Department of the Air Force
HQ AEDC (AFMC)
Arnold AFB, TN 37389

Safety, Health, and Environmental Standard

Title: GRINDING WHEELS

Standard No.: D7

Effective Date: 01/25/2011

The provisions and requirements of this standard are mandatory for use by all personnel engaged in work tasks necessary to fulfill the AEDC mission. Please contact your safety, industrial health and/or environmental representative for clarification or questions regarding this standard.

Approved:

Contractor/ATA Director
Safety and Health Group

Air Force Functional Chief

Record of Review/Revision

Date/POC	Description
01/18/11 Tate/Huggins	Two-year review; administrative/reformatting changes only.
05/18/09 Tate/Huggins	Annual review; no change required.
05/12/08 Tate	Annual review. Updated Reference list and removed ANSI B11.9 (discontinued)
04/26/07 Kelly	Annual review. Minor changes to clarify requirements as follows: Added Paragraph 4.3.1 instructing workers to de-energize and lockout units prior to removal of guards, tool rests, etc. Noted requirement for LOTO in Paragraph 4.4.1.
05/22/06 Roosa	Annual review; no change required.
01/29/05 R. Wheeler	Updated reference to AFOSH 91-501; made minor formatting changes; added "uncontrolled copy" statement.
09/30/02	Reformatted according to COI 91-5. Added additional PPE requirements for respirators and hearing protection, 4.4.6 Added additional storage requirement, para.4.2.10

Safety, Health, and Environmental Standard

GRINDING WHEELS

1.0 INTRODUCTION/SCOPE/APPLICABILITY

1.1 Introduction – This standard establishes general guidelines for the selection, use, handling, storage, inspection, and guarding of grinding wheels and specifies general requirements for grinding machinery and equipment.

1.2 Scope – This standard specifies general requirements for grinding machinery and equipment and incorporates the requirements and objectives of OSHA, ANSI, Air Force and other nationally recognized national consensus standards to assure implementation at AEDC. Excluded from this standard are natural sandstone wheels and metal, woolen, cloth, or paper disks having a surface layer of abrasive material.

1.3 Applicability – This standard applies to all AEDC personnel and operations.

2.0 BASIC HAZARDS/HUMAN FACTORS

Abrasive wheels are very useful tools, but can present many hazards. Hands or fingers that contact the moving wheel surfaces can incur severe injuries. Eye injuries are another serious hazard. The grinding operation can loosen chips or particles that can fly into the eye. Abrasive wheels can disintegrate if damaged, saturated, or improperly rated for the grinder motor being used. When this happens, it could send pieces of debris flying through the work area damaging expensive equipment or personnel. Another hazard is when employees are pulled into the machinery due to loose clothing being caught in the moving parts. Yet another hazard involves respiratory exposure due to inhaling of the dust (silica) and fumes generated during grinding operations.

3.0 DEFINITIONS

Abrasive Wheel – A grinding wheel consisting of abrasive grains held together by organic or inorganic bonds.

Inorganic-Bonded Wheels – Wheels bonded by inorganic material such as clay, porcelain, sodium silicate, magnesium oxychloride, or metal.

Organic-Bonded Wheels – Wheels bonded by organic material such as resin, rubber, shellac, or other similar bonding agent.

Operating Contractor – A base contractor directly accountable to the Air Force for the AEDC mission. This is the term used to identify the AEDC Operation, Maintenance, Information Management and Support Contractor.

Outside Contractor/Subcontractor – An organization employed by a contractor or the Air Force to do construction, maintenance, repair or other work at AEDC. There is no employment relationship, control or supervision of the subcontractor's employees by AEDC contractors. Also referred to as the construction contractor.

Ring Test – A test made by suspending a grinding wheel from the hole on a small pin or finger (heavier wheels may be allowed to rest in a vertical position on a clean, hard floor), tapping the wheel about 45 degrees on each side of the vertical center line and about two inches from the periphery. An undamaged wheel gives a clear, metallic ring. If cracked, there is a dead sound.

NOTE: Organic-bonded wheels do not emit the same clear, metallic ring as inorganic-bonded wheels.

Tongue – An adjustable guard attached to the top of the main grinding wheel guard on bench and stand grinders, which provides peripheral and angular protection for the user.

4.0 REQUIREMENTS/RESPONSIBILITIES

4.1 Grinding Wheel Before Use Inspection

4.1.1 Immediately prior to installation or use; grinding wheels must be inspected for cracks and damage and given a ring test.

4.1.2 Grinding machines should be inspected daily by operators. Deficiencies noted should be reported to supervisors immediately. The checklist in Annex A may be used for this.

4.2 Storage and Handling

4.2.1 Wheels must not be bumped, dropped, or rolled on the floor.

4.2.2 Wheels that cannot be hand carried must be transported by truck or other suitable conveyances that will provide support. Wheels must be secured so as to eliminate the possibility of shifting or rolling during transport. In addition, pinch point hazards must be identified and avoided.

4.2.3 Suitable racks, bins, drawers, or boxes must be provided to store various types of grinding wheels.

4.2.4 Thin, organic-bonded wheels should be laid flat on a horizontal surface to prevent warping. Blotters (compressible washers) should not be used.

4.2.5 Large, thick, straight, or tapered wheels should be stored vertically in cradled racks, preferably with partitions in the racks.

4.2.6 Cup and cylinder wheels should be stored on flat sides with cushioning material such as cardboard between each wheel.

4.2.7 Flaring cup wheels should be stored flat to prevent chipping of edges.

4.2.8 Small wheels (four inches or less in diameter), except flaring cup wheels, should be stored in boxes, bins, or drawers.

4.2.9 Wheels must be stored in dry, clean, uniformly heated storage areas.

4.2.10 Arrange grinding wheels so that older ones will be chosen before newer ones.

4.3 Installation

4.3.1 Prior to removal of guards, tool rests, tongues, or wheels; de-energize unit by unplugging the power cord or locking out and tagging out (LOTO) the breaker or dedicated disconnect.

4.3.2 Immediately prior to installation or use; grinding wheels must be inspected (see 4.1.1).

4.3.3 The spindle speed (RPM) of the machine, which must be stamped or stenciled on the machine housing/nameplate, must be checked before mounting the wheel to be certain that the machine speed does not exceed the maximum operating speed marked on the wheel. A grinding wheel must not be used if its maximum operating speed cannot be determined.

4.3.4 Wheel holes (arbor) must be of the same nominal size as the machine spindle or wheel mount. Wheels are to be re-bushed only by the manufacturer. Bushings must not exceed the width of the wheel and must not contact flanges.

4.3.5 Abrasive wheels must be mounted between flanges that are not less than one-third the diameter of the wheel with the following exceptions:

4.3.5.1 Permanently mounted wheels.

4.3.5.2 Portable wheels with threaded inserts or projecting studs.

4.3.5.3 Abrasive disk wheels (inserted nut, inserted washer, projecting stud type).

4.3.5.4 Plate-mounted wheels.

4.3.5.5 Cylinders

4.3.5.6 Cup or segmented wheels, mounted in chucks

4.3.5.7 Types 27 and 28 wheels

4.3.5.8 Certain internal wheels

4.3.5.9 Modified types 6 and 11 wheels

4.3.5.10 Cut-off wheels, types 1 and 27A

NOTE: See ANSI B7.1-2000 for illustrations of the above wheels.

4.3.6 Blotters must always be used between flanges and abrasive wheel surfaces to ensure uniform distribution of flange pressure.

Exceptions:

4.3.6.1 Permanently mounted wheels

4.3.6.2 Abrasive disk wheels (inserted nut, inserted washer, projecting stud type)

4.3.6.3 Plate-mounted wheels

4.3.6.4 Cylinders

4.3.6.5 Cup or segmented wheels, mounted in chucks

4.3.6.6 Types 27 and 28 wheels

4.3.6.7 Certain types 1 and 27A cut-off wheels

4.3.6.8 Certain internal wheels

4.3.6.9 Type 4 tapered wheels

4.3.6.10 Diamond wheels, except those vitrified

4.3.6.11 Modified types 6 and 11 wheels (terrazzo) (blotters applied flat side only) 13.4

NOTE: See ANSI B7.1-2000 for illustrations of the above wheels.

4.3.7 Spindle end nuts should only be tight enough to hold the wheel firmly. Excessive pressure may crack the wheel. A tightening torque of 15 to 20 foot-pounds is normally sufficient.

4.3.8 After installation, guards must be replaced, tool rests on stationary grinders must be adjusted to within one-eighth of an inch of grinding wheel surfaces, and tongues must be adjusted to within one-fourth of an inch of grinding wheel surfaces.

4.3.9 Never mount Type 27 grinding wheels on horizontal grinders.

4.4 Use

4.4.1 After a new abrasive wheel has been installed and before the power is turned on, the wheel should be turned a few revolutions by hand to ensure that the wheel does not come in contact with the wheel guard or tool rest. This should be accomplished in a 100 percent LOTO condition.

4.4.2 The operator of any grinding machine should stand to one side before starting the machine, since a defective stone is more likely to break when starting. New wheels must be run at full speed for one minute before work is applied. If excessive chatter occurs, the grinder should be stopped and inspected to determine the cause and not operated until the cause is corrected.

4.4.3 To prevent possible wheel cracks and breaks, the operator of a grinding machine should apply the work gradually at first, allowing the wheel to heat up gradually.

4.4.4 Gloves must not be worn when using grinding equipment.

EXCEPTION: When operating a large grinder where the work handled is rough or has sharp edges.

4.4.5 Operators of equipment using abrasive wheels and personnel in the immediate vicinity of the operation must wear impact-resistant type eye protection (safety glasses or goggles. Face shields alone do not give sufficient eye protection. However, they should be worn in addition to glasses as protection against sparks, dust, etc. Both face shields and eyeglasses or goggles are required when dressing down abrasive wheels.

4.4.6 A respirator must be worn if exposed to excessive dust and fumes

4.4.7 Hearing protection must be worn to prevent hearing damage from the noise generated by grinding operations.

4.4.8 Operators must not wear loose clothing, ties, rings or other jewelry.

4.4.9 Operators must not use grinding machines to grind soft metals such as aluminum, brass, and lead. Sanders equipped with abrasive disks or belts should be used for this purpose.

4.5 Grinding Machinery and Equipment

4.5.1 On offhand grinding machines, tool rests must be used to support work for abrasive grinding and should be kept adjusted to within one eighth of an inch of the grinding surface as the wheel wears down. Rests may not be used on wire wheels.

4.5.2 As wheels wear out of round or the face becomes uneven, they must be dressed down by a qualified person.

4.5.3 Grinding machine tongues must be kept adjusted to within one-fourth of an inch of the grinding surface. Safety wheel guards must be provided for abrasive wheel machinery.

EXCEPTION: Wheels used on internal work, mounted wheels two inches or smaller in diameter, and cones, plugs, and threaded-hole pot balls (see ANSI B7.1-1970), where the work offers protection.

4.5.4 The safety wheel guard must cover the spindle end, nut, and flange projections and must be mounted to maintain proper alignment with the wheel.

4.5.5 Maximum guard exposure angles must not exceed those specified in complete detail in OSHA1910.215 or ANSI B7.1 and generally given as follows:

4.5.5.1 Bench and floor stands – 90° (125° if the nature of work requires contact with the wheel below the horizontal plane of the spindle) with exposure beginning at a point not more than 65° above the horizontal plane.

4.5.5.2 Cylindrical grinders – 180° with exposure beginning not more than 65° above the horizontal plane.

4.5.5.3 Surface grinders and cutoff machines – 150° with exposure beginning at a point not less than 15° below the horizontal plane of the wheel spindle.

4.5.5.4 Swing frame grinders – 180° with the top half being enclosed at all times.

4.5.5.5 Top grinding – 60°with the exposure beginning at a point 30° on either side of the vertical plane of the wheel spindle.

4.5.5.6 Portable grinders – 180° with the top half of the wheel enclosed at all times.

4.5.6 Hood exhausts should be provided on grinding machines that are used extensively and where considerable dust particles are generated. OSHA Standard 1910.94 should be used for guidance on exhaust systems.

4.5.7 Pedestal and bench grinders should be provided with transparent shields mounted in front of grinding wheel exposures.

4.5.8 See Safety Standard D8, Portable Power Tools, for inspection requirements on portable air grinders.

4.5.9 Electric switches for lights on grinding machines should operate independently from motor switches so that light is available during set-up work.

5.0 Training

Personnel operating grinding equipment and machinery shall be aware of manufacturer guidelines and instructions for safe operation.

6.0 Inspections/Audits

Operating Contractor Safety may conduct spot verifications to confirm safe use and operation.

7.0 References

AEDC Safety, Health, and Environmental Standard
D8, Portable Power Tools

Air Force Occupational Safety and Health Standard
91-501, Air Force Consolidated Occupational and Health Safety Standard

American National Standards Institute (ANSI)
B7.1, Safety Code for the Use, Care, and Protection of Abrasive Wheels

Code of Federal Regulations (CFR) Occupational Safety and Health Administration (OSHA)
29 CFR OSHA Standard 1910.215, Abrasive Wheel Machinery
29 CFR OSHA Standard 1926.303, Abrasive Wheels and Tools

National Safety Council Accident Prevention Manual for Industrial Operations, 12th Edition

Annex A
Grinder Checklist

Date: _____ **Fac/Dept:** _____

Inspector: _____ **Bldg/Area:** _____

Type: _____ **Size:** _____

RPM: _____ **Peripheral Speed:** _____

	ITEM	YES	NO
Hood Guard:	Securely fastened		
	Properly aligned		
	Correct exposure angle (75% of wheel diameter)		
	Hood exhaust provided and in working order (where applicable)		
Glass Shield:	Clean		
	Unscored		
	In place		
Work Rest:	Within one-eighth of an inch of grinding surface		
	Securely clamped		
Tongue:	Within one-fourth of an inch of grinding surface		
	Tight		
Frame:	Securely mounted		
	Vibration free		
Wheel Face:	Well lighted		
	Properly dressed		
Flanges:	Equal size		
	Correct diameter (not less than one-third of wheel diameter)		
Speed or RPM:	Rated equal to or less than the wheel mounted		
Belt Guards:	Provided and properly in place		
Electrical:	Three-wire ground provided		
	Connecting cord and plug in good repair		
Comments:			