



## **Mechanical Equipment Guarding Procedure**

University Facilities

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Approved by: Bob Wells

### **1.0 Program Objective**

- 1.1 The policy of Clemson University Facilities (UF) is to provide and promote a program of mechanical equipment guarding designed to minimize personnel exposure to machinery.

### **2.0 Purpose and Scope**

- 2.1 This standard is intended to provide the framework upon which can be established an adequate guarding practice for mechanical equipment of all types.
- 2.2 Special problems in guarding which are not clearly covered in the requirements of this standard, and causes of difficulty arising from a literal interpretation, shall be referred to the Safety Coordinator for study and recommendations.

### **3.0 Definition of Terms**

- 3.1 Cutting Edge - A surface capable of performing a shearing, piercing action.
- 3.2 Guarded - The term "guarded" shall mean that the object or zone is so protected or enclosed as to prevent or minimize personal injury.
- 3.3 Interlock - A device so installed as to over-ride the normal controls on a piece of equipment.
- 3.4 Nip Point - That zone where one moving surface or object moves upon another moving or stationary object decreasing the clearance between their opposing surfaces to 18 inches or less in relation to each other so as to constitute a hazard to personnel.
- 3.5 Shatterproof Glass - Glass laminated with plastic.

## 4.0 Responsibilities

- 4.1 It is the responsibility of operating personnel to see that the procedures of this standard are adhered to with respect to all equipment.
- 4.2 It shall be the responsibility of the Project Manager in charge of a capital addition to ensure that all new equipment is properly guarded.
- 4.3 On projects where no Project Manager is assigned, the Maintenance Director or his designee is responsible to see that all equipment is guarded in accordance with this standard.
- 4.4 It is the responsibility of UF Management to insure that the procedures of this standard are followed. UF Managers are also responsible for ensuring proper progressive discipline policies are followed and enforced when personnel repeatedly fail to follow this procedure.
- 4.5 Supervisors are responsible for administering progressive discipline in accordance with the SC State Personnel Manual and Clemson University guidelines when subordinate personnel repeatedly fail to comply with this procedure as required.

## 5.0 Types of Guards

To eliminate the dangers involved in machine operation, guards built and installed over the hazardous areas or equipment shall be designed to have no exposed dangerous parts by one of the following types:

- 5.1 Fixed Guard - a permanently mounted guard installed at the point of operation which at all times prevents access to the dangerous parts of a machine or the materials being processed in the machine. Fixed guards are considered preferable to other types and should be used where possible.
  - 5.1.1 Fixed guards may be adjusted to accommodate different sets of tools or various kinds of work, but once adjusted, shall remain "fixed" and there shall be no movement or detachment.
- 5.2 Interlocking Guard - A permanently installed interlocking mechanism which may be of a mechanical, electrical, pneumatic, or combined mechanical, electrical and pneumatic type.
  - 5.2.1 The interlocking guard shall be considered as the first alternate of the fixed guard.
  - 5.2.2 The interlocking guard shall guard the dangerous part before the machine can be operated.

- 5.2.3 The interlocking guard shall prevent operation of the machine if the interlocking device fails.
- 5.3 Automatic Guards - A permanently installed device operated through a system of linkage or levers.
  - 5.3.1 An automatic guard must prevent the operator from coming in contact with the dangerous part of the machine while it is in operation.

## **6.0 Procedure**

- 6.1 Equipment shall not be operated until mechanical guards have been installed. This to include run-in periods.
- 6.2 No guard shall be removed unless specific permission is given by the Supervisor.
- 6.3 Defective or missing guards shall be reported to the responsible person immediately. Until repair is completed, the equipment shall be locked and tagged.
- 6.4 Before guards are removed to repair, adjust, or service equipment, the power for the equipment shall be turned off, and tried, the main switch locked, and Danger Red tagged, and tried.
- 6.5 Where equipment is being checked for tolerance or alignment, etc., following installation, maintenance or modification and the presence of a guard or activation of an interlock or other automatic safety device may interface with the desired observation, it shall be permissible to operate the equipment without the guard or interlock if mutual agreement between operating and maintenance resources is secured before the test. **DO NOT MAKE ADJUSTMENTS UNLESS THE MOVING MACHINERY IS SHUT DOWN.** (Refer to Lock Out / Tag Out Safety Standard No.)
- 6.6 All drive mechanisms shall be guarded.
- 6.7 All moving parts and nip points shall be guarded where possible and practical.
- 6.8 Prior to start-up of new equipment, the equipment shall be inspected by representatives of Safety, and Maintenance to determine the adequacy and/or need for additional guarding.

## **7.0 Construction of Guards**

- 7.1 All guards shall have the following characteristics if they are to be considered acceptable:
  - 7.1.1 Conform to the UF Safety Standards.
  - 7.1.2 Be considered a permanent part of the machine or equipment.

- 7.1.3 Prevent access to the danger zone during operation.
- 7.1.4 Not weaken the structure of the machine.
- 7.1.5 Be designed for the specific job and specific machine, with consideration given to the ease of installation and removal and with provisions made for lubrication, inspection, adjusting and repairing of the machine parts.
- 7.1.6 Be durable, resistant to fire and corrosion, and easily repaired.
- 7.1.7 Be constructed strongly enough to resist normal wear and shock, and to withstand long use with minimum maintenance. It should not in itself present new hazards such as splinters, pinch points, shear points, sharp points, sharp corners, rough edges, or other sources of injury.
- 7.1.8 Clearances for openings in a guard or between a guard and a working surface are recommended by the following table:

Distance of Opening From Nip Point	Maximum Width of Opening
0 to 4"	1/4"
4 to 8"	1/2"
over 8"	1"

Either the Safety Coordinator or the design engineer will make the final decision on the amount of clearances.

- 7.2 Materials of Construction - The following guides shall be used for the design and fabrication of guards:
  - 7.2.1 The preferable material of construction for mechanical guards shall be metal.
  - 7.2.2 Framework of guards should be made from structural metal shapes such as angle iron, strapping, bar or rod stock.
  - 7.2.3 Filler material for the guards should be expanded, perforated or solid sheet metal or wire mesh.
  - 7.2.4 Guards constructed of wood, because of their lack of durability and strength and combustible nature, shall have limited and temporary application.
  - 7.2.5 Where resistance to corrosion is a considerable factor, guards of aluminum, other soft metal, and plastic will be permitted.

- 7.2.6 Shatterproof glass, or plastic, may be used where visibility of guarded parts is necessary. Safety glass and plastics used where chips or other flying particles are likely to mar the surface may be protected by cover glasses.
- 7.2.7 When a guard cannot be made to exclude lint, ample ventilation shall be required. Larger guards should have self-closing access doors for cleaning.

### 7.3 Inspection of Guards

- 7.3.1 The inspection of mechanical guards shall be considered an important part of routine safety and maintenance inspections.
- 7.3.2 The inspection of mechanical guards, interlocks, and automatic guards shall be considered as a vital part of the prestart-up inspection of all mechanical equipment. Equipment found to be deficient because of insufficient guarding shall not be operated until this situation has been corrected.

## 8.0 References

- 8.1 OSHA Standard 1910, Subpart O Machinery and Machine Guarding
- 8.2 EHS Comprehensive Environmental Health and Safety Plan, Tab 4