

 CITY OF TUCSON	City of Tucson Central Safety Services Number: S-025 Subject:	Page 1 of 11
		Effective Date: January 15, 2009
	Machine Guarding	Reviewed/ Revised: January 1, 2013

1.0 PURPOSE

This procedure has been established to provide employees with a uniform policy for the safe operation of electrically, pneumatically or manually powered machinery.

2.0 SCOPE

This procedure will apply to all employees within the City of Tucson who are required to or work on electrically, pneumatically, or manually powered machinery in an energized or de-energized state.

The policies and procedures contained in this section are intended to assist in identifying and complying with OSHA Safety Standards. In all cases where there is a difference between specific OSHA standards and Machine Guarding policies set forth in this chapter, the stricter of the two shall apply.

3.0 DEFINITIONS

After guarding: Is the process of guarding a machine or machinery that either does not have a guard designed by the manufacturer, or is not deemed adequate by the employer to protect against potential employee injury.

Chip Guard: means a guard affixed, either permanently or by other temporary means, that protects the eyes from debris generated by the work process. The guard is made from safety glass or Lexan (clear, hard plastic), enclosed or supported by a metal frame.

Machines: Includes, but is not limited to:

- Compressed Air Nozzles
- Electrically-powered pipe threaders
- Fans
- Grinders
 - Bench
 - Pedestal
 - Angle
 - Peanut
- Lathes
 - Wood
 - Metal
- Presses
 - Drill

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- Hydraulic
- Bearing
- Brake
- Punch
- Sanders
 - Belt, fixed
 - Belt, Portable
- Saws
 - Table
 - Scroll
 - Chop
 - Band
 - Radial
 - Circular
- Jointers
- Planers

Machine Hazard: Occurs at the point of operation where the actual work is performed and can be created by:

- Components which transmit energy, such as pulleys, belts, chains, gears, couplings or flywheels; or,
- Other parts which move while the machine is working, including reciprocating, rotating and transverse or ejecting parts.

4.0 RESPONSIBILITIES

A. Department/Division Managers

1. The Department shall ensure that all machine guarding designed and implemented by the manufacturer is in place and functioning as designed.

B. Supervisor

1. Supervisors shall ensure that employees do not remove or circumvent machine guarding from operating equipment and replace machine guarding after repairs or maintenance have been performed.

C. Employees

1. Employees shall not remove or circumvent machine guarding from operating equipment and shall promptly replace machine guarding after maintenance or repair of equipment.
2. Employees shall also immediately report unguarded machinery hazards to their supervisor.

D. Central Safety Services

1. Central Safety Services shall inspect machines for adequate and appropriate guarding during the annual facility safety inspection (MAIT) and shall recommend appropriate guarding or corrective action.

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5.0 EDUCATION AND TRAINING

- A.** All departments/divisions shall provide initial employee training to every employee that will operate electrically, pneumatically or manually driven machinery, shall afford employees the opportunity for refresher training and shall repeat the training when:
1. Changes in the work process render previous training obsolete;
 2. Changes in the types of machinery to be operated render previous training obsolete;
 3. An effected employee's is observed operating machinery without the proper machine guard or circumventing a machine guard.
- B.** Departments/divisions, in coordination with Central Safety Services, will verify that each affected employee has received and understands the required training through a written documentation that contains the name of each employee trained, the date(s) of training, on the subject of Machine Guarding.

6.0 GENERAL

A. Power Controls

1. Each anchored machine shall be equipped with a master switch that is capable of being locked or tagged out during repair or maintenance operations. Power controls shall be within easy reach of the operator at the workstation and shall be of contrasting colors and readily identified as the master control.
2. Machinery controlled by electrical disconnects shall be capable of being locked or tagged out during repair or maintenance operations and shall be readily identifiable (labeled) as to the machinery the disconnect controls.

B. Anchoring of Machinery

1. All fixed machinery will be anchored to the floor or bench by means of anchor bolts (or similar) or in the case of portable machinery (such as a pedestal grinder) it shall be anchored by a heavy base that prevents tipping, limits vibration and inhibits accidental movement.

C. Guarding

1. Appropriate guards, either designed and installed by the manufacturer or installed as "after guarding" shall be in place to protect the operator and other employees from the hazards that may occur from exposure to moving parts such as exposed belts, pulleys, sheaves, drive shafts, drive couplings, springs, chains, rotating or reciprocating parts, blades, flying debris, chips or sparks.
2. Appropriate guarding shall be solid shielding, expanded metal or other material that is adequate in type to protect the eyes of the employee and is adequate in size or opening dimension to prevent the employee from reaching or accidently reaching the point of operation.

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3. Guards shall be designed to allow for maintenance of machinery to that in best practice situations, a guard will not need to be removed for routine maintenance. If a guard is removed for machine maintenance or repair, lockout/tagout/tryout procedures shall be followed and the guard shall be immediately replaced and secured at the conclusion of the repair or maintenance.
4. Self-adjusting guards shall not be removed, "pinned" back or otherwise compromised by the operator.

D. Lockout/Tagout/Tryout

1. Operators, repair or maintenance personnel shall place all machinery in a de-energized state at the point of energy control before removing any machine guarding for service or repair. The procedures delineated in OSHM directive S-009 – Lockout/Tagout/Tryout shall be followed by employees.

E. Remote Guarding (Guard by Location)

1. Fans, pulleys, sprockets and chain drives greater than seven feet (7') above the working level, need not be guarded and shall be considered guarded by location. When employees must work from ladders on or near equipment guarded by location (unguarded equipment) that equipment shall be placed in a de-energized state (locked out).
2. Working space around anchored or fixed machinery should be marked with caution tape or painted lines to identify areas where hazards from ejecting material or moving parts may occur.

F. Personal Protective Equipment

1. Eye and Face Protection
 - a. Operators, repair or maintenance personnel shall wear ANSI approved eye protection when performing job tasks. In some circumstances operators, repair or maintenance mechanics shall be required to wear face protection (face shield) as per the manufacturer's recommendation or as required by Job Hazard Assessment.
2. Hearing Protection
 - a. Operators, repair or maintenance personnel shall wear hearing protection in the form of ear plugs or ear muffs (or both) where required (danger) or advised (warning) by posting of signs.
3. Foot Protection
 - a. Operators, repair or maintenance personnel shall wear appropriate foot wear with protective or non-conductive toe protection when working on or near equipment requiring machine guarding.

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G. Appropriate Work Attire

1. Operators, repair or maintenance personnel shall not wear loose fitting clothing while operating, repairing or maintaining energized equipment. In addition:
 - a. Jewelry, such as neck chains, shall be secured under clothing or removed entirely before operating, repair or maintenance of energized equipment;
 - b. Earrings that hang beneath the ear lobe shall be secured or removed entirely before operating, repair or maintenance of energized equipment;
 - c. Long hair shall be restrained before operating, repair or maintenance of energized equipment.

H. Bench or Pedestal Grinders

1. Bench grinders shall be secured at all times. Pedestal Grinders shall be secured against movement by bolts (or similar) or secure (heavy) anchor. Eye protection devices (shield) on the grinders are not required, **provided** signs are posted requiring the wearing of eye and face protection during the operation of a grinder.
2. Tongue guards shall be constantly adjusted to no greater than ¼ inch from the working surface of the grinding wheel (Appendix A).
3. Tool (work) rests shall be constantly adjusted to no greater than 1/8 inch from the working surface of the grinding wheel (Appendix A).
4. The spindle of the grinding wheel shall be covered so that 75% of the wheel is protected against inadvertent contact from the operator.
5. Operators shall ensure that the maximum RPM rating for the grinding wheel is compatible with the RPM rating for grinder.
6. To determine whether a grinding wheel is safe to utilize and before mounting a grinding wheel, the operator shall visually inspect each grinding wheel for defects and shall perform a ring test (Appendix B).
7. Operators shall replace a grinding wheel when the wear is down to 1 inch before the paper or decal marking the flange opening and when the wheel is grooved or otherwise deformed.
8. Employees shall only grind appropriate (hard) metals on the grinding wheel to avoid wheel heat retention and wheel explosion.

I. Compressed Air

1. Compressed air utilized for cleaning shall be:
 - a. Regulated to less than 30 pounds per square inch (PSI); and

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- b. Cleaning nozzles shall have a “blow back” feature (hole or nozzle gap) in where any compressed air inadvertently forced directly against the skin of an employee will be directed out the side or behind the tip of the nozzle.
2. Operators, repair or maintenance personnel shall wear eye protection when utilizing compressed air for cleaning purposes.
3. Compressed air shall not be utilized for cleaning debris from employee skin, clothes, or hair.

J. Interlock Devices

1. Operators, repair or maintenance personnel shall not circumvent or defeat a safety interlock device for machine operation or while performing servicing or maintenance or to clear jammed material.

7.0 ADVICE AND COUNSEL

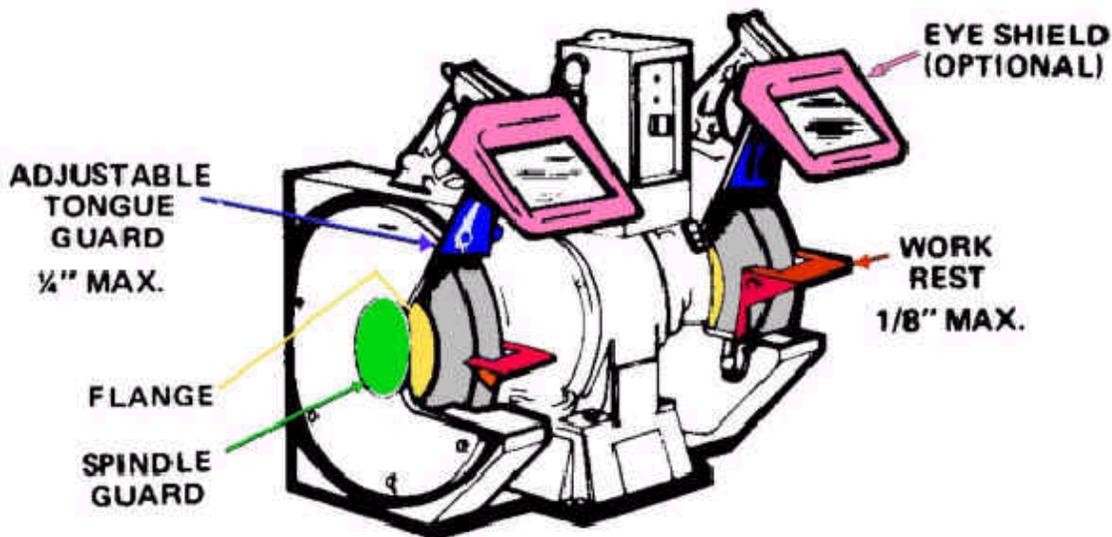
Central Safety Services shall provide advice and counsel on this procedure by referencing OSHA 29CFR 1910 Subpart O and shall review the procedure and appendix on an annual basis.

Appendix A

Pedestal and Bench Grinders

Stationary grinding machines should be heavy enough and rigid enough to prevent dangerous vibration or tipping over. They should be mounted securely on substantial floors, benches, or foundations.

Enclosures for grinding machines are needed to protect employees from flying fragments of a bursting abrasive wheel.



Description	Yes	No
Do side guards cover the spindle, nut and flange and 75% of the wheel diameter?		
Is the work rest used and kept adjusted to within 1/8-inch (0.3175cm) of the wheel?		
Is the adjustable tongue guard on the top side of the grinder used and kept to within 1/4-inch (0.6350cm) of the wheel?		
Is the maximum RPM rating of each abrasive wheel compatible with the RPM rating of the grinder motor?		
Before new abrasive wheels are mounted, are they visually inspected and ring tested?		
Is eye protection and face shields always worn when grinding?		
Are bench and pedestal grinders permanently mounted?		
Is each electrically operated grinder effectively grounded?		
Does each grinder have an individual on and off control switch?		

A CHECK IN THE NO COLUMN SHALL SIGNIFY THE NEED FOR IMMEDIATE CORRECTION

Appendix B

Ring Test

“Tap” wheels about 45° each side of the vertical centerline and about 1 or 2 inches from the periphery as indicated by the spots in Figure 1 and Figure 2. Then rotate the wheel 45° and repeat the test. An undamaged wheel will yield a clear metallic tone. If cracked, there will be a dead sound and not a clear “ring.”

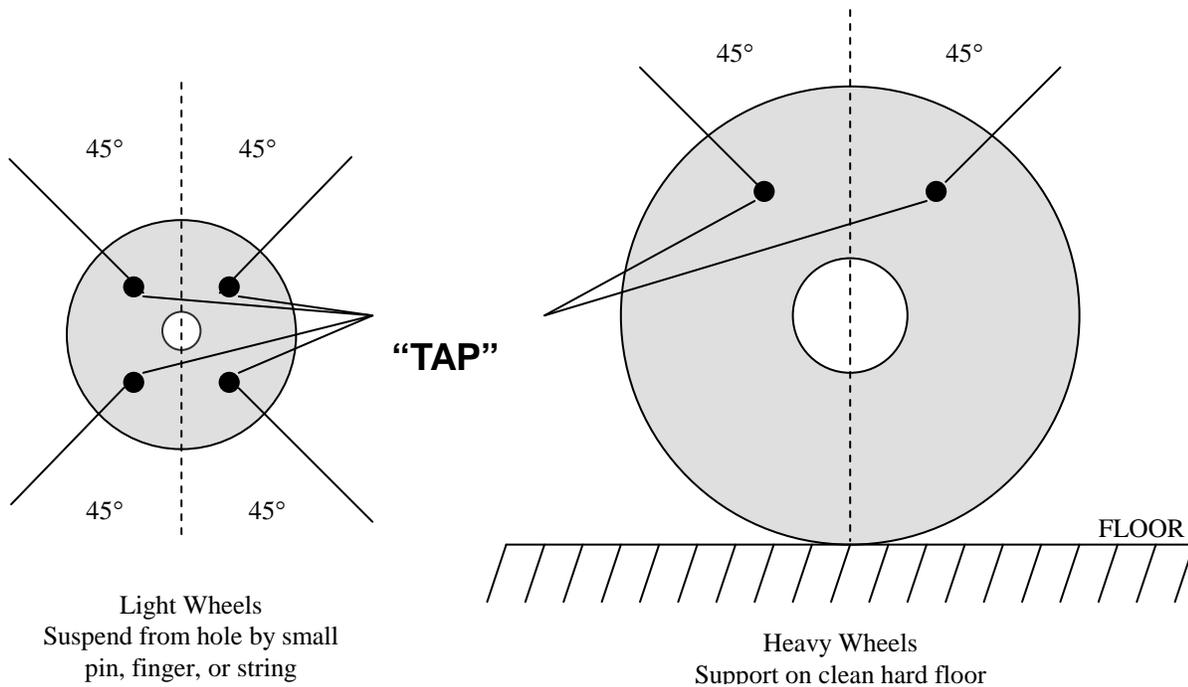


Figure 1

Figure 2

General Safety Checklist for Machine Guarding

The following checklist is intended to assist operators, repair and maintenance personnel in determining that machinery is properly functioning and required machine guards are in place per OSHA Machine Guard Standards 1910 Subpart O

General Requirements	Yes	No
Electrical Power Controls		
Is each machine equipped with a master switch or disconnect that can be locked and tagged during repair or maintenance?		
Are power and operating controls located within easy reach of the operator?		
Are controls marked with contrasting red/black or yellow/black colors allowing operators to easily identify the control?		
Pedestal or Bench Grinders		
Does spindle guard cover 75% of the wheel diameter?		
Is the work rest positioned with 1/8" from the grinding wheel?		
Is the Tongue Guard on the top side of the grinding wheel positioned within 1/4" of the grinding wheel?		
Is the maximum PRM rating of the grinding wheel matched or compatible to the RPM of the grinder motor?		
Before grinding wheels are mounted are they visually inspected and a Ring Test performed?		
Are bench grinders permanently mounted?		
Are pedestal grinders anchored against vibration and movement?		
Are Eye and Face Protection Required signs in place on or near the Bench Grinder?		
Drill Press		
Is the Drill Press secured to the bench or floor?		
Is the power transmission parts (rotating bit) properly guarded or shielded by a chip guard?		
Is the top of the drill press, where the motor and pulley are located, completely enclosed?		
Is an Eye Protection Required sign in place on or near the Drill Press?		

General Requirements	Yes	No
Hydraulic or Electrically Powered Presses		
Are blankets or barriers provided for bearing presses?		
Is guarding or interlocks provided for brake presses?		
Is an Eye Protection Required sign in place on or near the Press?		
Band Saws		
Is the cutting edge of the blade completely enclosed by an adjustable guard except at the point of operation?		
Are both upper and lower drive wheels completely enclosed		
Is an Eye Protection Required sign in place on or near the Band Saw and is there a chip guard in place?		
Circular Saws		
Are table saws equipped with a self-adjusting guard that protects the portion of the saw blade above the table?		
Is the saw blade, the motor and pulley completely enclosed below the table?		
For hand-held circular saws is the blade guard of self-adjusting type that snaps back into position after the cut has been completed?		
Is there an eye protection required sign in place on or near the table saw and an eye protection required policy in place for the operation of hand-held circular saws?		
Radial Arm Saws		
Is the radial arm saw designed to return gradually and automatically to the starting position when released by the operator?		
Is the blade rotation marked?		
Is the "Do Not Rip or Plough from this Direction" Sticker in place?		
Is the self-adjusting blade guard in place and does the guard snap back into position after the cut has been completed?		
Is an Eye Protection Required sign in place on or near the Band Saw?		
Belt Sanding Machines		
Do belt sanders have the guards in place at each in-running nip point on the power transmission and feed roll?		

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Is there an eye protection required sign in place on or near the belt sander and an eye protection required policy in place for the operation of hand-held belt sanders?		
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General Requirements	Yes	No
Jointers		
Is the jointer blade guarded at the materials entry point?		
Is the opening between the table and the knife just large enough to clear the knife?		
Is an Eye Protection Required sign in place on or near the Jointer?		
Planers		
Are cutter heads completely enclosed in solid metal guards that are closed when the planer is operating?		
Are belts and pulleys completely enclosed below the table?		
Are feed rollers guarded to prevent operator finger entry into the rollers while boards pass through the machine?		
Is an Eye Protection Required sign in place on or near the Planer?		
Compressed Air Nozzles		
Is the air nozzle regulated no greater than 30 pounds per square inch (PSI)?		
Does the air nozzle have a opening in the flute or is the designed so that air can bypass the nozzle opening if the nozzle tip is covered?		
Is there a policy that requires the wearing of eye protection when utilizing compressed air for cleaning?		
Fans		
Are floor or portable fans completely guarded, with no openings greater than ½" x ½"?		