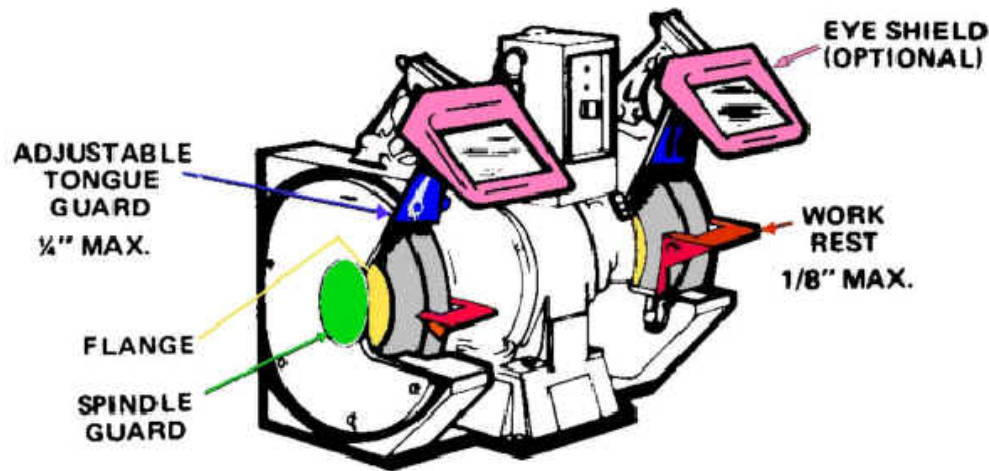


ABRASIVE WHEEL MACHINERY POLICY



SUMMARY

The document outlines the general requirements for machine guarding, focusing on abrasive wheels and their safety measures.

- **Machine Guarding Exceptions:** Abrasive wheels must have safety guards except for internal work, mounted wheels in portable operations, and specific types of cones and plugs where the work offers protection.
- **Guard Design:** Safety guards should cover the spindle end, nut, and flange projections, except in operations where the work provides protection, portable saws, and when the work covers the side of the wheel.
- **Work Rests:** On offhand grinding machines, work rests must be used to support the work, kept adjusted closely to the wheel, and securely clamped after each adjustment.
- **Excluded Machinery:** Natural sandstone wheels and discs with abrasive layers on the surface are not covered by these requirements.
- **Guard Exposure Angles:** Maximum exposure angles for guards on various machines are specified, ensuring that the exposure does not exceed a certain degree for safety.
- **Material Requirements:** Safety guards must meet specific material requirements and minimum dimensions based on the operating speed and type of wheels used.
- **Flanges:** All abrasive wheels must be mounted between flanges that are at least one-third the diameter of the wheel, with specific exceptions listed.
- **Inspection and Mounting:** Wheels must be inspected and tested for damage before mounting, ensuring the spindle speed does not exceed the wheel's maximum operating speed.
- **Blotters:** Blotters must be used between flanges and wheel surfaces to ensure uniform flange pressure, with specific exceptions noted.

ABRASIVE WHEEL MACHINERY POLICY

POLICY

GENERAL REQUIREMENTS

Machine Guarding

Abrasive wheels will be used only on machines provided with safety guards except:

- Wheels used for internal work while within the work being ground;
- Mounted wheels, used in portable operations, 2 inches and smaller in diameter; and
- Types 16, 17, 18, 18R, and 19 cones, plugs, and threaded hole pot balls where the work offers protection.

Guard Design

The safety guard will cover the spindle end, nut, and flange projections. The safety guard will be mounted so as to maintain proper alignment with the wheel, and the strength of the fastenings will exceed the strength of the guard, except:

Safety guards on all operations where the work provides a suitable measure of protection to the operator, may be so constructed that the spindle end, nut, and outer flange are exposed; and where the nature of the work is such as to entirely cover the side of the wheel, the side covers of the guard may be omitted; and

The spindle end, nut, and outer flange may be exposed on machines designed as portable saws.

Flanges

Grinding machines will be equipped with flanges.

Work Rests

On offhand grinding machines, work rests will be used to support the work. They will be of rigid construction and designed to be adjustable to compensate for wheel wear. Work rests will be kept adjusted closely to the wheel with a maximum opening of one-eighth inch to prevent the work from being jammed between the wheel and the rest, which may cause wheel breakage. The work rest will be securely clamped after each adjustment. The adjustment will not be made with the wheel in motion.

Excluded Machinery

Natural sandstone wheels and metal, wooden, cloth, or paper discs, having a layer of abrasive on the surface are not covered.

GUARDING OF ABRASIVE WHEEL MACHINERY

Cup Wheels

Cup wheels (Types 6 and 11) will be protected by:

- Safety guards;
- Band type guards; and

ABRASIVE WHEEL MACHINERY POLICY

- Special "Revolving Cup Guards" which mount behind the wheel and turn with it. They will be made of steel or other material with adequate strength and will enclose the wheel sides upward from the back for one-third of the wheel thickness. The mounting features will conform with all requirements. It is necessary to maintain clearance between the wheel side and the guard. This clearance will not exceed one-sixteenth inch.

Guard Exposure Angles

The maximum exposure angles will not exceed the standard. Visors or other accessory equipment will not be included as a part of the guard when measuring the guard opening, unless such equipment has strength equal to that of the guard.

Bench and Floor Stands

The angular exposure of the grinding wheel periphery and sides for safety guards used on machines known as bench and floor stands should not exceed 90 deg. or one-fourth of the periphery. This exposure will begin at a point not more than 65 deg. above the horizontal plane of the wheel spindle.

Wherever the nature of the work requires contact with the wheel below the horizontal plane of the spindle, the exposure will not exceed 125 deg.

Cylindrical Grinders

The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on cylindrical grinding machines will not exceed 180 deg. This exposure will begin at a point not more than 65 deg. above the horizontal plane of the wheel spindle.

Surface Grinders and Cutting-Off Machines

The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on cutting-off machines and on surface grinding machines which employ the wheel periphery will not exceed 150 deg. This exposure will begin at a point not less than 15 deg. below the horizontal plane of the wheel spindle.

Swing Frame Grinders

The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on machines known as swing frame grinding machines will not exceed 180 deg., and the top half of the wheel will be enclosed at all times.

Automatic Snagging Machines

The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on grinders known as automatic snagging machines will not exceed 180 deg. and the top half of the wheel will be enclosed at all times.

Top Grinding

Where the work is applied to the wheel above the horizontal centerline, the exposure of the grinding wheel periphery will be as small as possible and will not exceed 60 deg.

ABRASIVE WHEEL MACHINERY POLICY

Exposure Adjustment

Safety guards of the types described in Subparagraphs (3) and (4) of this paragraph, where the operator stands in front of the opening, will be constructed so that the peripheral protecting member can be adjusted to the constantly decreasing diameter of the wheel. The maximum angular exposure above the horizontal plane of the wheel spindle will never be exceeded per the standard, and the distance between the wheel periphery and the adjustable tongue or the end of the peripheral member at the top will never exceed one-fourth inch.

Material Requirements and Minimum Dimensions

- The minimum basic thickness of peripheral and side members for various types of safety guards and classes of service will not exceed the standard.
- If operating speed does not exceed 8,000 surface feet per minute cast iron safety guards, malleable iron guards or other guards will be used.
- Cast steel, or structural steel, safety guards will be used where operating speeds of wheels are faster
- than 8,000 surface feet per minute up to a maximum of 16,000 surface feet per minute.
- For cutting-off wheels 16 inches diameter and smaller and where speed does not exceed 16,000 surface feet per minute, cast iron or malleable iron safety guards will be used.
- For cutting-off wheels larger than 16 inches diameter and where speed does not exceed 14,200 surface feet per minute, safety guards will be used.
- For thread grinding wheels not exceeding 1 inch in thickness cast iron or malleable iron safety guards will be used.

Band Type Guards-General Specifications

Band type guards will conform to the following general specifications:

- The bands will be of steel plate or other material of equal or greater strength. They will be continuous, the ends being either riveted, bolted, or welded together in such a manner as to leave the inside free from projections. The inside diameter of the band will not be more than 1 inch larger than the outside diameter of the wheel, and will be mounted as nearly concentric with the wheel as practicable.
- The band will be of sufficient width and its position kept so adjusted that at no time will the wheel protrude beyond the edge of the band.

Guard Design Specifications

Abrasive wheel machinery guards will meet the design specifications of the American National Standard Safety Code for the Use, Care, and Protection of Abrasive Wheels, ANSI B7.1-1970, which is incorporated by reference as specified in Sec. 1910.6. This requirement will not apply to natural sandstone wheels or metal, wooden, cloth, or paper discs, having a layer of abrasive on the surface.

Flanges

ABRASIVE WHEEL MACHINERY POLICY

General Requirements

All abrasive wheels will be mounted between flanges which will not be less than one-third the diameter of the wheel.

Exceptions:

- Mounted wheels.
- Portable wheels with threaded inserts or projecting studs.
- Abrasive discs (inserted nut, inserted washer and projecting stud type).
- Plate mounted wheels.
- Cylinders, cup, or segmental wheels that are mounted in chucks.
- Types 27 and 28 wheels.
- Certain internal wheels.
- Modified types 6 and 11 wheels (terrazzo).
- Cutting-off wheels, Types 1 and 27A
- Type 1 cutting-off wheels are to be mounted between properly relieved flanges which have matching bearing surfaces. Such flanges will be at least one-fourth the wheel diameter.
- Type 27A cutting-off wheels are designed to be mounted by means of flat, not relieved, flanges having matching bearing surfaces and which may be less than one-third but will not be less than one-fourth the wheel diameter.
- There are three general types of flanges:
 - Straight relieved flanges (see Figure O-32);
 - Straight unrelieved flanges (see Figure O-30);
 - Adaptor flanges (see Figures O-33 and O-34);
- Regardless of flange type used, the wheel will always be guarded. Blotters will be used in accordance with the standard.

Finish and Balance

Flanges will be dimensionally accurate and in good balance. There will be no rough surfaces or sharp edges.

Uniformity of Diameter

Both flanges, of any type, between which a wheel is mounted, will be of the same diameter and have equal bearing surface. Exceptions are set forth in the remaining subdivisions of this subparagraph.

Type 27 and Type 28 wheels, because of their shape and usage, require specially designed adaptors. The back flange will extend beyond the central hub or raised portion and contact the wheel to counteract the side pressure on the wheel in use. The adaptor nut which is less than the minimum one-third diameter of wheel fits in the depressed side of wheel to prevent interference in side grinding and serves to drive the wheel by its clamping force against the depressed portion of the back flange. The variance in flange diameters, the adaptor nut being less than one-third wheel diameter, and the use of side pressure in wheel operation limits the use to reinforced organic bonded wheels. Mounts which are affixed to the wheel by the manufacturer will not be reused. Type 27

ABRASIVE WHEEL MACHINERY POLICY

and Type 28 wheels will be used only with a safety guard located between wheel and operator during use.

Types 27 and 28 wheels, because of their shape, require specially designed adaptors.

Modified Types 6 and 11 wheels (terrazzo) with tapered K dimension.

Recess and Undercut

- Straight relieved flanges will be recessed at least one-sixteenth inch on the side next to the wheel.
- Straight flanges of the adaptor or sleeve type will be undercut so that there will be no bearing on the sides of the wheel within one-eighth inch of the arbor hole.

Blotters

Blotters (compressible washers) will always be used between flanges and abrasive wheel surfaces to insure uniform distribution of flange pressure.

Exception:

- Mounted wheels.
- Abrasive discs (inserted nut, inserted washer, and projecting stud type).
- Plate mounted wheels.
- Cylinders, cups, or segmental wheels that are mounted in chucks.
- Types 27 and 28 wheels.
- Certain Type 1 and Type 27A cutting-off wheels.
- Certain internal wheels.
- Type 4 tapered wheels.
- Diamond wheels, except certain vitrified diamond wheels.
- Modified Types 6 and 11 wheel (terrazzo)-blotters applied flat side of wheel only.

Driving Flange

The driving flange will be securely fastened to the spindle and the bearing surface will run true. When more than one wheel is mounted between a single set of flanges, wheels may be cemented together or separated by specially designed spacers. Spacers will be equal in diameter to the mounting flanges and have equal bearing surfaces.

Dimensions

- The minimum dimensions for straight relieved and unrelieved flanges for use with wheels with small holes that fit directly on the machine spindle will not exceed the standard.
- The minimum dimensions for straight adaptor flanges for use with wheels having holes larger than the spindle. Dimensions of such adaptor flanges will never be less than indicated.
- The minimum dimensions for straight flanges that are an integral part of wheel sleeves which are frequently used on precision grinding machines. Dimensions of such flanges will never be less than the standard requires.

ABRASIVE WHEEL MACHINERY POLICY

Repairs and Maintenance

All flanges will be maintained in good condition. When the bearing surfaces become worn, warped, sprung, or damaged they should be trued or refaced. When refacing or truing, care will be exercised to make sure that proper relief and rigidity is maintained and that they will be replaced when they do not conform to the standard. Failure to observe these rules might cause excessive flange pressure around the hole of the wheel. This is especially true of wheel-sleeve or adaptor flanges.

MOUNTING

Inspection

- Immediately before mounting, all wheels will be closely inspected and sounded by the user (ring test) to make sure they have not been damaged in transit, storage, or otherwise. The spindle speed of the machine will be checked before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel. Wheels should be tapped gently with a light nonmetallic implement, such as the handle of a screwdriver for light wheels, or a wooden mallet for heavier wheels. If they sound cracked (dead), they will not be used. This is known as the "Ring Test".
- Wheels will be dry and free from sawdust when applying the ring test, otherwise the sound will be deadened. It should also be noted that organic bonded wheels do not emit the same clear metallic ring as do vitrified and silicate wheels.

Arbor Size

Grinding wheels will fit freely on the spindle and remain free under all grinding conditions. A controlled clearance between the wheel hole and the machine spindle (or wheel sleeves or adaptors) is essential to avoid excessive pressure from mounting and spindle expansion. To accomplish this, the machine spindle will be made to nominal

(standard) size plus zero minus .002 inch, and the wheel hole will be made suitably oversize to assure safety clearance under the conditions of operating heat and pressure.

Surface Condition

All contact surfaces of wheels, blotters and flanges will be flat and free of foreign matter.

Bushing

When a bushing is used in the wheel hole it will not exceed the width of the wheel and will not contact the flanges.

Blotters

When blotters or flange facings of compressible material are required, they will cover entire contact area of wheel flanges. Blotters need not be used with the following types of wheels:

- Mounted wheels.
- Abrasive discs (inserted nut, inserted washer, and projecting-stud type).

ABRASIVE WHEEL MACHINERY POLICY

- Plate mounted wheels.
- Cylinders, cups, or segmental wheels that are mounted in chucks.
- Types 27 and 28 wheels.
- Certain Type 1 and Type 27A cutting-off wheels.
- Certain internal wheels.
- Type 4 tapered wheels.
- Diamond wheels, except certain vitrified diamond wheels.

Multiple Wheel Mounting

When more than one wheel is mounted between a single set of flanges, wheels may be cemented together or separated by specially designed spacers. Spacers will be equal in diameter to the mounting flanges and have equal bearing surfaces. When mounting wheels which have not been cemented together, or ones which do not utilize separating spacers, care will be exercised to use wheels specially manufactured for that purpose.

ABRASIVE WHEEL MACHINERY POLICY

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