have safeguards affixed.

• The point of operation of machines that exposes an employee to injury, shall be guarded. The guarding device shall conform to appropriate standards. In the absence of applicable specific standards, the guards shall be designed and constructed as to prevent the operator from having any part of their body in the danger zone during the operating cycle.

• Revolving drums, barrels, and containers shall be guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place (i.e. cement / mortar mixer).

• When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the equipment shall be guarded. The guard shall have openings no larger than one-half (1/2) inch. Examples include: exhaust fans, window fans, portable fans, wall-mounted fans, and industrial fans.

• Machines designed for a fixed location shall be securely anchored to prevent walking or moving when in use.

Basic Safeguarding:

All safeguards must meet the following requirements:

• Prevent contact: The safeguard must prevent hands, arms, and any other part of the employee's body from making contact with dangerous moving parts. A good safeguarding system eliminates the possibility of the operator or another worker placing parts their body near the hazardous moving parts.

• Secure: Employees should not be able to easily remove or tamper with the safeguards. Guards and safety devices should be made of durable material that will withstand the conditions of normal use.

They must firmly be secured to the machine.

• Protect from falling objects: The safeguards should ensure that no objects can fall into moving parts. A small tool which is dropped into a cycling machine could easily become a projectile that could strike and injure someone.

• Creates no new hazard: A safeguard defeats its own purpose if it creates a hazard of its own such as a shear point, jagged edge, or an unfinished surface which can cause a laceration. The edges of guards should be rolled or bolted in such a way that they eliminate sharp edges.

• Create no interference: Any safeguard which impedes an employee from performing the job quickly and comfortably might soon be overridden or disregarded. Proper safeguarding can actually enhance efficiency as it can relieve the worker's apprehensions about injury.

• Allow safe lubrication: If possible, the employee should be able to lubricate the machine without removing the safeguards. Locating oil reservoirs outside the guard with a line leading to the lubrication points will reduce the need for the operator or maintenance employee to enter the hazardous area.

Guard Construction:

Manufactures of today's single-purpose machines provide point of operation and power transmission

safeguards, but not all machines that are used in the various shops at the University have built-in safeguards provided by the manufacturer.

Guards designed and installed by the manufacture offer two main advantages:

• They usually conform to the design and function of the machine.

• They can be designed to strengthen the machine in some way or to serve some additional functional purposes.

However, custom built guards are sometimes necessary for a variety of reasons. They have these advantages:

• Often, with older machinery, they are the only practical safeguarding solution.

• They me be the only choice for mechanical power transmission apparatus in older plants, where machinery is not powered by individual motor drives.

• They permit options for point of operation safeguards when skilled personnel design and make them.

• They can be designed and built to fit unique and changing situations.

• They can be installed on individual feeding mechanisms.

• Design and installation of machine safeguards by employees can help promote safety consciousness in the work environment.

Miscellaneous Aids:

While these aids do not give complete protection from machine hazards, they may provide the operator with extra margin of safety. Sound judgement is needed in their application and usage. Examples include:

• Awareness barrier: serves as a reminder to a person that he or she is approaching the danger area. Even though the barrier does not physically prevent an employee from entering the danger area, it calls their attention to it. For an employee to enter the danger area, an overt act must take place, that is, the employee must either reach or step over, under or through the barrier. An example of an awareness barrier would be a highly visible tape placed on a table saw a few inches away from the point of operation.

• Special hand tool: may be used to place or remove material, particularly from or into the point of operation of a machine. Typically, this use would be for reaching into the danger area of a machine.

Examples of special hand tools are push sticks, push block, etc.

Motions and Actions Hazards:

A wide variety of mechanical motions and actions may present hazards to the employee. These can include the movement of rotating members, reciprocating arms, moving belts, meshing gears, cutting teeth, and any movements that impact or shear. The different types of hazardous mechanical motions and actions are present in varying degrees for nearly all machines, and recognizing them is the first step towards protecting the employee. The basic types of hazards are divided between mechanical motions and actions.

Motions:

• Rotating motion: rotating shafts can grip hair and clothing and can force the hand and arm into a dangerous position. The danger increases

when projections such as set screws, bolts, nicks, abrasions, projecting keys, or set screws are exposed on rotating parts. Collars, couplings, cams, clutches, flywheels, shafts end, spindles, meshing gears, and horizontal or vertical shafting are some examples of common rotating mechanisms which may be hazardous.

• In-running nip point: hazards are caused by the rotating parts on machinery. There are three main types of in-running nip points:

Parts can rotate in opposite directions while their axes are parallel to each other. These parts may be in contact or in close proximity. Examples include: rolling mills, gears, and calenders.

Nip points are also created between rotating and tangentially moving parts. Some examples would be the point of contact between a power transmission belt and its pulley, a chain and a sprocket, and a rack and pinion.

Nip points can occur between rotating and fixed parts which create a shearing, crushing, or abrading action. Examples are spoked hand-wheels or flywheels, screw conveyors, or the periphery of an abrasive wheel and an incorrectly adjusted work rest and tongue.

• Reciprocating motions: may be hazardous because, during the back-and-forth or up-and-down motion, a worker may be stuck by or caught between a moving and a stationary part.

• Transverse motion: creates a hazard because an employee may be stuck or caught in a pinch or shear point by the moving part. This refers to movement in a straight and continuous line. An example is a stationary belt sander.

Actions:

• Cutting action: may involve rotating, reciprocating, or transverse motion. The danger of cutting action exists at the point of operation where finger, arm and body injuries can occur and where flying chips or scrap material can strike the head, particularly in the area of the eye or face. Such hazards are present at the point of operation in cutting materials.

• Punching action: results when power is applied to a slide (ram) 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. Typical machines used for punching operations are power presses and iron workers.

• Shearing action: involves applying power to a slide or knife in order to trim or shear metal or other materials. A hazard occurs at the point of operation where stock is actually inserted, held, and withdrawn. Examples of machines used for shearing operations are mechanically, hydraulically, or pneumatically powered shears.

• Bending action: results when power is applied to a slide in order to draw or stamp metal or other materials. A hazard occurs at the point of operation where stock is inserted, held, and withdrawn.

Equipment that uses bending action include power presses, press brakes, and tubing benders.

Machinery Maintenance and Repair:

The maintenance employees must never fail to replace the guards before the job is considered finished and the machine is released from Lockout/Tag-out. The following safeguarding measures should be taken in order to prevent hazards while servicing machines:

• Notify all affected employees (usually machine or equipment operators or users) that the machine or equipment must be shut down to service the machine or perform maintenance.

• Stop the machine.

• Isolate the machine or piece of equipment from its energy source.

• Lockout/Tag-out the energy source.

• Relieve any stored or residual energy.

• Verify that the machine or equipment is isolated from the energy source.

The following list are exceptions to the above general rules in regards to safeguarding measures that should be taken in order to prevent hazards:

• When the servicing or maintenance is not hazardous for an employee.

• When the servicing which is conducted is minor in nature.

• When servicing is done as an integral part of production.

• When the employer utilizes alternative safeguards which provide effective protection as required by

29 CFR 1910.212 or other specific standards.

When the servicing or maintenance is completed, there are specific steps which must be taken to return the or piece of equipment to service. These steps include:

• Inspection of the machine or equipment to ensure that all guards and other devices are in place and functional.

• Checking to ensure that energization and start-up of the machine or equipment will not endanger employees.

• Removal of the lockout devices.

• Re-energization of the machine or equipment.

• Notification of affected employees that the machine or equipment may be returned to service.

Machinery Inspection Requirements:

Employee driven machines shall be visually inspected prior to each use by the operator to ensure all necessary guards are in place and to mitigate hazards including those caused by the point of operation itself, the power transmission apparatus, or other moving parts.

OSHA Machine Specific Safeguarding:

In addition to the basic safeguarding requirements specified within the Basic Safeguarding section above, all machines and safeguards must also meet any applicable mandatory and non-mandatory machine-specific guarding requirements specified within 29 CFR 1910.213, 215, 217 and 219.

• For specific woodworking machinery requirements, refer to 29 CFR 1910.213.

• For abrasive wheel machinery requirements, refer to 29 CFR 1910.215.

• For mechanical power press requirements, refer to 29 CFR 1910.217.

• For mechanical power transmission apparatus, refer to 29 CFR 1910.219.

• For portable power tool requirements, refer to 29 CFR 1910.243