**MACHINE GUARDING PROGRAM**

**Purpose, Application, and Scope**

This program is developed to protect employees from the hazards associated with machinery by establishing the minimum requirements for machine guarding at Wichita State University (WSU). The purpose of machine guarding is to protect the machine operator and other employees in the work area from hazards created by machine motion such as ingoing nip points, rotating parts, flying chips, and sparks.

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.

**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. Examples: Gear and chain drives, cams, shafts, belts 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 whichdo not have an operator during normal operation.

**Roles and Responsibilities**

**EHS Department** is responsible for the following:

* Developing the Machine Guarding Program and revising the Program as appropriate
* Inspecting machines and machinery for appropriate guarding as deemed appropriate or upon request, and reporting any hazardous conditions to the appropriate department(s)
* Assisting departments with the selection of proper machine guards upon request

**Manager/Supervisor** is responsible for the following:

* Ensuring all machines are properly guarded in accordance with this Program
* Inspecting machines for adequate guarding as specified within this Program
* Providing adequate guarding solutions for machines in accordance with this Program
* Providing personal protective equipment (PPE)
* Ensure all employees received training and comply with the requirements of the Program

**Employees** are responsible for the following:

* Complies with this Program, and all applicable federal, state, and local regulations
* 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/manager of any machine that is damaged or malfunctioning
* Wear appropriate attire that won’t cause entanglement around the machines and machinery

**Program Elements**

**Types of Machines**

For the purposes of this 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:* Provide 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**

* 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, ingoing nip points, rotating parts, flying chips/material, and sparks.
* 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 of 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 are.

**OSHA Machine-Specific Safeguarding**

In addition to the basic safeguarding requirements specifies with in 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*

**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 if 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, flywheels, shafts ends, spindles, and meshing gears are some examples of common rotating mechanisms which may be hazardous.
* *In-running nip In-point*: hazards are caused by the rotating parts on the 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 pinon.
* Nip points can occur between rotating and fixed parts create a shearing, crushing, or abrading action. Examples are spoked hand-wheels or fly wheels, screw conveyors, or the periphery of an abrasive wheel and an incorrectly adjusted work rest and tongue.
* *Reciprocating motion*: may be hazardous because, during the back-and-forth or up-and-down motion, a worker may be struck by or caught between a moving and a stationary part or lacerated by the reciprocating part.
* *Transverse motion*: creates a hazard because an employee maybe 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 use 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.

**Training**

Supervisors are responsible for ensuring that employees understand the requirements of this program, and that employees are trained to recognize general machine-guard 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.
* 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.