

4123:1-5-12 Abrasive grinding and cutting, polishing and wire buffing equipment.

(A) Reserved.

(B) Reserved.

(C) Responsibility.

(1) The employer shall verbally and through demonstration instruct the employee in the safe operation and maintenance of abrasive grinding and cutting and polishing equipment.

(2) It shall be the duty of the employee to operate such equipment in accordance with such instruction.

(D) Abrasive wheel machinery.

(1) General requirements.

(a) Machine guarding.

Abrasive wheels shall be used only on machines provided with safety guards as defined in the following paragraphs of this rule, except:

(i) Wheels used for internal work while within the work being ground;

(ii) Mounted wheels, used in portable operations, two inches and smaller in diameter; and

(iii) Types 16, 17 and 18R and 19 cones, plugs, and threaded hole pot balls where the work offers protection (see appendix to this rule.)

(b) Guard design.

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

(i) Safety guards on all operations where the work provides 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

(ii) The spindle end, nut and outer flange may be exposed on machines, designed as portable saws, when used with abrasive wheels.

(c) Flanges.

Grinding machines shall be equipped with flanges in accordance with paragraph (D)(3) of this rule.

(d) Work rests.

(i) On off-hand grinding machines (see appendix to this rule) work rests shall be used to support the work. They shall be of rigid construction and designed to be adjustable to compensate for wheel wear. Work rests shall be kept adjusted to a maximum opening of one-eighth inch to prevent the work from being jammed between the wheel and the rest. The employer shall instruct the employee to securely clamp the work rest after each adjustment. The employer shall also instruct the employee not to adjust the work rest with the wheel in motion.

(ii) The work rest shall be used to support the work wherever practicable.

(iii) Wherever the nature of the work requires contact with the wheel below the horizontal plane of the spindle, work rests need not be used.

(e) Excluded machinery.

Natural sandstone wheels and metal, wooden, cloth, or paper discs, having a layer of abrasive on the surface are not covered by paragraph (D) of this rule.

(2) Guarding of abrasive wheel machinery.

(a) Cup wheels.

Cup wheels types 6 and 11 (see appendix to this rule) shall be protected by:

(i) Safety guards as specified in paragraph (D)(2)(a)(i) of this rule, applies to paragraphs (D)(2)(a) to (D)(2)(j) of this rule;

(ii) Band type guards as specified in paragraph (D)(2)(k) of this rule; and

(iii) Special "revolving cup guards" which mount behind the wheel and turn with it. They shall be made of steel or other material with strength enough to withstand the shock of the bursting wheel and shall enclose the wheel sides upward from the back for one-third of the wheel

thickness. The mounting features shall conform with all requirements of paragraph (D) of this rule. It is necessary to maintain clearance between the wheel side and the guard. This clearance shall not exceed one-sixteenth inch.

(b) Guard exposure angles.

The maximum exposure angles specified in paragraphs (D)(2)(a) to (D)(2)(h) of this rule shall not be exceeded. Visors or other necessary equipment shall 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.

(c) Bench and floor stands.

- (i) The angular exposure of the grinding wheel periphery and sides for safety guards used on machines known as bench and floor stands shall not exceed ninety degrees or one-fourth of the periphery. This exposure shall begin at a point not more than sixty-five degrees above the horizontal plane of the wheel spindle (see figures 12-1 and 12-2 to this rule, and paragraph (D)(2)(i) of this rule).



Figure 12-1



Figure 12-2

- (ii) Where the nature of the work requires contact with the wheel below the horizontal plane of the spindle, the exposure shall not exceed one hundred twenty-five degrees (see figures 12-3 and 12-4 to this rule).

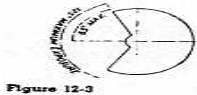


Figure 12-3

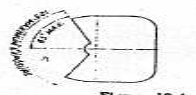


Figure 12-4

(d) Cylindrical grinders.

The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on cylindrical grinding machines shall not exceed one hundred eighty degrees. This exposure shall begin at a point not more than sixty-five degrees above the horizontal plane of the wheel spindle (see figures 12-5 and 12-6 to this rule, and paragraph (D)(2)(i) of this rule).



Figure 12-5

Figure 12-6

(e) 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 shall not exceed one hundred fifty degrees. This exposure shall begin at a point not less than fifteen degrees below the horizontal plane of the wheel spindle (see figures 12-7 and 12-8 to this rule).

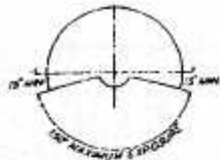


Figure 12-7

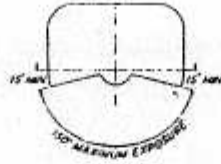


Figure 12-8

(f) 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 shall not exceed one hundred eighty degrees, and the top half of the wheel shall be enclosed at all times (see figures 12-9 and 12-10 to this rule).



(g) 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 shall not exceed one hundred eighty degrees and the top half of the wheel shall be enclosed at all times (see figures 12-9 and 12-10 to this rule).

(h) Top grinding.

Where the work is applied to the wheel above the horizontal centerline, the exposure of the grinding wheel periphery shall not exceed sixty degrees (see figures 12-11 and 12-12 to this rule).



Figure 12-11

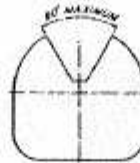
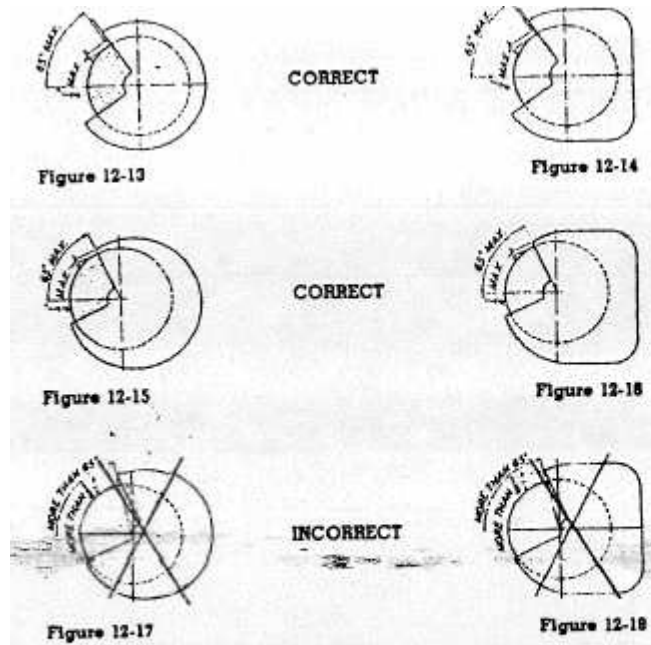


Figure 12-12

(i) Exposure adjustment.

Safety guards of the type described in paragraphs (D)(2)(c) and (D)(2)(d) of this rule, where the operator stands in front of the opening, shall 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 as specified in paragraphs (D)(2)(c) and (D)(2)(d) of this rule shall never be exceeded, and the distance between the wheel periphery member at the top shall never exceed one-fourth inch (see figures 12-13, 12-14, 12-15, 12-16, 12-17 and 12-18 to this rule).



(j) Material requirements and minimum dimensions.

- (i) See figures 12-31 and 12-32 and table 12-J to this rule for minimum basic thickness of peripheral and side members for various types of safety guards and classes of service.
- (ii) If operating speed does not exceed eight thousand surface feet per minute cast iron safety guards, malleable iron guards or other guards as described in paragraph (D)(2)(j)(iii) of this rule shall be used.
- (iii) Cast steel, or structural steel safety guards as specified in figures 12-31 and 12-32 and table 12-J to this rule shall be used where operating speeds of wheels are faster than eight thousand surface feet per minute up to a maximum of sixteen thousand surface feet per minute.
- (iv) For cutting-off wheels sixteen inches diameter and smaller and where speed does not exceed sixteen thousand surface feet per minute, cast iron or malleable iron safety guards as specified in figures 12-31 and 12-32 to this rule, and in table 12-J to this rule shall be used.
- (v) For cutting-off wheels larger than sixteen inches diameter and where speed does not exceed fourteen thousand two hundred surface feet per minute, safety guards as specified in figures 12-22 and 12-23 to this rule and in table 12-A to this rule shall be used.

- (vi) For thread grinding wheels not exceeding one inch in thickness cast iron or malleable iron safety guards as specified in figures 12-31 and 12-32 to this rule and in table 12-J to this rule shall be used.

(k) Band type guards - specifications.

Band type guards shall conform to the following specifications:

- (i) The bands shall be of steel plate or other material of equal or greater strength. They shall be continuous, the ends being either riveted, bolted, or welded together in such a manner as to leave the inside free from projections.
- (ii) The inside diameter of the band shall not be more than one inch larger than the outside diameter of the wheel, and shall be mounted as nearly concentric with the wheel as practicable.
- (iii) The band shall be of sufficient width and its position kept so adjusted that at no time will the wheel protrude beyond the edge of the band a distance greater than that indicated in figure 12-24 and table 12-B to this rule or the wall thickness (W), whichever is smaller.

(3) Flanges.

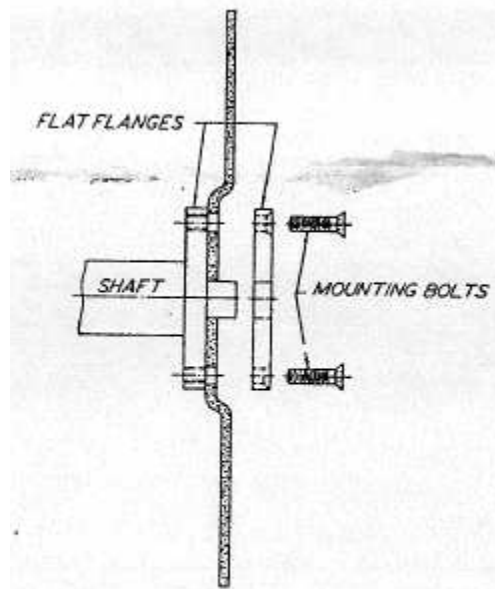
(a) General requirements.

- (i) All abrasive wheels shall be mounted between flanges which shall not be less than one-third the diameter of the wheel.

(ii) Exceptions.

- (a) Mounted wheels;
- (b) Portable wheels with threaded inserts or projecting studs;
- (c) Abrasive discs (inserted nut, inserted washer and projecting stud type);
- (d) Plate mounted wheels;
- (e) Cylinders, cup, or segmental wheels that are mounted in chucks;
- (f) Types 27 and 28 wheels;
- (g) Internal wheels, less than two inches in diameter;

- (h) Modified types 6 and 11 wheels (terrazzo);
- (i) Cutting-off wheels, types 1 and 27A (see paragraphs (D)(3)(a)(ii)(i)(i) and (D)(3)(a)(ii)(i)(ii) of this rule);
- (i) Type 1 cutting-off wheels are to be mounted between properly relieved flanges which have matching bearing surfaces. Such flanges shall be at least one-fourth the wheel diameter;
- (ii) 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 shall not be less than one-fourth the wheel diameter (see figure 12-19 to this rule for one such type of mounting);
- (iii) There are three general types of flanges: straight relieved flanges (see figure 12-27 to this rule); straight unrelieved flanges (see figure 12-25 to this rule); and adaptor flanges (see figures 12-28 and 12-29 to this rule);
- (iv) Regardless of flange type used, the wheel shall be used in accordance with paragraph (D)(3)(f) of this rule.



(b) Design and material.

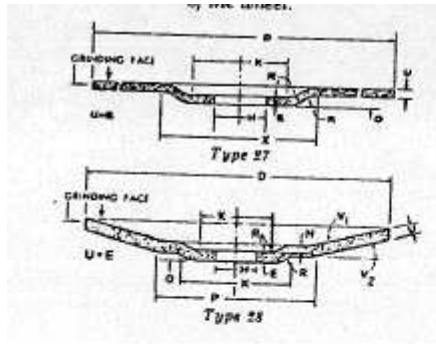
- (i) Flanges shall be of such design as to satisfactorily transmit the driving torque from the spindle to the grinding wheel.
- (ii) Flanges shall be made of steel, cast iron, or other material of equal or greater strength and rigidity.
- (iii) Flanges shall be designed with respect to rigidity so that when tightened, the radial width of bearing surface of contact on wheel is maintained (see table 12-F and figure 12-27 to this rule).

(c) Finish and balance.

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

(d) Uniformity of diameter.

- (i) Both flanges, of any type, between which a wheel is mounted, shall be of the same diameter and have equal bearing surface. Exceptions are set forth in the remaining requirements of this rule.
- (ii) Type 27 and type 28 wheels, because of their shape and usage, require specially designed adaptors. The back flange shall 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 shall not be reused. Type 27 and type 28 wheels shall be used only with a safety guard located between wheel and operator during use (see figure 12-19a to this rule).



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

(e) Recess and undercut.

(i) Straight relieved flanges made according to table 12-F to this rule and figure 12-27 to this rule shall be recessed at least one-sixteenth inch on the side next to the wheel for a distance as specified in table 12-F to this rule.

(ii) Straight flanges of the adaptor or sleeve type (see table 12-G to this rule and figures 12-28 and 12-29 to this rule) shall be undercut so that there will be no bearing on the sides of the wheel within one-eighth inch of the arbor hole.

(f) Blotters.

(i) Blotters (compressible washers) shall always be used between flanges and abrasive wheel surfaces to ensure uniform distribution of flange pressure (see paragraph (D)(4) of this rule).

(ii) Exceptions.

(a) Mounted wheels;

- (b) Abrasive discs (inserted washer, and projecting stud type);
- (c) Plate mounted wheels;
- (d) Cylinders, cups, or segmental wheels that are mounted in chucks;
- (e) Types 27 and 28 wheels;
- (f) Type 1 and type 27A cutting-off wheels;
- (g) Internal wheels less than two inches in diameter;
- (h) Diamond and cubic boron nitride wheels; and
- (i) Modified types 6 and 11 wheel (terrazzo) - blotters applied flat side of wheel only.

(g) Multiple wheel mounting.

The driving flange shall be securely fastened to the spindle and the bearing surface shall 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 shall be equal in diameter to the mounting flanges and have equal bearing surfaces.

(h) Dimensions.

- (i) Tables 12-D and 12-F to this rule and figures 12-25 and 12-27 to this rule show minimum dimensions for straight relieved and unrelieved flanges for use with wheels with small holes that fit directly on the machine spindle. Dimensions of such flanges shall never be less than indicated and should be greater where practicable.
- (ii) Tables 12-F and 12-G to this rule and figures 12-26 and 12-29 to this rule show minimum dimensions for straight adaptor flanges for use with wheels having holes larger than the spindle. Dimensions of such adaptor flanges shall never be less than indicated and should be greater where practicable.
- (iii) Table 12-H to this rule and figure 12-30 to this rule show 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 shall never be less than indicated and should be greater where practicable.

(i) Repairs and maintenance.

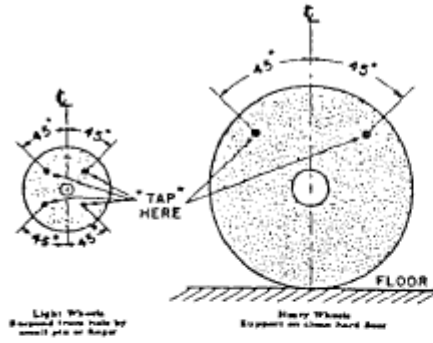
All flanges shall be maintained in good condition. When bearing surfaces become worn, warped, sprung, or damaged they shall be trued, refaced, or replaced. When refacing or truing, care shall be exercised to make sure that proper relief and rigidity is maintained as specified in paragraphs (D)(3)(b) and (D)(3)(e) of this rule, and they shall be replaced when they do not conform to these requirements and table 12-D to this rule, figure 12-25 to this rule, table 12-E to this rule, figure 12-26 to this rule, table 12-F to this rule, figure 12-27 to this rule, and table 12-H to this rule, figure 12-30 to this rule. Failure to observe these requirements might cause excessive flange pressure around the hole of the wheel. This is especially true of wheel-sleeve or adaptor flanges.

(4) Mounting.

(a) Inspection.

Immediately before mounting, all wheels shall be closely inspected and sounded by the employer or a designated employee (ring test) to make sure they have not been damaged in transit, storage, or otherwise. The spindle speed of the machine shall be checked before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel. Wheels shall 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 shall not be used. This is known as the "ring test."

- (i) Wheels must 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.
- (ii) "Tap" wheels about forty-five degrees each side of the vertical centerline and about one or two inches from the periphery as indicated by the spots in figure 12-20 and figure 12-21 to this rule. Then rotate the wheel forty-five degrees and repeat the test. A sound and undamaged wheel will give a clear metallic tone. If cracked, there will be a dead sound and not a clear ring.



(b) Arbor size.

Grinding wheels shall 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 shall be made from a nominal (standard) size to plus .002 inch. A wheel which must be forced on a spindle shall not be used.

(c) Surface condition.

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

(d) Bushing.

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

(e) Blotters.

A blotter shall be used between the flange and the abrasive wheel. The blotter shall cover the entire contact area of the flange. Blotters need not be used with the following types of wheels:

- (i) Mounted wheels;
- (ii) Abrasive discs (inserted nut, inserted washer, and projecting stud type);
- (iii) Plate mounted wheels;
- (iv) Cylinders, cups, or segmented wheels that are mounted in chucks;
- (v) Types 27 and 28 wheels;
- (vi) Type 1 and type 27A cutting-off wheels;
- (vii) Internal wheels less than two inches in diameter; and
- (viii) Diamond and cubic boron nitride wheels.

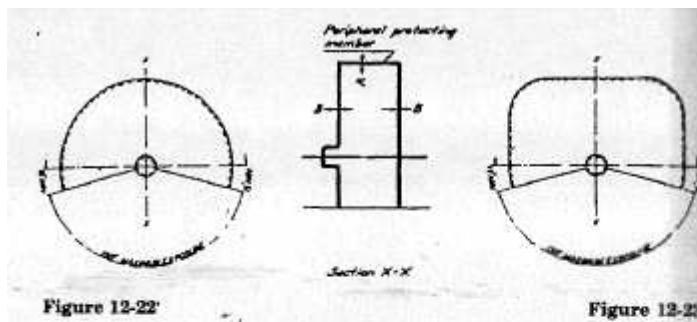


Table 12-A
MINIMUM BASIC THICKNESSES FOR PERIPHERAL
AND SIDE MEMBERS
FOR SAFETY GUARDS USED WITH CUTTING-OFF WHEELS

Material Used in Construction of Guard	Maximum Thickness of Cutting-Off Wheel	Speed Not to Exceed	Cutting-Off Wheel Diameters												
			6 to 11 inches		Over 11 to 20 in.		Over 20 to 30 in.		Over 30 to 48 in.		Over 48 to 72 in.				
			A	B	A	B	A	B	A	B	A	B			
Structural Steel (Min. Tensile Strength 60,000 PSI)	5/8 inch or less	14,200 SPPM	1/16	1/8	3/16	1/4	1/4	3/8	1/2	3/8	1/2	1/2	3/4	1/2	3/4
	1/2 inch or less	16,000 SPPM	3/32	1/4	1/4	3/8	1/2	1/2	3/4	3/4	1	1	1 1/4	1 1/4	1 1/2

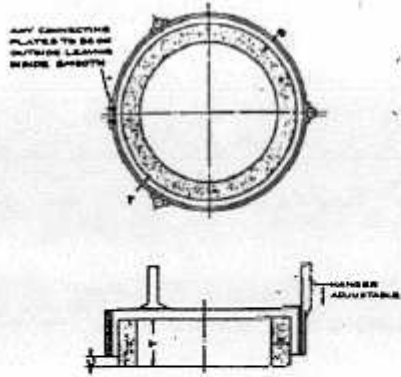


Figure 12-24

Table 12-B

EXPOSURE VERSUS WHEEL THICKNESS

Overall Thickness of Wheel (T) Inches	Maximum Exposure of Wheel (C) Inches
1/2	1/4
1	1/2
2	3/4
3	1
4	1 1/2
5 and over	2

Table 12-C
GUIDE FOR CONSTRUCTION OF BAND TYPE GUARDS
Maximum Wheel Speed 7000 SFPM

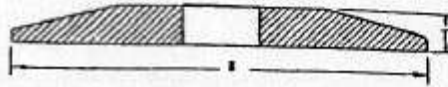
Minimum Material Specifications	Diameter of Wheel	Minimum Thickness of Band A'	Minimum Diameter of Rivets	Maximum Distance between Centers of Rivets
Hot Rolled Steel SAE 1006	Inches Under 8	Inches $\frac{1}{16}$	Inches $\frac{3}{16}$	Inches $\frac{3}{4}$
	8 to 24	$\frac{1}{8}$	$\frac{1}{4}$	1
	Over 24 to 30	$\frac{1}{4}$	$\frac{3}{8}$	$1\frac{1}{4}$

Table 12-D
MINIMUM DIMENSIONS FOR STRAIGHT UNRELIEVED FLANGES FOR WHEELS WITH THREADED INSERTS OR PROJECTING STUDS

A Diameter of Wheel	B* Minimum Outside Diameter of Flange	T Minimum Thickness of Flange
Inches	Inches	Inches
1	$\frac{5}{8}$	$\frac{1}{32}$
2	1	$\frac{1}{8}$
3	1	$\frac{3}{16}$
4	$1\frac{3}{8}$	$\frac{2}{16}$
5	$1\frac{3}{4}$	$\frac{1}{4}$
6	2	$\frac{3}{8}$

* NOTE: Must be large enough to extend beyond the bushing. Where prong anchor or cupback bushing are used, this footnote does not apply.

Figure 12-25



Driving flange secured to spindle for use only on portable wheels with threaded inserts or projecting studs.

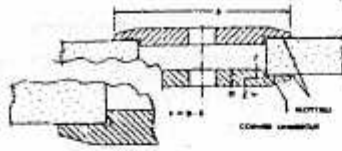


Figure 12-26

Table 12-E

**MINIMUM DIMENSIONS FOR STRAIGHT ADAPTOR FLANGE—
FOR ORGANIC BONDED WHEELS OVER 1/4 INCH THICK***

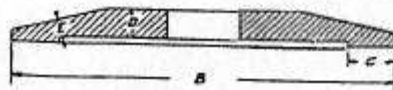
Wheel Diameter	Wheel Hole Diameter	B Minimum Flange Diameter	D Minimum Thickness of Flange at Bore	E Minimum Thickness of Flange at Edge of Undercut	F* (D-E) Minimum Thickness
Inches 12 to 14	Inches 4 5 6	Inches 6 7 8	Inches 3/8 3/8 3/8	Inches 3/8 3/8 3/8	Inches 3/8 3/8 3/8
Larger than 14 to 18	4 5 6 7 8	6 7 8 9 10	3/8 3/8 3/8 3/8	3/8 3/8 3/8 3/8	3/8 3/8 3/8 3/8
Larger than 18 to 24	6 7 8 10 12	8 9 10 12 14	1 1 1 1 1	3/8 3/8 3/8 3/8 3/8	3/8 3/8 3/8 3/8 3/8
Larger than 24 to 30	12	15	1	3/8	3/8
Larger than 30 to 36	12	15	1 1/4	3/8	3/8

*For wheels under 1/4 inch thick F dimension shall not exceed 40% of wheel thickness

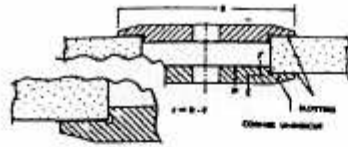
Table 12-F
MINIMUM DIMENSIONS FOR STRAIGHT RELIEVED FLANGES

A* Diameter of Wheel	B Minimum Outside Diameter of Flanges	C Radial Width of Bearing Surface		D Minimum Thickness of Flange at Bore	E Minimum Thickness of Flange at Edge of Recess
		Minimum	Maximum		
Inches	Inches	Inches	Inches	Inches	Inches
1	$\frac{1}{2}$	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{16}$
2	$\frac{3}{4}$	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{3}{16}$
3	1	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{16}$	$\frac{1}{4}$
4	$1\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$
5	$1\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{4}$
6	2	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{4}$
7	$2\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{4}$
8	3	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{4}$
10	$3\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{4}$
12	4	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{4}$
14	$4\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{4}$
16	$5\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{1}{2}$	$\frac{1}{4}$
18	6	$\frac{1}{2}$	1	$\frac{1}{2}$	$\frac{1}{4}$
20	7	$\frac{3}{8}$	$1\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$
22	$7\frac{1}{2}$	$\frac{3}{8}$	$1\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$
24	8	$\frac{3}{8}$	$1\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$
26	$8\frac{1}{2}$	$\frac{3}{8}$	$1\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$
28	10	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{4}$
30	10	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{4}$
36	12	1	2	$\frac{1}{2}$	$\frac{1}{4}$
42	14	1	2	$\frac{1}{2}$	$\frac{1}{4}$
48	16	$1\frac{1}{4}$	2	$1\frac{1}{8}$	1
60	20	$1\frac{1}{4}$	2	$1\frac{1}{8}$	$1\frac{1}{8}$
72	24	$1\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{1}{8}$

Flanges for wheels under 2 inches diameter may be unrelieved and shall be maintained flat and true.

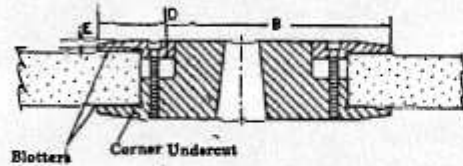


Driving flange secured to spindle.



Central Nut Mounting
Driving flange secured to spindle.

Figure 12-28



Multiple Screw Mounting
Driving flange secured to spindle.

Figure 12-29

Table 12-G

MINIMUM DIMENSIONS FOR STRAIGHT FLANGES—
FOR MECHANICAL GRINDERS
12,500 S.F.P.M. to 16,500 S.F.P.M.(1)

Wheel Diameter	Wheel Hole Diameter	"B" Minimum Flange Diameter	"D" Minimum Thickness of Flange at Bore	"E" Minimum Thickness of Flange at Edge of Undercut	F*(D-E) Minimum Thickness
20	6	8	1	1/2	1/2
20	8	10	1 1/2	3/4	3/4
24	12	15	2	1	1
30	12	15	2	1	1
36	12	15	2	1	1

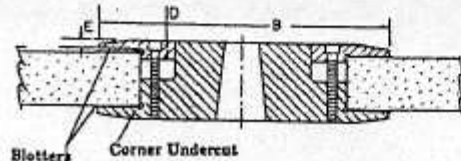
⁽¹⁾Flanges shall be of steel, quality SAE 1040 or equivalent, annealed plate, heat treated to Rc 25-30.

*For wheels under 1 1/2 inch thick F dimension shall not exceed 40% of wheel thickness.

Table 12-H
MINIMUM DIMENSIONS FOR STRAIGHT FLANGES USED AS
WHEEL SLEEVES FOR PRECISION GRINDING ONLY

Wheel Diameter	Wheel Hole Diameter	B Minimum Outside Diameter of Flange	D Minimum Thickness of Flange at Bore	E Minimum Thickness of Flange at Edge of Undercut
Inches	Inches	Inches	Inches	Inches
12 to 14	5	7	$\frac{1}{2}$	$\frac{7}{16}$
Larger than 14 to 20	5	7	$\frac{3}{8}$	$\frac{7}{16}$
	6	8	$\frac{3}{8}$	$\frac{7}{16}$
	8	10	$\frac{3}{8}$	$\frac{7}{16}$
	10	11 $\frac{1}{2}$	$\frac{3}{8}$	$\frac{7}{16}$
Larger than 20 to 30	12	13 $\frac{1}{2}$	$\frac{3}{8}$	$\frac{7}{16}$
	8	10	$\frac{3}{4}$	$\frac{1}{2}$
	10	11 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
	12	13 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
Larger than 30 to 42	16	17 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
	18	19 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
	20	21 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
	18	20	1	$\frac{3}{8}$
Larger than 42 to 60	20	24	1	$\frac{3}{8}$
	24	29	1 $\frac{1}{2}$	$\frac{3}{8}$

Note: These flanges may be clamped together by means of a central nut, or by a series of bolts or some other equivalent means of fastening.



Driving flange secured to spindle

Figure 12-31

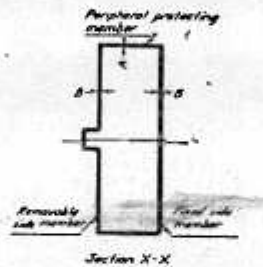
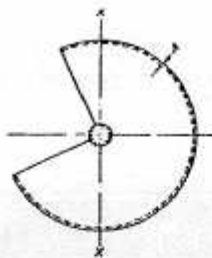


Figure 12-32

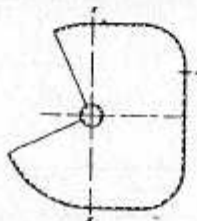


Table 12-J
MINIMUM BASIC THICKNESSES OF PERIPHERAL AND SIDE MEMBERS FOR SAFETY GUARDS

Material Used in Construction of Guard	Minimum Thickness of Guard for Wheel	Changing Wheel Dimensions											
		2 to 8 inches		Over 8 to 12 inches		Over 12 to 18 inches		Over 18 to 24 inches		Over 24 to 30 inches		Over 30 to 36 inches	
		A	B	A	B	A	B	A	B	A	B	A	B
Material Satisfactory for 10,000 RPM Steel 20,000 PSI Class 20	1/2 3/4 1 1 1/4 1 1/2 1 3/4 2	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1
Material Satisfactory for 10,000 RPM Aluminum 20,000 PSI Class 20	1/2 3/4 1 1 1/4 1 1/2 1 3/4 2	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1
Material Satisfactory for 10,000 RPM Steel 40,000 PSI Class 30	1/2 3/4 1 1 1/4 1 1/2 1 3/4 2	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1
Material Satisfactory for 10,000 RPM Aluminum 40,000 PSI Class 30	1/2 3/4 1 1 1/4 1 1/2 1 3/4 2	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1	1/4 3/8 1/2 5/8 3/4 7/8 1

*The recommendations listed in the above table are guides for the conditions stated. Other material designs or dimensions affording equal or superior protection are also acceptable.

Effective: 7/10/11
Prior Effective Dates: 4/1/64; 8/1/77; 1/1/86; 4/1/99