**P.1. Electrical and Machine Safeguarding**

1. Purpose: The purpose of this program element is to assure that there is a written work environment procedure relating to systems, programs, procedures, hardware and equipment installed upon, around, over or near any machine or electrical installation to eliminate accidental contact by any person with the hazardous mechanical and/or electrical components.
2. Introduction: This directive contains the minimum requirements necessary to protect employees from mechanical and electrical hazards. In general, any equipment, machine part, function, or process which may cause injury must be safeguarded. Where the operation/maintenance of equipment or a machine or accidental contact with them can injure the operator or others, the hazard must be controlled or eliminated.
3. Procedure Elements:

1. Hazard Assessment. This begins with the need to conduct an assessment to determine if an Electrical and/or Machine Safeguarding program is required for the agency. If it is found that there is a need, then follow the guidance in the remainder of this directive in developing, implementing, and maintaining an effective program to address the need. Maintain the assessment for recordkeeping purposes. The assessment should identify the following:
	1. The work locations, machines, processes, or job tasks where electrical / machine safeguards are being used or are needed. Determine if the location of electrical equipment or wiring exist in areas where other hazardous conditions can be present such as, storage of flammable or combustible materials.
	2. The types of electrical or mechanical hazards.
	3. The types of safeguards being utilized or that are needed.
2. Applicable Standards: Numerous safety standards and regulations pertain to electrical and machine safeguarding which includes, but are not limited to, the following:
	1. American National Standards Institute (ANSI) Standards. In most cases there are specific ANSI standards for specific machines, types of machines, and type of hazards.
	2. Occupational Safety and Health Administration (OSHA) Standards.
		1. OSHA 29 CFR 1910, Subpart O - Machinery and Machine Guarding
		2. OSHA 29 CFR 1910, Subpart S – Electrical
		3. OSHA 29 CFR 1910.269, Electrical Power Generation, Transmission and Distribution.
	3. National Electrical Code, NFPA 70 E
	4. National Electrical Code, NFPA 70 (NEC)
	5. Institution of Electrical & Electronics Engineers, IEEE 1584
3. Written Procedure: Develop a written policy for Electrical and/or Machine Safeguarding that is consistent with industry standards and applies to all employees that work on, near, or with electricity and machinery.
	1. List the work locations, machines, processes, or job tasks that are currently utilizing or are in need of electrical / machine safeguarding.
	2. List who is responsible for conducting inspections, training, and ensuring the proper electrical / machine safeguards are in place and used accordingly.
	3. Define the disciplinary actions for employees who do not follow the established procedures and who is responsible for initiating the disciplinary process.
	4. Define how the appropriate safeguards are selected and purchased for new and existing equipment.
	5. Define the methods used to identify the proper installation, use, and effectiveness of safeguards and equipment.
	6. Define the training required for new personnel, when any new or altered safeguards are put in service, or when workers are assigned to a new machine / operation.
		1. Equipment operators, servicing / maintenance staff, or other employees that work in proximity of hazards.
4. Training: Develop and provide training that, at minimum, addresses following areas:
	1. Employees shall be trained in and familiar with the safety-related work practices that pertain to their respective job assignments. The training should include the recognition of electrical equipment that is locked and tagged out for purposes of de-energizing electrical systems.
	2. The training shall be classroom or on-the-job type. The degree of training provided shall be determined by the hazard and risk to the employee.
	3. Description of the hazardous exposures and control measures.
	4. The type of safeguards and how they provide protection from the hazards.
	5. Proper operation and limitations of the safeguards.
	6. Maintenance, care, and inspection of the safeguards.
	7. Procedures for the temporary removal of safeguards (how to, who can, and under what circumstances).
	8. Procedures for safeguards when damaged, missing, or unable to provide adequate protection. Describe the program or method to alert employees that equipment is unsafe.
	9. Specific electrical hazards and proper work procedures.
		1. Employees who may reasonably be expected to face risk of injury due to electric shock or other electrical hazards must be trained.
		2. Employees permitted to work on or near exposed energized parts / equipment shall be trained.
5. Electrical Safeguarding Procedures: The established electrical safeguarding procedures must address, but are not limited to, the following areas as appropriate:
	1. Examination, proper installation, and use of equipment.
	2. Proper wiring methods and procedures.
	3. Electrical connections / splices.
	4. Guarding of live parts.
	5. Over current protection.
	6. Voltage specific work procedures, including high voltage.
	7. Use and maintenance of electrical protective equipment and tools.
	8. Use, identification, splices, and terminations of flexible cords and cables.
	9. Identification and protection of arcing parts.
	10. Proper equipment markings and identification of disconnects.
	11. Working space and storage clearances.
	12. Usage of equipment in hazardous (classified) or wet/damp locations.
	13. Methods of grounding and use of grounding devices, including ground-fault circuit interrupter protection.
	14. Proper inspection procedures of electrical equipment.
6. Machine Safeguarding Procedures: The established machine safeguarding procedures must address the following requirements for all machines:
	1. General requirements for machine safeguards
		1. Prevent Contact.
		2. Secure.
		3. Protect from falling objects.
		4. Create no new hazards.
		5. Create no interference.
		6. Allow safe lubrication.
	2. Types or methods of machine guards used to protect the operator and other employees in the machine area from hazards.
		1. Guards – Fixed, Interlocked, Adjustable, or self-adjusting.
		2. Devices – Presence Sensing, pullback, restraint, safety controls, or gates.
		3. Safeguarding by Location/Distance
		4. Potential Feeding and Ejection Methods – Automatic / Semi-automatic feed, auto or semi-automatic ejection, or robots.
	3. Miscellaneous Aids – awareness barriers, protective shields, or hand-feeding tools / holding fixtures, or manufactures recommendations.
	4. Protection during maintenance, servicing, and adjustment (lockout/tagout).
	5. Protection at the point of operation.
		1. Ingoing Nip Points, Pinch Points, Rotating Parts, and Flying Chips and Sparks.
	6. Protection from power transmission apparatus - all components of the mechanical system which transmit energy to the part of the machine performing the work.
		1. Flywheels, pulleys, belts, connecting rods, couplings, cams, spindles, chains, cranks, and gears.
	7. Protection from other moving parts (equipment motions and mechanical actions).
		1. Rotating motion, reciprocating motion, transverse motion, cutting, punching, shearing, and bending.
7. Checklists and Forms: There may be the need to provide and/or develop checklists for electrical and mechanical safeguarding to assist with hazard assessment, guard selection, and/or inspections.
8. Program Effectiveness Review and Response: The effectiveness of this program in preventing workplace injuries and illnesses should be evaluated at least annually with appropriate actions taken to address any program deficiencies found.