PHẦN II

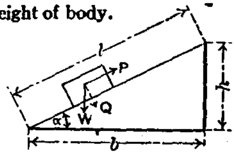
- KÝ HIỆU
- CÔNG THỨC
- SỐ LIỆU
CÁC NGÀNH KỸ THUẬT

- SYMBOLS
- FORMULAE
- MATERIAL NUMBERS
OF MECHANICAL ENGINEERINGS

MẶT PHẲNG NGHIÊNG - CHÊM

INCLINED PLANE - WEDGE

W = weight of body.



Neglecting friction:

$$P = W \times \frac{h}{l} = W \times \sin\alpha$$

$$W = P \times \frac{l}{h} = \frac{P}{\sin\alpha} = P \times \operatorname{cosec}\alpha$$

$$Q = W \times \frac{b}{l} = W \times \cos\alpha$$

If friction is taken into account, then force P to pull body up is:

$$P = W(\mu\cos\alpha + \sin\alpha)$$

Force P_1 to pull body down is:

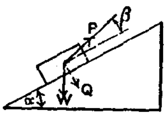
$$P_1 = W(\mu\cos\alpha - \sin\alpha)$$

Force P_2 to hold body stationary:

$$P_2 = W(\sin\alpha - \mu\cos\alpha)$$

in which μ is the coefficient of friction.

W = weight of body.



Neglecting friction:

$$P = W \times \frac{\sin\alpha}{\cos\beta}$$

$$W = P \times \frac{\cos\beta}{\sin\alpha}$$

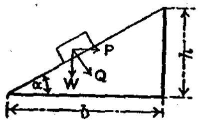
$$Q = W \times \frac{\cos(\alpha+\beta)}{\cos\beta}$$

With friction:

Coefficient of friction = $\mu = \tan\phi$.

$$P = W \times \frac{\sin(\alpha+\phi)}{\cos(\beta-\phi)}$$

W = weight of body.



Neglecting friction:

$$P = W \times \frac{h}{b} = W \times \tan\alpha$$

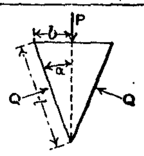
$$W = P \times \frac{b}{h} = P \times \cot\alpha$$

$$Q = \frac{W}{\cos\alpha} = W \times \sec\alpha$$

With friction:

Coefficient of friction = $\mu = \tan\phi$.

$$P = W\tan(\alpha+\phi)$$



Neglecting friction:

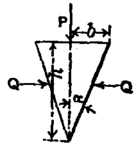
$$P = 2Q \times \frac{b}{l} = 2Q \times \sin\alpha$$

$$Q = P \times \frac{l}{2b} = \tfrac{1}{2}P \times \operatorname{cosec}\alpha$$

With friction:

Coefficient of friction = μ.

$$P = 2Q(\mu\cos\alpha + \sin\alpha)$$



Neglecting friction:

$$P = 2Q \times \frac{b}{h} = 2Q \times \tan\alpha$$

$$Q = P \times \frac{h}{2b} = \tfrac{1}{2}P \times \cot\alpha$$

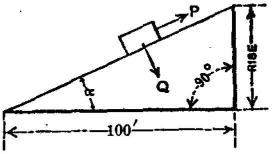
With friction:

Coefficient of friction = $\mu = \tan\phi$.

$$P = 2Q\tan(\alpha+\phi)$$

BẢNG TÍNH LỰC TRÊN MẶT PHẲNG NGHIÊNG

TABLE OF FORCES ON INCLINED PLANES



The table below makes it possible to find the force required for moving a body on an inclined plane. The friction on the plane is not taken into account. The column headed "Tension *P* in Cable per Ton of 2000 Pounds" gives the pull in pounds required for moving one ton along the inclined surface. The fourth column gives the perpendicular or normal pressure. If the coefficient of friction is known, the added pull required to overcome friction is thus easily determined:

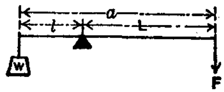
$Q \times$ coefficient of friction = additional pull required.

Tensions and Pressures in Pounds

Per Cent of Grade. Rise, Ft. per 100 Ft.	Angle α	Tension *P* in Cable per Ton of 2000 Lbs.	Perpendicular Pressure *Q* on Plane per Ton of 2000 Lbs.	Per Cent of Grade. Rise, Ft. Per 100 Ft.	Angle α	Tension *P* in Cable per Ton of 2000 Lbs.	Perpendicular Pressure *Q* on Plane per Ton of 2000 Lbs.
1	0° 35′	20.2	1999.8	39	21° 19′	727.0	1863.0
2	1 9	40.0	1999.4	40	21 49	743.2	1856.6
3	1 44	60.4	1999.0	41	22 18	758.8	1850.4
4	2 18	80.2	1998.2	42	22 47	774.4	1843.8
5	2 52	100.0	1997.4	43	23 17	790.4	1837.0
6	3 27	120.2	1996.2	44	23 45	805.4	1830.6
7	4 1	140.0	1995.0	45	24 14	820.8	1823.6
8	4 35	159.8	1993.6	46	24 43	836.2	1816.6
9	5 9	179.4	1991.8	47	25 11	851.0	1809.8
10	5 43	199.2	1990.0	48	25 39	865.6	1802.8
11	6 17	218.8	1987.8	49	26 7	880.4	1795.6
12	6 51	238.4	1985.6	50	26 34	894.4	1788.8
13	7 25	258.0	1983.2	51	27 2	909.0	1781.4
14	7 59	277.6	1980.6	52	27 29	922.8	1774.2
15	8 32	296.6	1977.8	53	27 56	936.8	1766.8
16	9 6	316.2	1974.8	54	28 23	950.6	1759.4
17	9 39	335.2	1971.6	55	28 49	964.0	1752.2
18	10 13	354.6	1968.2	56	29 15	977.2	1744.8
19	10 46	373.6	1964.6	57	29 41	990.4	1737.4
20	11 19	392.4	1961.0	58	30 7	1003.4	1730.0
21	11 52	411.2	1957.2	59	30 33	1016.4	1722.2
22	12 25	430.0	1953.2	60	30 58	1029.0	1714.8
23	12 58	448.6	1949.0	61	31 23	1041.4	1707.4
24	13 30	466.8	1944.6	62	31 48	1053.8	1699.6
25	14 3	485.4	1940.0	63	32 13	1066.2	1692.0
26	14 35	503.4	1935.4	64	32 38	1078.4	1684.2
27	15 7	521.4	1930.6	65	33 2	1090.2	1676.6
28	15 39	539.4	1925.8	66	33 26	1101.8	1669.0
29	16 11	557.4	1920.6	67	33 50	1113.4	1661.2
30	16 42	574.6	1915.6	68	34 13	1124.6	1653.8
31	17 14	592.4	1910.2	69	34 37	1136.0	1645.8
32	17 45	609.6	1904.6	70	35 0	1147.0	1638.2
33	18 16	626.8	1899.2	71	35 23	1158.0	1630.4
34	18 47	643.8	1893.4	72	35 46	1168.8	1622.8
35	19 18	661.0	1887.6	73	36 8	1179.2	1615.2
36	19 48	677.4	1881.6	74	36 31	1190.0	1607.2
37	20 19	694.4	1875.4	75	36 53	1200.4	1599.6
38	20 49	710.6	1869.4	..	.. ..	......	......

ĐÒN BẨY

LEVERS

<table>
<tr><th>Types of Levers</th><th>Examples</th></tr>
<tr><td>


$F:W=l:L \qquad F\times L=W\times l$

$F=\dfrac{W\times l}{L} \qquad W=\dfrac{F\times L}{l}$

$L=\dfrac{W\times a}{W+F}=\dfrac{W\times l}{F}; \quad l=\dfrac{F\times a}{W+F}=\dfrac{F\times L}{W}$
</td><td>
A pull of 80 pounds is exerted at the end of the lever, at W;

$l=12$ inches and $L=32$ inches.

Find the value of force F required to balance the lever.

$F=\dfrac{80\times 12}{32}=\dfrac{960}{32}=30$ pounds.

If $F=20$; $W=180$; and $l=3$; how long must L be made to secure equilibrium?

$L=\dfrac{180\times 3}{20}=27.$
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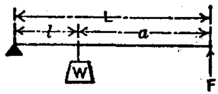
<tr><td>


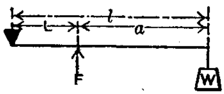
$F:W=l:L \qquad F\times L=W\times l$

$F=\dfrac{W\times l}{L} \qquad W=\dfrac{F\times L}{l}$

$L=\dfrac{W\times a}{W-F}=\dfrac{W\times l}{F}; \quad l=\dfrac{F\times a}{W-F}=\dfrac{F\times L}{W}$
</td><td>
Total length L of a lever is 25 inches. A weight of 90 pounds is supported at W; l is 10 inches. Find the value of F.

$F=\dfrac{90\times 10}{25}=36$ pounds.

If $F=100$ pounds, $W=2200$ pounds, and $a=5$ feet, what should L equal to secure equilibrium?

$L=\dfrac{2200\times 5}{2200-100}=5.24$ feet.
</td></tr>
<tr><td>


$F:W=l:L \qquad F\times L=W\times l$

$F=\dfrac{W\times l}{L} \qquad W=\dfrac{F\times L}{l}$

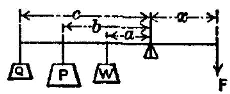
$L=\dfrac{W\times a}{F-W}=\dfrac{W\times l}{F}; \quad l=\dfrac{F\times a}{F-W}=\dfrac{F\times L}{W}$
</td><td>
$F=28$ pounds; $L=10$ inches; $a=24$ inches. What weight W can be supported?

$l=a+L=24+10=34$ inches.

$W=\dfrac{28\times 10}{34}=8.23$ pounds.

Let $F=12$ tons; $W=4.5$ tons; $a=16$ feet. Find L and l.

$L=\dfrac{4.5\times 16}{12-4.5}=9.6$ feet;

$l=16+9.6=25.6$ feet.
</td></tr>
<tr><td>


When three or more forces act on a lever:

$F\times x=W\times a+P\times b+Q\times c$

$x=\dfrac{W\times a+P\times b+Q\times c}{F}$

$F=\dfrac{W\times a+P\times b+Q\times c}{x}$
</td><td>
Let $W=20$, $P=30$, and $Q=15$ pounds; $a=4$, $b=7$, and $c=10$ inches.

If $x=6$ inches, find F.

$F=\dfrac{20\times 4+30\times 7+15\times 10}{6}=73\tfrac{1}{3}$ lbs.

Assuming $F=20$ in the example above, how long must lever arm x be made?

$x=\dfrac{20\times 4+30\times 7+15\times 10}{20}=22$ ins.
</td></tr>
</table>

KHỚP KHUỶU

TOGGLE-JOINT

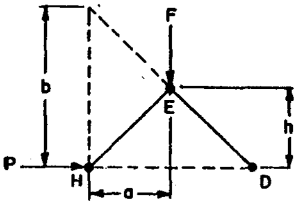
Toggle-joint. — If arms *ED* and *EH* are of unequal length:

$$P = \frac{Fa}{b}$$

The relation between P and F changes constantly as F moves downwards.

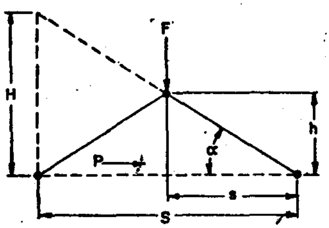
If arms *ED* and *EH* are equal:

$$P = \frac{Fa}{2h}$$



A double toggle-joint does not increase the pressure exerted so long as the relative distances moved by F and P remain the same.

Toggle-joints with Equal Arms



F = force applied;
P = resistance;
α = given angle.

$$2P\sin\alpha = F\cos\alpha;$$

$$\frac{P}{F} = \frac{\cos\alpha}{2\sin\alpha} = \text{coefficient};$$

or, $P = F \times \text{coefficient}.$

Equivalent expressions:

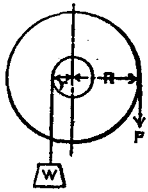
$$P = \frac{FS}{4h}; \qquad P = \frac{Fs}{H}, \text{ as per diagram.}$$

To use the table, measure angle α, and find the coefficient in the table corresponding to the angle found. The coefficient is the ratio of the resistance to the force applied, and multiplying the force applied by the coefficient gives the resistance, neglecting friction.

Angle	Coefficient	Angle	Coefficient	Angle	Coefficient	Angle	Coefficient
0° 2'	862	0° 50'	34.4	2° 45'	10.4	8° 0'	3.58
0 4	456	0 55	31.2	2 50	10.1	8 30	3.35
0 6	285	1 0	28.6	3 0	9.54	9 0	3.15
0 8	216	1 10	24.6	3 15	8.81	9 30	2.99
0 10	171	1 15	22.9	3 30	8.17	10 0	2.84
0 12	143	1 20	21.5	3 45	7.63	11 0	2.57
0 14	122	1 30	19.1	4 0	7.25	12 0	2.35
0 15	115	1 40	17.2	4 15	6.73	13 0	2.17
0 16	107	1 45	16.4	4 30	6.35	14 0	2.00
0 18	95.4	1 50	15.6	4 45	6.02	15 0	1.87
0 20	85.8	2 0	14.3	5 0	5.71	16 0	1.74
0 25	68.6	2 10	13.2	5 30	5.19	17 0	1.64
0 30	57.3	2 15	12.7	6 0	4.76	18 0	1.54
0 35	49.1	2 20	12.5	6 30	4.39	19 0	1.45
0 40	42.8	2 30	11.5	7 0	4.07	20 0	1.37
0 45	38.2	2 40	10.7	7 30	3.79	....	....

BÁNH XE - RÒNG RỌC

WHEELS AND PULLEYS



$F : W = r : R$

$F \times R = W \times r$

$F = \dfrac{W \times r}{R}$

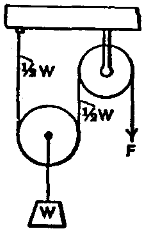
$W = \dfrac{F \times R}{r}$

$R = \dfrac{W \times r}{F}$

$r = \dfrac{F \times R}{W}$

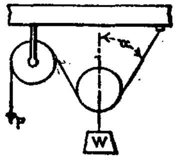
The radius of a drum on which is wound the lifting rope of a windlass is 2 inches. What force will be exerted at the periphery of a gear of 24 inches diameter, mounted on the same shaft as the drum and transmitting power to it, if one ton (2000 pounds) is to be lifted? Here $W = 2000$; $R = 12$; $r = 2$.

$$F = \frac{2000 \times 2}{12} = 333 \text{ pounds.}$$



$F = \frac{1}{2} W$

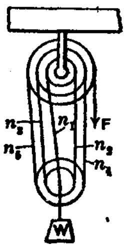
The velocity with which weight W will be raised equals one-half the velocity of the force applied at F.



$F : W = \sec\alpha : 2$

$F = \dfrac{W \times \sec\alpha}{2}$

$W = 2F \times \cos\alpha$



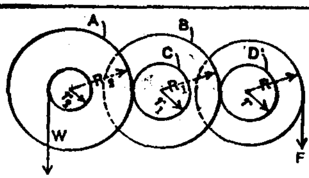
n = number of strands or parts of rope (n_1, n_2, etc.).

$$F = \frac{1}{n} \times W$$

The velocity with which W will be raised equals $\frac{1}{n}$ of the velocity of the force applied at F.

In the illustration is shown a combination of a double and triple block. The pulleys each turn freely on a pin as axis, and are drawn with different diameters, to show the parts of the rope more clearly. There are 5 parts of rope. Therefore, if 200 pounds is to be lifted, the force F required at the end of the rope is:

$$F = \tfrac{1}{5} \times 200 = 40 \text{ pounds.}$$



A, *B*, *C* and *D* are the pitch circles of gears.

$$F = \frac{W \times r \times n_1 \times n_2}{R \times R_1 \times R_2}$$

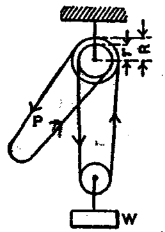
$$W = \frac{F \times R \times R_1 \times R_2}{r \times n_1 \times n_2}$$

Let the pitch diameters of gears *A*, *B*, *C* and *D* be 30, 28, 12 and 10 inches, respectively. Then $R_2 = 15$; $R_1 = 14$; $n_1 = 6$; and $r = 5$. Let $R = 12$, and $n_2 = 4$. Then the force F required to lift a weight W of 2000 pounds, friction being neglected, is:

$$F = \frac{2000 \times 5 \times 6 \times 4}{12 \times 14 \times 15} = 95 \text{ pounds}$$

RÒNG RỌC VI SAI - VIS

DIFFERENTIAL PULLEY - SCREW

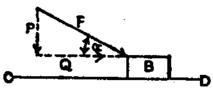


Differential Pulley. — In the differential pulley a chain must be used, engaging sprockets, so as to prevent the chain from slipping over the pulley faces.

$$P \times R = \tfrac{1}{2} W (R - r).$$

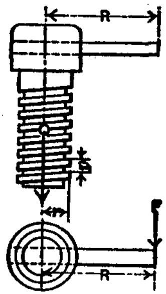
$$P = \frac{W (R - r)}{2R}$$

$$W = \frac{2PR}{R - r}$$



Force Moving Body on Horizontal Plane. — F tends to move B along line CD; Q is the component which actually moves B; P is the pressure, due to F, of the body on CD.

$$Q = F \times \cos\alpha; \qquad P = \sqrt{F^2 - Q^2}$$



Screw. — F = force at end of handle or wrench; R = lever-arm of F; r = pitch radius of screw; p = lead of thread; Q = load. Then, neglecting friction:

$$F = Q \times \frac{p}{6.2832\,R} \qquad Q = F \times \frac{6.2832\,R}{p}$$

If μ is the coefficient of friction, then:

For motion in direction of load Q which *assists* it:

$$F = Q \times \frac{6.2832\,\mu r - p}{6.2832\,r + \mu p} \times \frac{r}{R}$$

For motion opposite load Q which *resists* it:

$$F = Q \times \frac{p + 6.2832\,\mu r}{6.2832\,r - \mu p} \times \frac{r}{R}$$

Center of Gravity. — The center of gravity of a body, volume, area, or line is that point at which if the body, volume, area, or line were suspended it would be perfectly balanced in all positions. For symmetrical bodies of uniform material it is at the geometric center. The center of gravity of a uniform round rod, for example, is at the center of its diameter halfway along its length; the center of gravity of a sphere is at the center of the sphere. For solids, areas, and arcs that are not symmetrical, the determination of the center of gravity may be made experimentally or may be calculated by the use of formulas.

The tables that follow give such formulas for some of the more important shapes. For more complicated and unsymmetrical shapes the methods outlined on page 313 may be used.

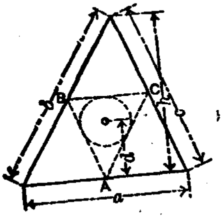
Example: A piece of wire is bent into the form of a semi-circular arc of 10-inch radius. How far from the center of the arc is the center of gravity located?

Accompanying the third diagram on page 308 is a formula for the distance from the center of gravity of an arc to the center of the arc: $a = 2r + \pi$. Therefore, in this case,

$$a = 2 \times 10 + 3.1416 = 6.366 \text{ inches.}$$

TRỌNG TÂM

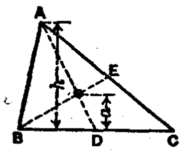
CENTER OF GRAVITY



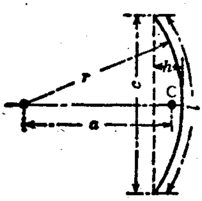
Perimeter of a Triangle. — If A, B and C are the middle points of the sides of the triangle, then the center of gravity is at the center of the circle that can be inscribed in triangle ABC. The distance d of the center of gravity from side a is:

$$d = \frac{h(b+c)}{2(a+b+c)}$$

where h is the height perpendicular to a.



Area of Triangle. — The center of gravity is at the intersection of lines AD and BE, which bisect the sides BC and AC. The perpendicular distance from the center of gravity to any one of the sides is equal to one-third the height perpendicular to that side. Hence, $a = h \div 3$.



Circular Arc. — The center of gravity is on the line that bisects the arc, at a distance

$$a = \frac{r \times c}{l} = \frac{c(c^2 + 4h^2)}{8lh}$$ from the center of the circle.

For an arc equal to one-half the periphery:

$$a = 2r \div \pi = 0.6366\,r$$

For an arc equal to one-quarter of the periphery:

$$a = 2r\sqrt{2} \div \pi = 0.9003\,r$$

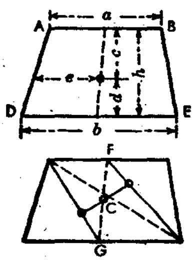
For an arc equal to one-sixth of the periphery:

$$a = 3r \div \pi = 0.9549\,r$$

Circular Arc (approximate). —

$$a = \tfrac{2}{3}h$$

This formula is very nearly exact for all arcs less than one-quarter of the periphery. The error is only about one per cent for a quarter circle, and decreases for smaller arcs.



Area of Trapezoid. — The center of gravity is on the line joining the middle points of parallel lines AB and DE.

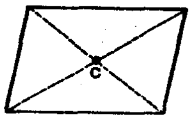
$$c = \frac{h(a+2b)}{3(a+b)} \qquad d = \frac{h(2a+b)}{3(a+b)}$$

$$e = \frac{a^2 + ab + b^2}{3(a+b)}$$

The trapezoid can also be divided into two triangles. The center of gravity is at the intersection of the line joining the centers of gravity of the triangles, and the middle line FG.

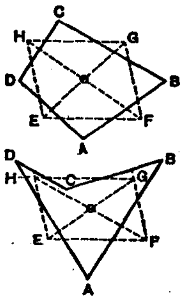
TRỌNG TÂM

CENTER OF GRAVITY

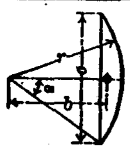


Perimeter of a Parallelogram. — The center of gravity is at the intersection of the diagonals.

Area of a Parallelogram. — The center of gravity is at the intersection of the diagonals.



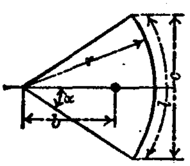
Any Four-sided Figure. — Two cases are possible, as shown in the illustration. To find the center of gravity of the four-sided figure *ABCD*, each of the sides is divided into three equal parts. A line is then drawn through each pair of division points next to the points of intersection *A*, *B*, *C*, and *D* of the sides of the figure. These lines form a parallelogram *EFGH*; the intersection of the diagonals *EG* and *FH* locates the required center of gravity.



Circle Segment. — The distance of the center of gravity from the center of the circle is:

$$b = \frac{c^3}{12A} = \frac{2}{3} \times \frac{r^3 \sin^3 \alpha}{A}$$

in which A = area of segment.



Circle Sector. — Distance b from center of gravity to center of circle is:

$$b = \frac{2rc}{3l} = \frac{r^2c}{3A} = 38.197\,\frac{r \sin \alpha}{\alpha}$$

in which A = area of sector, and α is expressed in degrees.

For the area of a half-circle:

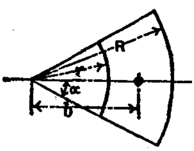
$$b = 4r \div 3\pi = 0.4244\,r$$

For the area of a quarter circle:

$$b = 4\sqrt{2} \times r \div 3\pi = 0.6002\,r$$

For the area of a sixth of a circle:

$$b = 2r \div \pi = 0.6366\,r$$



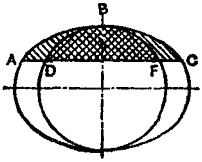
Part of Circle Ring. — Distance b from center of gravity to center of circle is:

$$b = 38.197\,\frac{(R^3 - r^3)\sin \alpha}{(R^2 - r^2)\,\alpha}$$

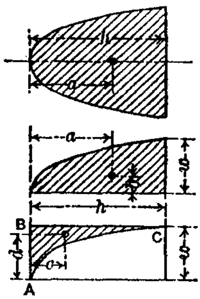
Angle α is expressed in degrees.

TRỌNG TÂM

CENTER OF GRAVITY



Segment of an Ellipse. — The center of gravity of an elliptic segment ABC, symmetrical about one of the axes, coincides with the center of gravity of the segment DBF of a circle, the diameter of which is equal to that axis of the ellipse about which the elliptic segment is symmetrical.



Area of a Parabola. — For the complete parabolic area, the center of gravity is on the center line or axis, and

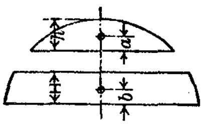
$$a = \frac{3h}{5}$$

For one-half of the parabola:

$$a = \frac{3h}{5} \quad \text{and} \quad b = \frac{3w}{8}$$

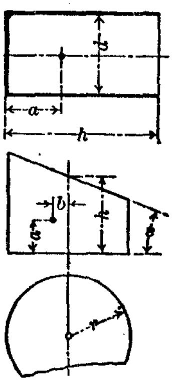
For the complement area ABC:

$$c = 0.3\,h \quad \text{and} \quad d = 0.75\,w$$



Spherical Surface of Segments and Zones of Spheres. — Distances a and b which determine the center of gravity, are:

$$a = \frac{h}{2} \qquad b = \frac{H}{2}$$



Cylinder. — The center of gravity of a solid cylinder (or prism) with parallel end surfaces, is located at the middle of the line that joins the centers of gravity of the end surfaces.

The center of gravity of a cylindrical surface or shell, with the base or end surface in one end, is found from:

$$a = \frac{2h^2}{4h + d}$$

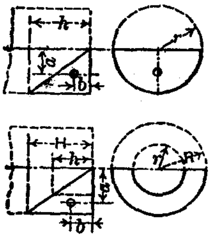
The center of gravity of a cylinder cut off by an inclined plane is located by:

$$a = \frac{h}{2} + \frac{r^2 \tan^2 \alpha}{8h} \qquad b = \frac{r^2 \tan \alpha}{4h}$$

where α is the angle between the obliquely cut off surface and the base surface.

TRỌNG TÂM

CENTER OF GRAVITY



Portion of Cylinder. — For a solid portion of a cylinder, as shown, the center of gravity is determined by:

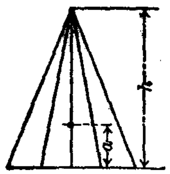
$$a = \tfrac{3}{16} \times 3.1416\, r \qquad b = \tfrac{3}{32} \times 3.1416\, h$$

For the cylindrical surface only:

$$a = \tfrac{1}{4} \times 3.1416\, r \qquad b = \tfrac{1}{8} \times 3.1416\, h$$

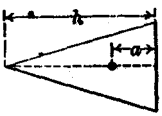
If the cylinder is hollow, the center of gravity of the solid shell is found by:

$$a = \tfrac{3}{16} \times 3.1416\, \frac{R^4 - r^4}{R^3 - r^3}; \quad b = \tfrac{3}{32} \times 3.1416\, \frac{H^4 - h^4}{H^3 - h^3}$$



Pyramid. — In a solid pyramid the center of gravity is located on the line joining the apex with the center of gravity of the base surface, at a distance from the base equal to one-quarter of the height; or $a = \frac{1}{4}h$.

The center of gravity of the triangular surfaces forming the pyramid is located on the line joining the apex with the center of gravity of the base surface, at a distance from the base equal to one-third of the height; or $a = \frac{1}{3}h$.

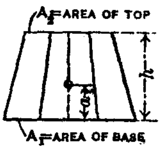


Cone. — The same rules apply as for the pyramid. For the solid cone:

$$a = \tfrac{1}{4} h$$

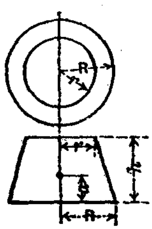
For the conical surface:

$$a = \tfrac{1}{3} h$$



Frustum of Pyramid. — The center of gravity is located on the line that joins the centers of gravity of the end surfaces. If A_1 = area of base surface, and A_2 area of top surface,

$$a = \frac{h\,(A_1 + 2\sqrt{A_1 \times A_2} + 3A_2)}{4\,(A_1 + \sqrt{A_1 \times A_2} + A_2)}$$



Frustum of Cone. — The same rules apply as for the frustum of a pyramid. For a solid frustum of a circular cone the formula below is also used:

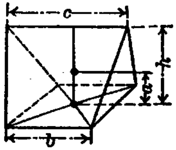
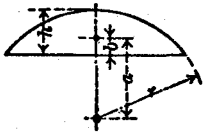
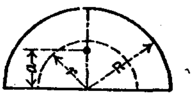
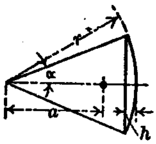
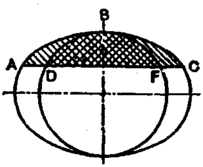
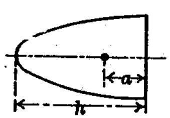
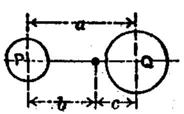
$$a = \frac{h\,(R^2 + 2Rr + 3r^2)}{4\,(R^2 + Rr + r^2)}$$

The location of the center of gravity of the conical surface of a frustum of a cone is determined by:

$$a = \frac{h\,(R + 2r)}{3\,(R + r)}$$

TRỌNG TÂM

CENTER OF GRAVITY

	*Wedge.* — The center of gravity is on the line joining the center of gravity of the base with the middle point of the edge, and is located at: $$a = \frac{h(b+c)}{2(2b+c)}$$
	*Spherical Segment.* — The center of gravity of a solid segment is determined by: $$a = \frac{3(2r-h)^2}{4(3r-h)}$$ $$b = \frac{h(4r-h)}{4(3r-h)}$$ For a half-sphere, $a = b = \frac{3}{8}r$
	*Half of a Hollow Sphere.* — The center of gravity is located at: $$a = \frac{3(R^4-r^4)}{8(R^3-r^3)}$$
	*Spherical Sector.* — The center of gravity of a solid sector is at: $$a = \frac{3}{8}(1+\cos\alpha)r = \frac{3}{8}(2r-h)$$
	*Segment of Ellipsoid or Spheroid.* — The center of gravity of a solid segment *ABC*, symmetrical about the axis of rotation, coincides with the center of gravity of the segment *DBF* of a sphere, the diameter of which is equal to the axis of rotation of the spheroid.
	*Paraboloid.* — The center of gravity of a solid paraboloid of rotation is at: $$a = \frac{1}{3}h$$
	*Center of Gravity of Two Bodies.* — If the weights of the bodies are *P* and *Q*, and the distance between their centers of gravity is *a*, then: $$b = \frac{Qa}{P+Q} \qquad c = \frac{Pa}{P+Q}$$

Center of Gravity of Figures of any Outline. — If the figure is symmetrical about a center line, as in Fig. 1, the center of gravity will be located on that line. To find the exact location on that line, the simplest method is by taking moments with reference to any convenient axis at right angles to this center line. Divide the area into geometrical figures, the centers of gravity of which can be easily found. In this case, divide the figure into three rectangles *KLMN*, *EFGH* and *OPRS*. Call the areas of these rectangles *A*, *B* and *C*, respectively, and find the center of gravity of each. Then select any convenient axis, as *XX*, at right angles to the center line *YY*, and determine distances *a*, *b* and *c*. The distance *y* of the center of gravity of the complete figure from the axis *XX* is then found from the equation:

$$y = \frac{Aa + Bb + Cc}{A + B + C}$$

As an example, assume that the area *A* is 24 square inches, *B*, 14 square inches,

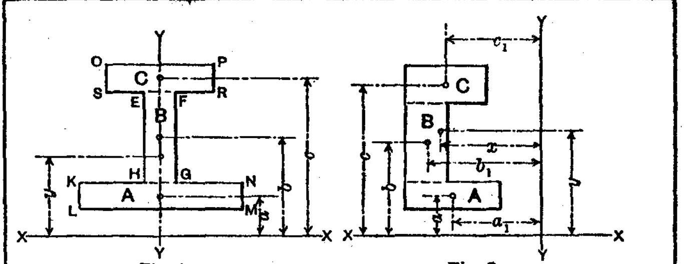


Fig. 1 Fig. 2

and *C*, 16 square inches, and that $a = 3$ inches, $b = 7.5$ inches, and $c = 12$ inches. Then:

$$y = \frac{24 \times 3 + 14 \times 7.5 + 16 \times 12}{24 + 14 + 16} = \frac{369}{54} = 6.83 \text{ inches.}$$

If the figure, the center of gravity of which is to be found, is not symmetrical about any axis, then moments must be taken with relation to two axes *XX* and *YY*, as shown in Fig. 2. The figure is divided into convenient geometrical figures, the centers of gravity of which can be easily found, the same as before. The center of gravity is determined by the equations:

$$x = \frac{Aa_1 + Bb_1 + Cc_1}{A + B + C} \qquad y = \frac{Aa + Bb + Cc}{A + B + C}$$

As an example, let $A = 14$ square inches, $B = 18$ square inches, and $C = 20$ square inches. Let $a = 3$ inches, $b = 7$ inches, and $c = 11.5$ inches. Let $a_1 = 6.5$ inches, $b_1 = 8.5$ inches, and $c_1 = 7$ inches. Then:

$$x = \frac{14 \times 6.5 + 18 \times 8.5 + 20 \times 7}{14 + 18 + 20} = \frac{384}{52} = 7.38 \text{ inches.}$$

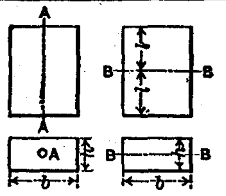
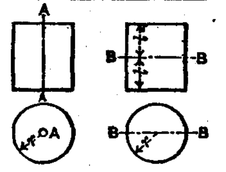
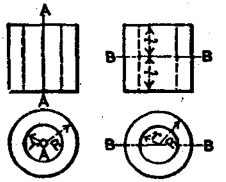
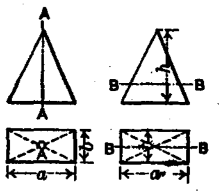
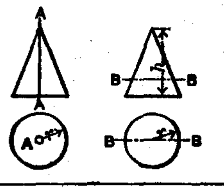
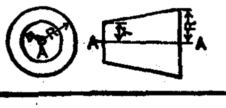
$$y = \frac{14 \times 3 + 18 \times 7 + 20 \times 11.5}{14 + 18 + 20} = \frac{398}{52} = 7.65 \text{ inches.}$$

In other words, the center of gravity is located at a distance of 7.65 inches from the axis *XX* and 7.38 inches from the axis *YY*.

MOMENT QUÁN TÍNH

MOMENTS OF INERTIA

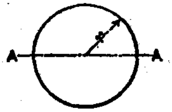
(M = mass of body = weight ÷ 32.16)

	***Prism.*** — With reference to axis $A-A$: $$I=\frac{M}{12}(h^2+b^2)$$ With reference to axis $B-B$: $$I=M\left(\frac{l^2}{3}+\frac{h^2}{12}\right)$$
	***Cylinder.*** — With reference to axis $A-A$: $$I=\tfrac{1}{2}Mr^2$$ With reference to axis $B-B$: $$I=M\left(\frac{l^2}{3}+\frac{r^2}{4}\right)$$
	***Hollow Cylinder.*** — With reference to axis $A-A$: $$I=\tfrac{1}{2}M(R^2+r^2)$$ With reference to axis $B-B$: $$I=M\left(\frac{l^2}{3}+\frac{R^2+r^2}{4}\right)$$
	***Pyramid,*** rectangular base. — With reference to axis $A-A$: $$I=\frac{M}{20}(a^2+b^2)$$ With reference to axis $B-B$ (through the center of gravity): $$I=M\left(\frac{3}{80}h^2+\frac{b^2}{20}\right)$$
	***Cone.*** — With reference to axis $A-A$: $$I=\frac{3M}{10}r^2$$ With reference to axis $B-B$ (through the center of gravity): $$I=\frac{3M}{20}\left(r^2+\frac{h^2}{4}\right)$$
	***Frustum of Cone.*** — With reference to axis $A-A$: $$I=\frac{3M(R^5-r^5)}{10(R^3-r^3)}$$

MOMENT QUÁN TÍNH

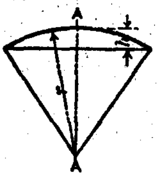
MOMENTS OF INERTIA

(M = mass of body = weight ÷ 32.16)



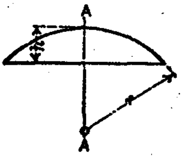
Sphere. — With reference to any axis through the center:

$$I = \tfrac{2}{5} M r^2$$



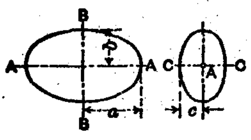
Spherical Sector. — With reference to axis $A-A$:

$$I = \frac{M}{5}(3rh - h^2)$$



Spherical Segment. — With reference to axis $A-A$:

$$I = M\left(r^2 - \frac{3rh}{4} + \frac{3h^2}{20}\right)\frac{2h}{3r-h}$$



Ellipsoid. — With reference to axis $A-A$:

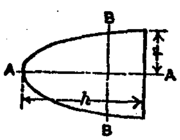
$$I = \frac{M}{5}(b^2 + c^2)$$

With reference to axis $B-B$:

$$I = \frac{M}{5}(a^2 + c^2)$$

With reference to axis $C-C$:

$$I = \frac{M}{5}(a^2 + b^2)$$

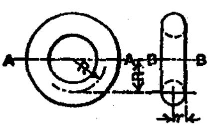


Paraboloid. — With reference to axis $A-A$:

$$I = \tfrac{1}{3} M r^2$$

With reference to axis $B-B$ (through the center of gravity):

$$I = M\left(\frac{r^2}{6} + \frac{h^2}{18}\right)$$



Torus. — With reference to axis $A-A$:

$$I = M\left(\frac{R^2}{2} + \frac{5r^2}{8}\right)$$

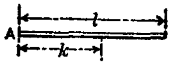
With reference to axis $B-B$:

$$I = M\left(R^2 + \tfrac{3}{4} r^2\right)$$

BÁN KÍNH HỒI CHUYỂN

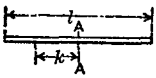
RADIUS OF GYRATION

Bar of Small Diameter.
Axis at end.



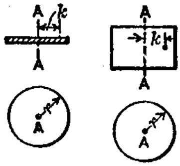
$k = 0.5773\, l$
$k^2 = \frac{1}{3} l^2$

Axis at center.



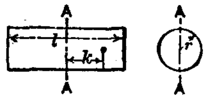
$k = 0.2886\, l$
$k^2 = \frac{1}{12} l^2$

Thin Circular Disk.
Axis through center.
Cylinder.
Axis through center.



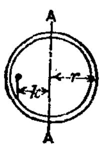
$k = 0.7071\, r$
$k^2 = \frac{1}{2} r^2$

Cylinder.
Axis, diameter at mid-length.



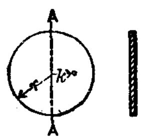
$k = 0.289 \sqrt{l^2 + 3r^2}$
$k^2 = \frac{l^2}{12} + \frac{r^2}{4}$

Bar of Small Diameter, bent to Circular Shape.
Axis, a diameter of the ring.



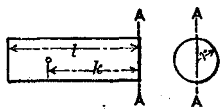
$k = 0.7071\, r$
$k^2 = \frac{1}{2} r^2$

Thin Circular Disk.
Axis its diameter.



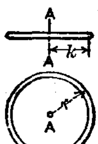
$k = \frac{1}{2} r$
$k^2 = \frac{1}{4} r^2$

Cylinder.
Axis, diameter at end.



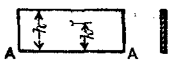
$k = 0.289 \sqrt{4 l^2 + 3 r^2}$
$k^2 = \frac{l^2}{3} + \frac{r^2}{4}$

Bar of Small Diameter, bent to Circular Shape.
Axis through center of ring.



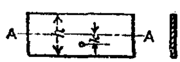
$k = r; \qquad k^2 = r^2$

Parallelogram (Thin flat plate).
Axis at base.



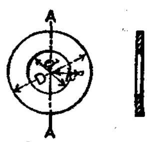
$k = 0.5773\, h; \quad k^2 = \frac{1}{3} h^2$

Axis at mid-height.



$k = 0.2886\, h; \quad k^2 = \frac{1}{12} h^2$

Thin, Flat, Circular Ring.
Axis its diameter.

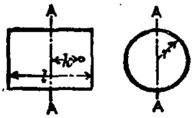


$k = \frac{1}{4} \sqrt{D^2 + d^2}$
$k^2 = \frac{D^2 + d^2}{16}$

BÁN KÍNH HỒI CHUYỂN

RADIUS OF GYRATION

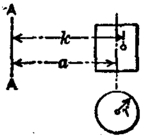
Thin Hollow Cylinder. Axis, diameter at mid-length.



$$k = 0.289\sqrt{l^2 + 6r^2}$$

$$k^2 = \frac{l^2}{12} + \frac{r^2}{2}$$

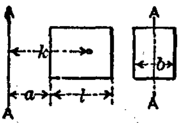
Cylinder. Axis at a distance.



$$k = \sqrt{a^2 + \tfrac{1}{2}r^2}$$

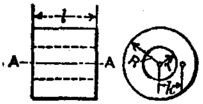
$$k^2 = a^2 + \tfrac{1}{2}r^2$$

Parallelepiped. Axis at distance from end.



$$k = \sqrt{\frac{4l^2 + b^2}{12} + a^2 + al}$$

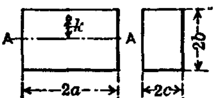
Hollow Cylinder. Longitudinal Axis.



$$k = 0.7071\sqrt{R^2 + r^2}$$

$$k^2 = \tfrac{1}{2}(R^2 + r^2)$$

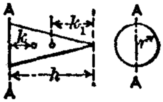
Rectangular Prism. Axis through center.



$$k = 0.577\sqrt{b^2 + c^2}$$

$$k^2 = \tfrac{1}{3}(b^2 + c^2)$$

Cone. Axis at base.

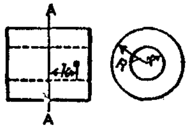


$$k = \sqrt{\frac{2h^2 + 3r^2}{20}}$$

Axis at apex.

$$k_1 = \sqrt{\frac{12h^2 + 3r^2}{20}}$$

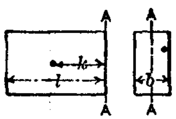
Hollow Cylinder. Axis, diameter at mid-length.



$$k = 0.289\sqrt{l^2 + 3(R^2 + r^2)}$$

$$k^2 = \frac{l^2}{12} + \frac{R^2 + r^2}{4}$$

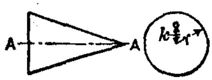
Parallelepiped. Axis at one end, central.



$$k = 0.289\sqrt{4l^2 + b^2}$$

$$k^2 = \frac{4l^2 + b^2}{12}$$

Cone. Axis through its center line.



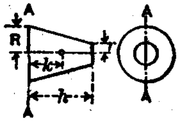
$$k = 0.5477\,r$$

$$k^2 = 0.3\,r^2$$

BÁN KÍNH HỒI CHUYỂN

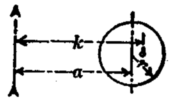
RADIUS OF GYRATION

Frustum of Cone.
Axis at large end.



$$k=\sqrt{\frac{h^2}{10}\left(\frac{R^2+3Rr+6r^2}{R^2+Rr+r^2}\right)+\frac{3}{20}\left(\frac{R^5-r^5}{R^3-r^3}\right)}$$

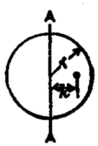
Sphere.
Axis at a distance.



$k=\sqrt{a^2+\frac{2}{5}r^2}$

$k^2=a^2+\frac{2}{5}r^2$

Sphere.
Axis its diameter.

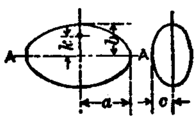


$k=0.6325\,r;\quad k^2=\frac{2}{5}r^2$

Thin Spherical Shell.

$k=0.8165\,r;\quad k^2=\frac{2}{3}r^2$

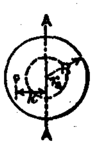
Ellipsoid.
Axis through center.



$k=0.447\sqrt{b^2+c^2}$

$k^2=\frac{1}{5}(b^2+c^2)$

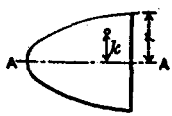
Hollow Sphere.
Axis its diameter.



$$k=0.6325\sqrt{\frac{R^5-r^5}{R^3-r^3}}$$

$$k^2=\frac{2\,(R^5-r^5)}{5\,(R^3-r^3)}$$

Paraboloid.
Axis through center.



$k=0.5773\,r$

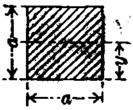
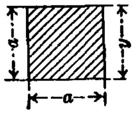
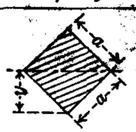
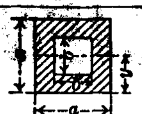
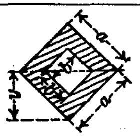
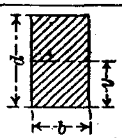
$k^2=\frac{1}{3}r^2$

STRENGTH OF MATERIALS

SỨC BỀN VẬT LIỆU

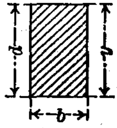
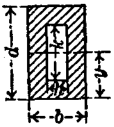
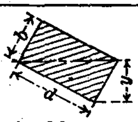
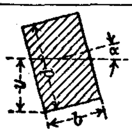
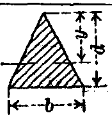
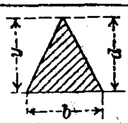
MOMENT QUÁN TÍNH : MODUL MẶT CẮT

MOMENTS OF INERTIA, SECTION MODULUS, etc., OF SECTION

Section A = area y = distance from axis to extreme fiber	Moment of Inertia I	Section Modulus $Z = \frac{I}{y}$	Radius of Gyration $r = \sqrt{\frac{I}{A}}$
 $A = a^2;\quad y = \frac{1}{2}a$	$\frac{a^4}{12}$	$\frac{a^3}{6}$	$\frac{a}{\sqrt{12}} = 0.289\,a$
 $A = a^2;\quad y = a$	$\frac{a^4}{3}$	$\frac{a^3}{3}$	$\frac{a}{\sqrt{3}} = 0.577\,a$
 $A = a^2$ $y = \frac{a}{\sqrt{2}} = 0.707\,a$	$\frac{a^4}{12}$	$\frac{a^3}{6\sqrt{2}} = 0.118\,a^3$	$\frac{a}{\sqrt{12}} = 0.289\,a$
 $A = a^2 - b^2;\; y = \frac{1}{2}a$	$\frac{a^4 - b^4}{12}$	$\frac{a^4 - b^4}{6a}$	$\sqrt{\frac{a^2 + b^2}{12}}$ $= 0.289\sqrt{a^2 + b^2}$
 $A = a^2 - b^2$ $y = \frac{a}{\sqrt{2}} = 0.707\,a$	$\frac{a^4 - b^4}{12}$	$\frac{\sqrt{2}\,(a^4 - b^4)}{12\,a}$ $= 0.118\,\frac{a^4 - b^4}{a}$	$\sqrt{\frac{a^2 + b^2}{12}}$ $= 0.289\sqrt{a^2 + b^2}$
 $A = bd;\quad y = \frac{1}{2}d$	$\frac{bd^3}{12}$	$\frac{bd^2}{6}$	$\frac{d}{\sqrt{12}} = 0.289\,d$

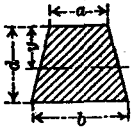
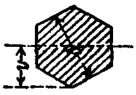
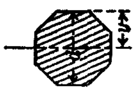
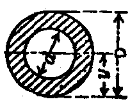
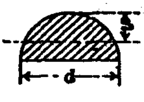
MOMENT QUÁN TÍNH : MODUL MẶT CẮT

MOMENTS OF INERTIA, SECTION MODULUS, etc., OF SECTION

A = area y = distance from axis to extreme fiber	Moment of Inertia I	Section Modulus $Z = \frac{I}{y}$	Radius of Gyration $r = \sqrt{\frac{I}{A}}$
 $A = bd;\ y = d$	$\frac{bd^3}{3}$	$\frac{bd^2}{3}$	$\frac{d}{\sqrt{3}} = 0.577\,d$
 $A = bd - hk$ $y = \frac{1}{2}d$	$\frac{bd^3 - hk^3}{12}$	$\frac{bd^3 - hk^3}{6\,d}$	$\sqrt{\frac{bd^3 - hk^3}{12\,(bd - hk)}}$ $= 0.289\sqrt{\frac{bd^3 - hk^3}{bd - hk}}$
 $A = bd$ $y = \frac{bd}{\sqrt{b^2 + d^2}}$	$\frac{b^3d^3}{6\,(b^2 + d^2)}$	$\frac{b^2d^2}{6\sqrt{b^2 + d^2}}$	$\frac{bd}{\sqrt{6\,(b^2 + d^2)}}$ $= 0.408\,\frac{bd}{\sqrt{b^2 + d^2}}$
 $A = bd$ $y = \frac{1}{2}\,(d\cos\alpha + b\sin\alpha)$	$\frac{bd}{12}\,(d^2\cos^2\alpha + b^2\sin^2\alpha)$	$\frac{bd}{6}\left(\frac{d^2\cos^2\alpha + b^2\sin^2\alpha}{d\cos\alpha + b\sin\alpha}\right)$	$\sqrt{\frac{d^2\cos^2\alpha + b^2\sin^2\alpha}{12}}$ $= 0.289 \times \sqrt{d^2\cos^2\alpha + b^2\sin^2\alpha}$
 $A = \frac{1}{2}\,bd;\ y = \frac{2}{3}\,d$	$\frac{bd^3}{36}$	$\frac{bd^2}{24}$	$\frac{d}{\sqrt{18}} = 0.236\,d$
 $A = \frac{1}{2}\,bd;\ y = d$	$\frac{bd^3}{12}$	$\frac{bd^2}{12}$	$\frac{d}{\sqrt{6}} = 0.408\,d$

MOMENT QUÁN TÍNH : MODUL MẶT CẮT

MOMENTS OF INERTIA, SECTION MODULUS, etc., OF SECTION

Section	Area of Section, A	Distance from Neutral Axis to Extreme Fiber, y
	$\frac{d(a+b)}{2}$	$\frac{d(a+2b)}{3(a+b)}$
	$\frac{3d^2 \tan 30^\circ}{2} = 0.866\,d^2$	$\frac{d}{2}$
	$\frac{3d^2 \tan 30^\circ}{2} = 0.866\,d^2$	$\frac{d}{2\cos 30^\circ} = 0.577\,d$
	$2d^2 \tan 22\tfrac{1}{2}^\circ = 0.828\,d^2$	$\frac{d}{2}$
	$\frac{\pi d^2}{4} = 0.7854\,d^2$	$\frac{d}{2}$
	$\frac{\pi(D^2-d^2)}{4}$ $= 0.7854\,(D^2-d^2)$	$\frac{D}{2}$
	$\frac{\pi d^2}{8} = 0.393\,d^2$	$\frac{(3\pi-4)d}{6\pi}$ $= 0.288\,d$
	$\frac{\pi(R^2-r^2)}{2}$ $= 1.5708\,(R^2-r^2)$	$\frac{4(R^3-r^3)}{3\pi(R^2-r^2)}$ $= 0.424\,\frac{R^3-r^3}{R^2-r^2}$

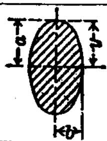
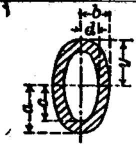
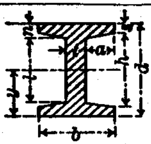
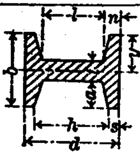
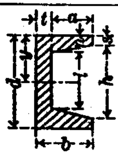
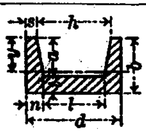
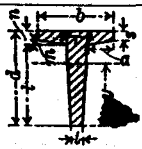
MOMENT QUÁN TÍNH : MODUL MẶT CẮT

MOMENTS OF INERTIA, SECTION MODULUS, etc., OF SECTION

Moment of Inertia, I	Section Modulus. $Z = \frac{I}{y}$	Radius of Gyration, $r = \sqrt{\frac{I}{A}}$
$\frac{d^2(a^2+4ab+b^2)}{36(a+b)}$	$\frac{d^2(a^2+4ab+b^2)}{12(a+2b)}$	$\sqrt{\frac{d^2(a^2+4ab+b^2)}{18(a+b)^2}}$
$\frac{A}{12}\left[\frac{d^2(1+2\cos^2 30^\circ)}{4\cos^2 30^\circ}\right]$ $= 0.06\, d^4$	$\frac{A}{6}\left[\frac{d(1+2\cos^2 30^\circ)}{4\cos^2 30^\circ}\right]$ $= 0.12\, d^3$	$\sqrt{\frac{d^2(1+2\cos^2 30^\circ)}{48\cos^2 30^\circ}}$ $= 0.264\, d$
$\frac{A}{12}\left[\frac{d^2(1+2\cos^2 30^\circ)}{4\cos^2 30^\circ}\right]$ $= 0.06\, d^4$	$\frac{A}{6.9}\left[\frac{d(1+2\cos^2 30^\circ)}{4\cos^2 30^\circ}\right]$ $= 0.104\, d^3$	$\sqrt{\frac{d^2(1+2\cos^2 30^\circ)}{48\cos^2 30^\circ}}$ $= 0.264\, d$
$\frac{A}{12}\left[\frac{d^2(1+2\cos^2 22\frac{1}{2}^\circ)}{4\cos^2 22\frac{1}{2}^\circ}\right]$ $= 0.055\, d^4$	$\frac{A}{6}\left[\frac{d(1+2\cos^2 22\frac{1}{2}^\circ)}{4\cos^2 22\frac{1}{2}^\circ}\right]$ $= 0.109\, d^3$	$\sqrt{\frac{d^2(1+2\cos^2 22\frac{1}{2}^\circ)}{48\cos^2 22\frac{1}{2}^\circ}}$ $= 0.257\, d$
$\frac{\pi d^4}{64} = 0.049\, d^4$	$\frac{\pi d^3}{32} = 0.098\, d^3$	$\frac{d}{4}$
$\frac{\pi(D^4-d^4)}{64}$ $= 0.049\,(D^4-d^4)$	$\frac{\pi(D^4-d^4)}{32D}$ $= 0.098\,\frac{D^4-d^4}{D}$	$\frac{\sqrt{D^2+d^2}}{4}$
$\frac{(9\pi^2-64)\,d^4}{1152\pi}$ $= 0.007\, d^4$	$\frac{(9\pi^2-64)\,d^3}{192(3\pi-4)}$ $= 0.024\, d^3$	$\frac{\sqrt{(9\pi^2-64)\,d^2}}{12\pi}$ $= 0.132\, d$
$0.1098\,(R^4-r^4) - \frac{0.283\,R^2r^2(R-r)}{R+r}$	$\frac{I}{y}$	$\sqrt{\frac{I}{A}}$

MOMENT QUÁN TÍNH : MODUL MẶT CẮT

MOMENTS OF INERTIA, SECTION MODULUS, etc., OF SECTION

Section	Area of Section, A	Distance from Neutral Axis to Extreme Fiber, y
	$\pi ab = 3.1416\, ab$	a
	$\pi(ab - cd)$ $= 3.1416\,(ab - cd)$	a
	$dt + 2a(s + n)$	$\frac{d}{2}$
	$dt + 2a(s + n)$	$\frac{b}{2}$
	$dt + a(s + n)$	$\frac{d}{2}$
	$dt + a(s + n)$	$b - [b^2s + \frac{ht^2}{2} + \frac{g}{3}(b - t)^3$ $\times (b + 2t)] \div A$ in which g = slope of flange $= \frac{h - l}{2(b - t)}$
	$\frac{l(T + t)}{2} + Tn + a(s + n)$	$d - [3s^2(b - T)$ $+ 2am(m + 3s) + 3Td^2$ $- l(T - t)(3d - l)] \div 6A$

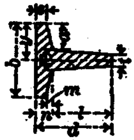
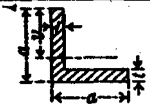
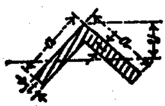
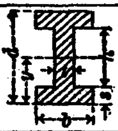
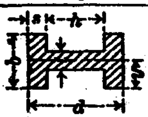
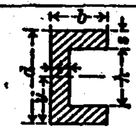
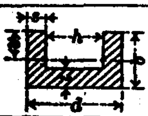
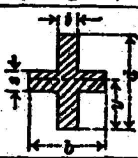
MOMENT QUÁN TÍNH : MODUL MẶT CẮT

MOMENTS OF INERTIA, SECTION MODULUS, etc., OF SECTION

Moment of Inertia, I	Section Modulus, $Z = \frac{I}{y}$	Radius of Gyration, $r = \sqrt{\frac{I}{A}}$
$\frac{\pi a^3 b}{4} = 0.7854\, a^3 b$	$\frac{\pi a^2 b}{4} = 0.7854\, a^2 b$	$\frac{a}{2}$
$\frac{\pi}{4}(a^3 b - c^3 d)$ $= 0.7854\,(a^3 b - c^3 d)$	$\frac{\pi (a^3 b - c^3 d)}{4a}$ $= 0.7854\, \frac{a^3 b - c^3 d}{a}$	$\frac{1}{2}\sqrt{\frac{a^3 b - c^3 d}{ab - cd}}$
$\frac{1}{12}\left[bd^3 - \frac{1}{4g}(h^4 - l^4)\right]$ in which g = slope of flange $= \frac{h-l}{b-t} = \frac{1}{6}$ for standard I-beams.	$\frac{1}{6d}\left[bd^3 - \frac{1}{4g}(h^4 - l^4)\right]$	$\sqrt{\frac{\frac{1}{12}\left[bd^3 - \frac{1}{4g}(h^4 - l^4)\right]}{dt + 2a(s+n)}}$
$\frac{1}{12}\left[b^3(d-h) + lt^3 + \frac{g}{4}(b^4 - t^4)\right]$ in which g = slope of flange (see above).	$\frac{1}{6b}\left[b^3(d-h) + lt^3 + \frac{g}{4}(b^4 - t^4)\right]$	$\sqrt{\frac{I}{A}}$
$\frac{1}{12}\left[bd^3 - \frac{1}{8g}(h^4 - l^4)\right]$ in which g = slope of flange $= \frac{h-l}{2(b-t)} = \frac{1}{6}$ for standard channels.	$\frac{1}{6d}\left[bd^3 - \frac{1}{8g}(h^4 - l^4)\right]$	$\sqrt{\frac{\frac{1}{12}\left[bd^3 - \frac{1}{8g}(h^4 - l^4)\right]}{dt + a(s+n)}}$
$\frac{1}{3}\left[2sb^3 + lt^3 + \frac{g}{2}(b^4 - t^4)\right] - A(b-y)^2$ in which g = slope of flange (see above).	$\frac{I}{y}$	$\sqrt{\frac{I}{A}}$
$\frac{1}{12}[l^3(T + 3t) + 4bn^3 - 2am^3] - A(d - y - n)^2$	$\frac{I}{y}$	$\sqrt{\frac{I}{A}}$

MOMENT QUÁN TÍNH : MODUL MẶT CẮT

MOMENTS OF INERTIA, SECTION MODULUS, etc., OF SECTION

Section	Area of Section, A	Distance from Neutral Axis to Extreme Fiber, y
	$\frac{l(T+t)}{2}+Tn+a(s+n)$	$\frac{b}{2}$
	$t(2a-t)$	$a-\frac{a^2+at-t^2}{2(2a-t)}$
	$t(2a-t)$	$\frac{a^2+at-t^2}{2(2a-t)\cos 45^\circ}$
	$bd-h(b-t)$	$\frac{d}{2}$
	$bd-h(b-t)$	$\frac{b}{2}$
	$bd-h(b-t)$	$\frac{d}{2}$
	$bd-h(b-t)$	$b-\frac{2b^2s+ht^2}{2bd-2h(b-t)}$
	$dt+s(b-t)$	$\frac{d}{2}$

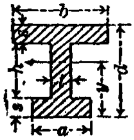
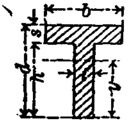
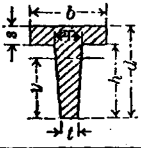
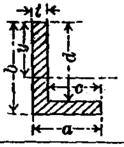
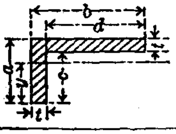
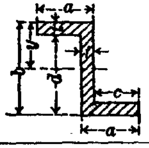
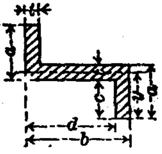
MOMENT QUÁN TÍNH : MODUL MẶT CẮT

MOMENTS OF INERTIA, SECTION MODULUS, etc., OF SECTION

Moment of inertia, I	Section Modulus, $Z = \frac{I}{y}$	Radius of Gyration, $r = \sqrt{\frac{I}{A}}$
$\frac{sb^3 + mT^3 + lt^3}{12} + \frac{am[2a^2 + (2a + 3T)^2]}{36} + \frac{l(T-t)[(T-t)^2 + 2(T+2t)^2]}{144}$	$\frac{I}{y}$	$\sqrt{\frac{I}{A}}$
$\frac{1}{3}[ty^3 + a(a-y)^3 - (a-t)(a-y-t)^3]$	$\frac{I}{y}$	$\sqrt{\frac{I}{A}}$
$\frac{1}{3}[2x^4 - 2(x-t)^4 + t[a - (2x - \frac{1}{2}t)]^3]$ in which $x = \frac{a^2 + at - t^2}{2(2a-t)}$	$\frac{I}{y}$	$\sqrt{\frac{I}{A}}$
$\frac{bd^3 - h^3(b-t)}{12}$	$\frac{bd^3 - h^3(b-t)}{6d}$	$\sqrt{\frac{bd^3 - h^3(b-t)}{12[bd - h(b-t)]}}$
$\frac{2sb^3 + ht^3}{12}$	$\frac{2sb^3 + ht^3}{6b}$	$\sqrt{\frac{2sb^3 + ht^3}{12[bd - h(b-t)]}}$
$\frac{bd^3 - h^3(b-t)}{12}$	$\frac{bd^3 - h^3(b-t)}{6d}$	$\sqrt{\frac{bd^3 - h^3(b-t)}{12[bd - h(b-t)]}}$
$\frac{2sb^3 + ht^3}{3} - A(b-y)^2$	$\frac{I}{y}$	$\sqrt{\frac{I}{A}}$
$\frac{td^3 + s^3(b-t)}{12}$	$\frac{td^3 + s^3(b-t)}{6d}$	$\sqrt{\frac{td^3 + s^3(b-t)}{12[td + s(b-t)]}}$

MOMENT QUÁN TÍNH : MOĐUL MẶT CẮT

MOMENTS OF INERTIA, SECTION MODULUS, etc., OF SECTION

Section	Area of Section, A	Distance from Neutral Axis to Extreme Fiber, y
	$bs + ht + as$	$d - [td^2 + s^2(b-t) + s(a-t)(2d-s)] \div 2A$
	$bs + ht$	$d - \dfrac{d^2t + s^2(b-t)}{2(bs+ht)}$
	$bs + \dfrac{h(T+t)}{2}$	$d - [3bs^2 + 3ht(d+s) + h(T-t)(h+3s)] \div 6A$
	$t(a+b-t)$	$b - \dfrac{t(2d+a)+d^2}{2(d+a)}$
	$t(a+b-t)$	$a - \dfrac{t(2c+b)+c^2}{2(c+b)}$
	$t[b+2(a-t)]$	$\dfrac{b}{2}$
	$t[b+2(a-t)]$	$\dfrac{2a-t}{2}$

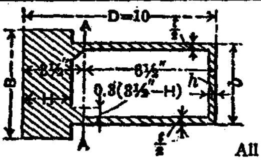
MOMENT QUÁN TÍNH : MODUL MẶT CẮT

MOMENTS OF INERTIA, SECTION MODULUS, etc., OF SECTION

Moment of Inertia, I	Section Modulus, $Z = \frac{I}{y}$	Radius of Gyration, $r = \sqrt{\frac{I}{A}}$
$\frac{1}{3}[b(d-y)^3 + ay^3 - (b-t)(d-y-s)^3 - (a-t)(y-s)^3]$	$\frac{I}{y}$	$\sqrt{\frac{I}{A}}$
$\frac{1}{3}[ty^3 + b(d-y)^3 - (b-t)(d-y-s)^3]$	$\frac{I}{y}$	$\sqrt{\frac{1}{3(bs+ht)}[ty^3 + b(d-y)^3 - (b-t)(d-y-s)^3]}$
$\frac{1}{12}[4bs^3 + h^3(3t+T)] - A(d-y-s)^2$	$\frac{I}{y}$	$\sqrt{\frac{I}{A}}$
$\frac{1}{3}[ty^3 + a(b-y)^3 - (a-t)(b-y-t)^3]$	$\frac{I}{y}$	$\sqrt{\frac{1}{3t(a+b-t)}[ty^3+a(b-y)^3-(a-t)(b-y-t)^3]}$
$\frac{1}{3}[ty^3 + b(a-y)^3 - (b-t)(a-y-t)^3]$	$\frac{I}{y}$	$\sqrt{\frac{1}{3t(a+b-t)}[ty^3+b(a-y)^3-(b-t)(a-y-t)^3]}$
$\frac{ab^3 - c(b-2t)^3}{12}$	$\frac{ab^3 - c(b-2t)^3}{6b}$	$\sqrt{\frac{ab^3-c(b-2t)^3}{12t[b+2(a-t)]}}$
$\frac{b(a+c)^3 - 2c^3d - 6a^2cd}{12}$	$\frac{b(a+c)^3 - 2c^3d - 6a^2cd}{6(2a-t)}$	$\sqrt{\frac{b(a+c)^3-2c^3d-6a^2cd}{12t[b+2(a-t)]}}$

TÍNH CHẤT CÁC TIẾT DIỆN KHUNG CẮT

PROPERTIES OF SECTIONS FOR PUNCH AND SHEAR FRAMES



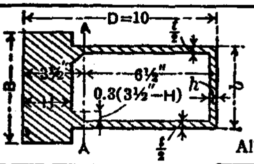
Z_c = Section Modulus for Compression;
Z_t = Section Modulus for Tension;
F = Area of Section;
I = Moment of Inertia about Gravity Axis $A - A$.

All dimensions in inches

B	b	$h = \frac{1}{2}t$	H	F	I	Z_c	Z_t
10	10	¼	0.57	15.36	228.51	35.20	65.40
		⅜	1.10	23.43	311.78	47.95	89.10
		½	1.80	31.82	397.83	61.20	113.70
	9	¼	0.51	14.66	200.77	30.89	57.36
		⅜	0.99	21.64	290.32	44.66	82.95
		½	1.61	29.56	371.95	57.22	106.27
		⅝	2.41	38.69	438.24	67.44	125.21
	8	¼	0.44	13.87	180.98	27.80	51.50
		⅜	0.88	20.41	272.07	41.90	77.70
		½	1.38	27.27	345.47	53.20	98.50
		⅝	2.04	35.20	410.37	63.10	117.00
		¾	3.50	49.63	462.98	71.20	132.00
	7	¼	0.38	13.15	172.76	26.50	49.30
		⅜	0.77	19.21	261.46	40.30	74.60
		½	1.24	25.69	320.52	49.30	91.50
		⅝	1.74	32.24	378.80	58.30	108.00
		¾	2.34	39.42	428.57	65.90	122.60
9	9	¼	0.59	14.66	204.06	31.40	58.30
		⅜	1.20	21.57	291.47	44.80	83.40
		½	2.00	30.68	363.50	55.80	103.60
	8	¼	0.50	13.83	185.91	28.60	53.65
		⅜	1.00	20.34	268.15	41.28	76.65
		½	1.70	28.07	338.66	52.15	96.81
		⅝	2.60	37.12	403.27	62.10	115.12
	7	¼	0.42	13.00	173.33	26.60	49.80
		⅜	0.89	19.25	250.41	38.40	71.60
		½	1.42	25.65	317.24	48.80	90.50
		⅝	2.11	33.03	375.00	57.70	107.10
		¾	3.06	42.13	420.36	64.60	120.10
	6	¼	0.36	12.40	161.70	24.90	46.20
		⅜	0.75	17.92	226.20	34.80	64.70
		½	1.23	23.89	290.50	44.70	83.00
		⅝	1.79	30.22	345.70	53.10	100.60
		¾	2.62	38.26	392.00	60.30	112.00
8	8	¼	0.62	14.09	187.46	28.90	53.55
		⅜	1.20	20.50	268.38	41.30	76.70
		½	2.10	28.79	336.75	51.80	96.20
	7	¼	0.55	13.69	172.25	26.50	49.20
		⅜	1.10	19.50	248.56	38.30	71.10
		½	1.90	27.07	315.01	48.50	90.00

TÍNH CHẤT CÁC TIẾT DIỆN KHUNG CẮT

PROPERTIES OF SECTIONS FOR PUNCH AND SHEAR FRAMES



Z_c = Section Modulus for Compression;
Z_t = Section Modulus for Tension;
F = Area of Section;
I = Moment of Inertia about Gravity Axis $A - A$.

All dimensions in inches

B	b	$h = \frac{1}{2} t$	H	F	I	Z_c	Z_t
8	7	⅝	3.00	36.41	377.05	58.0	108.0
	6	¼	0.43	12.43	155.80	23.9	44.5
		⅜	0.91	18.07	221.14	34.0	63.1
		½	1.50	24.20	283.77	43.5	80.8
		⅝	2.36	31.79	339.75	52.3	96.9
	5	¼	0.33	11.61	139.76	21.42	39.9
		⅜	0.75	16.81	204.37	31.41	58.4
		½	1.25	22.27	261.65	40.25	75.2
		⅝	2.00	29.00	310.74	49.7	88.8
		¾	2.75	35.66	350.65	54.0	100.0
7	7	¼	0.70	13.52	169.40	26.04	48.4
		⅜	1.40	19.99	243.80	37.5	69.6
		½	2.44	27.28	310.80	47.8	88.8
	6	¼	0.55	12.55	147.20	22.6	42.1
		⅜	1.14	18.27	220.03	33.8	62.8
		½	2.00	25.17	282.60	43.4	80.8
	5	¼	0.41	12.28	136.92	20.0	39.1
		⅜	0.95	16.98	203.40	31.0	58.0
		½	1.65	23.03	258.64	40.0	73.8
		⅝	2.55	30 36	302.60	46.5	86.5
	4	¼	0.31	10.96	124.20	19.12	35.5
		⅜	0.76	15.71	183.00	28.15	52.3
		½	1.31	20.80	232.20	35.7	66.4
		⅝	1.98	26.30	275.00	42.3	78.6
6	6	¼	0.68	12.56	156.25	24.0	44.6
		⅜	1.56	18.79	222.10	32.6	60.5
		½	3.50	30.00	275.00	42.3	78.6
	5	¼	0.53	11.68	180.83	29.0	51.6
		⅜	1.27	17.25	214.79	33.0	61.4
		½	2.35	24.15	253.85	39.0	73.4
	4	¼	0.38	10.88	125.59	19.3	35.8
		⅜	1.00	15.84	181.36	27.9	51.8
		½	1.80	20.87	228.96	35.2	65.4
5	5	¼	0.73	11.76	139.73	21.5	40.0
		⅜	1.70	17.28	196.98	30.2	56.2
	4	¼	0.55	10.97	125.40	19.3	35.9
		⅜	1.45	16.13	181.52	28.0	52.0
	3	¼	0.84	10.16	110.14	17.25	32.0
		⅜	1.12	14.90	167.70	25.7	47.6
		½	2.10	19.99	198.57	30.5	56.8

MODUL TIẾT DIỆN CHỮ NHẬT

SECTION MODULUS FOR RECTANGLES

Section modulus values shown are for rectangles 1 inch wide. To obtain section modulus for rectangle of given length of side, multiply value in table by given width.

Length of Side	Section Modulus	Length of Side	Section Modulus	Length of Side	Section Modulus	Length of Side	Section Modulus
1/8	0.0026	2 3/4	1.26	12	24.00	25	104.2
3/16	0.0059	3	1.50	12 1/2	26.04	26	112.7
1/4	0.0104	3 1/4	1.76	13	28.17	27	121.5
5/16	0.0163	3 1/2	2.04	13 1/2	30.38	28	130.7
3/8	0.0234	3 3/4	2.34	14	32.67	29	140.2
7/16	0.032	4	2.67	14 1/2	35.04	30	150
1/2	0.042	4 1/2	3.38	15	37.5	32	171
5/8	0.065	5	4.17	15 1/2	40.0	34	193
3/4	0.094	5 1/2	5.04	16	42.7	36	216
7/8	0.128	6	6.00	16 1/2	45.4	38	241
1	0.167	6 1/2	7.04	17	48.2	40	267
1 1/8	0.211	7	8.17	17 1/2	51.0	42	294
1 1/4	0.260	7 1/2	9.38	18	54.0	44	323
1 3/8	0.315	8	10.67	18 1/2	57.0	46	353
1 1/2	0.375	8 1/2	12.04	19	60.2	48	384
1 5/8	0.440	9	13.50	19 1/2	63.4	50	417
1 3/4	0.510	9 1/2	15.04	20	66.7	52	451
1 7/8	0.586	10	16.67	21	73.5	54	486
2	0.67	10 1/2	18.38	22	80.7	56	523
2 1/4	0.84	11	20.17	23	88.2	58	561
2 1/2	1.04	11 1/2	22.04	24	96.0	60	600

MODUL TIẾT DIỆN VÀ MOMENT QUÁN TÍNH CỦA TRỤC TRÒN

SECTION MODULUS AND MOMENTS OF INERTIA FOR ROUND SHAFTS

Diam.	Section Modulus	Moment of Inertia	Diam.	Section Modulus	Moment of Inertia	Diam.	Section Modulus	Moment of Inertia
1/8	0.00019	0.00001	27/64	0.0074	0.00155	23/32	0.0364	0.01308
9/64	0.00027	0.00002	7/16	0.0082	0.00180	47/64	0.0388	0.01425
5/32	0.00037	0.00003	29/64	0.0091	0.00207	3/4	0.0413	0.01550
11/64	0.00050	0.00004	15/32	0.0101	0.00237	49/64	0.0440	0.01684
3/16	0.00065	0.00006	31/64	0.0111	0.00270	25/32	0.0467	0.01825
13/64	0.00082	0.00008	1/2	0.0123	0.00306	51/64	0.0496	0.01976
7/32	0.00102	0.00011	33/64	0.0134	0.00346	13/16	0.0526	0.02135
15/64	0.00126	0.00015	17/32	0.0147	0.00390	53/64	0.0557	0.02305
1/4	0.00153	0.00019	35/64	0.0160	0.00438	27/32	0.0588	0.02483
17/64	0.00183	0.00024	9/16	0.0174	0.00491	55/64	0.0622	0.02673
9/32	0.00218	0.00031	37/64	0.0189	0.00547	7/8	0.0656	0.02872
19/64	0.00256	0.00038	19/32	0.0205	0.00609	57/64	0.0692	0.03083
5/16	0.00299	0.00047	39/64	0.0222	0.00676	29/32	0.0728	0.03305
21/64	0.00344	0.00057	5/8	0.0239	0.00748	59/64	0.0767	0.03539
11/32	0.00398	0.00068	41/64	0.0258	0.00825	15/16	0.0807	0.03785
23/64	0.0045	0.00082	21/32	0.0277	0.00909	61/64	0.0849	0.04044
3/8	0.0052	0.00097	43/64	0.0297	0.00999	31/32	0.0891	0.04316
25/64	0.0058	0.00114	11/16	0.0318	0.01095	63/64	0.0934	0.04601
13/32	0.0066	0.00133	45/64	0.0341	0.01198	...	...	...

In this and succeeding tables, the *Polar Section Modulus* for a shaft of given diameter can be obtained by multiplying its Section Modulus by 2. Similarly its *Polar Moment of Inertia* can be obtained by multiplying its Moment of Inertia by 2.

MODUL TIẾT DIỆN VÀ MOMENT QUÁN TÍNH CỦA TRỤC TRÒN

SECTION MODULUS AND MOMENTS OF INERTIA FOR ROUND SHAFTS

Diam.	Section Modulus	Moment of Inertia	Diam.	Section Modulus	Moment of Inertia	Diam.	Section Modulus	Moment of Inertia
1.00	0.0981	0.0490	1.50	0.3313	0.2485	2.00	0.7854	0.7854
1.01	0.1011	0.0510	1.51	0.3380	0.2552	2.01	0.7972	0.8012
1.02	0.1041	0.0531	1.52	0.3447	0.2620	2.02	0.8092	0.8172
1.03	0.1072	0.0552	1.53	0.3516	0.2689	2.03	0.8212	0.8335
1.04	0.1104	0.0574	1.54	0.3585	0.2761	2.04	0.8334	0.8501
1.05	0.1136	0.0596	1.55	0.3655	0.2833	2.05	0.8457	0.8669
1.06	0.1169	0.0619	1.56	0.3727	0.2907	2.06	0.8582	0.8839
1.07	0.1202	0.0643	1.57	0.3799	0.2982	2.07	0.8707	0.9012
1.08	0.1236	0.0667	1.58	0.3872	0.3059	2.08	0.8834	0.9188
1.09	0.1271	0.0692	1.59	0.3946	0.3137	2.09	0.8962	0.9366
1.10	0.1307	0.0718	1.60	0.4021	0.3217	2.10	0.9092	0.9547
1.11	0.1342	0.0745	1.61	0.4097	0.3298	2.11	0.9222	0.9729
1.12	0.1379	0.0772	1.62	0.4173	0.3380	2.12	0.9354	0.9915
1.13	0.1416	0.0800	1.63	0.4251	0.3465	2.13	0.9487	1.0103
1.14	0.1454	0.0829	1.64	0.4330	0.3550	2.14	0.9621	1.0295
1.15	0.1493	0.0859	1.65	0.4410	0.3638	2.15	0.9757	1.0488
1.16	0.1532	0.0888	1.66	0.4490	0.3727	2.16	0.9894	1.0685
1.17	0.1572	0.0919	1.67	0.4572	0.3818	2.17	1.0031	1.0884
1.18	0.1613	0.0951	1.68	0.4655	0.3910	2.18	1.0171	1.1086
1.19	0.1654	0.0984	1.69	0.4738	0.4004	2.19	1.0311	1.1291
1.20	0.1696	0.1018	1.70	0.4823	0.4100	2.20	1.0454	1.1499
1.21	0.1739	0.1052	1.71	0.4908	0.4197	2.21	1.0596	1.1709
1.22	0.1782	0.1087	1.72	0.4995	0.4296	2.22	1.0741	1.1923
1.23	0.1826	0.1123	1.73	0.5083	0.4397	2.23	1.0887	1.2139
1.24	0.1871	0.1160	1.74	0.5171	0.4499	2.24	1.1034	1.2358
1.25	0.1917	0.1198	1.75	0.5261	0.4603	2.25	1.1183	1.2580
1.26	0.1963	0.1237	1.76	0.5352	0.4710	2.26	1.1332	1.2806
1.27	0.2011	0.1277	1.77	0.5444	0.4818	2.27	1.1483	1.3034
1.28	0.2058	0.1317	1.78	0.5536	0.4927	2.28	1.1636	1.3265
1.29	0.2107	0.1359	1.79	0.5630	0.5039	2.29	1.1790	1.3499
1.30	0.2157	0.1402	1.80	0.5726	0.5153	2.30	1.1945	1.3737
1.31	0.2207	0.1445	1.81	0.5821	0.5268	2.31	1.2101	1.3977
1.32	0.2258	0.1490	1.82	0.5918	0.5385	2.32	1.2259	1.4234
1.33	0.2309	0.1535	1.83	0.6016	0.5505	2.33	1.2418	1.4468
1.34	0.2362	0.1582	1.84	0.6115	0.5626	2.34	1.2579	1.4718
1.35	0.2415	0.1630	1.85	0.6216	0.5749	2.35	1.2741	1.4971
1.36	0.2469	0.1679	1.86	0.6317	0.5875	2.36	1.2904	1.5227
1.37	0.2524	0.1729	1.87	0.6419	0.6002	2.37	1.3069	1.5487
1.38	0.2580	0.1780	1.88	0.6524	0.6132	2.38	1.3235	1.5750
1.39	0.2636	0.1832	1.89	0.6628	0.6263	2.39	1.3403	1.6016
1.40	0.2694	0.1886	1.90	0.6734	0.6397	2.40	1.3572	1.6286
1.41	0.2752	0.1940	1.91	0.6840	0.6532	2.41	1.3742	1.6559
1.42	0.2811	0.1995	1.92	0.6948	0.6670	2.42	1.3914	1.6836
1.43	0.2870	0.2052	1.93	0.7057	0.6810	2.43	1.4087	1.7116
1.44	0.2931	0.2110	1.94	0.7168	0.6953	2.44	1.4262	1.7399
1.45	0.2993	0.2170	1.95	0.7279	0.7097	2.45	1.4438	1.7686
1.46	0.3055	0.2230	1.96	0.7392	0.7244	2.46	1.4615	1.7977
1.47	0.3118	0.2292	1.97	0.7505	0.7393	2.47	1.4794	1.8271
1.48	0.3182	0.2355	1.98	0.7620	0.7544	2.48	1.4975	1.8526
1.49	0.3247	0.2419	1.99	0.7736	0.7698	2.49	1.5156	1.8870

MODUL TIẾT DIỆN VÀ MOMENT QUÁN TÍNH CỦA TRỤC TRÒN

SECTION MODULUS AND MOMENTS OF INERTIA FOR ROUND SHAFTS

Diam.	Section Modulus	Moment of Inertia	Diam.	Section Modulus	Moment of Inertia	Diam.	Section Modulus	Moment of Inertia
2.50	1.5340	1.9175	3.00	2.6510	3.9761	3.50	4.2090	7.3662
2.51	1.5525	1.9483	3.01	2.6773	4.0293	3.51	4.2455	7.4507
2.52	1.5711	1.9796	3.02	2.7041	4.0831	3.52	4.2818	7.5360
2.53	1.5899	2.0112	3.03	2.7310	4.1375	3.53	4.3184	7.6220
2.54	1.6088	2.0431	3.04	2.7581	4.1924	3.54	4.3552	7.7087
2.55	1.6279	2.0755	3.05	2.7855	4.2478	3.55	4.3922	7.7962
2.56	1.6471	2.1083	3.06	2.8130	4.3038	3.56	4.4294	7.8845
2.57	1.6665	2.1414	3.07	2.8406	4.3604	3.57	4.4669	7.9734
2.58	1.6860	2.1749	3.08	2.8685	4.4175	3.58	4.5045	8.0631
2.59	1.7057	2.2088	3.09	2.8965	4.4751	3.59	4.5424	8.1536
2.60	1.7260	2.2432	3.10	2.9250	4.5333	3.60	4.5804	8.2448
2.61	1.7455	2.2779	3.11	2.9531	4.5921	3.61	4.6187	8.3367
2.62	1.7656	2.3130	3.12	2.9817	4.6514	3.62	4.6572	8.4296
2.63	1.7859	2.3485	3.13	3.0104	4.7113	3.63	4.6959	8.5231
2.64	1.8064	2.3844	3.14	3.0394	4.7718	3.64	4.7347	8.6174
2.65	1.8270	2.4208	3.15	3.0685	4.8330	3.65	4.7740	8.7125
2.66	1.8478	2.4575	3.16	3.0978	4.8946	3.66	4.8133	8.8084
2.67	1.8686	2.4947	3.17	3.1274	4.9568	3.67	4.8529	8.9050
2.68	1.8897	2.5322	3.18	3.1570	5.0197	3.68	4.8926	9.0025
2.69	1.9110	2.5702	3.19	3.1869	5.0832	3.69	4.9325	9.1007
2.70	1.9320	2.6087	3.20	3.2170	5.1472	3.70	4.9730	9.1998
2.71	1.9539	2.6476	3.21	3.2472	5.2119	3.71	5.0133	9.2996
2.72	1.9756	2.6868	3.22	3.2777	5.2771	3.72	5.0540	9.4003
2.73	1.9975	2.7266	3.23	3.3083	5.3430	3.73	5.0948	9.5018
2.74	2.0195	2.7668	3.24	3.3391	5.4094	3.74	5.1359	9.6041
2.75	2.0417	2.8074	3.25	3.3701	5.4765	3.75	5.1771	9.7072
2.76	2.0641	2.8484	3.26	3.4014	5.5442	3.76	5.2187	9.8112
2.77	2.0866	2.8899	3.27	3.4328	5.6126	3.77	5.2605	9.9160
2.78	2.1093	2.9319	3.28	3.4644	5.6815	3.78	5.3024	10.0216
2.79	2.1321	2.9743	3.29	3.4961	5.7511	3.79	5.3444	10.1286
2.80	2.1550	3.0172	3.30	3.5280	5.8214	3.80	5.3870	10.2350
2.81	2.1783	3.0605	3.31	3.5603	5.8923	3.81	5.4297	10.3436
2.82	2.2016	3.1043	3.32	3.5926	5.9638	3.82	5.4726	10.4526
2.83	2.2251	3.1486	3.33	3.6252	6.0363	3.83	5.5156	10.5624
2.84	2.2488	3.1933	3.34	3.6580	6.1088	3.84	5.5590	10.6732
2.85	2.2727	3.2385	3.35	3.6909	6.1823	3.85	5.6025	10.7848
2.86	2.2966	3.2842	3.36	3.7241	6.2564	3.86	5.6462	10.8970
2.87	2.3208	3.3304	3.37	3.7575	6.3312	3.87	5.6903	11.0110
2.88	2.3452	3.3771	3.38	3.7909	6.4067	3.88	5.7345	11.1250
2.89	2.3697	3.4242	3.39	3.8246	6.4829	3.89	5.7789	11.2400
2.90	2.3940	3.4719	3.40	3.8590	6.5597	3.90	5.8240	11.3560
2.91	2.4192	3.5200	3.41	3.8928	6.6372	3.91	5.8685	11.4730
2.92	2.4442	3.5686	3.42	3.9272	6.7154	3.92	5.9137	11.5910
2.93	2.4695	3.6178	3.43	3.9617	6.7943	3.93	5.9590	11.7100
2.94	2.4949	3.6674	3.44	3.9965	6.8739	3.94	6.0046	11.8290
2.95	2.5204	3.7175	3.45	4.0314	6.9542	3.95	6.0505	11.9500
2.96	2.5461	3.7682	3.46	4.0666	7.0352	3.96	6.0966	12.0690
2.97	2.5720	3.8196	3.47	4.1019	7.1168	3.97	6.1429	12.1930
2.98	2.5981	3.8711	3.48	4.1375	7.1976	3.98	6.1894	12.3170
2.99	2.6243	3.9233	3.49	4.1732	7.2824	3.99	6.2361	12.4410

MODUL TIẾT DIỆN VÀ MOMENT QUÁN TÍNH CỦA TRỤC TRÒN

SECTION MODULUS AND MOMENTS OF INERTIA FOR ROUND SHAFTS

Diam.	Section Modulus	Moment of Inertia	Diam.	Section Modulus	Moment of Inertia	Diam.	Section Modulus	Moment of Inertia
4.00	6.2830	12.566	4.50	8.946	20.129	5.00	12.272	30.680
4.01	6.3304	12.692	4.51	9.006	20.308	5.01	12.345	30.926
4.02	6.3779	12.820	4.52	9.066	20.489	5.02	12.420	31.173
4.03	6.4256	12.948	4.53	9.126	20.671	5.03	12.493	31.423
4.04	6.4736	13.077	4.54	9.186	20.854	5.04	12.568	31.673
4.05	6.5217	13.207	4.55	9.247	21.039	5.05	12.644	31.925
4.06	6.5701	13.337	4.56	9.308	21.224	5.06	12.718	32.179
4.07	6.6188	13.469	4.57	9.370	21.411	5.07	12.794	32.434
4.08	6.6677	13.602	4.58	9.431	21.599	5.08	12.870	32.691
4.09	6.7169	13.736	4.59	9.493	21.788	5.09	12.946	32.949
4.10	6.7660	13.871	4.60	9.556	21.979	5.10	13.023	33.209
4.11	6.8159	14.007	4.61	9.618	22.170	5.11	13.099	33.470
4.12	6.8657	14.143	4.62	9.681	22.363	5.12	13.177	33.733
4.13	6.9164	14.281	4.63	9.744	22.557	5.13	13.254	33.997
4.14	6.9663	14.420	4.64	9.807	22.753	5.14	13.332	34.263
4.15	7.0169	14.560	4.65	9.870	22.950	5.15	13.410	34.530
4.16	7.0677	14.701	4.66	9.934	23.148	5.16	13.488	34.799
4.17	7.1188	14.843	4.67	9.998	23.347	5.17	13.567	35.070
4.18	7.1702	14.985	4.68	10.063	23.548	5.18	13.645	35.342
4.19	7.2217	15.129	4.69	10.127	23.750	5.19	13.725	35.615
4.20	7.2740	15.274	4.70	10.193	23.953	5.20	13.804	35.891
4.21	7.3256	15.420	4.71	10.258	24.157	5.21	13.884	36.168
4.22	7.3779	15.568	4.72	10.323	24.363	5.22	13.964	36.446
4.23	7.4305	15.715	4.73	10.389	24.570	5.23	14.045	36.726
4.24	7.4833	15.865	4.74	10.455	24.779	5.24	14.125	37.008
4.25	7.5364	16.015	4.75	10.522	24.989	5.25	14.206	37.291
4.26	7.5898	16.166	4.76	10.588	25.200	5.26	14.287	37.576
4.27	7.6433	16.319	4.77	10.655	25.412	5.27	14.369	37.863
4.28	7.6972	16.472	4.78	10.722	25.626	5.28	14.451	38.151
4.29	7.7513	16.626	4.79	10.790	25.841	5.29	14.534	38.440
4.30	7.8060	16.782	4.80	10.857	26.058	5.30	14.616	38.732
4.31	7.8602	16.938	4.81	10.925	26.275	5.31	14.699	39.025
4.32	7.9149	17.096	4.82	10.994	26.495	5.32	14.782	39.320
4.33	7.9701	17.255	4.83	11.062	26.715	5.33	14.866	39.617
4.34	8.0254	17.415	4.84	11.131	26.937	5.34	14.949	39.915
4.35	8.0810	17.576	4.85	11.200	27.160	5.35	15.034	40.215
4.36	8.1369	17.738	4.86	11.269	27.385	5.36	15.118	40.516
4.37	8.1930	17.902	4.87	11.339	27.611	5.37	15.202	40.819
4.38	8.2494	18.066	4.88	11.409	27.839	5.38	15.288	41.124
4.39	8.3060	18.231	4.89	11.479	28.067	5.39	15.373	41.431
4.40	8.3630	18.398	4.90	11.550	28.298	5.40	15.459	41.739
4.41	8.4200	18.566	4.91	11.621	28.530	5.41	15.545	42.049
4.42	8.4775	18.735	4.92	11.692	28.763	5.42	15.631	42.361
4.43	8.5351	18.905	4.93	11.763	28.997	5.43	15.718	42.674
4.44	8.5930	19.077	4.94	11.835	29.233	5.44	15.805	42.990
4.45	8.6513	19.249	4.95	11.907	29.471	5.45	15.893	43.307
4.46	8.7097	19.423	4.96	11.979	29.710	5.46	15.980	43.626
4.47	8.7685	19.598	4.97	12.052	29.950	5.47	16.068	43.946
4.48	8.8274	19.773	4.98	12.124	30.192	5.48	16.157	44.268
4.49	8.8867	19.950	4.99	12.198	30.435	5.49	16.245	44.592

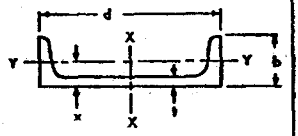
TIÊU CHUẨN MỸ CHO THÉP XÂY DỰNG TIẾT DIỆN U

AMERICAN STANDARD STRUCTURAL CHANNELS

These channels are commonly designated by nominal depth, group symbol, and weight per foot, thus:

9⊔13.4

indicates a 9 x 2½-inch channel weighing 13.4 pounds per foot.



Nominal Size	Weight per Foot	Area	Depth, *d*	Flange: Width, *b*	Flange: Average Thickness	Web Thickness, *t*	Axis *X-X*: *I*	Axis *X-X*: *Z*	Axis *X-X*: *r*	Axis *Y-Y*: *I*	Axis *Y-Y*: *Z*	Axis *Y-Y*: *r*	Axis *Y-Y*: *x*
In.	Lb.	In.²	In.	In.	In.	In.	In.⁴	In.³	In.	In.⁴	In.³	In.	In.
*18 x 4	58.0	16.98	18.00	4.200	.625	.700	670.7	74.5	6.29	18.5	5.6	1.04	.88
	51.9	15.18	18.00	4.100	.625	.600	622.1	69.1	6.40	17.1	5.3	1.06	.87
	45.8	13.38	18.00	4.000	.625	.500	573.5	63.7	6.55	15.8	5.1	1.09	.89
	42.7	12.48	18.00	3.950	.625	.450	549.2	61.0	6.64	15.0	4.9	1.10	.90
15 x 3⅜	50.0	14.64	15.00	3.716	.650	.716	401.4	53.6	5.24	11.2	3.8	.87	.80
	40.0	11.70	15.00	3.520	.650	.520	346.3	46.2	5.44	9.3	3.4	.89	.78
	33.9	9.90	15.00	3.400	.650	.400	312.6	41.7	5.62	8.2	3.2	.91	.79
12 x 3	30.0	8.79	12.00	3.170	.501	.510	161.2	26.9	4.28	5.2	2.1	.77	.68
	25.0	7.32	12.00	3.047	.501	.387	143.5	23.9	4.43	4.5	1.9	.79	.68
	20.7	6.03	12.00	2.940	.501	.280	128.1	21.4	4.61	3.9	1.7	.81	.70
10 x 2⅝	30.0	8.80	10.00	3.033	.436	.673	103.0	20.6	3.42	4.0	1.7	.67	.65
	25.0	7.33	10.00	2.886	.436	.526	90.7	18.1	3.52	3.4	1.5	.68	.62
	20.0	5.86	10.00	2.739	.436	.379	78.5	15.7	3.66	2.8	1.3	.70	.61
	15.3	4.47	10.00	2.600	.436	.240	66.9	13.4	3.87	2.3	1.2	.72	.64
9 x 2½	20.0	5.86	9.00	2.648	.413	.448	60.6	13.5	3.22	2.4	1.2	.65	.59
	15.0	4.39	9.00	2.485	.413	.285	50.7	11.3	3.40	1.9	1.0	.67	.59
	13.4	3.89	9.00	2.430	.413	.230	47.3	10.5	3.49	1.8	.97	.67	.61
8 x 2¼	18.75	5.49	8.00	2.527	.390	.487	43.7	10.9	2.82	2.0	1.0	.60	.57
	13.75	4.02	8.00	2.343	.390	.303	35.8	9.0	2.99	1.5	.86	.62	.56
	11.5	3.36	8.00	2.260	.390	.220	32.3	8.1	3.10	1.3	.79	.63	.58
7 x 2⅛	14.75	4.32	7.00	2.299	.366	.419	27.1	7.7	2.51	1.4	.79	.57	.53
	12.25	3.58	7.00	2.194	.366	.314	24.1	6.9	2.59	1.2	.71	.58	.53
	9.8	2.85	7.00	2.090	.366	.210	21.1	6.0	2.72	.98	.63	.59	.55
6 x 2	13.0	3.81	6.00	2.157	.343	.437	17.3	5.8	2.13	1.1	.65	.53	.52
	10.5	3.07	6.00	2.034	.343	.314	15.1	5.0	2.22	.87	.57	.53	.50
	8.2	2.39	6.00	1.920	.343	.200	13.0	4.3	2.34	.70	.50	.54	.52
5 x 1¾	9.0	2.63	5.00	1.885	.320	.325	8.8	3.5	1.83	.64	.45	.49	.48
	6.7	1.95	5.00	1.750	.320	.190	7.4	3.0	1.95	.48	.38	.50	.49
4 x 1⅝	7.25	2.12	4.00	1.720	.296	.320	4.5	2.3	1.47	.44	.35	.46	.46
	5.4	1.56	4.00	1.580	.296	.180	3.8	1.9	1.56	.32	.29	.45	.46
3 x 1½	6.0	1.75	3.00	1.596	.273	.356	2.1	1.4	1.08	.31	.27	.42	.46
	5.0	1.46	3.00	1.498	.273	.258	1.8	1.2	1.12	.25	.24	.41	.44
	4.1	1.19	3.00	1.410	.273	.170	1.6	1.1	1.17	.20	.21	.41	.44

† Data from American Institute of Steel Construction Manual, Fifth Edition, 1950.
* Car and Shipbuilding Channel; not an American Standard.
Meaning of symbols: I = moment of inertia; Z = section modulus; r = radius of gyration.

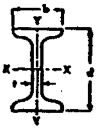
TIÊU CHUẨN MỸ CHO THANH I

AMERICAN STANDARD I-BEAMS

These beams are commonly designated by nominal depth, group symbol and weight per foot, thus:

15 I 42.9

indicates a 15 x 5½-inch beam weighing 42.9 pounds per foot.



Nominal Size	Weight per Foot	Area	Depth, d	Flange Width, b	Flange Thickness	Web Thickness, t	Axis X-X I	Axis X-X Z	Axis X-X r	Axis Y-Y I	Axis Y-Y Z	Axis Y-Y r
In.	Lb.	In.^{2}	In.	In.	In.	In.	In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}	In.
24 x 7⅞	120.0	35.13	24.00	8.048	1.102	.798	3010.8	250.9	9.26	84.9	21.1	1.56
	105.9	30.98	24.00	7.875	1.102	.625	2811.5	234.3	9.53	78.9	20.0	1.60
24 x 7	100.0	29.25	24.00	7.247	.871	.747	2371.8	197.6	9.05	48.4	13.4	1.29
	90.0	26.30	24.00	7.124	.871	.624	2230.1	185.8	9.21	45.5	12.8	1.32
	79.9	23.33	24.00	7.000	.871	.500	2087.2	173.9	9.46	42.9	12.2	1.36
20 x 7	95.0	27.74	20.00	7.200	.916	.800	1599.7	160.0	7.59	50.5	14.0	1.35
	85.0	24.80	20.00	7.053	.916	.653	1501.7	150.2	7.78	47.0	13.3	1.38
20 x 6¼	75.0	21.90	20.00	6.391	.789	.641	1263.5	126.3	7.60	30.1	9.4	1.17
	65.4	19.08	20.00	6.250	.789	.500	1169.5	116.9	7.83	27.9	8.9	1.21
18 x 6	70.0	20.46	18.00	6.251	.691	.711	917.5	101.9	6.70	24.5	7.8	1.09
	54.7	15.94	18.00	6.000	.691	.460	795.5	88.4	7.07	21.2	7.1	1.15
15 x 5½	50.0	14.59	15.00	5.640	.622	.550	481.1	64.2	5.74	16.0	5.7	1.05
	42.9	12.49	15.00	5.500	.622	.410	441.8	58.9	5.95	14.6	5.3	1.08
12 x 5¼	50.0	14.57	12.00	5.477	.659	.687	301.6	50.3	4.55	16.0	5.8	1.05
	40.8	11.84	12.00	5.250	.659	.460	268.9	44.8	4.77	13.8	5.3	1.08
12 x 5	35.0	10.20	12.00	5.078	.544	.428	227.0	37.8	4.72	10.0	3.9	.99
	31.8	9.26	12.00	5.000	.544	.350	215.8	36.0	4.83	9.5	3.8	1.01
10 x 4⅝	35.0	10.22	10.00	4.944	.491	.594	145.8	29.2	3.78	8.5	3.4	.91
	25.4	7.38	10.00	4.660	.491	.310	122.1	24.4	4.07	6.9	3.0	.97
8 x 4	23.0	6.71	8.00	4.171	.425	.441	64.2	16.0	3.09	4.4	2.1	.81
	18.4	5.34	8.00	4.000	.425	.270	56.9	14.2	3.26	3.8	1.9	.84
7 x 3⅝	20.0	5.83	7.00	3.860	.392	.450	41.9	12.0	2.68	3.1	1.6	.74
	15.3	4.43	7.00	3.660	.392	.250	36.2	10.4	2.86	2.7	1.5	.78
6 x 3⅜	17.25	5.02	6.00	3.565	.359	.465	26.0	8.7	2.28	2.3	1.3	.68
	12.5	3.61	6.00	3.330	.359	.230	21.8	7.3	2.46	1.8	1.1	.72
5 x 3	14.75	4.29	5.00	3.284	.326	.494	15.0	6.0	1.87	1.7	1.0	.63
	10.0	2.87	5.00	3.000	.326	.210	12.1	4.8	2.05	1.2	.82	.65
4 x 2⅝	9.5	2.76	4.00	2.796	.293	.326	6.7	3.3	1.56	.91	.65	.58
	7.7	2.21	4.00	2.660	.293	.190	6.0	3.0	1.64	.77	.58	.59
3 x 2⅜	7.5	2.17	3.00	2.509	.260	.349	2.9	1.9	1.15	.59	.47	.52
	5.7	1.64	3.00	2.330	.260	.170	2.5	1.7	1.23	.46	.40	.53

† Data from American Institute of Steel Construction Manual, Fifth Edition, 1950.

Meaning of symbols: I = moment of inertia; Z = section modulus; r = radius of gyration.

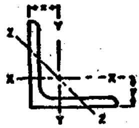
CÁC THÀNH PHẦN CỦA THÉP GÓC ĐỀU

ELEMENTS OF ANGLES WITH EQUAL LEGS

These angles are commonly designated by group symbol, width of each leg, and thickness, thus:

L 3x3x ¼

indicates a 3 x 3-inch angle of ¼-inch thickness.



Size	Thickness	Weight per Foot	Area	Axis X-X & Y-Y: I	Axis X-X & Y-Y: r	Axis X-X & Y-Y: x or y	Z-Z: r
In.	In.	Lb.	In.²	In.⁴	In.	In.	In.
8 x 8	1⅛	56.9	16.73	98.0	2.42	2.41	1.56
	1	51.0	15.00	89.0	2.44	2.37	1.56
	⅞	45.0	13.23	79.6	2.45	2.32	1.57
	¾	38.9	11.44	69.7	2.47	2.28	1.57
	⅝	32.7	9.61	59.4	2.49	2.23	1.58
	9/16	29.6	8.68	54.1	2.50	2.21	1.58
	½	26.4	7.75	48.6	2.50	2.19	1.59
6 x 6	1	37.4	11.00	35.5	1.80	1.86	1.17
	⅞	33.1	9.73	31.9	1.81	1.82	1.17
	¾	28.7	8.44	28.2	1.83	1.78	1.17
	⅝	24.2	7.11	24.2	1.84	1.73	1.18
	9/16	21.9	6.43	22.1	1.85	1.71	1.18
	½	19.6	5.75	19.9	1.86	1.68	1.18
	7/16	17.2	5.06	17.7	1.87	1.66	1.19
	⅜	14.9	4.36	15.4	1.88	1.64	1.19
	5/16	12.5	3.66	13.0	1.89	1.61	1.19
5 x 5	⅞	27.2	7.98	17.8	1.49	1.57	.97
	¾	23.6	6.94	15.7	1.51	1.52	.97
	⅝	20.0	5.86	13.6	1.52	1.48	.98
	½	16.2	4.75	11.3	1.54	1.43	.98
	7/16	14.3	4.18	10.0	1.55	1.41	.98
	⅜	12.3	3.61	8.7	1.56	1.39	.99
	5/16	10.3	3.03	7.4	1.57	1.37	.99
4 x 4	¾	18.5	5.44	7.7	1.19	1.27	.78
	⅝	15.7	4.61	6.7	1.20	1.23	.78
	½	12.8	3.75	5.6	1.22	1.18	.78
	7/16	11.3	3.31	5.0	1.23	1.16	.78
	⅜	9.8	2.86	4.4	1.23	1.14	.79
	5/16	8.2	2.40	3.7	1.24	1.12	.79
	¼	6.6	1.94	3.0	1.25	1.09	.80
3½ x 3½	½	11.1	3.25	3.6	1.06	1.06	.68
	7/16	9.8	2.87	3.3	1.07	1.04	.68
	⅜	8.5	2.48	2.9	1.07	1.01	.69
	5/16	7.2	2.09	2.5	1.08	.99	.69
	¼	5.8	1.69	2.0	1.09	.97	.69

Size	Thickness	Weight per Foot	Area	Axis X-X & Y-Y: I	Axis X-X & Y-Y: r	Axis X-X & Y-Y: x or y	Z-Z: r
In.	In.	Lb.	In.²	In.⁴	In.	In.	In.
3 x 3	½	9.4	2.75	2.2	.90	.93	.58
	7/16	8.3	2.43	2.0	.91	.91	.58
	⅜	7.2	2.11	1.8	.91	.89	.58
	5/16	6.1	1.78	1.5	.92	.87	.59
	¼	4.9	1.44	1.2	.93	.84	.59
	3/16	3.71	1.09	.96	.94	.82	.59
2½ x 2½	½	7.7	2.25	1.2	.74	.81	.49
	⅜	5.9	1.73	.98	.75	.76	.49
	5/16	5.0	1.47	.85	.76	.74	.49
	¼	4.1	1.19	.70	.77	.72	.49
	3/16	3.07	.90	.55	.78	.69	.49
2 x 2	⅜	4.7	1.36	.48	.59	.64	.39
	5/16	3.92	1.15	.42	.60	.61	.39
	¼	3.19	.94	.35	.61	.59	.39
	3/16	2.44	.71	.27	.62	.57	.39
	⅛	1.65	.48	.19	.63	.55	.40
1¾ x 1¾	¼	2.77	.81	.23	.53	.53	.34
	3/16	2.12	.62	.18	.54	.51	.34
	⅛	1.44	.42	.13	.55	.48	.35
1½ x 1½	¼	2.34	.69	.14	.45	.47	.29
	3/16	1.80	.53	.11	.46	.44	.29
	⅛	1.23	.36	.08	.47	.42	.30
1¼ x 1¼	¼	1.92	.56	.08	.37	.40	.24
	3/16	1.48	.43	.06	.38	.38	.24
	⅛	1.01	.30	.04	.38	.36	.25
1 x 1	¼	1.49	.44	.04	.29	.34	.20
	3/16	1.16	.34	.03	.30	.32	.19
	⅛	.80	.23	.02	.30	.30	.20
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	..	...	....	...	...	...	...
	..	...	....	...	...	...	...

† Data from American Institute of Steel Construction Manual, Fifth Edition, 1950.
Meaning of symbols: I = moment of inertia; r = radius of gyration.

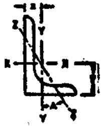
CÁC THÀNH PHẦN CỦA THÉP GÓC KHÔNG ĐỀU

ELEMENTS OF ANGLES WITH UNEQUAL LEGS

These angles are commonly designated by group symbol, width of each leg, and thickness, thus:

L 7 x 4 x ½

indicates a 7 x 4-inch angle of ½-inch thickness.



Size	Thickness	Weight per Foot	Area	Axis X-X				Axis Y-Y				Axis Z-Z	
				I	*Z*	*r*	*y*	*I*	*Z*	*r*	*x*	*r*	Tan *A*
In.	In.	Lb.	In.^{2}	In.^{4}	In.^{3}	In.	In.	In.^{4}	In.^{3}	In.	In.	In.	
9 x 4	1	40.8	12.00	97.0	17.6	2.84	3.50	12.0	4.0	1.00	1.00	.83	.203
	7/8	36.1	10.61	86.8	15.7	2.86	3.45	10.8	3.6	1.01	.95	.84	.208
	3/4	31.3	9.19	76.1	13.6	2.88	3.41	9.6	3.1	1.02	.91	.84	.212
	5/8	26.3	7.73	64.9	11.5	2.90	3.36	8.3	2.6	1.04	.86	.85	.216
	9/16	23.8	7.00	59.1	10.4	2.91	3.33	7.6	2.4	1.04	.83	.85	.218
	1/2	21.3	6.25	53.2	9.3	2.92	3.31	6.9	2.2	1.05	.81	.85	.220
8 x 6	1	44.2	13.00	80.8	15.1	2.49	2.65	38.8	8.9	1.73	1.65	1.28	.543
	7/8	39.1	11.48	72.3	13.4	2.51	2.61	34.9	7.9	1.74	1.61	1.28	.547
	3/4	33.8	9.94	63.4	11.7	2.53	2.56	30.7	6.9	1.76	1.56	1.29	.551
	5/8	28.5	8.36	54.1	9.9	2.54	2.52	26.3	5.9	1.77	1.52	1.29	.554
	9/16	25.7	7.56	49.3	9.0	2.55	2.50	24.0	5.3	1.78	1.50	1.30	.556
	1/2	23.0	6.75	44.3	8.0	2.56	2.47	21.7	4.8	1.79	1.47	1.30	.558
	7/16	20.2	5.93	39.2	7.1	2.57	2.45	19.3	4.2	1.80	1.45	1.31	.560
8 x 4	1	37.4	11.00	69.6	14.1	2.52	3.05	11.6	3.9	1.03	1.05	.85	.247
	7/8	33.1	9.73	62.5	12.5	2.53	3.00	10.5	3.5	1.04	1.00	.85	.253
	3/4	28.7	8.44	54.9	10.9	2.55	2.95	9.4	3.1	1.05	.95	.85	.258
	5/8	24.2	7.11	46.9	9.2	2.57	2.91	8.1	2.6	1.07	.91	.86	.262
	9/16	21.9	6.43	42.8	8.4	2.58	2.88	7.4	2.4	1.07	.88	.86	.265
	1/2	19.6	5.75	38.5	7.5	2.59	2.86	6.7	2.2	1.08	.86	.86	.267
	7/16	17.2	5.06	34.1	6.6	2.60	2.83	6.0	1.9	1.09	.83	.87	.269
7 x 4	7/8	30.2	8.86	42.9	9.7	2.20	2.55	10.2	3.5	1.07	1.05	.86	.318
	3/4	26.2	7.69	37.8	8.4	2.22	2.51	9.1	3.0	1.09	1.01	.86	.324
	5/8	22.1	6.48	32.4	7.1	2.24	2.46	7.8	2.6	1.10	.96	.86	.329
	9/16	20.0	5.87	29.6	6.5	2.24	2.44	7.2	2.4	1.11	.94	.87	.332
	1/2	17.9	5.25	26.7	5.8	2.25	2.42	6.5	2.1	1.11	.92	.87	.335
	7/16	15.8	4.62	23.7	5.1	2.26	2.39	5.8	1.9	1.12	.89	.88	.337
	3/8	13.6	3.98	20.6	4.4	2.27	2.37	5.1	1.6	1.13	.87	.88	.339
6 x 4	7/8	27.2	7.98	27.7	7.2	1.86	2.12	9.8	3.4	1.11	1.12	.86	.421
	3/4	23.6	6.94	24.5	6.3	1.88	2.08	8.7	3.0	1.12	1.08	.86	.428
	5/8	20.0	5.86	21.1	5.3	1.90	2.03	7.5	2.5	1.13	1.03	.86	.435
	9/16	18.1	5.31	19.3	4.8	1.90	2.01	6.9	2.3	1.14	1.01	.87	.438
	1/2	16.2	4.75	17.4	4.3	1.91	1.99	6.3	2.1	1.15	.99	.87	.440
	7/16	14.3	4.18	15.5	3.8	1.92	1.96	5.6	1.9	1.16	.96	.87	.443
	3/8	12.3	3.61	13.5	3.3	1.93	1.94	4.9	1.6	1.17	.94	.88	.446
	5/16	10.3	3.03	11.4	2.8	1.94	1.92	4.2	1.4	1.17	.92	.88	.449
6 x 3½	1/2	15.3	4.50	16.6	4.2	1.92	2.08	4.3	1.6	.97	.83	.76	.344
	3/8	11.7	3.42	12.9	3.2	1.94	2.04	3.3	1.2	.99	.79	.77	.350
	5/16	9.8	2.87	10.9	2.7	1.95	2.01	2.9	1.0	1.00	.76	.77	.352
	1/4	7.9	2.31	8.9	2.2	1.96	1.99	2.3	.85	1.01	.74	.78	.355
5 x 3½	3/4	19.8	5.81	13.9	4.3	1.55	1.75	5.6	2.2	.98	1.00	.75	.464
	5/8	16.8	4.92	12.0	3.7	1.56	1.70	4.8	1.9	.99	.95	.75	.472
	1/2	13.6	4.00	10.0	3.0	1.58	1.66	4.1	1.6	1.01	.91	.75	.479
	7/16	12.0	3.53	8.9	2.6	1.59	1.63	3.6	1.4	1.01	.88	.76	.482
	3/8	10.4	3.05	7.8	2.3	1.60	1.61	3.2	1.2	1.02	.86	.76	.486
	5/16	8.7	2.56	6.6	1.9	1.61	1.59	2.7	1.0	1.03	.84	.76	.489
	1/4	7.0	2.06	5.4	1.6	1.61	1.56	2.2	.83	1.04	.81	.76	.492

† See footnotes at end of table on next page.

CÁC THÀNH PHẦN CỦA THÉP GÓC KHÔNG ĐỀU

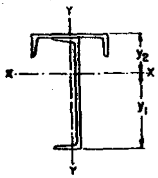
ELEMENTS OF ANGLES WITH UNEQUAL LEGS

Size	Thick-ness	Weight per Foot	Area	Axis X-X				Axis Y-Y				Axis Z-Z	
				I	*Z*	*r*	*y*	*I*	*Z*	*r*	*x*	*r*	Tan *A*
In.	In.	Lb.	In.²	In.⁴	In.³	In.	In.	In.⁴	In.³	In.	In.	In.	
5x3	½	12.8	3.75	9.5	2.9	1.59	1.75	2.6	1.1	.83	.75	.65	.357
	7/16	11.3	3.31	8.4	2.6	1.60	1.73	2.3	1.0	.84	.73	.65	[illegible]
	⅜	9.8	2.86	7.4	2.2	1.61	1.70	2.0	.89	.84	.70	.65	.364
	5/16	8.2	2.40	6.3	1.9	1.61	1.68	1.8	.75	.85	.68	.66	.368
	¼	6.6	1.94	5.1	1.5	1.62	1.66	1.4	.61	.86	.66	.66	.371
4x3½	⅝	14.7	4.30	6.4	2.4	1.22	1.29	4.5	1.8	1.03	1.04	.72	.745
	½	11.9	3.50	5.3	1.9	1.23	1.25	3.8	1.5	1.04	1.00	.72	.750
	7/16	10.6	3.09	4.8	1.7	1.24	1.23	3.4	1.4	1.05	.98	.72	.753
	⅜	9.1	2.67	4.2	1.5	1.25	1.21	3.0	1.2	1.06	.96	.73	.755
	5/16	7.7	2.25	3.6	1.3	1.26	1.18	2.6	1.0	1.07	.93	.73	.757
	¼	6.2	1.81	2.9	1.0	1.27	1.16	2.1	.81	1.07	.91	.73	.759
4x3	⅝	13.6	3.98	6.0	2.3	1.23	1.37	2.9	1.4	.85	.87	.64	.534
	½	11.1	3.25	5.1	1.9	1.25	1.33	2.4	1.1	.86	.83	.64	.543
	7/16	9.8	2.87	4.5	1.7	1.25	1.30	2.2	1.0	.87	.80	.64	.547
	⅜	8.5	2.48	4.0	1.5	1.26	1.28	1.9	.87	.88	.78	.64	.551
	5/16	7.2	2.09	3.4	1.2	1.27	1.26	1.7	.73	.89	.76	.65	.554
	¼	5.8	1.69	2.8	1.0	1.28	1.24	1.4	.60	.90	.74	.65	.558
3½x3	½	10.2	3.00	3.5	1.5	1.07	1.13	2.3	1.1	.88	.88	.62	.714
	7/16	9.1	2.65	3.1	1.3	1.08	1.10	2.1	.98	.89	.85	.62	.718
	⅜	7.9	2.30	2.7	1.1	1.09	1.08	1.9	.85	.90	.83	.62	.721
	5/16	6.6	1.93	2.3	.95	1.10	1.06	1.6	.72	.90	.81	.63	.724
	¼	5.4	1.56	1.9	.78	1.11	1.04	1.3	.59	.91	.79	.63	.727
3½x2½	½	9.4	2.75	3.2	1.4	1.09	1.20	1.4	.76	.70	.70	.53	.486
	7/16	8.3	2.43	2.9	1.3	1.09	1.18	1.2	.68	.71	.68	.54	.491
	⅜	7.2	2.11	2.6	1.1	1.10	1.16	1.1	.59	.72	.66	.54	.496
	5/16	6.1	1.78	2.2	.93	1.11	1.14	.94	.50	.73	.64	.54	.501
	¼	4.9	1.44	1.8	.75	1.12	1.11	.78	.41	.74	.61	.54	.506
3x2½	½	8.5	2.50	2.1	1.0	.91	1.00	1.3	.74	.72	.75	.52	.667
	7/16	7.6	2.21	1.9	.93	.92	.98	1.2	.66	.73	.73	.52	.672
	⅜	6.6	1.92	1.7	.81	.93	.96	1.0	.58	.74	.71	.52	.676
	5/16	5.6	1.62	1.4	.69	.94	.93	.90	.49	.74	.68	.53	.680
	¼	4.5	1.31	1.2	.56	.95	.91	.74	.40	.75	.66	.53	.684
3x2	½	7.7	2.25	1.9	1.0	.92	1.08	.67	.47	.55	.58	.43	.414
	7/16	6.8	2.00	1.7	.89	.93	1.06	.61	.42	.55	.56	.43	.421
	⅜	5.9	1.73	1.5	.78	.94	1.04	.54	.37	.56	.54	.43	.428
	5/16	5.0	1.47	1.3	.66	.95	1.02	.47	.32	.57	.52	.43	.435
	¼	4.1	1.19	1.1	.54	.95	.99	.39	.26	.57	.49	.43	.440
	3/16	3.07	.90	.84	.41	.97	.97	.31	.20	.58	.47	.44	.446
2½x2	⅜	5.3	1.55	.91	.55	.77	.83	.51	.36	.58	.58	.42	.614
	5/16	4.5	1.31	.79	.47	.78	.81	.45	.31	.58	.56	.42	.620
	¼	3.62	1.06	.65	.38	.78	.79	.37	.25	.59	.54	.42	.626
	3/16	2.75	.81	.51	.29	.79	.76	.29	.20	.60	.51	.43	.631
2½x1½	⅜	4.7	1.36	.82	.52	.78	.92	.22	.20	.40	.42	.32	.340
	5/16	3.92	1.15	.71	.44	.79	.90	.19	.17	.41	.40	.32	.349
	¼	3.19	.94	.59	.36	.79	.88	.16	.14	.41	.38	.32	.357
	3/16	2.44	.72	.46	.28	.80	.85	.13	.11	.42	.35	.33	.364
2x1½	¼	2.77	.81	.32	.24	.62	.66	.15	.14	.43	.41	.32	.543
	3/16	2.12	.62	.25	.18	.63	.64	.12	.11	.44	.39	.32	.551
	⅛	1.44	.42	.17	.13	.64	.62	.09	.08	.45	.37	.33	.558
1¾x1¼	¼	2.34	.69	.20	.18	.54	.60	.09	.10	.35	.35	.27	.486
	3/16	1.80	.53	.16	.14	.55	.58	.07	.08	.36	.33	.27	.496
	⅛	1.23	.36	.11	.09	.56	.56	.05	.05	.37	.31	.27	.506

† Data from American Institute of Steel Construction Manual, Fifth Edition, 1950.
Meaning of symbols: I = moment of inertia; Z = section modulus; r = radius of gyration.

CÁC THÀNH PHẦN CỦA THÉP 2 LÒNG MÁNG

ELEMENTS OF TWO CHANNELS



Data from American Institute of Steel Construction Manual, 5th Ed.

I = moment of inertia;
S, S_1, and S_2 = section moduli;
r = radius of gyration.

Vertical Channel Size and Weight	Horizontal Channel Size and Weight	Total Area	Weight per Foot	Axis X-X					Axis Y-Y		
				I	$S_1=\frac{I}{y_1}$	$S_2=\frac{I}{y_2}$	r	y_1	I	S	r
		In.²	Lb.	In.⁴	In.³	In.³	In.	In.	In.⁴	In.³	In.
3″— 4.1	4″— 5.4	2.75	9.5	2.9	1.3	3.0	1.03	2.19	4.0	2.0	1.21
4″— 5.4	4″— 5.4	3.12	10.8	6.4	2.2	4.9	1.44	2.86	4.1	2.1	1.15
	5″— 6.7	3.51	12.1	6.8	2.3	5.4	1.39	2.94	7.7	3.1	1.48
5″— 6.7	5″— 6.7	3.90	13.4	12.6	3.5	7.9	1.80	3.60	7.9	3.2	1.42
	6″— 8.2	4.34	14.9	13.2	3.6	8.8	1.74	3.70	13.5	4.5	1.76
	7″— 9.8	4.80	16.5	13.8	3.7	9.6	1.69	3.78	21.6	6.8	2.12
6″— 8.2	5″— 6.7	4.34	14.9	21.3	5.1	10.8	2.22	4.21	8.1	3.2	1.37
	6″— 8.2	4.78	16.4	22.3	5.1	12.0	2.16	4.34	13.7	4.6	1.69
	7″— 9.8	5.24	18.0	23.2	5.2	13.2	2.10	4.45	21.8	6.2	2.04
	8″—11.5	5.75	19.7	24.0	5.3	14.3	2.04	4.54	33.0	8.2	2.40
	9″—13.4	6.28	21.6	25.0	5.4	15.5	1.99	4.62	48.0	10.7	2.76
	10″—15.3	6.86	23.5	25.8	5.5	16.7	1.94	4.69	67.6	13.5	3.14
7″— 9.8	6″— 8.2	5.24	18.0	35.0	7.1	15.5	2.58	4.95	14.0	4.7	1.69
	7″— 9.8	5.70	19.6	36.3	7.2	17.0	2.52	5.08	22.1	6.3	1.97
	8″—11.5	6.21	21.3	37.6	7.2	18.6	2.46	5.20	33.3	8.3	2.31
	9″ 13.4	6.74	23.2	38.9	7.4	20.2	2.40	5.30	48.3	10.7	2.68
	10″—15.3	7.32	25.1	40.2	7.4	21.7	2.34	5.39	67.9	13.6	3.05
8″—11.5	6″— 8.2	5.75	19.7	51.9	9.4	19.4	3.00	5.53	14.3	4.8	1.58
	7″— 9.8	6.21	21.3	53.9	9.5	21.3	2.95	5.68	22.4	6.4	1.90
	8″—11.5	6.72	23.0	55.9	9.6	23.3	2.88	5.82	33.6	8.4	2.24
	9″—13.4	7.25	24.9	57.8	9.7	25.2	2.82	5.94	48.6	10.8	2.59
	10″—15.3	7.83	26.8	59.5	9.8	27.2	2.76	6.05	68.2	13.6	2.95
	12″—20.7	9.39	32.2	63.8	10.1	32.2	2.61	6.30	129.4	21.6	3.71
9″—13.4	7″— 9.8	6.74	23.2	76.8	12.3	26.0	3.37	6.26	22.9	6.5	1.84
	8″—11.5	7.25	24.9	79.5	12.4	28.4	3.31	6.42	34.1	8.5	2.17
	9″—13.4	7.78	26.8	82.1	12.5	30.8	3.25	6.56	49.1	10.9	2.51
	10″—15.3	8.36	28.7	84.6	12.6	33.2	3.18	6.69	68.7	13.7	2.87
	12″—20.7	9.92	34.1	90.6	13.0	39.4	3.02	6.98	129.9	21.6	3.62
10″—15.3	8″—11.5	7.83	26.8	109.5	15.7	33.9	3.74	6.99	34.6	8.6	2.10
	9″—13.4	8.36	28.7	113.1	15.8	36.7	3.68	7.15	49.6	11.0	2.44
	10″—15.3	8.94	30.6	116.5	16.0	39.6	3.61	7.30	69.2	13.8	2.78
	12″—20.7	10.50	36.0	124.7	16.3	47.0	3.45	7.63	130.4	21.7	3.41
	15″—33.9	14.37	49.2	140.4	17.2	63.2	3.13	8.18	314.9	42.0	4.68
12″—20.7	9″—13.4	9.92	34.1	204.7	25.0	50.8	4.54	8.20	51.2	11.4	2.27
	10″—15.3	10.50	36.0	211.0	25.2	54.7	4.48	8.38	70.8	14.2	2.60
	12″—20.7	12.06	41.4	225.9	25.7	64.7	4.33	8.79	132.0	22.0	3.31
	15″—33.9	15.93	54.6	254.0	26.8	87.3	3.99	9.49	316.5	42.2	4.46
15″—33.9	10″—15.3	14.37	49.2	[illegible]	48.4	85.0	5.72	9.71	75.1	15.0	2.29
	12″—20.7	15.93	54.6	[illegible]	49.5	98.9	5.63	10.18	136.3	22.7	2.93
	15″—33.9	19.80	67.8	570.7	51.6	131.5	5.37	11.06	320.8	42.8	4.02
	18″—42.7	22.38	76.6	602.1	52.7	149.8	5.19	11.43	557.2	61.9	4.99
18″—42.7	12″—20.7	18.51	63.4	852.0	72.2	131.5	6.78	11.80	143.1	23.8	2.78
	15″—33.9	22.38	76.6	966.4	75.4	172.9	6.57	12.81	327.6	43.7	3.83
	18″—42.7	24.96	85.4	1020.7	76.9	197.0	6.39	13.27	564.0	62.7	4.75

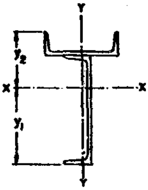
Centers of gravity of both channels are in the same vertical line.

CÁC THÀNH PHẦN CỦA THÉP 2 LÒNG MÁNG

ELEMENTS OF TWO CHANNELS

Data from American Institute of Steel Construction Manual, 5th Ed.

I = moment of inertia;
S, S_1, and S_2 = section moduli;
r = radius of gyration.

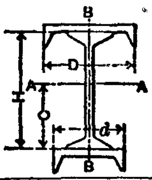


Vertical Channel Size and Weight	Horizontal Channel Size and Weight	Total Area	Weight per Foot	Axis X-X					Axis Y-Y		
				I	$S_1=\frac{I}{y_1}$	$S_2=\frac{I}{y_2}$	r	y_1	I	S	r
		In.²	Lb	In.⁴	In.³	In.³	In.	In.	In.⁴	In.³	In.
3″— 4.1	4″— 5.4	2.75	9.5	4.5	1.7	2.3	1.28	2.61	4.0	2.0	1.21
4″— 5.4	4″— 5.4	3.12	10.8	8.8	2.7	3.8	1.69	3.23	4.1	2.1	1.15
	5″— 6.7	3.51	12.1	9.7	2.9	4.1	1.66	3.38	7.7	3.1	1.48
5″— 6.7	5″— 6.7	3.90	13.4	16.6	4.2	6.0	2.06	3.99	7.9	3.2	1.42
	6″— 8.2	4.34	14.9	17.9	4.3	6.5	2.03	4.16	13.5	4.5	1.76
	7″— 9.8	4.80	16.5	19.1	4.4	6.9	1.99	4.31	21.6	6.2	2.12
6″— 8.2	5″— 6.7	4.34	14.9	26.6	5.8	8.4	2.47	4.57	8.1	3.2	1.37
	6″— 8.2	4.78	16.4	28.5	6.0	9.0	2.44	4.76	13.7	4.6	1.69
	7″— 9.8	5.24	18.0	30.4	6.2	9.6	2.41	4.93	21.8	6.2	2.04
	8″—11.5	5.75	19.7	32.2	6.3	10.2	2.37	5.09	33.0	8.2	2.40
	9″—13.4	6.28	21.6	34.0	6.5	10.7	2.33	5.24	48.0	10.7	2.76
	10″—15.3	6.86	23.5	36.0	6.7	11.1	2.29	5.37	67.6	13.5	3.14
7″— 9.8	6″— 8.2	5.24	18.0	42.8	8.0	11.9	2.86	5.33	14.0	4.7	1.69
	7″— 9.8	5.70	19.6	45.5	8.2	12.8	2.82	5.52	22.1	6.3	1.97
	8″—11.5	6.21	21.3	48.0	8.4	13.5	2.78	5.71	33.3	8.3	2.31
	9″—13.4	6.74	23.2	50.7	8.6	14.2	2.74	5.87	48.3	10.7	2.68
	10″—15.3	7.32	25.1	53.2	8.8	14.9	2.70	6.03	67.9	13.6	3.05
8″—11.5	6″— 8.2	5.75	19.7	61.5	10.5	15.2	3.27	5.88	14.3	4.8	1.58
	7″— 9.8	6.21	21.3	65.2	10.7	16.3	3.24	6.09	22.4	6.4	1.90
	8″—11.5	6.72	23.0	68.8	10.9	17.3	3.20	6.29	33.6	8.4	2.24
	9″—13.4	7.25	24.9	72.5	11.2	18.3	3.16	6.47	48.6	10.8	2.59
	10″—15.3	7.83	26.8	75.9	11.4	19.2	3.11	6.65	68.2	13.6	2.95
	12″—20.7	9.39	32.2	83.8	11.9	21.4	2.99	7.02	129.4	21.6	3.71
9″—13.4	7″— 9.8	6.74	23.2	90.2	13.6	20.3	3.66	6.64	22.9	6.5	1.84
	8″—11.5	7.25	24.9	95.2	13.9	21.6	3.62	6.85	34.1	8.5	2.17
	9″—13.4	7.78	26.8	99.8	14.1	22.8	3.58	7.06	49.1	10.9	2.51
	10″—15.3	8.36	28.7	104.5	14.4	24.0	3.54	7.25	68.7	13.7	2.87
	12″—20.7	9.92	34.1	115.2	15.0	26.9	3.41	7.66	129.9	21.6	3.62
10″—15.3	8″—11.5	7.83	26.8	127.8	17.3	26.3	4.04	7.40	34.6	8.6	2.10
	9″—13.4	8.36	28.7	134.2	17.6	27.8	4.01	7.61	49.6	11.0	2.44
	10″—15.3	8.94	30.6	140.3	17.9	29.4	3.96	7.82	69.2	13.8	2.78
	12″—20.7	10.50	36.0	154.3	18.7	33.0	3.83	8.27	130.4	21.7	3.52
	15″—33.9	14.37	49.2	178.3	19.8	40.4	3.52	8.99	314.9	42.0	4.68
12″—20.7	9″—13.4	9.92	34.1	233.2	27.2	39.9	4.85	8.59	51.2	11.4	2.27
	10″—15.3	10.50	36.0	243.5	27.6	42.2	4.82	8.83	70.8	14.2	2.60
	12″—20.7	12.06	41.4	267.3	28.6	47.8	4.71	9.35	132.0	22.0	3.31
	15″—33.9	15.93	54.6	309.0	30.2	59.7	4.40	10.22	316.5	42.2	4.46
15″—33.9	10″—15.3	14.37	49.2	519.0	51.8	68.6	6.01	10.03	75.1	15.0	2.29
	12″—20.7	15.93	54.6	568.7	53.6	77.5	5.97	10.60	136.3	22.7	2.93
	15″—33.9	19.80	67.8	661.4	56.8	97.8	5.78	11.64	320.8	42.8	4.02
	18″—42.7	22.38	76.6	717.6	58.9	106.0	5.66	12.18	557.2	61.9	4.99
18″—42.7	12″—20.7	18.51	63.4	935.4	76.9	106.5	7.11	12.16	143.1	23.8	2.78
	15″—33.9	22.38	76.6	1086.4	81.5	134.6	6.97	13.33	327.6	43.7	3.83
	18″—42.7	24.96	85.4	1175.6	84.3	147.0	6.86	13.95	564.0	62.7	4.75

Centers of gravity of both channels are in the same vertical line.

MẶT CẮT CỦA THÉP LÀM RAY CHO CẦN TRỤC VÀ CÁP TREO

SECTIONS FOR CRANE AND TELPHER RUNWAYS

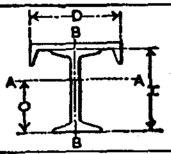


Properties of Sections Consisting of One I-beam and Two Channels

Upper Channel		I-beam		Lower Channel		Section Modulus				Moment of Inertia	Distance, C
D, Inches	Weight per Foot, Pounds	*H*, Inches	Weight per Foot, Pounds	*d*, Inches	Weight per Foot, Pounds	Upper Chord, Axis *A–A*	Lower Chord, Axis *A–A*	Upper Chord, Axis *B–B*	Lower Chord, Axis *B–B*		
10	15	10	25	8	11.25	62.87	43.62	14.09	8.97	321.89	5.12
12	20.5	10	25	10	15	76.93	50.92	21.98	14.09	394.66	5.15
12	20.5	12	31.5	10	15	99.54	68.40	22.19	14.35	603.23	6.22
12	20.5	15	42	10	15	139.08	100.03	22.62	14.86	1040.34	7.80
15	33	15	42	12	20.5	185.61	119.97	42.65	22.62	1336.49	8.20
12	20.5	18	55	10	15	185.03	138.27	23.16	15.52	1652.32	9.35
15	33	18	55	12	20.5	241.06	163.01	43.11	23.16	2075.17	9.79

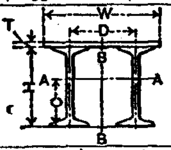
MẶT CẮT CỦA THÉP LÀM RAY CHO CẦN TRỤC VÀ CÁP TREO

SECTIONS FOR CRANE AND TELPHER RUNWAYS



Properties of Sections Consisting of One I-beam and One Channel

Channel		I-beam		Section Modulus			Moment of Inertia	Distance C
D, Inches	Weight per Foot, Lbs.	H, Inches	Weight per Foot, Lbs.	Upper Chord, Axis A–A	Lower Chord, Axis A–A	Upper Chord, Axis B–B		
10	15	10	25	52.06	27.15	14.09	182.72	6.73
10	15	12	31.5	70.22	39.97	14.35	311.78	7.80
12	20.5	12	31.5	81.71	40.66	22.19	333.39	8.20
12	20.5	12	40	90.41	50.31	22.55	396.91	7.89
10	15	15	42	103.55	64.87	14.86	607.83	9.37
12	20.5	15	42	118.80	66.06	22.62	648.68	9.82
15	33	15	42	151.94	68.18	42.65	724.77	10.63
12	25	15	50	135.28	75.02	25.33	742.67	9.90
12	20.5	15	60	140.17	90.13	23.56	838.22	9.30
15	33	15	60	173.59	93.20	43.43	933.90	10.02
12	20.5	18	55	161.57	99.11	23.16	1122.90	11.33
15	33	18	55	203.18	102.50	43.11	1253.60	12.23
15	33	15	80	197.81	120.17	44.48	1151.27	9.58
12	20.5	20	65	199.98	129.60	23.72	1594.03	12.30
15	33	20	65	247.50	133.85	43.56	1772.11	13.24
15	33	20	80	278.43	164.98	44.52	2113.31	12.81
15	40	20	80	305.44	168.05	49.12	2226.62	13.25
15	33	24	80	339.17	196.13	44.56	3032.18	15.46
15	55	24	100	455.00	239.53	60.64	3894.80	16.26

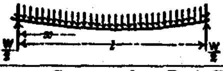
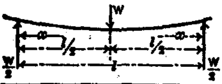
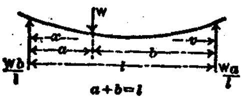
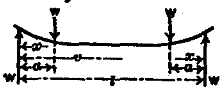
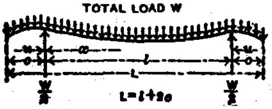


Properties of Sections Consisting of Two I-beams and One Connecting Plate

Plate		I-beam		Section Modulus			Distance, D	Moment of Inertia	Distance, C
W, Inches	T, Inches	H, Inches	Weight per Foot, Lbs.	Upper Chord, Axis A–A	Lower Chord, Axis A–A	Upper Chord, Axis B–B			
12	⅝	10	25	81.01	54.18	20.27	5.75	337.02	6.22
14	½	12	31.5	131.53	81.72	36.30	7.50	630.03	7.71
14	½	12	40	147.64	100.75	40.38	7.25	748.53	7.43
14	½	15	42	192.53	131.50	40.03	7.00	1211.00	9.21
15	½	15	60	239.39	179.40	55.30	7.50	1589.54	8.86
15	½	15	70	251.22	196.35	61.22	7.50	1708.27	8.70
15	½	15	80	285.65	230.98	65.55	7.25	1979.53	8.57
16	½	18	55	279.02	197.60	60.51	8.50	2140.06	10.83
16	½	20	65	347.57	257.80	65.48	8.25	3034.28	11.77
16	½	20	80	406.10	318.45	67.99	7.50	3658.97	11.49
18	½	24	80	504.42	379.58	90.22	9.50	5306.49	13.98
18	½	24	100	545.59	435.11	106.12	9.50	5930.54	13.63

ỨNG SUẤT VÀ ĐỘ UỐN CỦA THANH

STRESSES AND DEFLECTIONS IN BEAMS

Type of Beam	Stresses	
	General Formula for Stress at any Point	Stresses at Critical Points
Case 1. — Supported at Both Ends, Uniform Load TOTAL LOAD W 	$s = -\frac{W}{2Zl}x(l-x)$	Stress at center, $-\frac{Wl}{8Z}$ If cross-section is constant, this is the maximum stress.
Case 2. — Supported at Both Ends, Load at Center 	Between each support and load, $s = -\frac{Wx}{2Z}$	Stress at center, $-\frac{Wl}{4Z}$ If cross-section is constant, this is the maximum stress.
Case 3. — Supported at Both Ends, Load at any Point 	For segment of length a, $s = -\frac{Wbx}{Zl}$ For segment of length b, $s = -\frac{Wav}{Zl}$	Stress at load, $-\frac{Wab}{Zl}$ If cross-section is constant, this is the maximum stress.
Case 4. — Supported at Both Ends, Two Symmetrical Loads 	Between each support and adjacent load, $s = -\frac{Wx}{Z}$ Between loads, $s = -\frac{Wa}{Z}$	Stress at each load, and at all points between, $-\frac{Wa}{Z}$
Case 5. — Both Ends Overhanging Supports Symmetrically, Uniform Load TOTAL LOAD W 	Between each support and adjacent end, $s = \frac{W}{2ZL}(c-u)^2$ Between supports, $s = \frac{W}{2ZL}[c^2 - x(l-x)]$	Stress at each support, $\frac{Wc^2}{2ZL}$ Stress at center, $\frac{W}{2ZL}(c^2 - \frac{1}{4}l^2)$ If cross-section is constant, the greater of these is the maximum stress. If l is greater than $2c$, the stress is zero at points $\sqrt{\frac{1}{4}l^2 - c^2}$ on both sides of the center. If cross-section is constant and if $l = 2.828\,c$, the stresses at supports and center are equal and opposite, and are $\pm\frac{WL}{46.62\,Z}$

ỨNG SUẤT VÀ ĐỘ UỐN CỦA THANH

STRESSES AND DEFLECTIONS IN BEAMS

Deflections	
General Formula for Deflection at any Point	**Deflections at Critical Points**
$y = \frac{Wx(l-x)}{24EIl}[l^2 + x(l-x)]$	Maximum deflection, at center, $\frac{5}{384}\frac{Wl^3}{EI}$
Between each support and load, $y = \frac{Wx}{48EI}(3l^2 - 4x^2)$	Maximum deflection, at load, $\frac{Wl^3}{48EI}$
For segment of length a, $y = \frac{Wbx}{6EIl}(l^2 - x^2 - b^2)$ For segment of length b, $y = \frac{Wav}{6EIl}(l^2 - v^2 - a^2)$	Deflection at load, $\frac{Wa^2b^2}{3EIl}$ Let a be the length of the shorter segment and b of the longer one. The maximum deflection is in the longer segment, at $v = b\sqrt{\frac{1}{3} + \frac{2a}{3b}} = v_1$, and is $\frac{Wav_1^3}{3EIl}$
Between each support and adjacent load, $y = \frac{Wx}{6EI}[3a(l-a) - x^2]$ Between loads, $y = \frac{Wa}{6EI}[3v(l-v) - a^2]$	Maximum deflection at center, $\frac{Wa}{24EI}(3l^2 - 4a^2)$ Deflection at loads $\frac{Wa^2}{6EI}(3l - 4a)$
Between each support and adjacent end, $y = \frac{Wu}{24EIL}[6c^2(l+u) - u^2(4c-u) - l^3]$ Between supports, $y = \frac{Wx(l-x)}{24EIL}[x(l-x) + l^2 - 6c^2]$	Deflection at ends, $\frac{Wc}{24EIL}[3c^2(c+2l) - l^3]$ Deflection at center, $\frac{Wl^2}{384EIL}(5l^2 - 24c^2)$ If l is between $2c$ and $2.449c$, there are maximum upward deflections at points $\sqrt{3(\frac{1}{4}l^2 - c^2)}$ on both sides of the center, which are, $-\frac{W}{96EIL}(6c^2 - l^2)^2$

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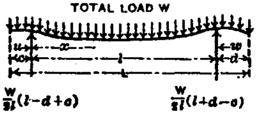
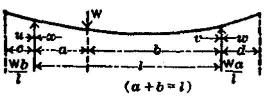
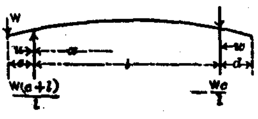
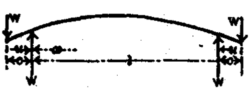
STRESSES AND DEFLECTIONS IN BEAMS

Type of Beam	Stresses	
	General Formula for Stress at any Point	Stresses at Critical Points
Case 6. — Both Ends Overhanging Supports Unsymmetrically, Uniform Load 	For overhanging end of length c, $s = \frac{W}{2ZL}(c-u)^2$ Between supports, $s = \frac{W}{2ZL}\left\{c^2\left(\frac{l-x}{l}\right) + d^2\frac{x}{l} - x(l-x)\right\}$ For overhanging end of length d, $s = \frac{W}{2ZL}(d-w)^2$	Stress at support next end of length c, $\frac{Wc^2}{2ZL}$ Critical stress between supports is at $x = \frac{l^2+c^2-d^2}{2l} = x_1$ and is $\frac{W}{2ZL}(c^2 - x_1^2)$ Stress at support next end of length d, $\frac{Wd^2}{2ZL}$ If cross-section is constant, the greatest of these three is the maximum stress. If $x_1 > c$, the stress is zero at points $\sqrt{x_1^2-c^2}$ on both sides of $x = x_1$.
Case 7. — Both Ends Overhanging Supports, Load at any Point Between 	Between supports: For segment of length a, $s = -\frac{Wbx}{Zl}$ For segment of length b, $s = -\frac{Wav}{Zl}$ Beyond supports $s = 0$.	Stress at load, $-\frac{Wab}{Zl}$ If cross-section is constant, this is the maximum stress.
Case 8. — Both Ends Overhanging Supports, Single Overhanging Load 	Between load and adjacent support, $s = \frac{W}{Z}(c-u)$ Between supports, $s = \frac{Wc}{Zl}(l-x)$ Between unloaded end and adjacent support, $s = 0$.	Stress at support adjacent to load, $\frac{Wc}{Z}$ If cross-section is constant, this is the maximum stress. Stress is zero at other support.
Case 9. — Both Ends Overhanging Supports, Symmetrical Overhanging Loads 	Between each load and adjacent support, $s = \frac{W}{Z}(c-u)$ Between supports, $s = \frac{Wc}{Z}$	Stress at supports and at all points between, $\frac{Wc}{Z}$ If cross-section is constant, this is the maximum stress.

ỨNG SUẤT VÀ ĐỘ UỐN CỦA THANH

STRESSES AND DEFLECTIONS IN BEAMS

Deflections	
General Formula for Deflections at any Point	**Deflections at Critical Points**
For overhanging end of length c, $y = \frac{Wu}{24\,EIL}[2\,l\,(d^2 + 2\,c^2) + 6\,c^2u - u^3(4\,c - u) - l^3]$ Between supports, $y = \frac{Wx\,(l-x)}{24\,EIL}\left\{x\,(l-x) + l^2 - 2\,(d^2 + c^2) - \frac{2}{l}[d^2x + c^2(l-x)]\right\}$ For overhanging end of length d, $y = \frac{Ww}{24\,EIL}[2\,l\,(c^2 + 2\,d^2) + 6\,d^2w - w^3(4\,d - w) - l^3]$	Deflection at end c, $\frac{Wc}{24\,EIL}[2\,l\,(d^2 + 2\,c^2) + 3\,c^3 - l^3]$ Deflection at end d, $\frac{Wd}{24\,EIL}[2\,l\,(c^2 + 2\,d^2) + 3\,d^3 - l^3]$ This case is so complicated that convenient general expressions for the critical deflections between supports cannot be obtained.
Between supports, same as Case 3. For overhanging end of length c, $y = -\frac{Wabu}{6\,EIl}(l+b)$ For overhanging end of length d, $y = -\frac{Wabw}{6\,EIl}(l+a)$	Between supports, same as Case 3. Deflection at end c, $-\frac{Wabc}{6\,EIl}(l+b)$ Deflection at end d, $-\frac{Wabd}{6\,EIl}(l+a)$
Between load and adjacent support, $y = \frac{Wu}{6\,EI}(3\,cu - u^2 + 2\,cl)$ Between supports, $y = -\frac{Wcx}{6\,EIl}(l-x)(2\,l-x)$ Between unloaded end and adjacent support, $y = \frac{Wclw}{6\,EI}$	Deflection at load, $\frac{Wc^2}{3\,EI}(c+l)$ Maximum upward deflection is at $x = 0.42265\,l$, and is $-\frac{Wcl^2}{15.55\,EI}$ Deflection at unloaded end, $\frac{Wcld}{6\,EI}$
Between each load and adjacent support, $y = \frac{Wu}{6\,EI}[3\,c\,(l+u) - u^2]$ Between supports, $y = -\frac{Wcx}{2\,EI}(l-x)$	Deflections at loads, $\frac{Wc^2}{6\,EI}(2\,c + 3\,l)$ Deflection at center, $-\frac{Wcl^2}{8\,EI}$

The above expressions involve the usual approximations of the theory of flexure, and hold only for small deflections. Exact expressions for deflections of any magnitude are as follows:

Between supports the curve is a circle of radius $r = \frac{EI}{Wc}$; $y = \sqrt{r^2 - \frac{1}{4}l^2} - \sqrt{r^2 - (\frac{1}{2}l - x)^2}$

Deflection at center, $\sqrt{r^2 - \frac{1}{4}l^2} - r$

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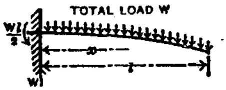
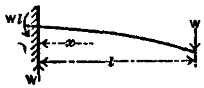
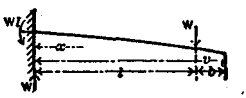
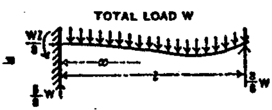
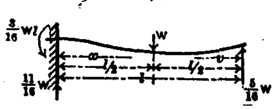
STRESSES AND DEFLECTIONS IN BEAMS

Type of Beam	Stresses	
	General Formula for Stress at any Point	Stresses at Critical Points
Case 10. — Fixed at One End, Uniform Load 	$s = \frac{W}{2Zl}(l-x)^2$	Stress at support, $\frac{Wl}{2Z}$ If cross-section is constant, this is the maximum stress.
Case 11. — Fixed at One End, Load at Other 	$s = \frac{W}{Z}(l-x)$	Stress at support, $\frac{Wl}{Z}$ If cross-section is constant, this is the maximum stress.
Case 12. — Fixed at One End, Intermediate Load 	Between support and load, $s = \frac{W}{Z}(l-x)$ Beyond load, $s = 0$.	Stress at support, $\frac{Wl}{Z}$ If cross-section is constant, this is the maximum stress.
Case 13. — Fixed at One End, Supported at the Other, Uniform Load 	$s = \frac{W(l-x)}{2Zl}(\frac{1}{4}l - x)$	Maximum stress at point of fixture, $\frac{Wl}{8Z}$ Stress is zero at $x = \frac{1}{4}l$. Greatest negative stress is at $x = \frac{5}{8}l$ and is $-\frac{9}{128}\frac{Wl}{Z}$
Case 14. — Fixed at One End, Supported at the Other, Load at Center 	Between point of fixture and load, $s = \frac{W}{16Z}(3l - 11x)$ Between support and load, $s = -\frac{5}{16}\frac{Wv}{Z}$	Maximum stress at point of fixture, $\frac{3}{16}\frac{Wl}{Z}$ Stress is zero at $x = \frac{3}{11}l$ Greatest negative stress at center, $-\frac{5}{32}\frac{Wl}{Z}$

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STRESSES AND DEFLECTIONS IN BEAMS

Deflections	
General Formula for Deflection at any Point	Deflections at Critical Points
$y = \frac{Wx^2}{24EIl}[2l^2 + (2l - x)^2]$	Maximum deflection, at end, $\frac{Wl^3}{8EI}$
$y = \frac{Wx^2}{6EI}(3l - x)$	Maximum deflection, at end, $\frac{Wl^3}{3EI}$
Between support and load, $y = \frac{Wx^2}{6EI}(3l - x)$ Beyond load, $y = \frac{Wl^2}{6EI}(3v - l)$	Deflection at load, $\frac{Wl^3}{3EI}$ Maximum deflection, at end, $\frac{Wl^2}{6EI}(2l + 3b)$
$y = \frac{Wx^2(l - x)}{48EIl}(3l - 2x)$	Maximum deflection is at $x = 0.5785\,l$, and is $\frac{Wl^3}{185EI}$ Deflection at center, $\frac{Wl^3}{192EI}$ Deflection at point of greatest negative stress, at $x = \frac{5}{8}l$ is $\frac{Wl^3}{187EI}$
Between point of fixture and load, $y = \frac{Wx^2}{96EI}(9l - 11x)$ Between support and load, $y = \frac{Wv}{96EI}(3l^2 - 5v^2)$	Maximum deflection is at $v = 0.4472\,l$, and is $\frac{Wl^3}{107.33EI}$ Deflection at load, $\frac{7}{768}\frac{Wl^3}{EI}$

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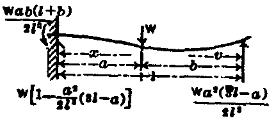
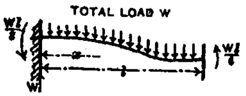
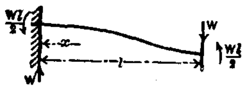
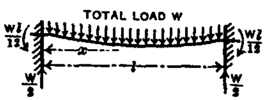
STRESSES AND DEFLECTIONS IN BEAMS

Type of Beam	Stresses	
	General Formula for Stress at any Point	Stresses at Critical Points
Case 15. — Fixed at One End, Supported at the Other, Load at any Point $m = (l+a)(l+b)+al$ $n = al(l+b)$ 	Between point of fixture and load, $s = \frac{Wb}{2Zl^3}(n - mx)$ Between support and load, $s = -\frac{Wa^2v}{2Zl^3}(3l-a)$	Greatest positive stress, at point of fixture, $\frac{Wab}{2Zl^2}(l+b)$ Greatest negative stress, at load, $-\frac{Wa^2b}{2Zl^3}(3l-a)$ If $a < 0.5858\,l$, the first is the maximum stress. If $a = 0.5858\,l$, the two are equal and are $\pm\frac{Wl}{5.83\,Z}$. If $a > 0.5858\,l$, the second is the maximum stress. Stress is zero at $x = \frac{n}{m}$
Case 16. — Fixed at One End, Free but Guided at the Other, Uniform Load 	$s = \frac{Wl}{Z}\left\{\frac{1}{3} - \frac{x}{l} + \frac{1}{2}\left(\frac{x}{l}\right)^2\right\}$	Maximum stress, at support, $\frac{Wl}{3Z}$ Stress is zero for $x = 0.4227\,l$ Greatest negative stress, at free end, $-\frac{Wl}{6Z}$
Case 17. — Fixed at One End, Free but Guided at the Other, with Load 	$s = \frac{W}{Z}(½\,l - x)$	Stress at support, $\frac{Wl}{2Z}$ Stress at free end $-\frac{Wl}{2Z}$ These are the maximum stresses and are equal and opposite. Stress is zero at center.
Case 18. — Fixed at Both Ends, Uniform Load 	$s = \frac{Wl}{2Z}\left\{\frac{1}{6} - \frac{x}{l} + \left(\frac{x}{l}\right)^2\right\}$	Maximum stress, at ends, $\frac{Wl}{12Z}$ Stress is zero at $x = 0.7887\,l$ and at $x = 0.2113\,l$ Greatest negative stress, at center, $-\frac{Wl}{24Z}$

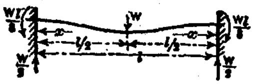
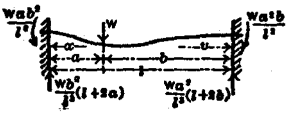
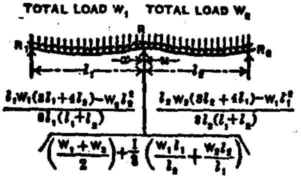
ỨNG SUẤT VÀ ĐỘ UỐN CỦA THANH

STRESSES AND DEFLECTIONS IN BEAMS

Deflections	
General Formula for Deflections at any Point	Deflections at Critical Points
Between point of fixture and load, $y = \frac{Wx^2b}{12\,EIl^3}(3\,n - mx)$ Between support and load, $y = \frac{Wa^2v}{12\,EIl^3}[3\,l^2b - v^2(3\,l - a)]$	Deflection at load, $\frac{Wa^3b^2}{12\,EIl^3}(3\,l + b)$ If $a < 0.5858\,l$, maximum deflection is between load and support, at $v = l\sqrt{\frac{b}{2\,l + b}}$ and is $\frac{Wa^2b}{6\,EI}\sqrt{\frac{b}{2\,l + b}}$ If $a = 0.5858\,l$, maximum deflection is at load and is $\frac{Wl^3}{101.9\,EI}$ If $a > 0.5858\,l$, maximum deflection is between load and point of fixture, at $x = \frac{2\,n}{m}$, and is $\frac{Wbn^3}{3\,EIm^2l^3}$
$y = \frac{Wx^2}{24\,EIl}(2\,l - x)^2$	Maximum deflection, at free end, $\frac{Wl^3}{24\,EI}$
$y = \frac{Wx^2}{12\,EI}(3\,l - 2\,x)$	Maximum deflection, at free end, $\frac{Wl^3}{12\,EI}$
$y = \frac{Wx^2}{24\,EIl}(l - x)^2$	Maximum deflection, at center, $\frac{Wl^3}{384\,EI}$

ỨNG SUẤT VÀ ĐỘ UỐN CỦA THANH

STRESSES AND DEFLECTIONS IN BEAMS

Type of Beam	Stresses: General Formula for Stress at any Point	Stresses: Stresses at Critical Points
Case 19. — Fixed at Both Ends, Load at Center 	Between each end and load, $s = \frac{W}{2Z}(\frac{1}{4}l - x)$	Stress at ends $\frac{Wl}{8Z}$; at load $-\frac{Wl}{8Z}$ These are the maximum stresses and are equal and opposite. Stress is zero at $x = \frac{1}{4}l$
Case 20. — Fixed at Both Ends, Load at any Point 	For segment of length a, $s = \frac{Wb^2}{Zl^3}[al - x(l+2a)]$ For segment of length b, $s = \frac{Wa^2}{Zl^3}[bl - v(l+2b)]$	Stress at end next segment of length a, $\frac{Wab^2}{Zl^2}$ Stress at end next segment of length b, $\frac{Wa^2b}{Zl^2}$ Maximum stress is at end next shorter segment. Stress is zero for $x = \frac{al}{l+2a}$ and $v = \frac{bl}{l+2b}$ Greatest negative stress, at load, $-\frac{2Wa^2b^2}{Zl^3}$
Case 21. — Continuous Beam, with Two Equal Spans, Uniform Load TOTAL LOAD ON EACH SPAN, W 	$s = \frac{W(l-x)}{2Zl}(\frac{1}{4}l - x)$	Maximum stress at point A, $\frac{Wl}{8Z}$ Stress is zero at $x = \frac{1}{4}l$. Greatest negative stress is at $x = \frac{5}{8}$ and is, $-\frac{9}{128}\frac{Wl}{Z}$
Case 22. — Continuous Beam, with Two Unequal Spans, Unequal, Uniform Loads TOTAL LOAD W_1 TOTAL LOAD W_2 	Between R_1 and R, $s = \frac{l_1 - x}{Z}\left\{\frac{(l_1 - x)W_1}{2l_1} - r_1\right\}$ Between R_2 and R, $s = \frac{l_2 - u}{Z}\left\{\frac{(l_2 - u)W_2}{2l_2} - r_2\right\}$	Stress at support R, $\frac{W_1 l_1^2 + W_2 l_2^2}{8Z(l_1 + l_2)}$ Greatest stress in the first span is at $x = \frac{l_1}{W_1}(W_1 - r_1)$, and is, $-\frac{r_1^2 l_1}{2ZW_1}$ Greatest stress in the second span is at $u = \frac{l_2}{W_2}(W_2 - r_2)$, and is, $-\frac{r_2^2 l_2}{2ZW_2}$

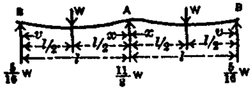
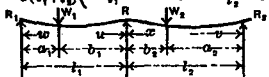
ỨNG SUẤT VÀ ĐỘ UỐN CỦA THANH

STRESSES AND DEFLECTIONS IN BEAMS

Deflections	
General Formula for Deflections at any Point	Deflections at Critical Points
$y = \frac{Wx^2}{48\,EI}(3\,l - 4\,x)$	Maximum deflection, at load, $\frac{Wl^3}{192\,EI}$
For segment of length a, $y = \frac{Wx^2b^2}{6\,EIl^3}[2\,a\,(l-x) + l\,(a-x)]$ For segment of length b, $y = \frac{Wv^2a^2}{6\,EIl^3}[2\,b\,(l-v) + l\,(b-v)]$	Deflection at load, $\frac{Wa^3b^3}{3\,EIl^3}$ Let b be the length of the longer segment and a of the shorter one. The maximum deflection is in the longer segment, at $v = \frac{2\,bl}{l + 2\,b}$, and is $\frac{2\,Wa^3b^2}{3\,EI\,(l + 2\,b)^2}$
$y = \frac{Wx^2\,(l-x)}{48\,EIl}(3\,l - 2\,x)$	Maximum deflection is at $x = 0.5785\,l$, and is $\frac{Wl^3}{185\,EI}$ Deflection at center of span, $\frac{Wl^3}{192\,EI}$ Deflection at point of greatest negative stress, at $x = \frac{5}{8}\,l$ is $\frac{Wl^3}{187\,EI}$
Between R_1 and R, $y = \frac{x\,(l_1 - x)}{24\,EI}\left\{(2\,l_1 - x)(4\,r_1 - W_1) - \frac{W_1\,(l_1 - x)^2}{l_1}\right\}$ Between R_2 and R, $y = \frac{u\,(l_2 - u)}{24\,EI}\left\{(2\,l_2 - u)(4\,r_2 - W_2) - \frac{W_1\,(l_2 - u)^2}{l_2}\right\}$	This case is so complicated that convenient general expressions for the critical deflections cannot be obtained.

ỨNG SUẤT VÀ ĐỘ UỐN CỦA THANH

STRESSES AND DEFLECTIONS IN BEAMS

Type of Beam	Stresses	
	General Formula for Stress at any Point	Stresses at Critical Points
Case 23. — Continuous Beam, with Two Equal Spans, Equal Loads at Center of Each 	Between point A and load, $s = \frac{W}{16\,Z}(3\,l - 11\,x)$ Between point B and load, $s = -\frac{5}{16}\frac{Wv}{Z}$	Maximum stress at point A, $\frac{3}{16}\frac{Wl}{Z}$. Stress is zero at $x = \frac{3}{11}\,l$ Greatest negative stress at center of span, $-\frac{5}{32}\frac{Wl}{Z}$
Case 24. — Continuous Beam, with Two Unequal Spans, Unequal Loads at any Point of Each $m = \frac{1}{2(l_1+l_2)}\left(\frac{W_1 a_1 b_1}{l_1}(l_1+a_1) + \frac{W_2 a_2 b_2}{l_2}(l_2+a_2)\right)$ $\frac{W_1 b_1 - m}{l_1} = r_1$ $\frac{W_1 a_1 + m}{l_1} + \frac{W_2 a_2 + m}{l_2} = r$ $\frac{W_2 b_2 - m}{l_2} = r_2$	Between R_1 and W_1, $s = -\frac{wr_1}{Z}$ Between R and W_1, $s = \frac{1}{l_1 Z}[m(l_1 - u) - W_1 a_1 u]$ Between R and W_2, $s = \frac{1}{l_2 Z}[m(l_2 - x) - W_2 a_2 x]$ Between R_2 and W_2, $s = -\frac{vr_2}{Z}$	Stress at load W_1, $-\frac{a_1 r_1}{Z}$ Stress at support R, $\frac{m}{Z}$ Stress at load W_2, $-\frac{a_2 r_2}{Z}$ The greatest of these is the maximum stress.

ỨNG SUẤT VÀ ĐỘ UỐN CỦA THANH

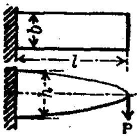
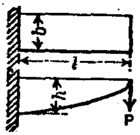
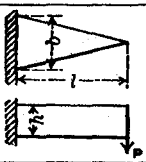
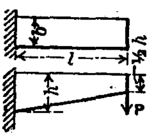
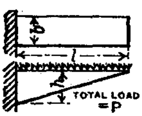
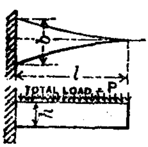
STRESSES AND DEFLECTIONS IN BEAMS

Deflections	
General Formula for Deflections at any Point	Deflections at Critical Points
Between point A and load, $y = \frac{Wx^2}{96\,EI}(9\,l - 11\,x)$ Between point B and load, $y = \frac{Wv}{96\,EI}(3\,l^2 - 5\,v^2)$	Maximum deflection is at $v = 0.4472\,l$, and is $\frac{Wl^3}{107.33\,EI}$ Deflection at load, $\frac{7}{768}\,\frac{Wl^3}{EI}$
Between R_1 and W_1, $y = \frac{w}{6\,EI}\left\{ (l_1 - w)(l_1 + w)\,r_1 - \frac{W_1 b_1^3}{l_1} \right\}$ Between R and W_1, $y = \frac{u}{6\,EIl_1}[W_1 a_1 b_1 (l_1 + a_1) - W_1 a_1 u^2 - m\,(2\,l_1 - u)(l_1 - u)]$ Between R and W_2, $y = \frac{x}{6\,EIl_2}[W_2 a_2 b_2 (l_2 + a_2) - W_2 a_2 x^2 - m\,(2\,l_2 - x)(l_2 - x)]$ Between R_2 and W_2, $y = \frac{v}{6\,EI}\left\{ (l_2 - v)(l_2 + v)\,r_2 - \frac{W_2 b_2^3}{l_2} \right\}$	Deflection at load W_1, $\frac{a_1 b_1}{6\,EIl_1}[2\,a_1 b_1 W_1 - m\,(l_1 + a_1)]$ Deflection at load W_2, $\frac{a_2 b_2}{6\,EIl_2}[2\,a_2 b_2 W_2 - m\,(l_2 + a_2)]$ This case is so complicated that convenient general expressions for the maximum deflections cannot be obtained.

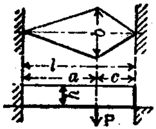
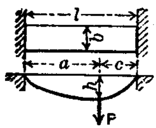
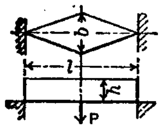
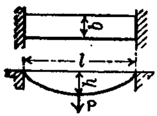
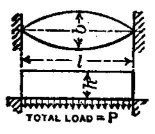
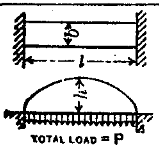
CÁC THANH CHỊU LỰC ĐỒNG NHẤT TRÊN SUỐT CHIỀU DÀI

BEAMS OF UNIFORM STRENGTH THROUGHOUT THEIR LENGTH

(All loads in pounds, All dimensions in inches.)

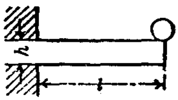
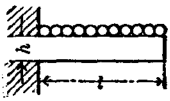
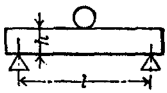
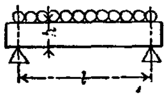
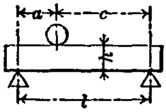
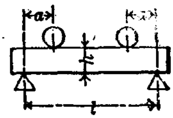
Type of Beam	Description	P = Carrying Capacity S = Safe Stress per Square Inch
	Load at one end. Width of beam uniform. Depth of beam decreasing towards loaded end. Outline of beam-shape, parabola with vertex at loaded end.	$P = \frac{Sbh^2}{6l}$
	Load at one end. Width of beam uniform. Depth of beam decreasing towards loaded end. Outline of beam, one-half of a parabola with vertex at loaded end. Beam may be reversed so that upper edge is parabolic.	$P = \frac{Sbh^2}{6l}$
	Load at one end. Depth of beam uniform. Width of beam decreasing towards loaded end. Outline of beam triangular, with apex at loaded end.	$P = \frac{Sbh^2}{6l}$
	Beam of *approximately* uniform strength. Load at one end. Width of beam uniform. Depth of beam decreasing towards loaded end, but not tapering to a sharp point.	$P = \frac{Sbh^2}{6l}$
	Uniformly distributed load. Width of beam uniform. Depth of beam decreasing towards outer end. Outline of beam, right-angled triangle.	$P = \frac{Sbh^2}{3l}$
	Uniformly distributed load. Depth of beam uniform. Width of beam gradually decreasing towards outer end. Outline of beam is formed by two parabolas which tangent each other at their vertices at the outer end of the beam.	$P = \frac{Sbh^2}{3l}$

Beams of Uniform Strength Throughout Their Length

Type of Beam	Description	P = Carrying Capacity S = Safe Stress per Square Inch
	Beam supported at both ends. Load concentrated at any point. Depth of beam uniform. Width of beam maximum at point of loading. Outline of beam, two triangles with apexes at points of support.	$P = \dfrac{Sbh^2l}{6\,ac}$
	Beam supported at both ends. Load concentrated at any point. Width of beam uniform. Depth of beam maximum at point of loading. Outline of beam is formed by two parabolas with their vertexes at points of support.	$P = \dfrac{Sbh^2l}{6\,ac}$
	Beam supported at both ends. Load concentrated in the middle. Depth of beam uniform. Width of beam maximum at point of loading. Outline of beam, two triangles with apexes at points of support.	$P = \dfrac{2\,Sbh^2}{3\,l}$
	Beam supported at both ends. Load concentrated at center. Width of beam uniform. Depth of beam maximum at point of loading. Outline of beam, two parabolas with vertices at points of support.	$P = \dfrac{2\,Sbh^2}{3\,l}$
	Beam supported at both ends. Load uniformly distributed. Depth of beam uniform. Width of beam maximum at center. Outline of beam, two parabolas with vertexes at middle of beam.	$P = \dfrac{4\,Sbh^2}{3\,l}$
	Beam supported at both ends. Load uniformly distributed. Width of beam uniform. Depth of beam maximum at center. Outline of beam one-half of an ellipse.	$P = \dfrac{4\,Sbh^2}{3\,l}$

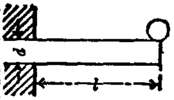
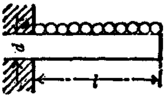
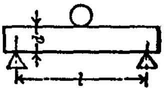
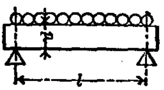
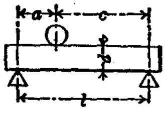
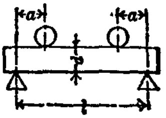
THANH ĐẶC TIẾT DIỆN CHỮ NHẬT

RECTANGULAR SOLID BEAMS

Style of Loading and Support	Breadth of Beam in Inches	Height of Beam in Inches	Stress per Sq. In. in Extreme Fibers of Beam	Length of Beam in Inches	Total Load in Pounds
	b	h	f	l	W
	Beam fixed at one end, loaded at the other				
	$\frac{6\,lW}{fh^2}=b$	$\sqrt{\frac{6\,lW}{bf}}=h$	$\frac{6\,lW}{bh^2}=f$	$\frac{bfh^2}{6\,W}=l$	$\frac{bfh^2}{6\,l}=W$
	Beam fixed at one end, uniformly loaded				
	$\frac{3\,lW}{fh^2}=b$	$\sqrt{\frac{3\,lW}{bf}}=h$	$\frac{3\,lW}{bh^2}=f$	$\frac{bfh^2}{3\,W}=l$	$\frac{bfh^2}{3\,l}=W$
	Beam supported at both ends, single load in middle				
	$\frac{3\,lW}{2\,fh^2}=b$	$\sqrt{\frac{3\,lW}{2\,bf}}=h$	$\frac{3\,lW}{2\,bh^2}=f$	$\frac{2\,bfh^2}{3\,W}=l$	$\frac{2\,bfh^2}{3\,l}=W$
	Beam supported at both ends, uniformly loaded				
	$\frac{3\,lW}{4\,fh^2}=b$	$\sqrt{\frac{3\,lW}{4\,bf}}=h$	$\frac{3\,lW}{4\,bh^2}=f$	$\frac{4\,bfh^2}{3\,W}=l$	$\frac{4\,bfh^2}{3\,l}=W$
	Beam supported at both ends, single unsymmetrical load				
	$\frac{6\,Wac}{fh^2l}=b$	$\sqrt{\frac{6Wac}{bfl}}=h$	$\frac{6\,Wac}{bh^2l}=f$	$a+c=l$	$\frac{bh^2fl}{6\,ac}=W$
	Beam supported at both ends, two symmetrical loads				
	$\frac{3\,Wa}{fh^2}=b$	$\sqrt{\frac{3\,Wa}{bf}}=h$	$\frac{3\,Wa}{bh^2}=f$	l, any length $\frac{bh^2f}{3\,W}=a$	$\frac{bh^2f}{3\,a}=W$

THANH ĐẶC TIẾT DIỆN TRÒN

ROUND SOLID BEAMS

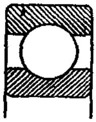
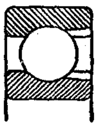
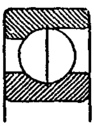
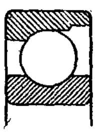
Style of Loading and Support	Diameter of Beam in Inches	Stress per Sq. In. in Extreme Fibers of Beam	Length of Beam in Inches	Total Load in Pounds
	d	f	l	W
	Beam fixed at one end, loaded at the other			
	$\sqrt[3]{\frac{10.18\, lW}{f}}=d$	$\frac{10.18\, lW}{d^3}=f$	$\frac{d^3f}{10.18\, W}=l$	$\frac{d^3f}{10.18\, l}=W$
	Beam fixed at one end, uniformly loaded			
	$\sqrt[3]{\frac{5.092\, Wl}{f}}=d$	$\frac{5.092\, Wl}{d^3}=f$	$\frac{d^3f}{5.092\, W}=l$	$\frac{d^3f}{5.092\, l}=W$
	Beam supported at both ends, single load in middle			
	$\sqrt[3]{\frac{2.546\, Wl}{f}}=d$	$\frac{2.546\, Wl}{d^3}=f$	$\frac{d^3f}{2.546\, W}=l$	$\frac{d^3f}{2.546\, l}=W$
	Beam supported at both ends, uniformly loaded			
	$\sqrt[3]{\frac{1.273\, Wl}{f}}=d$	$\frac{1.273\, Wl}{d^3}=f$	$\frac{d^3f}{1.273\, W}=l$	$\frac{d^3f}{1.273\, l}=W$
	Beam supported at both ends, single unsymmetrical load			
	$\sqrt[3]{\frac{10.18\, Wac}{fl}}=d$	$\frac{10.18\, Wac}{d^3l}=f$	$a+c=l$	$\frac{d^3fl}{10.18\, ac}=W$
	Beam supported at both ends, two symmetrical loads			
	$\sqrt[3]{\frac{5.092\, Wa}{f}}=d$	$\frac{5.092\, Wa}{d^3}=f$	l, any length $\frac{d^3f}{5.092\, W}=a$	$\frac{d^3f}{5.092\, a}=W$

BEARINGS

Ổ LĂN
(BẠC ĐẠN)

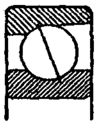
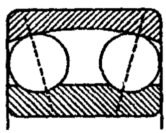
BẢNG 1 : CÁC KIỂU Ổ BI VÀ KHOẢNG KÍCH THƯỚC

Table 1. BALL BEARING TYPES AND RANGES OF SIZES

General Description	Type	Cross-section	Range of Standard Sizes by Nominal Bore Diam.	Dimen.
SINGLE ROW RADIAL BALL BEARINGS				
Single row, radial, non-filling slot assembly. Metric dimensions.	BC		Series 10 (Extra-light) 10 to 320 mm Series 02 (Light) 4 to 320 mm Series 03 (Medium) 10 to 280 mm Series 04 (Heavy) 17 to 150 mm Series 19 15 to 300 mm	See Table 5
Inch dimensions.	BIC		0.0250 to 0.0937 inch $\frac{1}{8}$ to $1\frac{1}{2}$ inches	See Table 10
Single row, radial, filling slot assembly. Metric dimensions.	BL		Series 02 (Light) 10 to 320 mm Series 03 (Medium) 10 to 280 mm Series 04 (Heavy) 17 to 150 mm	See Table 5
Inch dimensions.	BIL		0.0250 to 0.0937 inch $\frac{1}{8}$ to $1\frac{1}{2}$ inches	See Table 10
Single row, radial, self-contained counterbored assembly. Metric dimensions.	BH		Series 10 (Extra-Light) 10 to 320 mm Series 02 (Light) 10 to 320 mm Series 03 (Medium) 10 to 280 mm Series 04 (Heavy) 17 to 150 mm	See Table 5
Inch dimensions.	BIH		$\frac{1}{8}$ to $1\frac{1}{2}$ inches	See Table 10
Single row, radial, separable assembly. Metric dimensions.	BM		Magneto Bearing Series 5 to 17 mm	See Table 9

BẢNG 1 : CÁC KIỂU Ổ BI VÀ KHOẢNG KÍCH THƯỚC

Table 1. BALL BEARING TYPES AND RANGES OF SIZES

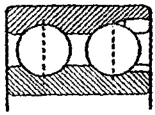
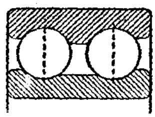
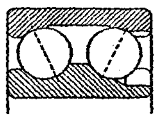
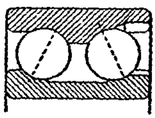
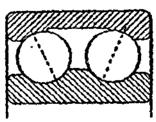
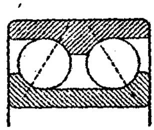
General Description	Type	Cross-section	Range of Standard Sizes by Nominal Bore Diam.	Dimen.
SINGLE ROW ANGULAR CONTACT BALL BEARINGS*				
Single row, angular contact, self-contained, contact angle less than 22 deg. Metric dimensions. Inch dimensions.	BN BIN		*Metric Dimensions* Series 10 (Extra Light) 10 to 320 mm Series 02 (Light) 10 to 320 mm Series 03 (Medium) 10 to 280 mm Series 04 (Heavy) 17 to 150 mm	See Table 5
Single row, angular contact, self-contained, contact angle 22 to 32 deg., incl. Metric dimensions. Inch dimensions.	BA BIA		*Inch Dimensions* For BIN: ⅛ to 1½ inches	
Single row, angular contact, self-contained, contact angle larger than 32 but less than 45 deg. Metric dimensions. Inch dimensions.	BT BIT		For BIA and BIT: 0.0250 to 0.0937 inch ⅛ to 1½ inches	See Table 10
DOUBLE ROW SELF-ALIGNING BALL BEARINGS†				
Double row, radial, self-aligning, raceway of outer ring spherical. Metric dimensions.	BS		Series 02 (Light) 5 to 110 mm Series 03 (Medium) 10 to 110 mm Series 04 (Heavy) 17 to 90 mm Series 22 (Light) 10 to 320 mm Series 23 (Medium) 10 to 280 mm	See Table 5
Inch dimensions.	BIS		⅛ to 1½ inches	See Table 10

* Other single row, angular contact ball bearings, for which data are not given in these tables, are: Type BY, split outer ring, metric dimensions; Type BIY, inch dimensions, otherwise similar to Type BY; Type BZ, split inner ring, metric dimensions; and Type BIZ, inch dimensions, otherwise similar to Type BZ.

† Other self-aligning ball bearings for which data are not given in these tables, are: Type BCA, single row, radial, non-filling slot assembly, self-aligning by means of spherical outer diameter, metric dimensions; Type BLA, single row, radial, filling slot assembly, self-aligning by means of spherical outer diameter, metric dimensions; and Type BIB, single row, self-aligning, raceway of outer ring spherical, inch dimensions.

BẢNG 1 : CÁC KIỂU Ổ BI VÀ KHOẢNG KÍCH THƯỚC

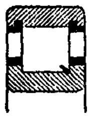
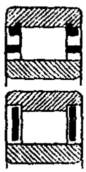
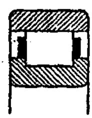
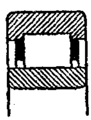
Table 1. BALL BEARING TYPES AND RANGES OF SIZES

General Description	Type	Cross-section	Range of Standard Sizes by Nominal Bore Diam.	Dimen.
DOUBLE ROW, RADIAL OR ANGULAR CONTACT BALL BEARINGS*				
Double row, filling slot assembly, radial contact. Metric bore and O. D.	BF		*Metric Bore and O. D.* Series 32 (Light) 10 to 110 mm Series 92 (Extended Light) 120 to 320 mm Series 33 (Medium) 10 to 110 mm Series 93 (Extended Medium) 120 to 200 mm Series 34 (Heavy) 17 to 90 mm *Inch Bore and O. D.* $\frac{3}{8}$ to $1\frac{1}{2}$ inches	See Table 5 See Table 10
Double row, non-filling slot assembly, radial contact. Metric bore and O. D. Inch bore and O. D.	BK BIK			
Double row, filling slot assembly, angular contact, vertex of contact angle inside bearing. Metric bore and O. D.	BD			
Double row, filling slot assembly, angular contact, vertex of contact angle outside bearing. Metric bore and O. D.	BE			
Double row, non-filling slot assembly, angular contact, vertex of contact angle inside bearing. Metric bore and O. D.	BJ			
Double row, non-filling slot assembly, angular contact, vertex of contact angle outside bearing. Metric bore and O. D. Inch bore and O. D.	BG BIG			

* Other double row radial or angular contact bearings, for which data are not given in these tables, are: Type BAA, angular contact, self-contained, vertex of contact angle inside bearing, two-piece outer ring, metric dimensions; and Type BHA, radial, self-contained, two-piece outer ring, metric dimensions.

BẢNG 2 : CÁC KIỂU Ổ ĐŨA VÀ KHOẢNG KÍCH THƯỚC

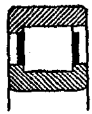
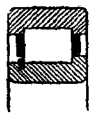
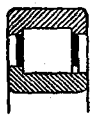
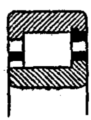
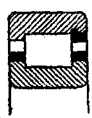
Table 2. ROLLER BEARING TYPES AND RANGES OF SIZES

General Description	Type	Cross-section	Range of Standard Sizes by Nominal Bore Diam.	Dimen.
NON-LOCATING CYLINDRICAL ROLLER BEARINGS*				
Single row, double ribbed inner ring. Rollers located by internal snap rings recessed in outer ring, non-separable. Metric bore and O. D.	RK		Series 02 (Light) 17 to 150 mm Series 03 (Medium) 15 to 200 mm Series 32 17 to 110 mm Series 92 120 to 320 mm Series 33 17 to 110 mm Series 93 120 to 200 mm	See Table 5
Single row, inner ring without ribs. Rollers located by cage, end rings or internal snap rings recessed in outer ring. Inner ring separable. Metric bore and O. D.	RM		Series 02 (Light) 15 to 150 mm Series 03 (Medium) 15 to 150 mm Series 32 17 to 110 mm Series 92 120 to 320 mm Series 33 17 to 110 mm Series 93 120 to 200 mm	See Table 5
Single row, double ribbed inner ring, outer ring without ribs. Outer ring separable. Metric bore and O. D.	RN		Series 10 17 to 320 mm Series 30 25 to 240 mm Series 02 (Light) 15 to 320 mm Series 03 (Medium) 15 to 200 mm Series 32 17 to 110 mm Series 92 120 to 320 mm Series 33 17 to 110 mm Series 93 120 to 200 mm	See Table 5
Single row, inner ring without ribs, double ribbed outer ring, inner ring separable. Metric bore and O. D.	RU		Series 10 17 to 320 mm Series 02 (Light) 17 to 320 mm Series 03 (Medium) 15 to 200 mm Series 32 17 to 110 mm Series 92 120 to 320 mm Series 33 17 to 110 mm Series 93 120 to 200 mm	See Table 5

* Other non-locating cylindrical roller bearings, for which data are not given in these tables, are: Type RR, single row, single ribbed inner ring, rollers located by snap rings recessed in outer ring, inner ring separable, metric bore and O. D.; Type RAB, single row, inner ring without ribs, single ribbed outer ring, both rings separable, metric dimensions; Type RNS, single row, double ribbed inner ring, outer ring without ribs, outer ring separable, self-aligning by means of spherical outer diameter, metric dimensions; and Type RUA, single row, double ribbed outer ring, inner ring without ribs, inner ring separable, self-aligning by means of spherical outer diameter, metric dimensions.

BẢNG 2 : CÁC KIỂU Ô DŨA VÀ KHOẢNG KÍCH THƯỚC

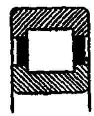
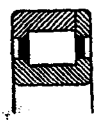
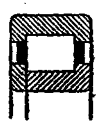
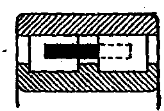
Table 2. ROLLER BEARING TYPES AND RANGES OF SIZES

General Description	Type	Cross-section	Range of Standard Sizes by Nominal Bore Diam.	Dimen.
ONE-DIRECTION LOCATING CYLINDRICAL ROLLER BEARINGS*				
Single row, double ribbed inner ring, single ribbed outer ring, outer ring separable. Metric bore and O. D.	RF		Series 02 (Light) 17 to 320 mm Series 03 (Medium) 15 to 200 mm	See Table 5
Single row, single ribbed inner ring, double ribbed outer ring, rollers located by snap ring recessed in inner ring, non-separable. Metric bore and O. D.	RG		Series 02 (Light) 15 to 320 mm Series 03 (Medium) 15 to 200 mm	See Table 5
Single row, double ribbed outer ring, single ribbed inner ring, inner ring separable. Metric bore and O. D.	RJ		Series 02 (Light) 17 to 320 mm Series 03 (Medium) 15 to 200 mm	See Table 5
Single row, single ribbed inner and outer rings, rollers located by rib and single snap ring recessed in outer ring, inner ring separable. Metric bore and O. D.	RS		Series 02 (Light) 15 to 150 mm Series 03 (Medium) 15 to 150 mm	See Table 5
Single row, double ribbed inner ring, single ribbed outer ring, rollers located by rib and snap ring recessed in outer ring, non-separable. Metric bore and O. D.	RY		Series 02 (Light) 15 to 150 mm Series 03 (Medium) 15 to 150 mm	See Table 5

* Another type of one-direction locating cylindrical roller bearing, for which data are not given in these tables, is Type RAA, single row, single ribbed inner and outer rings, either ring separable, metric bore and O. D.

BẢNG 2 : CÁC KIỂU Ổ ĐŨA VÀ KHOẢNG KÍCH THƯỚC

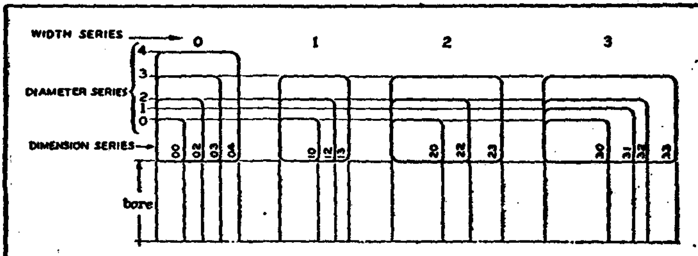
Table 2. ROLLER BEARING TYPES AND RANGES OF SIZES

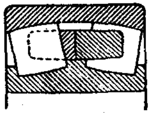
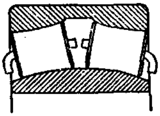
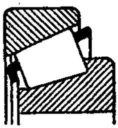
General Description	Type	Cross-section	Range of Standard Sizes by Nominal Bore Diam.	Dimen.
TWO-DIRECTION CYLINDRICAL ROLLER BEARINGS*				
Single row, double ribbed inner and outer rings, non-separable. Metric bore and O. D.	RC		Series 02 (Light) 15 to 320 mm; Series 03 (Medium) 15 to 200 mm	See Table 5
Single row, double ribbed inner ring, double ribbed outer ring with one loose rib, outer ring separable. Metric bore and O. D.	RP		Series 02 (Light) 15 to 320 mm; Series 03 (Medium) 15 to 200 mm	See Table 5
Single row, double ribbed inner ring with one loose rib, double ribbed outer ring, inner ring separable. Metric bore and O. D.	RT		Series 02 (Light) 15 to 320 mm; Series 03 (Medium) 15 to 200 mm	See Table 5
DOUBLE ROW NON-LOCATING CYLINDRICAL ROLLER BEARINGS†				
Double row, ribbed inner ring, outer ring without ribs, outer ring separable. Metric bore and O. D.	RD		Series 30 25 to 240 mm	See Table 5

*Another type of two-direction cylindrical roller bearing, for which data are not given in these tables, is Type RCS, single row, double ribbed inner and outer rings, non-separable, self-aligning by means of spherical outside diameter, metric dimensions.

†Other double row, non-locating cylindrical roller bearings, for which data are not given in these tables, are: Type RA, inner ring without ribs, ribbed outer ring, inner ring separable, metric bore and O. D.; and Type RB, ribbed inner ring, rollers located by snap rings recessed in outer ring, non-separable, metric bore and O. D.

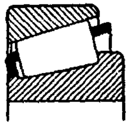
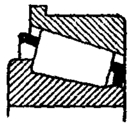
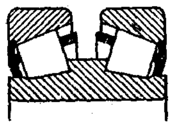
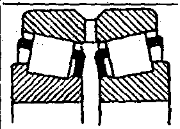
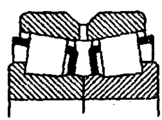
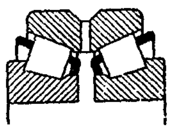
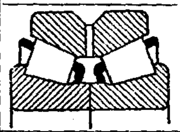
Relative Proportions of Bearing Dimension Series



General Description	Type	Cross-section	Range of Std. Sizes by Nominal Bore Diam.	Dimen.
SELF-ALIGNING ROLLER BEARINGS*				
Double row, raceway of outer ring spherical. Metric dimensions.	SD		Series 02 30 to 100 mm Series 03 35 to 100 mm Series 22 80 to 320 mm Series 23 40 to 280 mm Series 30 120 to 900 mm Series 31 110 to 850 mm Series 32 100 to 750 mm	See Table 5
Double row, raceway of inner ring spherical. Metric dimensions.	SW		Series 22 80 to 320 mm Series 23 40 to 280 mm Series 30 120 to 500 mm Series 31 110 to 500 mm Series 32 220 to 500 mm	See Table 5
TAPERED ROLLER BEARINGS†				
Single row, with or without cage. Inch dimensions.	TS		0.3750 to 12.5000 inches	See Table 11
Single row, with or without cage, steep contact angle. Inch dimensions.	TSS		0.6250 to 12.5000 inches	

*Other self-aligning roller bearings, for which data are not given in these tables, are: Type SR., single row, radial contact, raceway of outer ring spherical, metric dimensions; Type SA, single row, angular contact, raceway of outer ring spherical, metric dimensions; and Type SB, single row, angular contact, raceway of inner ring spherical, metric dimensions.

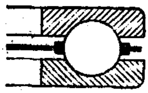
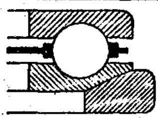
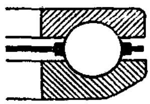
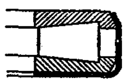
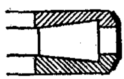
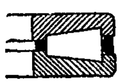
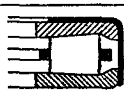
†Any single cone listed in the TS and TSS tables can be used with flanged outer race (Type TSF) or double row (Type TDO) in the same series.

General Description	Type	Cross-section	Range of Std. Sizes by Nominal Bore Diam.	Dimen.
TAPERED ROLLER BEARINGS *(Continued)*				
Single row, tapered bore, with or without cage. Inch dimensions.	TST		0.9375 to 9.1875 inches	
Single row, flanged cup (outer races), with or without cage. Inch dimensions.	TSF		0.4720 to 9.5000 inches	
Double row, double cone (inner races), single cups (outer races), with or without cage. Inch dimensions.	TDI		1.8750 to 9.5000 inches	
Double row, single cones (inner races), double cup (outer races), with or without cage.* Inch dimensions.	TDO		0.7500 to 9.5000 inches	
Double row, single cones (inner races), double cup (outer races), non-adjustable, with or without cage. Inch dimensions.	TNA		0.7500 to 9.500 inches	
Double row, single cones (inner races), double cup (outer races), steep angle, with or without cage.* Inch dimensions.	TDOS		0.7500 to 8.9945 inches	
Double row, single cones (inner races), double cup (outer races), steep angle, non-adjustable, with or without cage. Inch dimensions.	TNAS		0.7500 to 4.500 inches	

*Any single cone listed in the TS and TSS tables can be used with flanged outer race (Type TSF) or double row (Type TDO) in the same series.

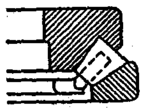
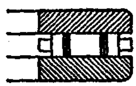
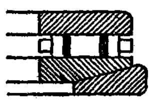
BẢNG 3: KIỂU LOẠI VÀ KHOẢNG KÍCH THƯỚC CỦA Ổ BI VÀ Ổ ĐŨA CHẶN

Table 3. BALL AND ROLLER THRUST BEARING TYPES AND RANGES OF SIZES

General Description	Type	Cross-section	Range of Std. Sizes by Nominal Bore Diam.	Dimen.
ONE-DIRECTION BALL THRUST BEARINGS				
Grooved raceways, flat seats. Metric dimensions.	TA		Series 11 35 to 280 mm Light Series 10 to 125 mm Medium Series 10 to 140 mm	See Table 15
Single or multiple grooved raceways with flat seats. Inch dimensions.	TB		Extra Light Series ½ to 3½ inches Light Series ¼ to 12 inches Medium Series ½ to 7⅜ inches	See Table 17
Grooved raceways, one flat seat, one self-aligning seat with aligning washer. Metric dimensions.	TE		Series 200 10 to 140 mm	See Table 16
Grooved raceways, one flat seat, one self-aligning seat without aligning washer. Metric dimensions.	TF		Series 200 10 to 140 mm	See Table 16
TAPERED ROLLER THRUST BEARINGS				
Cageless thrust. A tapered roller thrust bearing with full retaining band and without cage. Inch dimensions.	TTC		1.2600 to 3.0100 inches	
Cageless thrust side. A tapered roller thrust bearing without cage and with an O. D. retaining band only. Inch dimensions.	TTCS		1.8850 to 3.0100 inches	
Heavy duty thrust. A tapered roller thrust bearing for heavy duty service without retaining band but with heavy-duty bronze cage. Inch dimensions.	TTHD		3.0000 to 9.0000 inches	
Tapered roller thrust bearing with retaining band and cage. Inch dimensions.	TTSP		0.6350 to 1.3850 inches	

BẢNG 3 : KIỂU LOẠI VÀ KHOẢNG KÍCH THƯỚC CỦA Ổ BI VÀ Ổ ĐŨA CHẶN

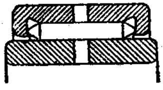
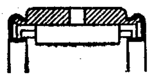
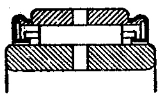
Table 3. BALL AND ROLLER THRUST BEARING TYPES AND RANGES OF SIZES

General Description	Type	Cross-section	Range of Std. Sizes by Nominal Bore Diam.	Dimen.
SPHERICAL ROLLER THRUST BEARINGS				
Spherical roller thrust bearing. Offset rings, flat seats. Metric dimensions.	TS		Series 93 110 to 530 mm Series 94 90 to 340 mm	See Table 18
CYLINDRICAL ROLLER THRUST BEARINGS*				
Roller thrust bearing. Cylindrical rollers, single direction, flat seats. Inch dimensions.	TP		Light Series $\frac{1}{8}$ to $3\frac{9}{16}$ ins. Heavy Series 2 to 30 inches	See Table 21
Roller thrust bearing. Cylindrical rollers, single direction, one flat, one self-aligning seat with aligning washer. Inch dimensions.	TR		Light Series 1 to $3\frac{1}{2}$ inches Heavy Series 2 to 30 inches	See Table 22

*Other cylindrical roller thrust bearings, for which data are not given in these tables, are: Type TDR, two direction, two self-aligning seats with aligning washers, one center plate flat seat, one inside locating collar, two roller assemblies, inch dimensions; Type TDP, two direction, flat seats, one center plate, one inside locating collar, two roller assemblies, inch dimensions; Type TPS, two direction, flat seats, one inside locating collar, one outside locating collar, one roller assembly, inch dimensions; and Type TPC, one direction, flat seats, outside band attached to outside diameter of larger ring, length extends under over-all width of bearing, inch dimensions.

BẢNG 4 : CÁC KIỂU Ổ KIM VÀ KHOẢNG KÍCH THƯỚC

Table 4. NEEDLE BEARING TYPES AND RANGES OF SIZES

General Description	Type	Cross-section	Range of Std. Sizes by Nominal Bore Diams.	Dimen.
WITH ONE-PIECE CHANNEL-SHAPED ROLLER-GUIDING RACEWAY				
Single row, rollers retained by outer ring, no inner ring. Inch dimensions.	NAA		0.3750 to 9.2500 inches	See Table 13
Single row, rollers retained by outer ring, separable inner ring. Inch dimensions.	NAB		0.3750 to 8.0000 inches	See Table 13
WITH COMPOSITE ROLLER-GUIDING RACEWAY				
Single row, rollers retained by outer ring, no inner ring. Inch dimensions.	NBA		0.3750 to 9.2500 inches	See Table 13
Single row, rollers retained by outer ring, separable inner ring. Inch dimensions.	NBB		0.3750 to 8.0000 inches	See Table 13

BẢNG 5 : CÁC KÍCH THƯỚC GIỚI HẠN Ổ BI VÀ Ổ ĐŨA ĐỠ THEO CHUỖI HỆ MÉT TIÊU CHUẨN

Table 5. STANDARD METRIC SERIES ANNULAR BALL AND ROLLER BEARING BOUNDARY DIMENSIONS

Bore Diameter		Out-side Diam.	Dimension Series Number							Out-side Diam.	Dimension Series Number								
			08	18	28	38	48	08	18 to 48		09	19	29	39	49	59	69	09	19 to 69
Mm.	Inches		Width					Radius			Width							Radius	
10	0.3937	0.7480	.....	.1968	......	0.2756	......	....	.012	0.8661	.....	0.2362	......	0.3937	......	0.6299	0.8661	....	.012
12	0.4724	0.8268	.....	.1968	......	0.2756	......	....	.012	0.9449	.....	0.2362	......	0.3937	......	0.6299	0.8661	....	.012
15	0.5906	0.9449	.....	.1968	......	0.2756	......	....	.012	1.1024	.....	0.2756	......	0.3937	0.5118	0.7087	0.9055	....	.012
17	0.6693	1.0236	.....	.1968	......	0.2756	......	....	.012	1.1811	.....	0.2756	......	0.3937	0.5118	0.7087	0.9055	....	.012
20	0.7874	1.2598	.1575	.2756	......	0.3937	......	.012	.012	1.4567	.2756	0.3543	0.4331	0.5118	0.6693	0.9055	1.1811	.012	.012
25	0.9843	1.4567	.1575	.2756	......	0.3937	......	.012	.012	1.6535	.2756	0.3543	0.4331	0.5118	0.6693	0.9055	1.1811	.012	.012
30	1.1811	1.6535	.1575	.2756	......	0.3937	......	.012	.012	1.8504	.2756	0.3543	0.4331	0.5118	0.6693	0.9055	1.1811	.012	.012
35	1.3780	1.8504	.1575	.2756	......	0.3937	......	.012	.012	2.1654	.2756	0.3937	0.5118	0.5906	0.7874	1.0630	1.4173	.012	.024
40	1.5748	2.0472	.1575	.2756	......	0.3937	......	.012	.012	2.4409	.3150	0.4724	0.5512	0.6299	0.8661	1.1811	1.5748	.012	.024
45	1.7717	2.2835	.1575	.2756	......	0.3937	0.5118	.012	.012	2.6772	.3150	0.4724	0.5512	0.6299	0.8661	1.1811	1.5748	.012	.024
50	1.9685	2.5591	.1968	.2756	0.3937	0.4724	0.5906	.012	.012	2.8346	.3150	0.4724	0.5512	0.6299	0.8661	1.1811	1.5748	.012	.024
55	2.1654	2.8346	.2756	.3543	0.4331	0.5118	0.6693	.012	.012	3.1496	.3543	0.5118	0.6299	0.7480	0.9843	1.3386	1.7717	.012	.039
60	2.3622	3.0709	.2756	.3937	0.4724	0.5512	0.7087	.012	.012	3.3465	.3543	0.5118	0.6299	0.7480	0.9843	1.3386	1.7717	.012	.039
65	2.5591	3.3465	.2756	.3937	0.5118	0.5906	0.7874	.012	.024	3.5433	.3543	0.5118	0.6299	0.7480	0.9843	1.3386	1.7717	.012	.039
70	2.7559	3.5433	.3150	.3937	0.5118	0.5906	0.7874	.012	.024	3.9370	.3937	0.6299	0.7480	0.9055	1.1811	1.5748	2.1260	.024	.039
75	2.9528	3.7402	.3150	.3937	0.5118	0.5906	0.7874	.012	.024	4.1339	.3937	0.6299	0.7480	0.9055	1.1811	1.5748	2.1260	.024	.039
80	3.1496	3.9370	.3150	.3937	0.5118	0.5906	0.7874	.012	.024	4.3307	.3937	0.6299	0.7480	0.9055	1.1811	1.5748	2.1260	.024	.039
85	3.3465	4.3307	.3543	.5118	0.6299	0.7480	0.9843	.012	.039	4.7244	.4331	0.7087	0.8661	1.0236	1.3780	1.8110	2.4803	.024	.039
90	3.5433	4.5276	.3543	.5118	0.6299	0.7480	0.9843	.012	.039	4.9213	.4331	0.7087	0.8661	1.0236	1.3780	1.8110	2.4803	.024	.039
95	3.7402	4.7244	.3543	.5118	0.6299	0.7480	0.9843	.012	.039	5.1181	.4331	0.7087	0.8661	1.0236	1.3780	1.8110	2.4803	.024	.039
100	3.9370	4.9213	.3543	.5118	0.6299	0.7480	0.9843	.012	.039	5.5118	.5118	0.7874	0.9449	1.1811	1.5748	2.1260	2.7953	.024	.039
105	4.1339	5.1181	.3543	.5118	0.6299	0.7480	0.9843	.012	.039	5.7087	.5118	0.7874	0.9449	1.1811	1.5748	2.1260	2.7953	.024	.039
110	4.3307	5.5118	.3937	.6299	0.7480	0.9055	1.1811	.024	.039	5.9055	.5118	0.7874	0.9449	1.1811	1.5748	2.1260	2.7953	.024	.039
120	4.7244	5.9055	.3937	.6299	0.7480	0.9055	1.1811	.024	.039	6.4961	.5512	0.8661	1.0630	1.3386	1.7717	2.3622	3.1496	.024	.039
130	5.1181	6.4961	.4331	.7087	0.8661	1.0236	1.3780	.024	.039	7.0866	.6299	0.9449	1.1811	1.4567	1.9685	2.6378	3.5433	.039	.059
140	5.5118	6.8898	.4331	.7087	0.8661	1.0236	1.3780	.024	.039	7.4803	.6299	0.9449	1.1811	1.4567	1.9685	2.6378	3.5433	.039	.059
150	5.9055	7.4803	.5118	.7874	0.9449	1.1811	1.5748	.024	.039	8.2677	.7480	1.1024	1.4173	1.7717	2.3622	3.1496	4.2913	.039	.079

BẢNG 5 : CÁC KÍCH THƯỚC GIỚI HẠN Ổ BI VÀ Ổ ĐŨA ĐỠ THEO CHUỖI HỆ MÉT TIÊU CHUẨN

Table 5. STANDARD METRIC SERIES ANNULAR BALL AND ROLLER BEARING BOUNDARY DIMENSIONS

Bore Diameter		Out-side Diam.	Dimension Series Number									Out-side Diam.	Dimension Series Number					
			00	10	20	30	40	50	60	00	10 to 60		01	11	21	31	01	11 to 31
Mm.	Inch		Width							Radius			Width				Radius	
10	0.3937	1.0236	......	0.3150	0.3937	0.4724	0.6299	0.8268	1.1417	....	.012	......	......	......	......	......	....	....
12	0.4724	1.1024	......	0.3150	0.3937	0.4724	0.6299	0.8268	1.1417	....	.012	......	......	......	......	......	....	....
15	0.5906	1.2598	0.3150	0.3543	0.4331	0.5118	0.6693	0.9055	1.1811	.012	.012	......	......	......	......	......	....	....
17	0.6693	1.3780	0.3150	0.3937	0.4724	0.5512	0.7087	0.9449	1.2598	.012	.012	......	......	......	......	......	....	....
20	0.7874	1.6535	0.3150	0.4724	0.5512	0.6299	0.8661	1.1811	1.5748	.012	.024	......	......	......	......	......	....	....
25	0.9843	1.8504	0.3150	0.4724	0.5512	0.6299	0.8661	1.1811	1.5748	.012	.024	......	......	......	......	......	....	....
30	1.1811	2.1654	0.3543	0.5118	0.6299	0.7480	0.9843	1.3386	1.7717	.012	.039	......	......	......	......	......	....	....
35	1.3780	2.4409	0.3543	0.5512	0.6693	0.7874	1.0630	1.4173	1.8898	.012	.039	......	......	......	......	......	....	....
40	1.5748	2.6772	0.3543	0.5906	0.7087	0.8268	1.1024	1.4961	1.9685	.012	.039	......	......	......	......	......	....	....
45	1.7717	2.9528	0.3937	0.6299	0.7480	0.9055	1.1811	1.5748	2.1260	.024	.039	......	......	......	......	......	....	....
50	1.9685	3.1496	0.3937	0.6299	0.7480	0.9055	1.1811	1.5748	2.1260	.024	.039	......	......	......	......	......	....	....
55	2.1654	3.5433	0.4331	0.7087	0.8661	1.0236	1.3780	1.8110	2.4803	.024	.039	......	......	......	......	......	....	....
60	2.3622	3.7402	0.4331	0.7087	0.8661	1.0236	1.3780	1.8110	2.4803	.024	.039	......	......	......	......	......	....	....
65	2.5591	3.9370	0.4331	0.7087	0.8661	1.0236	1.3780	1.8110	2.4803	.024	.039	......	......	......	......	......	....	....
70	2.7559	4.3307	0.5118	0.7874	0.9449	1.1811	1.5748	2.1260	2.7953	.024	.039	......	......	......	......	......	....	....
75	2.9528	4.5276	0.5118	0.7874	0.9449	1.1811	1.5748	2.1260	2.7953	.024	.039	......	......	......	......	......	....	....
80	3.1496	4.9213	0.5512	0.8661	1.0630	1.3386	1.7716	2.3622	3.1496	.024	.039	......	......	......	......	......	....	....
85	3.3465	5.1181	0.5512	0.8661	1.0630	1.3386	1.7716	2.3622	3.1496	.024	.039	......	......	......	......	......	....	....
90	3.5433	5.5118	0.6299	0.9449	1.1811	1.4567	1.9685	2.6378	3.5433	.039	.059	......	......	......	......	......	....	....
95	3.7402	5.7086	0.6299	0.9449	1.1811	1.4567	1.9685	2.6378	3.5433	.039	.059	......	......	......	......	......	....	....
100	3.9370	5.9055	0.6299	0.9449	1.1811	1.4567	1.9685	2.6378	3.5433	.039	.059	6.4961	0.8268	1.1811	1.5354	2.0472	.039	.079
105	4.1339	6.2992	0.7087	1.0236	1.2992	1.6142	2.2047	2.9528	3.9370	.039	.079	6.8898	0.8661	1.2992	1.6535	2.2047	.039	.079
110	4.3307	6.6929	0.7480	1.1024	1.4173	1.7717	2.3622	3.1496	4.2913	.039	.079	7.0866	0.8661	1.2992	1.6535	2.2047	.039	.079
120	4.7244	7.0866	0.7480	1.1024	1.4173	1.8110	2.3622	3.1496	4.2913	.039	.079	7.8740	0.9843	1.4961	1.8898	2.4409	.059	.079
130	5.1181	7.8740	0.8661	1.2992	1.6535	2.0472	2.7165	3.7402	4.9213	.039	.079	8.2677	0.9843	1.4961	1.8898	2.5197	.059	.079
140	5.5118	8.2677	0.8661	1.2992	1.6535	2.0866	2.7165	3.7402	4.9213	.039	.079	8.8583	1.0630	1.5748	1.9685	2.6772	.059	.079
150	5.9055	8.8583	0.9449	1.3780	1.7717	2.2047	2.9528	3.9370	5.3543	.039	.079	9.8425	1.2205	1.8110	2.3622	3.1496	.079	.079

BẢNG 5 : CÁC KÍCH THƯỚC GIỚI HẠN Ổ BI VÀ Ổ ĐŨA ĐỠ THEO CHUỖI HỆ MÉT TIÊU CHUẨN

Table 5. STANDARD METRIC SERIES ANNULAR BALL AND ROLLER BEARING BOUNDARY DIMENSIONS

Bore Diameter		Out-side Diam.	Dimension Series Number					02 to 92	Out-side Diam.	Dimension Series Number				03 to 93	Out-side Diam.	Dimen. Series No.			04 and 24
			02	12	22	32	92			03	23	33	93			04	24	34	
Mm.	Inch		Width					Radius		Width				Radius		Width			Radius
10	0.3937	1.1811	0.3543	....	0.5512	9/16	....	.024	1.3780	0.4331	0.6693	3/4	....	.024	.....	....	....	....	....
12	0.4724	1.2598	0.3937	....	0.5512	5/8	....	.024	1.4567	0.4724	0.6693	3/4	....	.039	1.6535	0.5118	0.7480	....	.039
15	0.5906	1.3780	0.4331	....	0.5512	5/8	....	.024	1.6535	0.5118	0.6693	3/4	....	.039	2.0472	0.5906	0.9449	....	.039
17	0.6693	1.5748	0.4724	....	0.6299	11/16	....	.024	1.8504	0.5512	0.7480	7/8	....	.039	2.4409	0.6693	1.1417	1 3/16	.039
20	0.7874	1.8504	0.5512	....	0.7087	13/16	....	.039	2.0472	0.5906	0.8268	7/8	....	.039	2.8346	0.7480	1.2992	1 3/8	.039
25	0.9843	2.0472	0.5906	....	0.7087	13/16	....	.039	2.4409	0.6693	0.9449	1	....	.039	3.1496	0.8268	1.4173	1 3/8	.059
30	1.1811	2.4409	0.6299	....	0.7874	15/16	....	.039	2.8346	0.7480	1.0630	1 3/16	....	.039	3.5433	0.9055	1.5748	1 9/16	.059
35	1.3780	2.8346	0.6693	....	0.9055	1 1/16	....	.039	3.1496	0.8268	1.2205	1 3/8	....	.059	3.9370	0.9843	1.6929	1 3/4	.059
40	1.5748	3.1496	0.7087	....	0.9055	1 3/16	....	.039	3.5433	0.9055	1.2992	1 7/16	....	.059	4.3307	1.0630	1.8110	1 15/16	.079
45	1.7717	3.3465	0.7480	....	0.9055	1 3/16	....	.039	3.9370	0.9843	1.4173	1 9/16	....	.059	4.7244	1.1417	1.9685	2 1/8	.079
50	1.9685	3.5433	0.7874	....	0.9055	1 3/16	....	.039	4.3307	1.0630	1.5748	1 3/4	....	.079	5.1181	1.2205	2.0866	2 5/16	.079
55	2.1654	3.9370	0.8268	....	0.9843	1 5/16	....	.059	4.7244	1.1417	1.6929	1 15/16	....	.079	5.5118	1.2992	2.2441	2 1/2	.079
60	2.3622	4.3307	0.8661	....	1.1024	1 7/16	....	.059	5.1181	1.2205	1.8110	2 1/8	....	.079	5.9055	1.3780	2.3622	2 5/8	.079
65	2.5591	4.7244	0.9055	....	1.2205	1 1/2	....	.059	5.5188	1.2992	1.8898	2 5/16	....	.079	6.2992	1.4567	2.5197	2 13/16	.079
70	2.7559	4.9213	0.9449	....	1.2205	1 9/16	....	.059	5.9055	1.3780	2.0079	2 1/2	....	.079	7.0866	1.6535	2.9134	3 1/8	.098
75	2.9528	5.1181	0.9843	....	1.2205	1 5/8	....	.059	6.2992	1.4567	2.1654	2 11/16	....	.079	7.4803	1.7717	3.0315	3 1/4	.098
80	3.1496	5.5118	1.0236	....	1.2992	1 3/4	....	.079	6.6929	1.5354	2.2835	2 11/16	....	.079	7.8740	1.8898	3.1496	3 7/16	.098
85	3.3465	5.9055	1.1024	....	1.4173	1 15/16	....	.079	7.0866	1.6142	2.3622	2 7/8	....	.098	8.2677	2.0472	3.3858	3 5/8	.118
90	3.5433	6.2992	1.1811	....	1.5748	2 1/16	....	.079	7.4803	1.6929	2.5197	2 7/8	....	.098	8.8583	2.1260	3.5433	3 7/8	.118
95	3.7402	6.6929	1.2598	....	1.6929	2 3/16	....	.079	7.8740	1.7717	2.6378	3 1/16	....	.098	9.4488	2.1654	3.7402	....	.118
100	3.9370	7.0866	1.3386	....	1.8110	2 3/8	....	.079	8.4646	1.8504	2.8740	3 1/4	....	.098	9.8425	2.2835	3.8583	....	.118
105	4.1339	7.4803	1.4173	....	1.9685	2 9/16	....	.079	8.8583	1.9291	3.0315	3 7/16	....	.098	10.2362	2.3622	3.9370	....	.118
110	4.3307	7.8740	1.4961	....	2.0866	2 3/4	....	.079	9.4488	1.9685	3.1496	3 5/8	....	.098	11.0236	2.5591	4.2520	....	.118
120	4.7244	8.4646	1.5748	1.6535	2.2835	2.9921	3	.079	10.2362	2.1654	3.3858	4.1732	4 1/8	.098	12.2047	2.8346	4.6457	....	.157
130	5.1181	9.0551	1.5748	1.8110	2.5197	3.1496	3 1/8	.098	11.0236	2.2835	3.6614	4.4094	4 3/8	.118	13.3858	3.0709	5.0394	....	.157
140	5.5118	9.8425	1.6535	1.9685	2.6772	3.4646	3 1/4	.098	11.8110	2.4409	4.0157	4.6457	4 1/2	.118	14.1732	3.2283	5.1968	....	.157
150	5.9055	10.6299	1.7717	2.1260	2.8740	3.7795	3 1/2	.098	12.5984	2.5591	4.2520	5.0394	4 7/8	.118	14.9606	3.3465	5.4331	....	.157

BẢNG 6 : DUNG SAI ABEC-1 VÀ RBEC-1 CHO Ổ BI VÀ Ổ ĐŨA CHẶN THEO HỆ MÉT VÀ HỆ INCH

Table 6. ABEC-1 AND RBEC-1 TOLERANCES FOR METRIC AND INCH DIMENSION ANNULAR BALL AND ROLLER BEARINGS

Inner Ring Bore Diameter				Bore Tolerance,[2] inch				Radial Runout,[3] inch
Mm.		Inches						
Over	Incl.	Over	Incl.	$d_{aver.}$		$d_{min.}$[4]	$d_{max.}$[4]	
0	10	0.0000	0.3937	−.0003	+0	−.0004	+.0001	.0003
10	18	0.3937	0.7087	−.0003	+0	−.0004	+.0001	.0004
18	30	0.7087	1.1811	−.0004	+0	−.0005	+.0001	.0005
30	50	1.1811	1.9685	−.0005	+0	−.0007	+.0002	.0006
50	80	1.9685	3.1496	−.0006	+0	−.0008	+.0002	.0008
80	120	3.1496	4.7244	−.0008	+0	−.0011	+.0003	.0010
120	180	4.7244	7.0866	−.0010	+0	−.0013	+.0003	.0012

Outer Ring Outside Diameter				Outside Diameter Tolerance,[2] inch						Radial Run-out,[3] Inch
Mm.		Inches								
Over	Incl.	Over	Incl.	$D_{aver.}$		$D_{max.}$[5]	$D_{min.}$[5]	$D_{max.}$[6]	$D_{min.}$[6]	
0	18	0.0000	0.7087	+0	−.0004	+.0001	−.0005	+.0002	−.0006	.0006
18	30	0.7087	1.1811	+0	−.0004	+.0001	−.0005	+.0002	−.0006	.0006
30	50	1.1811	1.9685	+0	−.0005	+.0002	−.0007	+.0004	−.0009	.0008
50	80	1.9685	3.1496	+0	−.0005	+.0002	−.0007	+.0004	−.0009	.0010
80	120	3.1496	4.7244	+0	−.0006	+.0003	−.0009	+.0006	−.0012	.0014
120	150	4.7244	5.9055	+0	−.0008	+.0003	−.0011	+.0006	−.0014	.0016
150	180	5.9055	7.0866	+0	−.0010	+.0003	−.0013	+.0006	−.0016	.0018
180	250	7.0866	9.8425	+0	−.0012	+.0004	−.0016	+.0008	−.0020	.0020
250	315	9.8425	12.4015	+0	−.0014	+.0004	−.0018	+.0008	−.0022	.0024
315	400	12.4015	15.7480	+0	−.0016	+.0004	−.0020	+.0009	−.0025	.0028

Width Tolerances							
Bearings other than Duplex				Duplex Bearings			
Nom. Inner Ring Bore, mm.		Width Tolerance, inch[7]		Nom. Inner Ring Bore, mm.		Width Tolerance, inch[8]	
Over	Incl.			Over	Incl.		
0	180	+0	−.0050	0	80	+0	−.0200
180	315	+0	−.0100	80	180	+0	−.0300
315	400	+0	−.0160	180	315	+0	−.0400
...	...	...	...	315	400	+0	−.0500

Anti-Friction Bearing Manufacturers Association Standard.
For sizes beyond range of this table, see AFBMA Standards, Section No. 3.
[1] Not included are Type BM (Magneto), Tapered Roller Bearings, and Roller Bearing Types SA, SIA, SB, SIB, SIY, SIV, SIM, SIN, SIC, and SIT. [2] The amounts by which the maximum measured diameter, $d_{max.}$ or $D_{max.}$ the minimum measured diameter, $d_{min.}$ or $D_{min.}$ and the arithmetical average $d_{aver.}$ or $D_{aver.}$ of these two may vary from the nominal. [3] Total indicator reading. [4] These values apply to Diameter Series 0, 2, 3, and 4; in Diameter Series 0 only up to and including $d = 40$ mm. [5] These values apply only to Diameter Series 0, 2, 3, and 4 and before insertion of shields or seals, if any; in Diameter Series 0 up to and including $D = 80$ mm. and in Diameter Series 2 up to and including $D = 315$ mm. [6] Applicable to shielded or sealed bearings only in Diameter Series 2, 3, and 4. [7] Based on width of individual inner or outer ring. [8] Based on total width of inner or outer ring. If other than a pair of bearings is involved, the tolerance is in proportion to the number of bearings.

BẢNG 7 : DUNG SAI ABEC-5 VÀ ABEC-7 CHO Ổ BI CHẶN THEO HỆ MÉT VÀ HỆ INCH

DUNG SAI RBEC-5 CHO Ổ ĐŨA CHẶN THEO HỆ MÉT VÀ HỆ INCH

Inner Ring Bore Diameter				Bore Tolerances, inch				Radial Runout, Inch		Parallelism of Sides, inch		Side Runout with Bore, inch		Groove Parallelism with side, inch	
Mm.		Inches		$d_{min.}$	$d_{max.}$	$d_{min.}$	$d_{max.}$								
Over	Incl.	Over	Incl.	ABEC-5, RBEC-5		ABEC-7		ABEC-5, RBEC-5	ABEC-7	ABEC-5, RBEC-5	ABEC-7	ABEC-5, RBEC-5	ABEC-7	ABEC-5, RBEC-5	ABEC-7
0	10	0.0000	0.3937	−.0002	+0	−.00015	+0	.0002	.0001	.0002	.0001	.0003	.0001	.0003	.0001
10	18	0.3937	0.7087	−.0002	+0	−.00015	+0	.0002	.0001	.0002	.0001	.0003	.0001	.0003	.0001
18	30	0.7087	1.1811	−.0002	+0	−.00015	+0	.0002	.00015	.0002	.0001	.0003	.00015	.0003	.00015
30	50	1.1811	1.9685	−.0002	+0	−.0002	+0	.0002	.00015	.0002	.0001	.0003	.00015	.0003	.00015
50	80	1.9685	3.1496	−.0003	+0	−.0002	+0	.0002	.00015	.0002	.00015	.0003	.0002	.0003	.00015
80	120	3.1496	4.7244	−.0003	+0	−.00025	+0	.0003	.0002	.0003	.00015	.0003	.0002	.0004	.0002
120	180	4.7244	7.0866	−.0004	+0	−.0003	+0	.0003	.0003	.0003	.0002	.0004	.0003	.0004	.0003

Outer Ring Outside Diameter				Outside Diameter Tolerance, inch				Radial Runout, Inch		Parallelism of Sides, inch		O.D. Squareness with Side, inch		Groove Parallelism with side, inch	
Mm.		Inches		$D_{max.}$	$D_{min.}$	$D_{max.}$	$D_{min.}$								
Over	Incl.	Over	Incl.	ABEC-5, RBEC-5		ABEC-7		ABEC-5, RBEC-5	ABEC-7	ABEC-5, RBEC-5	ABEC-7	ABEC-5, RBEC-5	ABEC-7	ABEC-5, RBEC-5	ABEC-7
10	18	0.0000	0.7087	+0	−.0002	+0	−.0002	.0002	.0002	.0002	.0001	.0003	.00015	.0003	.0002
18	30	0.7087	1.1811	+0	−.0002	+0	−.0002	.0002	.0002	.0002	.0001	.0003	.00015	.0003	.0002
30	50	1.1811	1.9685	+0	−.0002	+0	−.0002	.0002	.0002	.0002	.0001	.0003	.00015	.0003	.0002
50	80	1.9685	3.1496	+0	−.0003	+0	−.0002	.0003	.0002	.0002	.0001	.0003	.00015	.0004	.0002
80	120	3.1496	4.7244	+0	−.0003	+0	−.0003	.0004	.0002	.0003	.0002	.0003	.0002	.0005	.0002
120	150	4.7244	5.9055	+0	−.0004	+0	−.0004	.0004	.0003	.0003	.0002	.0004	.0002	.0005	.0003
150	180	5.9055	7.0866	+0	−.0005	+0	−.0004	.0005	.0003	.0003	.0002	.0004	.0002	.0006	.0003
180	250	7.0866	9.8425	+0	−.0005	+0	−.0004	.0005	.0004	.0004	.0003	.0004	.0003	.0006	.0004
250	315	9.8425	12.4015	+0	−.0005	+0	−.0005	.0006	.0004	.0005	.0003	.0005	.0003	.0007	.0004
315	400	12.4015	15.7480	+0	−.0006	+0	−.0005	.0007	.0005	.0005	.0003	.0005	.0004	.0008	.0005

BẢNG 8 : DUNG SAI ABEC-9 THEO HỆ MÉT VÀ HỆ INCH CHO Ổ BI HƯỚNG TÂM

Table 8. ABEC-9 TOLERANCES FOR METRIC AND INCH DIMENSION RADIAL BALL BEARINGS

Inner Ring

Bore Diameter				Bore Tolerance, inch		Radial Run-out,[5] inch	Width Variation, inch	Side Runout with Bore, inch	Groove Runout with Side,[1] inch
Mm.		Inches							
Over	Incl.	Over	Incl.	$d_{min.}$	$d_{max.}$				
0	10	0.0000	0.3937	−.0001	+0	.00005	.00005	.00005	.00005
10	18	0.3937	0.7087	−.0001	+0	.00005	.00005	.00005	.00005
18	30	0.7087	1.1811	−.0001	+0	.0001	.00005	.00005	.0001
30	50	1.1811	1.9685	−.0001	+0	.0001	.00005	.00005	.0001
50	80	1.9685	3.1496	−.00015	+0	.0001	.00005	.00005	.0001
80	120	3.1496	4.7244	−.0002	+0	.0001	.0001	.0001	.0001
120	150	4.7244	5.9055	−.00025	+0	.0001	.0001	.0001	.0001
150	180	5.9055	7.0866	−.00025	+0	.0002	.00015	.00015	.0002

Outer Ring

Outside Diameter				Outside Diameter Tolerance, inch[2]		Radial Run-out,[6] inch	Width Variations, inch	Outside Cylin. Surface Runout with Side,[3] inch	Groove Runout with Side,[1] inch
Mm.		Inches							
Over	Incl.	Over	Incl.	$D_{max.}$	$D_{min.}$				
0	18	0	0.7087	+0	−.0001	.00005	.00005	.00005	.00005
18	30	0.7087	1.1811	+0	−.00015	.0001	.00005	.00005	.0001
30	50	1.1811	1.9685	+0	−.00015	.0001	.00005	.00005	.0001
50	80	1.9685	3.1496	+0	−.00015	.00015	.00005	.00005	.00015
80	120	3.1496	4.7244	+0	−.0002	.0002	.0001	.0001	.0002
120	150	4.7244	5.9055	+0	−.0002	.0002	.0001	.0001	.0002
150	180	5.9055	7.0866	+0	−.00025	.0002	.0001	.0001	.0002
180	250	7.0866	9.8425	+0	−.0003	.00025	.00015	.00015	.00025
250	315	9.8425	12.4015	+0	−.0003	.00025	.00015	.00015	.00025

Width Tolerance Limits

Bearings other than Duplex — Width of Individual Inner or Outer Ring				Duplex Bearings — Total Width of a Pair of Inner or Outer Rings[4]			
Nominal Inner Ring Bore		Width Tolerance, inch		Nominal Inner Ring Bore		Width Tolerance, inch	
Millimeters				Millimeters			
Over	Incl.			Over	Incl.		
0	10	+0	−.0010	0	80	+0	−.0200
10	80	+0	−.0050	80	180	+0	−.0300

1 Applies to groove type ball bearings only. "Side" is reference side.
2 Outer ring tolerances apply before seals or shields are inserted.
3 Applies to Bearing Width Series 1, or narrower, as designated in AFBMA Standards, Section No. 2 — Boundary Dimensions. "Side" is reference side.
4 If other than a pair of bearings is involved, the tolerance is in proportion to the number of bearings.
5 This is the difference between the maximum and minimum indicator readings taken on the bore when the inner ring is rotated one revolution.
6 This is the difference between the maximum and minimum indicator readings when the outer ring is rotated one revolution with the arbor stationary.

BẢNG 9 : KIỂU TIÊU CHUẨN BM. KÍCH THƯỚC GIỚI HẠN Ổ BI NGĂN CÁCH BẰNG TỪ TÍNH

Table 9. STANDARD TYPE BM (MAGNETO) SEPARABLE BALL BEARING BOUNDARY DIMENSIONS

Bearing Number	Bore		Outside Diameter		Individual Ring Width		Fillet Radius[1]	
	Mm	Inch	Mm	Inch	Mm	Inch	Mm	Inch
5BM002	5	.1969	16	0.6299	5	.1969	0.2	.008
6BM002	6	.2362	24	0.9449	7	.2756	0.3	.012
7BM002	7	.2756	24	0.9449	7	.2756	0.3	.012
8BM016	8	.3150	24	0.9449	7	.2756	0.3	.012
9BM001	9	.3543	28	1.1024	8	.3150	0.3	.012
10BM001	10	.3937	28	1.1024	8	.3150	0.3	.012
11BM002	11	.4331	32	1.2598	7	.2756	0.4	.016
12BM002	12	.4724	32	1.2598	7	.2756	0.4	.016
13BM001	13	.5118	30	1.1811	7	.2756	0.3	.012
14BM001	14	.5512	35	1.3780	8	.3150	0.5	.020
15BM001	15	.5906	35	1.3780	8	.3150	0.5	.020
16BM001	16	.6299	38	1.4961	10	.3937	1.0	.040
17BM003	17	.6693	44	1.7323	11[2]	.4331	1.0	.040

[1] The corner radius or chamfer on bearings must clear the maximum fillet radius given in the table. This specification does not control bearing corner contours.
[2] Outer ring width is 10 mm or .3937 inch.

BẢNG 10 : KÍCH THƯỚC GIỚI HẠN TIÊU CHUẨN Ổ BI THEO INCH

Table 10. STANDARD INCH DIMENSION BALL BEARING BOUNDARY DIMENSIONS

Bearing Number	Bore		Outside Diameter		Individual Ring Width				Fillet Radius
					Open		Shielded		
	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch
01BIC00V	...	0.0250	...	0.100	1/32	.....	...	.....	.003
02BIC00V	...	0.0400	1/8	......	3/64	.....	...	.....	.005
03BIC00	...	0.0469	5/32	......	1/16	.....	...	.....	.005
04BIC00	...	0.0550	3/16	......	5/64	.....	...	.....	.005
05BIC00	...	0.0781	1/4	......	3/32	.....	...	.....	.008
06BIC00	...	0.0937	5/16	......	7/64	.....	...	.....	.008
2BIC00	1/8	0.1250	3/8	0.3750	5/32	.1562	5/32	.1562	.012
2BIC02	1/8	0.1250	1/2	0.5000	11/64	.1719	11/64	.1719	.012
3BIC00	3/16	0.1875	1/2	0.5000	5/32	.1562	...	.1960	.012
4BIC00	1/4	0.2500	5/8	0.6250	...	.1960	...	.1960	.012
4BIC02	1/4	0.2500	3/4	0.7500	7/32	.2188	9/32	.2812	.016
6BIC00	3/8	0.3750	7/8	0.8750	7/32	.2188	9/32	.2812	.016
8BIC00	1/2	0.5000	1 1/8	1.1250	1/4	.2500	5/16	.3125	.016
10BIC00	5/8	0.6250	1 3/8	1.3750	9/32	.2812	11/32	.3438	.031
12BIC00	3/4	0.7500	1 5/8	1.6250	5/16	.3125	7/16	.4375	.031
14BIC00	7/8	0.8750	1 7/8	1.8750	3/8	.3750	1/2	.5000	.031
16BIC00	1	1.0000	2	2.0000	3/8	.3750	1/2	.5000	.031
18BIC00	1 1/8	1.1250	2 1/8	2.1250	3/8	.3750	1/2	.5000	.031
20BIC00	1 1/4	1.2500	2 1/4	2.2500	3/8	.3750	1/2	.5000	.031
22BIC00	1 3/8	1.3750	2 1/2	2.5000	7/16	.4375	9/16	.5625	.031
24BIC00	1 1/2	1.5000	2 5/8	2.6250	7/16	.4375	9/16	.5625	.031

BẢNG 11 : Ổ CÔN KIỂU TS

Table 11. TYPE TS TAPERED ROLLER BEARINGS

Bore Diam., Inch	Outside Diam., Inch	Bearing Width, Inch	Cone Radius Inch	Cup Radius Inch	Bore Diam., Inch	Outside Diam., Inch	Bearing Width, Inch	Cone Radius Inch	Cup Radius Inch
0.3750	1.2595	0.3940	3/64	3/64	1.2500	2.4410	0.7150	9/64	3/64
0.4720	1.2595	0.3940	1/32	3/64	1.2500	2.6875	0.8750	9/64	1/16
0.5000	1.3775	0.4330	3/64	3/64	1.2500	2.7170	0.7813	9/64	3/64
0.5900	1.3775	0.4330	1/32	3/64	1.2500	2.7500	0.9375	9/64	3/64
0.6250	1.5745	0.4730	3/64	3/64	1.2500	2.8593	1.1875	9/64	1/8
0.6250	1.6875	0.6563	1/16	1/16	1.2500	2.8750	0.8750	9/64	1/8
0.6250	1.8504	0.5662	1/16	3/64	1.2500	2.8750	0.8750	9/64	1/8
0.6250	1.9380	0.9063	1/32	1/16	1.2500	3.1250	1.1563	3/64	1/8
0.6696	1.5745	0.4730	1/32	3/64	1.2500	3.1496	0.8268	1/32	3/64
0.7500	1.5745	0.4730	.040	3/64	1.2600	2.8345	0.7480	1/16	1/16
0.7500	1.8504	0.5662	3/64	3/64	1.3125	2.7170	0.7813	9/64	3/64
0.7500	1.9380	0.7100	3/64	3/64	1.3125	2.7500	0.9375	9/64	3/64
0.7500	1.9380	0.9063	3/64	1/16	1.3125	2.8593	1.1875	9/64	1/8
0.7500	2.2400	0.7625	1/16	3/64	1.3125	2.8750	0.8750	9/64	1/8
0.7870	1.8504	0.5662	1/16	3/64	1.3125	3.0000	0.9375	9/64	1/8
0.7874	1.9687	0.5313	1/16	.040	1.3125	3.0000	1.1563	.025	1/8
0.8125	1.9380	0.7813	1/16	1/16	1.3750	2.7170	0.7813	1/16	3/64
0.8125	2.4375	1.1250	3/32	1/8	1.3750	2.8750	0.8750	9/64	1/8
0.8750	2.0470	0.5910	3/64	3/64	1.3750	2.8750	0.8750	1/32	1/8
0.8750	2.1250	0.7625	1/16	1/16	1.3750	2.8750	0.9375	9/64	3/32
0.8750	2.2400	0.7625	3/64	3/64	1.3750	3.0000	0.9375	13/64	1/8
0.8750	2.2500	0.8750	1/32	1/16	1.3750	3.0000	1.1563	1/16	1/8
0.9375	2.2400	0.7625	1/32	3/64	1.3750	3.0000	1.1563	9/64	1/8
0.9375	2.4375	1.1250	3/32	1/8	1.3750	3.1250	1.1563	9/64	1/8
0.9375	2.6150	0.9375	1/32	3/64	1.3750	3.1496	0.8268	1/32	3/64
0.9375	2.8345	0.7480	3/32	1/16	1.3750	3.1562	1.1563	9/64	1/8
0.9835	2.0470	0.5910	1/16	3/64	1.3750	3.4843	1.0625	1/32	1/32
1.0000	2.0470	0.5910	.040	3/64	1.3750	3.7500	1.0938	1/32	3/32
1.0000	2.2500	0.6875	3/64	1/16	1.3770	2.8345	0.6700	1/16	1/16
1.0000	2.3125	0.7500	3/64	3/64	1.3779	3.1496	0.8268	1/32	3/64
1.0000	2.5000	0.8125	9/64	3/64	1.3779	3.1562	1.0000	1/32	1/8
1.0000	2.6150	0.9375	3/64	3/64	1.4365	3.0000	0.9375	9/64	1/8
1.0000	2.8345	0.7480	1/16	1/16	1.4375	2.8345	0.6700	1/16	1/16
1.0000	2.8592	1.1875	1/32	1/8	1.4375	2.8345	0.7480	9/64	1/16
1.0625	2.2500	0.6875	9/64	1/16	1.4375	3.3750	1.1875	1/32	1/8
1.1250	2.3125	0.7500	1/32	3/64	1.5000	2.5625	0.5000	1/16	1/32
1.1250	2.5000	0.8125	9/64	9/64	1.5000	2.7170	0.7500	9/64	3/32
1.1250	2.6150	0.9375	3/64	3/64	1.5000	2.8345	0.6700	.060	1/16
1.1250	2.6875	0.8750	1/32	1/16	1.5000	2.8440	0.8125	9/64	3/64
1.1250	2.7500	0.9375	3/32	3/64	1.5000	3.0000	0.9375	9/64	1/8
1.1250	2.8345	0.7480	1/16	1/16	1.5000	3.1250	1.1563	9/64	1/8
1.1250	2.8593	1.1875	3/64	1/8	1.5000	3.1495	0.8270	9/64	1/16
1.1250	2.8570	0.8750	1/32	1/8	1.5000	3.1495	0.8268	1/32	3/64
1.1562	2.6150	0.9375	9/64	3/64	1.5000	3.1562	1.1563	9/64	1/8
1.1805	2.4410	0.6300	1/16	1/16	1.5000	3.3750	1.1875	9/64	1/8
1.1805	2.5000	0.8125	3/64	3/64	1.5000	3.4843	1.0625	9/64	1/16
1.1810	2.7170	0.7813	9/64	3/64	1.5000	3.6875	1.2500	9/64	1/8
1.1875	2.4410	0.6300	1/16	1/16	1.5000	3.7500	1.0938	9/64	3/32
1.1875	2.7500	0.9375	3/32	3/64	1.5000	4.2500	1.4375	9/64	1/8
1.1875	2.8593	1.1875	9/64	1/8	1.5625	3.1562	1.0000	9/64	1/8
1.1895	2.5000	0.8125	9/64	3/64	1.5625	3.1562	1.1563	9/64	1/8
1.1900	2.7170	0.7813	1/32	3/64	1.5625	3.4843	1.0625	9/64	1/16
1.2450	2.6250	0.8125	1/16	1/16	1.5740	3.0000	0.7090	1/16	1/16
1.2500	2.3125	0.5781	.040	.040	1.5748	3.1495	0.8270	1/16	1/16

BẢNG 11 : Ổ CÔN KIỂU TS

Table 11 TYPE TS TAPERED ROLLER BEARINGS

Bore Diam., Inch	Outside Diam., Inch	Bearing Width, Inch	Cone Radius Inch	Cup Radius Inch	Bore Diam., Inch	Outside Diam., Inch	Bearing Width, Inch	Cone Radius Inch	Cup Radius Inch
1.5748	3.1496	0.8268	9/64	3/64	1.9685	3.5000	0.8125	3/32	3/64
1.5748	3.4843	1.0625	9/64	1/16	1.9685	4.1250	1.1875	3/32	1/8
1.6250	3.0000	0.8750	9/64	1/32	2.0000	3.3750	0.7500	.060	.060
1.6250	3.1495	0.7090	1/16	1/16	2.0000	3.5000	0.8125	1/16	3/64
1.6250	3.1496	0.8268	9/64	3/64	2.0000	3.5000	0.8125	9/64	3/64
1.6250	3.1562	1.0000	9/64	1/8	2.0000	3.6718	1.1875	9/64	1/8
1.6250	3.3750	1.1875	9/64	1/8	2.0000	3.8125	0.8750	3/32	1/16
1.6250	3.4375	1.1875	9/64	1/8	2.0000	4.0000	1.2500	9/64	1/8
1.6250	3.4843	1.0625	9/64	1/16	2.0000	4.0000	1.3750	9/64	1/8
1.6250	3.5625	1.5625	9/64	1/8	2.0000	4.1250	1.1875	1/32	1/8
1.6250	3.6875	1.2500	9/64	1/8	2.0000	4.1250	1.4375	9/64	1/8
1.6250	3.6875	1.2500	1/32	1/8	2.0000	4.1250	1.5625	9/64	1/8
1.6250	3.7500	1.0938	9/64	3/32	2.0000	4.2500	1.4375	9/64	1/8
1.6250	4.0000	1.3750	9/64	1/8	2.0000	4.4375	1.1875	9/64	1/8
1.6875	3.0312	0.6875	.060	.060	2.0000	4.7500	1.6250	9/64	1/8
1.6875	3.2650	0.9375	.090	1/32	2.0000	4.8750	1.5000	3/32	1/8
1.6875	3.4375	1.1875	9/64	1/8	2.0000	5.0000	2.0000	9/64	1/8
1.6880	3.1496	0.8268	9/64	3/64	2.0625	3.6718	1.1875	3/32	1/8
1.6880	3.1562	1.0000	9/64	1/8	2.0625	3.7500	1.0938	1/16	3/32
1.6880	3.2650	0.9375	9/64	1/32	2.0625	3.8125	0.8750	3/32	1/16
1.7500	3.0312	0.6875	.060	.060	2.0625	4.2500	1.4375	9/64	1/8
1.7500	3.1875	0.7500	0	1/16	2.1250	3.8750	0.8268	1/32	1/32
1.7500	3.2650	0.8750	9/64	1/32	2.1250	4.1250	1.1875	9/64	1/8
1.7500	3.2650	0.9375	9/64	1/32	2.1250	4.1250	1.5625	9/64	1/8
1.7500	3.3464	0.8125	3/32	3/64	2.1250	4.2500	1.4375	9/64	1/8
1.7500	3.4375	1.1875	9/64	1/8	2.1250	4.7500	1.6250	9/64	1/8
1.7500	3.6875	1.2500	9/64	1/8	2.1250	4.8750	1.5000	9/64	1/8
1.7500	3.6875	1.2500	9/64	1/8	2.1250	5.0000	2.0000	9/64	1/8
1.7500	3.7500	1.0938	9/64	3/32	2.1250	5.3750	1.6250	9/64	1/8
1.7500	4.0000	1.3750	9/64	1/8	2.1653	3.8750	0.8268	3/32	1/32
1.7500	4.1250	1.1875	9/64	1/8	2.1875	4.1250	1.1875	3/32	1/8
1.7500	4.1250	1.4375	9/64	1/8	2.1880	3.8750	0.8268	3/32	1/32
1.7500	4.2500	1.4375	9/64	1/8	2.2500	3.8437	0.9688	9/64	1/32
1.7500	4.5000	1.7500	9/64	1/32	2.2500	3.8750	0.8268	3/32	1/32
1.7500	4.7500	1.6250	9/64	1/8	2.2500	3.8750	0.8268	9/64	1/32
1.7710	3.2650	0.9375	1/16	1/32	2.2500	4.1250	1.1875	3/32	1/8
1.7710	3.6718	1.1875	9/64	1/8	2.2500	4.3307	0.8661	3/32	3/64
1.7716	3.3464	0.8125	1/16	3/64	2.2500	4.4375	1.1875	9/64	1/8
1.7716	3.8125	0.8750	1/32	1/16	2.2500	4.7500	1.6250	9/64	1/8
1.8125	3.1250	0.6875	7/64	1/16	2.2500	4.8750	1.5000	9/64	1/8
1.8125	3.1875	0.7500	1/32	1/16	2.2500	5.0000	1.7500	9/64	1/8
1.8125	3.3464	0.8125	3/32	3/64	2.2500	5.3447	2.1250	11/64	1/8
1.8125	3.3464	1.0000	9/64	3/64	2.3622	4.2500	1.0000	1/32	1/8
1.8125	3.7500	1.0938	9/64	3/32	2.3622	4.3307	0.8661	1/32	3/64
1.8750	3.5000	0.8125	9/64	3/64	2.3750	4.0000	1.0000	9/64	1/8
1.8750	3.6718	1.1875	1/4	1/8	2.3750	4.4375	1.1875	9/64	1/8
1.8750	3.6718	1.1875	9/64	1/8	2.3750	4.8125	1.7188	1/32	1/8
1.8750	4.0000	1.2500	9/64	1/8	2.3750	5.3447	2.1250	9/64	1/8
1.8750	4.0000	1.3750	9/64	1/8	2.5000	4.1250	0.8438	.080	.080
1.8750	4.0625	1.7188	3/64	1/8	2.5000	4.3307	0.8661	9/64	3/64
1.8750	4.1250	1.1875	3/16	1/8	2.5000	4.4375	1.1875	9/64	1/8
1.8750	4.2500	1.4375	9/64	1/8	2.5000	4.6250	1.1875	1/32	1/8
1.8750	4.7500	1.6250	9/64	1/8	2.5000	4.7244	1.1418	1/32	1/8
1.9375	3.6718	1.1875	9/64	1/8	2.5000	4.8125	1.7188	9/64	1/8
1.9375	4.0625	1.7188	9/64	1/8	2.5000	4.8750	1.5000	9/64	1/8

BẢNG 11 : Ổ CÔN KIỂU TS

Table 11. TYPE TS TAPERED ROLLER BEARINGS

Bore Diam., Inch	Outside Diam., Inch	Bearing Width, Inch	Cone Radius Inch	Cup Radius Inch	Bore Diam., Inch	Outside Diam., Inch	Bearing Width, Inch	Cone Radius Inch	Cup Radius Inch
2.5000	5.0000	1.4375	9/64	1/8	3.3750	5.3750	1.1875	9/64	1/8
2.5000	5.3750	1.6250	9/64	1/8	3.3750	6.0000	1.5625	9/64	1/8
2.5625	5.3447	2.1250	9/64	1/8	3.3750	6.0000	1.6250	9/64	1/8
2.6250	4.3307	0.8661	9/64	3/64	3.5000	5.8437	1.1250	.120	.120
2.6250	4.4375	1.1875	9/64	1/8	3.5000	6.0000	1.5625	9/64	1/8
2.6250	4.6250	1.1875	9/64	1/8	3.5000	6.3750	1.8750	9/64	1/8
2.6250	4.7244	1.1418	3/32	1/8	3.5000	6.3750	2.1250	9/64	1/8
2.6250	4.8750	1.5000	9/64	1/8	3.5000	7.5000	2.2500	5/16	1/8
2.6250	5.3447	2.1250	11/64	1/8	3.5430	6.3030	1.1860	3/32	1/8
2.6250	5.3750	1.6250	9/64	1/8	3.6250	5.7500	1.3125	9/64	1/8
2.6875	4.3307	0.8661	3/32	3/64	3.6250	5.8437	1.1250	9/64	.120
2.6875	4.7244	1.1418	9/64	1/8	3.6250	6.0000	1.5625	9/64	1/8
2.6875	4.8750	1.5000	9/64	1/8	3.6250	6.7500	1.8750	9/64	1/8
2.6875	5.0000	1.4375	9/64	1/8	3.6875	5.8437	1.1250	.120	.120
2.7500	4.6250	1.1875	9/64	1/8	3.7500	5.8437	1.1250	.120	.120
2.7500	4.7244	1.1418	9/64	1/8	3.7500	6.0000	1.5625	9/64	1/8
2.7500	5.0000	1.4375	9/64	1/8	3.7500	6.6250	1.6250	9/64	1/8
2.7500	5.3750	1.6250	9/64	1/8	3.7500	6.7500	1.8750	9/64	1/8
2.7500	5.8750	2.1250	13/64	1/8	3.7500	7.5000	2.2500	5/16	1/8
2.7500	6.0000	1.6250	9/64	1/8	3.8750	6.1875	1.4375	9/64	1/8
2.7500	6.6250	2.1250	9/64	1/8	3.8750	6.6250	1.6250	9/64	1/8
2.7559	4.7812	0.9688	.080	.080	3.8750	7.1250	1.8750	9/64	1/8
2.8125	4.6250	1.1875	9/64	1/8	4.0000	6.1875	1.4375	9/64	1/8
2.8125	5.0000	1.4375	9/64	1/8	4.0000	6.6250	1.6250	9/64	1/8
2.8125	5.3750	1.6250	1/4	1/8	4.0000	7.1250	1.8750	9/64	1/8
2.8750	5.0000	1.4375	9/64	1/8	4.0000	7.5000	2.2500	5/16	1/8
2.8750	5.8750	2.1250	9/64	1/8	4.1250	7.1250	1.8750	9/64	1/8
2.8750	5.9090	1.7500	9/64	1/8	4.1875	6.5000	1.4375	9/64	1/8
2.8750	6.0000	1.6250	9/64	1/8	4.2500	6.2500	0.9063	9/64	1/8
2.9062	5.0000	1.4375	1/32	1/8	4.2500	6.5000	1.4375	9/64	1/8
3.0000	4.7812	0.9688	.080	.080	4.2500	7.5000	1.8750	9/64	1/8
3.0000	5.0000	1.1875	9/64	1/8	4.2500	8.3750	2.6250	5/16	1/8
3.0000	5.2500	1.3125	1/32	1/8	4.3304	7.0000	1.6250	9/64	1/8
3.0000	5.3750	1.1875	9/64	1/8	4.3750	7.5000	1.8750	9/64	1/8
3.0000	5.5115	1.4375	9/64	1/8	4.5000	7.0000	1.6250	9/64	1/8
3.0000	5.8750	2.1250	9/64	1/8	4.5000	7.5000	1.8750	9/64	1/8
3.0000	5.9090	1.7500	9/64	1/8	4.5000	8.3750	2.6250	9/32	1/8
3.0000	6.0000	1.6250	9/64	1/8	4.6250	7.1250	1.3750	9/64	1/8
3.0000	6.3750	2.1250	9/64	1/8	4.7500	8.1250	1.8750	1/8	1/8
3.0000	6.6250	2.1250	1/4	1/8	4.7500	10.0000	3.0625	3/8	1/4
3.0625	4.7812	0.9688	9/64	.080	5.0000	8.0000	1.8125	9/64	1/8
3.1875	5.2500	1.3125	9/64	1/8	5.0000	8.5000	1.8750	9/64	1/8
3.1875	5.3750	1.1875	9/64	1/8	5.0000	9.2500	2.5000	1/4	1/8
3.1875	5.5115	1.4375	9/64	1/8	5.0000	9.7500	2.5000	1/8	3/16
3.1875	5.9090	1.7500	13/64	1/8	5.0000	10.0000	3.0625	3/8	1/4
3.1875	6.6250	2.1250	1/32	1/8	5.0000	11.6250	3.2500	17/32	1/4
3.2500	5.2500	1.3125	9/64	1/8	5.0000	11.6250	3.3750	1/4	1/4
3.2500	5.3750	1.1875	9/64	1/8	5.0000	12.0000	3.1250	1/4	1/8
3.2500	5.5115	1.4375	9/64	1/8	5.0000	12.0000	2.3750	1/4	1/4
3.2500	6.0000	1.6250	9/64	1/8	5.0625	7.5000	1.3750	9/64	1/8
3.2500	6.3750	2.1250	9/64	1/8	5.0625	8.1250	1.8750	1/8	1/8
3.2500	6.6250	2.1250	9/64	1/8	5.1181	8.1250	1.8750	9/64	1/8
3.2813	4.9375	1.0000	9/64	1/16	5.2500	8.0000	1.8125	9/64	1/8
3.3125	5.3750	1.1875	9/64	1/8	5.2500	8.5000	1.8750	9/64	1/8
3.3475	5.9090	1.7500	9/64	1/8	5.2500	9.2500	2.5000	3/8	1/8

BẢNG 12 : DUNG SAI TIÊU CHUẨN CHO Ổ CÔN VÀ Ổ ĐŨA TỰ LỰA

Table 12. AFBMA STANDARD TOLERANCES FOR TAPERED ROLLER BEARINGS, AND SELF-ALIGNING ROLLER BEARINGS

	Class 4		Class 2		Class 3		Class 0		Class 00	
Cone Bore	Cone Bore Tolerances, Inches									
Up to 2½ in., incl.	+.0005,	−0	+.0005,	−0	+.0005,	−0	+.0005,	−0	+.0003,	−0
Over 2½ to 12 in., incl.	+.001,	−0	+.001,	−0	+.0005,	−0	+.0005,	−0	+.0003,	−0
Over 12 to 24 in., incl.	+.002,	−0	+.002,	−0	+.001,	−0	....		....	
Cup Outside Diameter	Cup Outside Diameter Tolerances, Inches									
Up to 12 in., incl.	+.001,	−0	+.001,	−0	+.0005,	−0	+.0005,	−0	+.0003,	−0
Over 12 to 24 in., incl.	+.002,	−0	+.002,	−0	+.001,	−0	....		....	
Over 24 to 36 in., incl.	+.003,	−0	+.002,	−0	+.0015,	−0	....		....	
Bearing Type and Size	Overall Bearing Width Tolerances, Inches**									
TS, TSF, TSS, TSSF, and TST	+	−	+	−	+	−	+	−	+	−
To 4-in. bore, incl.†	.008	.000	.008	.000	.008	.008	.008	.008	.008	.008
Over 4- to 12-in. bore, incl.	.014	.010	.008	.000	.008	.008	.008	.008	.008	.008
Over 12-in. bore; up to 20-in. cup O.D., incl.	.015	.015	.015	.015	.008	.008	...	...	...	...
Over 12-in. bore; over 20-in. cup O.D.	.015	.015	.015	.015	.015	.015	...	...	...	...
TNA and TNAS										
To 5-in. bore, incl.	.010	.000	.010	.000	.010	.000	...	...	...	...
Over 5-in. bore	.030	.000	.030	.000	.030	.000	...	...	...	...
TDI, TDO, TDIS & TDOS										
To 4-in. bore, incl.	.016	.000	.016	.000	.016	.016	.016	.016	.016	.016
Over 4-in. to 12-in. bore, incl.	.028	.020	.016	.016	.016	.016	.016	.016	.016	.016
Over 12-in. bore; up to 20-in. cup O.D., incl.	.030	.030	.030	.030	.016	.016	...	...	...	...
Over 12-in. bore; over 20-in. cup O.D.	.030	.030	.030	.030	.030	.030	...	...	...	...

Bearing Outside Diameter	Class 4	Class 2	Class 3	Class 0	Class 00
	Assembled Bearing Maximum Runout, Inches				
Up to 12 in., incl.	.0020	.0015	.0003	.00015	.000075
Over 12 to 24 in., incl.	.0020	.0015	.0007	....	....
Over 24 to 36 in., incl.	.0030	.0020	.0020	....	....

Radius tolerance is +1/64 in., −0.

* Self-aligning Types SA, SIA, SB, SIB, SIY, SIV, SIM, SIN, SIC, and SIT.

** For TSF and TSSF bearings, width tolerances apply to dimension from back face of cup flange to back face of cone.

† For Class 4B bearings tolerance is +.014 in., −.010 in.

BANG 13 : Ô KIM KIỂU NAA, NAB, NBA, NBB

Table 13. TYPES NAA, NAB, NBA, AND NBB NEEDLE ROLLER BEARINGS

TYPES NAA AND NBA				TYPES NAB AND NBB					
Bore Diam.	Outside Diam.	Width	Fillet Radius	Bore Diam.	Outside Diam.	Inner Ring O.D.	Outer Ring O.D.	Overall Width	Fillet Radius
Inches	Inches	Inches	Inch	Inches	Inches	Inches	Inches	Inches	Inch
0.3750	0.8125	0.750	.025	0.3750	1.1250	0.625	0.750	0.760	.025
0.5000	1.0000	0.750	.025	0.5000	1.2500	0.750	0.750	0.760	.040
0.6250	1.1250	0.750	.025	0.6250	1.3750	0.875	0.750	0.760	.040
0.7500	1.2500	0.750	.040	0.7500	1.5000	1.000	1.000	1.010	.040
0.8750	1.3750	0.750	.040	0.8750	1.6250	1.125	1.000	1.010	.040
1.0000	1.5000	1.000	.040	1.0000	1.7500	1.250	1.000	1.010	.040
1.1250	1.6250	1.000	.040	1.1250	1.8750	1.375	1.000	1.010	.040
1.2500	1.7500	1.000	.040	1.2500	2.0625	1.500	1.250	1.260	.060
1.3750	1.8750	1.000	.040	1.3750	2.1875	1.625	1.250	1.260	.060
1.5000	2.0625	1.250	.060	1.5000	2.3125	1.750	1.250	1.260	.060
1.6250	2.1875	1.250	.060	1.6250	2.5625	2.000	1.250	1.260	.060
1.7500	2.3125	1.250	.060	1.7500	3.0000	2.250	1.500	1.510	.060
1.8750	2.4375	1.250	.060	2.0000	3.2500	2.500	1.500	1.510	.080
2.0000	2.5625	1.250	.060	2.2500	3.5000	2.750	1.500	1.510	.080
2.2500	3.0000	1.500	.060	2.5000	3.7500	3.000	1.500	1.510	.080
2.5000	3.2500	1.500	.080	2.7500	4.2500	3.250	2.000	2.010	.080
2.7500	3.5000	1.500	.080	3.0000	4.5000	3.500	2.000	2.010	.080
3.0000	3.7500	1.500	.080	3.2500	5.0000	4.000	2.000	2.010	.100
3.2500	4.2500	2.000	.080	3.5000	5.2500	4.250	2.000	2.010	.100
3.5000	4.5000	2.000	.080	3.7500	6.0000	4.500	2.500	2.515	.100
3.7500	4.7500	2.000	.100	4.0000	6.5000	5.000	2.500	2.515	.100
4.0000	5.0000	2.000	.100	4.5000	7.0000	5.500	2.500	2.515	.100
4.2500	5.2500	2.000	.100	5.0000	7.5000	6.000	2.500	2.515	.120
4.5000	6.0000	2.500	.100	5.5000	8.0000	6.500	2.500	2.515	.120
5.0000	6.5000	2.500	.100	6.0000	9.1250	7.250	3.000	3.015	.120
5.5000	7.0000	2.500	.100	6.5000	9.6250	7.750	3.000	3.015	.120
6.0000	7.5000	2.500	.120	7.0000	10.1250	8.250	3.000	3.015	.120
6.5000	8.0000	2.500	.120	7.5000	10.6250	8.750	3.000	3.015	.160
7.2500	9.1250	3.000	.120	8.0000	11.1250	9.250	3.000	3.015	.160
7.7500	9.6250	3.000	.120	....	....	....	....	....	....
8.2500	10.1250	3.000	.120	....	....	....	....	....	....
8.7500	10.6250	3.000	.160	....	....	....	....	....	....
9.2500	11.1250	3.000	.160	....	....	....	....	....	....

BANG 14 : DUNG SAI TIÊU CHUẨN AFBMA CHO Ô KIM CÔNG NGHIỆP

Table 14. AFBMA STANDARD TOLERANCES FOR INDUSTRIAL NEEDLE ROLLER BEARINGS

Bore or Outside Diameter			Bearing Widths			Shaft Diameter (Series NAA and NBA)		
Dimension, Inches		Tolerance, Inch	Size, Inches	Tolerance, Inch		Size, Inches		Tolerance, Inch
Over	Incl.	+0.0000				From	To	+0.0000
0.0000	0.7500	−0.0004	Outer Ring, all sizes	+0.000	−0.005	0	4	−0.0005
0.7500	2.0000	−0.0005				4	6	−0.0007
2.0000	3.2500	−0.0006				6	—	−0.0010
3.2500	4.7500	−0.0008	Inner Ring,			...	...	....
4.7500	7.2500	−0.0010	5-in. O. D. or less	+0.005	+0.010	...	...	....
7.2500	10.2500	−0.0012	Over 5-in. O. D.	+0.010	+0.015	...	...	....
10.2500	12.5000	−0.0014				...	...	....

BẢNG 15 : Ổ BI CHẶN MỘT HƯỚNG KIỂU TA KÍCH THƯỚC THEO HỆ MÉT

Table 15. TYPE TA ONE-DRIRECTION BALL THRUST BEARINGS - METRIC DIMENSIONS

Bearing Number	Small Bore Diam., Nom.		Large Bore Diam., Nom.		Outside Diam., Nom.		Height, Nominal		Fillet Radius*
	Mm.	Inches	Mm.	Inches	Mm.	Inches	Mm.	Inches	Inch
DIMENSION SERIES 11									
35TA11	35	1.3780	36	1.417	53	2.0866	12	0.472	.024
40TA11	40	1.5748	42	1.654	60	2.3622	13	0.512	.024
45TA11	45	1.7717	47	1.850	65	2.5591	14	0.551	.024
50TA11	50	1.9685	52	2.047	70	2.7559	14	0.551	.024
55TA11	55	2.1654	57	2.244	78	3.0709	16	0.630	.024
60TA11	60	2.3622	62	2.441	85	3.3465	17	0.669	.039
65TA11	65	2.5591	67	2.638	90	3.5433	18	0.709	.039
70TA11	70	2.7559	72	2.835	95	3.7402	18	0.709	.039
75TA11	75	2.9528	77	3.031	100	3.9370	19	0.748	.039
80TA11	80	3.1496	82	3.228	105	4.1339	19	0.748	.039
85TA11	85	3.3465	88	3.465	110	4.3307	19	0.748	.039
90TA11	90	3.5433	93	3.661	120	4.7244	22	0.866	.039
100TA11	100	3.9370	103	4.055	135	5.3150	25	0.984	.039
110TA11	110	4.3307	113	4.449	145	5.7087	25	0.984	.039
120TA11	120	4.7244	123	4.843	155	6.1024	25	0.984	.039
130TA11	130	5.1181	133	5.236	170	6.6929	30	1.181	.039
140TA11	140	5.5118	143	5.630	180	7.0866	31	1.220	.039
150TA11	150	5.9055	153	6.024	190	7.4803	31	1.220	.039
160TA11	160	6.2992	163	6.417	200	7.8740	31	1.220	.039
170TA11	170	6.6929	173	6.811	215	8.4646	34	1.339	.039
180TA11	180	7.0866	183	7.205	225	8.8583	34	1.339	.039
190TA11	190	7.4803	193	7.598	240	9.4488	37	1.457	.039
200TA11	200	7.8740	203	7.992	250	9.8425	37	1.457	.039
220TA11	220	8.6614	223	8.780	270	10.6299	37	1.457	.039
240TA11	240	9.4488	243	9.567	300	11.8110	45	1.772	.059
260TA11	260	10.2362	263	10.354	320	12.5984	45	1.772	.059
280TA11	280	11.0236	283	11.142	350	13.7795	53	2.087	.059
LIGHT SERIES									
10TA025	10	0.3937	10.2	0.4016	26	1.0236	12	0.4724	.02
12TA025	12	0.4724	12.2	0.4803	28	1.1024	12	0.4724	.02
15TA025	15	0.5906	15.2	0.5985	31	1.2205	12	0.4724	.02
18TA025	18	0.7087	18.2	0.7166	35	1.3780	12	0.4724	.02
20TA025	20	0.7874	20.2	0.7953	37	1.4567	12	0.4724	.02
25TA025	25	0.9843	25.2	0.9922	45	1.7717	14	0.5512	.02
30TA025	30	1.1811	30.2	1.1890	50	1.9685	14	0.5512	.02
35TA025	35	1.3780	35.2	1.3859	55	2.1654	16	0.6299	.02
40TA025	40	1.5748	40.2	1.5827	60	2.3622	16	0.6299	.02
45TA025	45	1.7717	45.2	1.7796	68	2.6772	16	0.6299	.02
50TA025	50	1.9685	50.2	1.9764	74	2.9134	18	0.7087	.02
55TA025	55	2.1654	55.2	2.1733	78	3.0709	18	0.7087	.02
60TA025	60	2.3622	60.2	2.3701	82	3.2284	18	0.7087	.02
65TA025	65	2.5591	65.2	2.5670	90	3.5433	20	0.7874	.02
70TA025	70	2.7559	70.2	2.7638	95	3.7402	20	0.7874	.02
75TA025	75	2.9528	75.2	2.9607	100	3.9370	20	0.7874	.02
80TA025	80	3.1496	80.2	3.1575	110	4.3307	22	0.8661	.02
85TA025	85	3.3465	85.2	3.3544	115	4.5276	22	0.8661	.02
90TA11	90	3.5433	90.2	3.5512	120	4.7244	22	0.8661	.02
95TA025	95	3.7402	95.2	3.7481	130	5.1181	25	0.9843	.02
100TA11	100	3.9370	100.2	3.9449	135	5.3150	25	0.9843	.02
105TA025	105	4.1339	105.2	4.1418	140	5.5118	25	0.9843	.02
110TA011	110	4.3307	110.2	4.3386	145	5.7087	25	0.9843	.02
115TA025	115	4.5276	115.2	4.5355	150	5.9055	25	0.9843	.02
120TA025	120	4.7244	120.2	4.7323	160	6.2992	27	1.0630	.02
125TA025	125	4.9213	125.2	4.9292	165	6.4961	27	1.0630	.02

* For tolerances see Table 19. See also footnote at end of table.

BẢNG 15 : Ổ BI CHẶN MỘT HƯỚNG KIỂU TA KÍCH THƯỚC THEO HỆ MÉT

Table 15. TYPE TA ONE-DRIRECTION BALL THRUST BEARINGS - METRIC DIMENSIONS

Bearing Number	Small Bore Diam., Nom.		Large Bore Diam., Min.		Outside Diam., Nom.		Height, Nominal		Fillet Radius
	Mm.	Inches	Mm.	Inches	Mm.	Inches	Mm.	Inches	Inch
MEDIUM SERIES									
10TA026	10	0.3937	10.2	0.4016	30	1.1811	12	0.4724	.02
15TA026	15	0.5906	15.2	0.5985	35	1.3780	14	0.5512	.02
20TA12	20	0.7874	20.2	0.7953	40	1.5748	14	0.5512	.02
25TA026	25	0.9843	25.2	0.9922	48	1.8898	15.5	0.6103	.02
30TA026	30	1.1811	30.2	1.1890	53	2.0866	15.5	0.6103	.02
35TA12	35	1.3780	35.2	1.3859	62	2.4409	18	0.7087	.02
40TA026	40	1.5748	40.2	1.5827	64	2.5197	18	0.7087	.02
45TA026	45	1.7717	45.2	1.7796	73	2.8740	22	0.8661	.02
50TA12	50	1.9685	50.2	1.9764	78	3.0709	22	0.8661	.02
55TA026	55	2.1654	55.2	2.1733	88	3.4646	24.5	0.9646	.02
60TA026	60	2.3622	60.2	2.3701	90	3.5433	24.5	0.9646	.02
65TA12	65	2.5591	65.2	2.5670	100	3.9370	27	1.0630	.04
70TA026	70	2.7559	70.2	2.7638	103	4.0551	27	1.0630	.04
75TA12	75	2.9528	75.2	2.9607	110	4.3307	27	1.0630	.04
80TA026	80	3.1496	80.2	3.1575	115	4.5276	29	1.1417	.04
85TA026	85	3.3465	85.2	3.3544	125	4.9213	30.5	1.2008	.04
90TA026	90	3.5433	90.2	3.5512	135	5.3150	30.5	1.2008	.04
95TA026	95	3.7402	95.2	3.7481	140	5.5118	32.5	1.2795	.04
100TA026	100	3.9370	100.2	3.9449	150	5.9055	32.5	1.2795	.04
105TA026	105	4.1339	105.2	4.1418	155	6.1024	40	1.5748	.04
115TA026	115	4.5276	115.2	4.5355	165	6.4961	43	1.6929	.04
125TA026	125	4.9213	125.2	4.9292	175	6.8898	46.5	1.8307	.04
140TA026	140	5.5118	140.2	5.5197	200	7.8740	52	2.0472	.04

BẢNG 16 : Ổ BI CHẶN TỰ LỰA MỘT HƯỚNG KIỂU TE VÀ TF KÍCH THƯỚC THEO HỆ MÉT

Table 16. TYPES TE AND TF ONE-DIRECTION SELF-ALIGNING BALL THRUST BEARINGS - METRIC DIMENSIONS

Small Bore Diam., Nom.		Large Bore Diam., Min.		Outside Diam., Nominal	Aligning Washer O.D., Nom.	Height, Nominal	Aligning Seat Radius	Aligning Seat Center	Fillet Radius
Mm.	Inches	Mm.	Inches	Inches	Inches	Inches	Inches	Inches	Inch
10	0.3937	12	.472	1.1811	1.3780	0.5906	0.9843	0.402	.02
15	0.5906	17	.669	1.3780	1.4961	0.6693	1.1811	0.488	.02
20	0.7874	22	.866	1.5748	1.7717	0.7087	1.3780	0.638	.02
25	0.9843	27	1.063	1.8898	1.9685	0.7480	1.3780	0.492	.02
30	1.1811	32	1.260	2.0866	2.3228	0.7874	1.5748	0.630	.02
35	1.3780	37	1.457	2.4409	2.6378	0.9055	1.9685	0.913	.02
40	1.5748	42	1.654	2.5197	2.7165	0.9055	1.9685	0.882	.02
45	1.7717	47	1.850	2.8740	3.0709	1.0630	2.3622	1.126	.02
50	1.9685	52	2.047	3.0709	3.2677	1.0630	2.5591	1.299	.02
55	2.1654	57	2.244	3.4646	3.7008	1.1811	2.7559	1.276	.02
60	2.3622	62	2.441	3.5433	3.7795	1.1811	2.9528	1.496	.02
65	2.5591	67	2.638	3.9370	4.1339	1.3386	3.1496	1.516	.04
70	2.7559	72	2.835	4.0551	4.2913	1.3386	3.3465	1.677	.04
75	2.9528	77	3.031	4.3307	4.4882	1.3386	3.5433	1.819	.04
80	3.1496	82	3.228	4.5276	4.8819	1.4567	3.7402	1.913	.04
85	3.3465	88	3.465	4.9213	5.4331	1.5748	4.1339	2.161	.04
90	3.5433	93	3.661	5.3150	5.5512	1.5748	4.3307	2.260	.04
95	3.7402	98	3.858	5.5118	5.9449	1.7126	4.5276	2.370	.04
100	3.9370	103	4.055	5.9055	6.1417	1.7323	4.9213	2.717	.04
105	4.1339	108	4.252	6.1024	6.4173	1.9291	5.1181	2.732	.04
110	4.3307	...	...	6.2992	6.6929	1.9291	5.3150	2.902	.04
115	4.5276	118	4.646	6.4961	6.8110	2.0472	5.5118	2.957	.04
125	4.9213	128	5.039	6.8898	7.3228	2.2047	5.9055	3.142	.04
140	5.5118	143	5.630	7.8740	8.3464	2.4409	6.6929	3.583	.04

BẢNG 17 : Ổ BI CHẶN MỘT HƯỚNG TB KÍCH THƯỚC THEO INCH

Table 17. TYPE TB ONE-DIRECTION BALL THRUST BEARINGS-INCH DIMENSIONS

DIMENSION SERIES 30 (EXTRA LIGHT)							
Bore Diam., Nominal	Outside Diam., Nominal	Height, Nominal	Fillet Radius	Bore Diam., Nominal	Outside Diam., Nominal	Height, Nominal	Fillet Radius
Inches	Inches	Inch	Inch	Inches	Inches	Inch	Inch
1/2	1 7/32	9/16	.030	1 7/8	3 7/32	1 3/16	.040
9/16	1 7/32	9/16	.030	1 15/16	3 7/32	1 3/16	.040
5/8	1 11/32	9/16	.030	2	3 11/32	1 3/16	.040
11/16	1 11/32	9/16	.030	2 1/16	3 11/32	1 3/16	.060
3/4	1 15/32	9/16	.030	2 1/8	3 19/32	1 3/16	.060
13/16	1 15/32	9/16	.030	2 3/16	3 19/32	1 3/16	.060
7/8	1 27/32	5/8	.030	2 1/4	3 23/32	1 3/16	.060
15/16	1 27/32	5/8	.030	2 5/16	3 23/32	1 3/16	.060
1	1 31/32	5/8	.030	2 3/8	3 27/32	1 3/16	.060
1 1/16	1 31/32	5/8	.030	2 7/16	3 27/32	1 3/16	.060
1 1/8	2 3/32	5/8	.030	2 1/2	3 31/32	1 3/16	.060
1 3/16	2 3/32	5/8	.030	2 9/16	3 31/32	1 3/16	.060
1 1/4	2 11/32	5/8	.030	2 5/8	4 11/32	1	.060
1 5/16	2 11/32	5/8	.030	2 11/16	4 11/32	1	.060
1 3/8	2 15/32	5/8	.030	2 3/4	4 15/32	1	.060
1 7/16	2 15/32	5/8	.030	2 13/16	4 15/32	1	.060
1 1/2	2 19/32	5/8	.040	2 7/8	4 19/32	1	.060
1 9/16	2 19/32	5/8	.040	2 15/16	4 19/32	1	.080
1 5/8	2 31/32	1 3/16	.040	3	4 23/32	1	.080
1 11/16	2 31/32	1 3/16	.040	3 1/4	4 31/32	1	.080
1 3/4	3 3/32	1 3/16	.040	3 1/2	5 7/32	1	.080
1 13/16	3 3/32	1 3/16	.040	....	....	....	....

DIMENSION SERIES 31 (LIGHT)									
Small Bore Diam., Nominal	Large Bore Diam., Minimum	Outside Diam., Nominal	Height, Nominal	Fillet Radius	Small Bore Diam., Nominal	Large Bore Diam., Minimum	Outside Diam., Nominal	Height, Nominal	Fillet Radius
Inch	Inch	Inches	Inch	Inch	Inches	Inches	Inches	Inches	Inch
1/4	9/32	13/16	3/8	.030	2 3/4	2 25/32	4 1/32	1	.060
5/16	....	1	17/32	.030	2 7/8	2 29/32	4 5/32	1	.060
3/8	13/32	1	17/32	.030	3	3 1/32	4 3/8	1 1/8	.080
7/16	....	1 9/32	5/8	.030	3 1/8	3 5/32	4 1/2	1 1/8	.080
1/2	17/32	1 9/32	5/8	.030	3 1/4	3 9/32	4 13/16	1 1/4	.080
9/16	....	1 13/32	5/8	.030	3 3/8	3 13/32	4 15/16	1 1/4	.080
5/8	21/32	1 13/32	5/8	.030	3 1/2	3 17/32	5 1/16	1 1/4	.080
3/4	25/32	1 17/32	5/8	.030	3 5/8	3 21/32	5 3/16	1 1/4	.080
7/8	29/32	1 21/32	5/8	.030	3 3/4	3 25/32	5 5/16	1 1/4	.080
1	1 1/32	1 25/32	5/8	.030	3 7/8	3 29/32	5 11/16	1 3/8	.080
1 1/8	1 5/32	1 29/32	5/8	.030	4	4 1/32	5 13/16	1 3/8	.080
1 1/4	1 9/32	2 3/32	23/32	.030	4 1/4	4 9/32	6 5/16	1 3/4	.120
1 3/8	1 13/32	2 7/32	23/32	.030	4 1/2	4 17/32	6 9/16	1 3/4	.120
1 1/2	1 17/32	2 11/32	23/32	.040	4 3/4	4 25/32	7 1/16	2	.120
1 5/8	1 21/32	2 15/32	23/32	.040	5	5 1/32	7 5/16	2	.120
1 3/4	1 25/32	2 17/32	3/4	.040	5 1/2	5 17/32	8 1/16	2 3/16	.120
1 7/8	1 29/32	2 21/32	3/4	.040	6	6 1/32	8 11/16	2 3/8	.120
2	2 1/32	2 31/32	3/4	.040	7	7 1/32	10 1/8	2 5/8	.160
2 1/8	2 5/32	3 7/32	7/8	.060	8	8 1/32	11 5/8	3	.160
2 1/4	2 9/32	3 11/32	7/8	.060	9	9 1/32	13 1/8	3 1/2	.160
2 3/8	2 13/32	3 19/32	1	.060	10	10 1/32	14 5/8	4	.180
2 1/2	2 17/32	3 23/32	1	.060	11	11 1/32	15 5/8	4 1/4	.180
2 5/8	2 21/32	3 27/32	1	.060	12	12 1/32	17 3/8	4 1/2	.180

BẢNG 17 : Ổ BI CHẶN MỘT HƯỚNG TB KÍCH THƯỚC THEO INCH

DIMENSION SERIES 32 (MEDIUM)							
Bore Diameter, Nominal	Outside Diameter, Nominal	Height, Nominal	Fillet Radius	Bore Diameter, Nominal	Outside Diameter, Nominal	Height, Nominal	Fillet Radius
Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch
1/2	1 7/16	5/8	.030	2 7/8	4 7/16	1 1/8	.060
9/16	1 7/16	5/8	.030	2 15/16	4 7/16	1 1/8	.080
5/8	1 9/16	5/8	.030	3	4 1/2	1 1/8	.080
11/16	1 9/16	5/8	.030	3 1/8	4 5/8	1 1/8	.080
3/4	1 11/16	5/8	.030	3 1/4	4 3/4	1 1/8	.080
13/16	1 11/16	5/8	.030	3 3/8	4 7/8	1 1/8	.080
7/8	1 15/16	3/4	.030	3 1/2	5	1 1/8	.080
15/16	1 15/16	3/4	.030	3 5/8	5 5/8	1 3/8	.080
1	2 1/16	3/4	.030	3 3/4	5 3/4	1 3/8	.080
1 1/16	2 1/16	3/4	.030	3 7/8	5 7/8	1 3/8	.080
1 1/8	2 3/16	3/4	.030	4	6	1 3/8	.080
1 3/16	2 3/16	3/4	.030	4 1/8	6 1/8	1 3/8	.120
1 1/4	2 5/16	3/4	.030	4 1/4	6 1/4	1 3/8	.120
1 5/16	2 5/16	3/4	.030	4 3/8	6 3/8	1 3/8	.120
1 3/8	2 7/16	3/4	.030	4 1/2	6 3/4	1 5/8	.120
1 7/16	2 7/16	3/4	.030	4 5/8	6 7/8	1 5/8	.120
1 1/2	2 9/16	3/4	.040	4 3/4	7	1 5/8	.120
1 9/16	2 9/16	3/4	.040	4 7/8	7 1/8	1 5/8	.120
1 5/8	2 13/16	7/8	.040	5	7 1/4	1 5/8	.120
1 11/16	2 13/16	7/8	.040	5 1/8	7 3/8	1 5/8	.120
1 3/4	2 15/16	7/8	.040	5 1/4	7 1/2	1 5/8	.120
1 13/16	2 15/16	7/8	.040	5 3/8	7 5/8	1 5/8	.120
1 7/8	3 1/16	7/8	.040	5 1/2	8 1/4	1 7/8	.120
1 15/16	3 1/16	7/8	.040	5 5/8	8 3/8	1 7/8	.120
2	3 3/16	7/8	.040	5 3/4	8 1/2	1 7/8	.120
2 1/16	3 3/16	7/8	.060	5 7/8	8 5/8	1 7/8	.120
2 1/8	3 5/16	7/8	.060	6	8 3/4	1 7/8	.120
2 3/16	3 5/16	7/8	.060	6 1/8	8 7/8	1 7/8	.160
2 1/4	3 7/16	7/8	.060	6 1/4	9	1 7/8	.160
2 5/16	3 7/16	7/8	.060	6 3/8	9 1/8	1 7/8	.160
2 3/8	3 9/16	7/8	.060	6 1/2	9 1/2	2 1/4	.160
2 7/16	3 9/16	7/8	.060	6 5/8	9 5/8	2 1/4	.160
2 1/2	4	1 1/8	.060	6 3/4	9 3/4	2 1/4	.160
2 9/16	4	1 1/8	.060	6 7/8	9 7/8	2 1/4	.160
2 5/8	4 1/8	1 1/8	.060	7	10	2 1/4	.160
2 11/16	4 1/8	1 1/8	.060	7 1/8	10 1/8	2 1/4	.160
2 3/4	4 1/4	1 1/8	.060	7 1/4	10 1/4	2 1/4	.160
2 13/16	4 1/4	1 1/8	.060	7 3/8	10 3/8	2 1/4	.160

BẢNG 18 : Ổ ĐŨA CẦU CHẶN KIỂU TS KÍCH THƯỚC THEO HỆ MÉT

DIMENSION SERIES 93						DIMENSION SERIES 94					
Bore Diam., Nominal		Outside Diam., Nom.	Height, Nominal	Fillet Radius*		Bore Diam., Nominal		Outside Diam., Nom.	Height, Nominal	Fillet Radius*	
Mm.	Inches	Inches	Inches	Inch		Mm.	Inches	Inches	Inches	Inch	
110	4.3307	7.4803	1.890	.079		90	3.5433	7.4803	2.362	.079	
130	5.1181	8.8583	2.283	.079		100	3.9370	8.2677	2.638	.098	
150	5.9055	9.8425	2.362	.079		110	4.3307	9.0551	2.874	.098	
170	6.6929	11.0236	2.638	.098		120	4.7244	9.8425	3.071	.118	
190	7.4803	12.5984	3.071	.118		130	5.1181	10.6299	3.346	.118	
220	8.6614	14.1732	3.346	.118		150	5.9055	11.8110	3.543	.118	
240	9.4488	14.9606	3.346	.118		170	6.6929	13.3858	4.055	.157	
260	10.2362	16.5354	3.740	.157		190	7.4803	14.9606	4.528	.157	
300	11.8110	18.8976	4.291	.157		200	7.8740	15.7480	4.803	.157	
320	12.5984	19.6850	4.291	.157		220	8.6614	16.5354	4.803	.197	
360	14.1732	22.0472	4.803	.157		260	10.2362	18.8976	5.197	.197	
400	15.7480	24.4094	5.197	.197		300	11.8110	21.2598	5.709	.197	
460	18.1102	27.9528	5.906	.197		340	13.3858	24.4094	6.693	.236	
530	20.8661	31.4961	6.299	.236		...	......	......	.....	....	

* The corner radius or chamfer on these bearings must clear this fillet radius.

BẢNG 19 : DUNG SAI Ổ BI CHẶN - CHUỖI KÍCH THƯỚC THEO HỆ MÉT

DIMENSION SERIES WITH 2-DIGIT NUMBERS															
Bore Diam., d				Inside Diam., d_4		Height, H		Height, H_1		Outside Diameters					
										D & D_1		D		D_1	
Nominal		Tolerances		Tolerances		Tolerances		Tolerances		Nominal		Tolerances		Tolerances	
Over	Incl.	+	−	+	−	+	−	+	−	Over	Incl.	+	−	+	−
Mm.		Inch		Inch		Inch		Inch		Mm.		Inch		Inch	
0	18	.0002	.0003	.0028	0	0	.0030	.0020	.0030	10	18	0	.0004	0	.0012
18	30	.0003	.0004	.0028	0	0	.0030	.0020	.0030	18	30	0	.0005	0	.0012
30	50	.0004	.0005	.0033	0	0	.0039	.0020	.0039	30	50	0	.0006	0	.0014
50	80	.0005	.0006	.0039	0	0	.0049	.0030	.0049	50	80	0	.0007	0	.0018
80	120	.0006	.0008	.0047	0	0	.0059	.0030	.0059	80	120	0	.0009	0	.0024
120	180	.0007	.0010	.0055	0	0	.0069	.0039	.0069	120	180	0	.0010	0	.0030
180	250	.0009	.0012	.0055	0	0	.0079	.0039	.0079	180	250	0	.0012	0	.0035
250	315	.0010	.0014	.0063	0	0	.0089	.0049	.0089	250	315	0	.0014	0	.0041
315	400	.0011	.0016	.0071	0	0	.0118	.0059	.0108	315	400	0	.0016	0	.0047

DIMENSION SERIES WITH 3-DIGIT NUMBERS									
Bore Diameter, d				Heights H & H_1		Outside Diams. D & D_1			
Nominal		Tolerances		Tolerances		Nominal		Tolerances	
Over	Incl.	+	−	+	−	Over	Incl.	+	−
Millimeters		Inch	Inch	Inch	Inch	Millimeters		Inch	Inch
0	18	.0002	.0003	.005	.005	10	18	0	.0004
18	30	.0003	.0004	.005	.005	18	30	0	.0005
30	50	.0004	.0005	.005	.005	30	50	0	.0006
50	80	.0005	.0006	.005	.005	50	80	0	.0007
80	120	.0006	.0008	.010	.010	80	120	0	.0009

* Anti-Friction Bearing Manufacturers Standard.

Diameter d_4 is the inside diameter of the aligning washer; D is the outside diameter of the bearing rings; D_1 is the outside diameter of the aligning washer; H is the height of the assembled bearing without the aligning washer; H_1 is the height of the assembled bearing and the aligning washer.

BẢNG 20 : GIỚI HẠN VÀ DUNG SAI CHO Ổ BI CHẶN - CHUỖI KÍCH THƯỚC THEO INCH

Bore Diameter				Height		Outside Diameter			
Nominal		Limits		Tolerance		Nominal		Tolerance	
Over	Incl.	Min.	Max.	+	−	Over	Incl.	+	−
Inches	Inches	Inches	Inches	Inch	Inch	Inch	Inch	Inch	Inch
DIMENSION SERIES 030									
0	15/16	Nom. +.004	Nom. +.006	.005	.005	0	4 23/32	0	.002
15/16	1 15/16	" +.005	" +.007	.005	.005	4 23/32	5 7/32	0	.002
1 15/16	3	" +.006	" +.008	.005	.005	....	....	...	....
3	3 1/2	" +.008	" +.010	.010	.010	....	....	...	....
DIMENSION SERIES 031									
0	1 3/8	Nominal	Nom. + 0008	.005	.005	0	5 5/16	0	.002
1 3/8	2 3/8	"	" +.0010	.005	.005	5 5/16	17 3/8	0	.003
2 3/8	3	"	" +.0012	.005	.005	....	....	...	....
3	12	"	" +.0012	.010	.010	....	....	...	....
DIMENSION SERIES 032									
0	15/16	Nom. +.004	Nom. +.006	.005	.005	0	5	0	.002
15/16	1 15/16	" +.005	" +.007	.005	.005	5	10 3/8	0	.003
1 15/16	3	" +.006	" +.008	.005	.005	....	....	...	....
3	3 1/8	" +.006	" +.008	.010	.010	....	....	...	....
3 1/8	7 3/8	" +.008	" + 010	.010	.010	....	....		..

* Anti-Friction Bearing Manufacturers Association Standard.

BANG 21 : Ô ĐŨA CHẶN TRỤ KIỂU TP - KÍCH THƯỚC THEO INCH

Bearing Number	Bore Diam.	Outside Diam.	Height	Bearing Number	Bore Diam.	Outside Diam.	Height
	Inch	Inch	Inch		Inch	Inch	Inch
LIGHT SERIES							
14TP030	7/8	1 27/32	5/8	28TP131	1 3/4	3 3/8	1
15TP030	15/16	1 27/32	5/8	29TP030	1 13/16	3 3/32	13/16
16TP030	1	1 31/32	5/8	29TP131	1 13/16	3 3/8	1
16TP131	1	2 1/8	13/16	30TP030	1 7/8	3 7/32	13/16
17TP030	1 1/16	1 31/32	5/8	30TP131	1 7/8	3 1/2	1
17TP131	1 1/16	2 1/8	13/16	31TP030	1 15/16	3 7/32	13/16
18TP030	1 1/8	2 3/32	5/8	31TP131	1 15/16	3 1/2	1
18TP131	1 1/8	2 1/4	13/16	32TP030	2	3 11/32	13/16
19TP030	1 3/16	2 3/32	5/8	32TP131	2	3 5/8	1
19TP131	1 3/16	2 1/4	13/16	34TP030	2 1/8	3 19/32	13/16
20TP030	1 1/4	2 11/32	5/8	34TP131	2 1/8	3 3/4	1
20TP131	1 1/4	2 3/8	13/16	35TP030	2 3/16	3 19/32	13/16
21TP030	1 5/16	2 11/32	5/8	36TP030	2 1/4	3 23/32	13/16
21TP131	1 5/16	2 3/8	13/16	36TP131	2 1/4	3 7/8	1
22TP030	1 3/8	2 15/32	5/8	38TP030	2 3/8	3 27/32	13/16
22TP131	1 3/8	2 7/8	13/16	38TP131	2 3/8	4	1
23TP030	1 7/16	2 15/32	5/8	39TP030	2 7/16	3 27/32	13/16
23TP131	1 7/16	2 7/8	13/16	40TP030	2 1/2	3 31/32	13/16
24TP030	1 1/2	2 19/32	5/8	40TP131	2 1/2	4 1/8	1
24TP131	1 1/2	3	13/16	42TP030	2 5/8	4 11/32	1
25TP030	1 9/16	2 19/32	5/8	44TP030	2 3/4	4 15/32	1
25TP131	1 9/16	3	13/16	48TP030	3	4 23/32	1
26TP030	1 5/8	2 31/32	13/16	52TP030	3 1/4	4 31/32	1
26TP131	1 5/8	3 1/4	1	55TP131	3 7/16	5 7/32	1
27TP030	1 11/16	2 31/32	13/16	56TP030	3 1/2	5 7/32	1
27TP131	1 11/16	3 1/4	1	57TP131	3 9/16	5 7/32	1
28TP030	1 3/4	3 3/32	13/16	....	....	....	....

BANG 22 : Ô ĐŨA CHẶN TRỤ KIỂU TR - KÍCH THƯỚC THEO INCH

Bearing Number	Bore Diam.	Outside Diameter		Total Height	Bearing Number	Bore Diam.	Outside Diameter		Total Height
		Bear-ing	Seat Ring				Bear-ing	Seat Ring	
	Inch	Inch	Inch	Inch		Inch	Inch	Inch	Inch
LIGHT SERIES									
16TR400	1	2 1/16	2 1/4	1 1/16	29TR400	1 13/16	3 5/16	3 1/2	1 5/16
17TR400	1 1/16	2 1/16	2 1/4	1 1/16	30TR400	1 7/8	3 7/16	3 5/8	1 5/16
18TR400	1 1/8	2 3/16	2 3/8	1 1/16	31TR400	1 15/16	3 7/16	3 5/8	1 5/16
19TR400	1 3/16	2 3/16	2 3/8	1 1/16	32TR400	2	3 9/16	3 3/4	1 5/16
20TR400	1 1/4	2 5/16	2 1/2	1 1/16	34TR400	2 1/8	3 11/16	3 7/8	1 5/16
21TR400	1 5/16	2 5/16	2 1/2	1 1/16	36TR400	2 1/4	3 13/16	4	1 5/16
22TR400	1 3/8	2 13/16	3	1 1/16	38TR400	2 3/8	3 15/16	4 1/8	1 5/16
23TR400	1 7/16	2 13/16	3	1 1/16	40TR400	2 1/2	4 1/16	4 1/4	1 5/16
24TR400	1 1/2	2 15/16	3 1/8	1 1/16	42TR400	2 5/8	4 9/32	4 17/32	1 5/16
25TR400	1 9/16	2 15/16	3 1/8	1 1/16	44TR400	2 3/4	4 13/16	4 21/32	1 5/16
26TR400	1 5/8	3 3/16	3 3/8	1 5/16	48TR400	3	4 21/32	4 31/32	1 5/16
27TR400	1 11/16	3 3/16	3 3/8	1 5/16	52TR400	3 1/4	4 29/32	5 7/32	1 5/16
28TR400	1 3/4	3 5/16	3 1/2	1 5/16	56TR400	3 1/2	5 5/32	5 15/32	1 5/16

BANG 23 : CÁC ĐƯỜNG KÍNH TIÊU CHUẨN AFBMA CỦA BICH CHẶN TRỤC CỰC TIỂU VÀ BICH CHẶN LỖ CỰC ĐẠI ĐỐI VỚI Ổ BI

Metric Annular Ball Bearings*

Bore, Mm.	Minimum Shaft Shoulder Diameter, Inches				Maximum Housing Shoulder Diameter, Inches			
	10 Series	02 Series	03 Series	04 Series	10 Series	02 Series	03 Series	04 Series
10	0.47	0.50	0.50	...	0.95	0.98	1.18	...
12	0.55	0.58	0.63	...	1.02	1.06	1.22	...
15	0.67	0.69	0.75	...	1.18	1.18	1.42	...
17	0.75	0.77	0.83	0.95	1.30	1.34	1.61	2.17
20	0.89	0.94	0.94	1.06	1.46	1.61	1.77	2.56
25	1.08	1.14	1.14	1.34	1.65	1.81	2.17	2.80
30	1.34	1.34	1.34	1.54	1.93	2.21	2.56	3.19
35	1.53	1.53	1.69	1.73	2.21	2.56	2.80	3.58
40	1.73	1.73	1.93	1.97	2.44	2.87	3.19	3.94
45	1.94	1.94	2.13	2.17	2.72	3.07	3.58	4.33
50	2.13	2.13	2.36	2.44	2.91	3.27	3.94	4.65
55	2.33	2.41	2.56	2.64	3.27	3.58	4.33	5.04
60	2.53	2.67	2.84	2.84	3.47	3.98	4.65	5.43
65	2.72	2.86	3.03	3.03	3.66	4.37	5.04	5.83
70	2.91	3.06	3.23	3.31	4.06	4.57	5.43	6.54
75	3.11	3.25	3.43	3.50	4.25	4.76	5.83	6.93
80	3.31	3.55	3.62	3.70	4.65	5.12	6.22	7.32
85	3.50	3.75	3.90	4.06	4.84	5.51	6.54	7.56
90	3.84	3.94	4.09	4.25	5.16	5.91	6.93	8.15
95	4.05	4.21	4.29	...	5.35	6.22	7.32	...
100	4.23	4.41	4.49	...	5.55	6.61	7.91	...
105	4.53	4.61	4.69	...	5.91	7.01	8.31	...
110	4.72	4.80	4.88	...	6.30	7.40	8.90	...
120	5.12	5.20	5.28	...	6.69	7.99	9.69	...
130	5.51	5.67	5.83	...	7.48	8.50	10.32	...
140	5.91	6.06	6.22	...	7.87	9.29	11.10	...
150	6.38	6.46	6.61	...	8.39	10.08	11.89	...
160	6.77	6.85	7.01	...	8.98	10.87	12.68	...
170	7.17	7.40	7.40	...	9.76	11.50	13.47	...
180	7.56	7.80	7.80	...	10.55	11.89	14.25	...
190	7.95	8.19	8.35	...	10.95	12.68	14.88	...
200	8.35	8.58	8.74	...	11.73	13.47	15.67	...

Type BM Ball Bearings			Type BIC Ball Bearings				
Bore, Mm.	Min. Shaft Shoulder Diam., In.	Max. Shaft Shoulder Diam., In.	Bearing Size, Inches: Bore	O.D.	Width	Min. Shaft Shoulder Diam., In.	Max. Housing Shoulder Diam., In.
5	1/4	37/64	1/8	3/8	5/32	3/16	5/16
6	5/16	7/8	3/16	1/2	5/32	1/4	7/16
7	23/64	7/8	1/4	5/8	0.196	5/16	9/16
8	25/64	7/8	1/8	1/2	11/64	3/16	7/16
9	7/16	1 1/32	1/4	3/4	7/32	5/16	11/16
10	15/32	1 1/32	3/8	7/8	7/32	7/16	13/16
11	33/64	1 3/16	1/2	1 1/8	1/4	9/16	1 1/16
12	9/16	1 3/16	5/8	1 3/8	9/32	3/4	1 1/4
13	19/32	1 7/64	3/4	1 5/8	5/16	7/8	1 1/2
14	5/8	1 9/32	7/8	1 7/8	3/8	1	1 3/4
15	11/16	1 9/32	1	2	3/8	1 1/8	1 7/8
16	49/64	1 23/64	1 1/8	2 1/8	3/8	1 1/4	2
17	51/64	1 19/32	1 1/4	2 1/4	3/8	1 3/8	2 1/8
19	57/64	1 7/16	1 3/8	2 1/2	7/16	1 1/2	2 3/8
20	59/64	1 23/32	1 1/2	2 5/8	7/16	1 5/8	2 1/2
25	1 1/8	1 29/32	...	...	...	...	...

* Also given in this standard are similar data for sizes of 4 to 9 mm bore and 220 to 320 mm bore.

BẢNG 24 : CÁC ĐƯỜNG KÍNH TIÊU CHUẨN AFBMA CỦA BÍCH CHẶN TRỤC CỰC TIỂU VÀ BÍCH CHẶN LỖ CỰC ĐẠI CHO Ổ ĐŨA TRỤ

Table 24. AFBMA STANDARD MINIMUM SHAFT SHOULDER AND MAXIMUM HOUSING SHOULDER DIAMETERS FOR CYLINDRICAL ROLLER BEARINGS

Bore, Mm.	Minimum Shaft Shoulder Diameter,[1] inches				Maximum Housing Shoulder Diameters,[2] inches			
	Dimen. Series 19	Dimen. Series 10	Dimen. Series 02	Dimen. Series 03	Dimen. Series 19	Dimen. Series 10	Dimen. Series 02	Dimen. Series 03
10	.....	.52	.55	.58	.....	.92	1.05	1.19
12	.....	.60	.62	.67	.....	1.00	1.11	1.26
15	.....	.72	.74	.81	.....	1.15	1.23	1.45
17	.....	.82	.82	.90	.....	1.26	1.43	1.63
20	.92	.96	1.02	1.02	1.33	1.45	1.68	1.82
25	1.12	1.15	1.20	1.24	1.53	1.71	1.85	2.20
30	1.31	1.38	1.42	1.49	1.73	1.98	2.22	2.52
35	1.55	1.59	1.64	1.72	2.00	2.24	2.57	2.81
40	1.74	1.80	1.86	1.93	2.29	2.47	2.87	3.20
45	1.95	2.00	2.08	2.20	2.51	2.73	3.08	3.56
50	2.13	2.21	2.27	2.40	2.68	2.93	3.26	3.90
55	2.36	2.44	2.52	2.62	2.96	3.29	3.60	4.28
60	2.56	2.64	2.73	2.87	3.16	3.49	3.99	4.64
65	2.76	2.84	3.03	3.10	3.36	3.69	4.33	5.00
70	2.99	3.05	3.22	3.32	3.72	4.07	4.55	5.34
75	3.18	3.25	3.37	3.56	3.92	4.27	4.73	5.74
80	3.38	3.48	3.59	3.78	4.11	4.63	5.09	6.08
85	3.63	3.68	3.86	4.05	4.48	4.83	5.48	6.47
90	3.82	3.92	4.06	4.26	4.67	5.18	5.81	6.80
95	4.02	4.11	4.29	4.53	4.87	5.38	6.18	7.16
100	4.22	4.31	4.57	4.82	5.[illegible]5	5.58	6.58	7.66
105	4.41	4.56	4.78	5.04	5.44	5.91	6.90	8.01
110	4.61	4.80	5.01	5.35	5.64	6.27	7.24	8.55
120	5.11	5.20	5.48	5.82	6.21	6.66	7.83	9.26
130	5.48	5.63	5.87	6.31	6.76	7.41	8.42	10.02
140	5.87	6.05	6.36	6.77	7.15	7.80	9.15	10.68
150	6.36	6.47	6.86	7.13	7.84	8.36	9.88	11.50
160	6.76	6.91	7.31	7.70	8.24	8.92	10.61	12.16
170	7.15	7.41	7.76	8.12	8.63	9.61	11.32	12.93
180	7.60	7.86	8.17	8.63	9.38	10.35	11.74	13.60
190	7.99	8.25	8.67	9.04	9.78	10.74	12.46	14.07
200	8.48	8.70	9.15	9.57	10.49	11.47	13.17	14.72
220	9.27	9.62	10.08	....	11.28	12.55	14.65	.....
240	10.05	10.40	11.00	....	12.07	13.37	16.08	.....
260	11.01	11.35	11.97	....	13.50	14.82	17.56	.....
280	11.80	12.14	12.67	....	14.29	15.61	18.26	.....
300	12.77	13.08	13.80	....	15.72	17.08	19.80	.....
320	13.56	13.86	14.70	....	16.51	17.83	21.18	.....

[1] Minimum shaft shoulder diameter which will satisfy the maximum inner race corner contour.

[2] Maximum housing shoulder diameter which will satisfy the maximum outer race corner contour.

Shoulder diameters outside these limits may be used upon advice of the particular manufacturer whose bearings are to be used.

GEARING

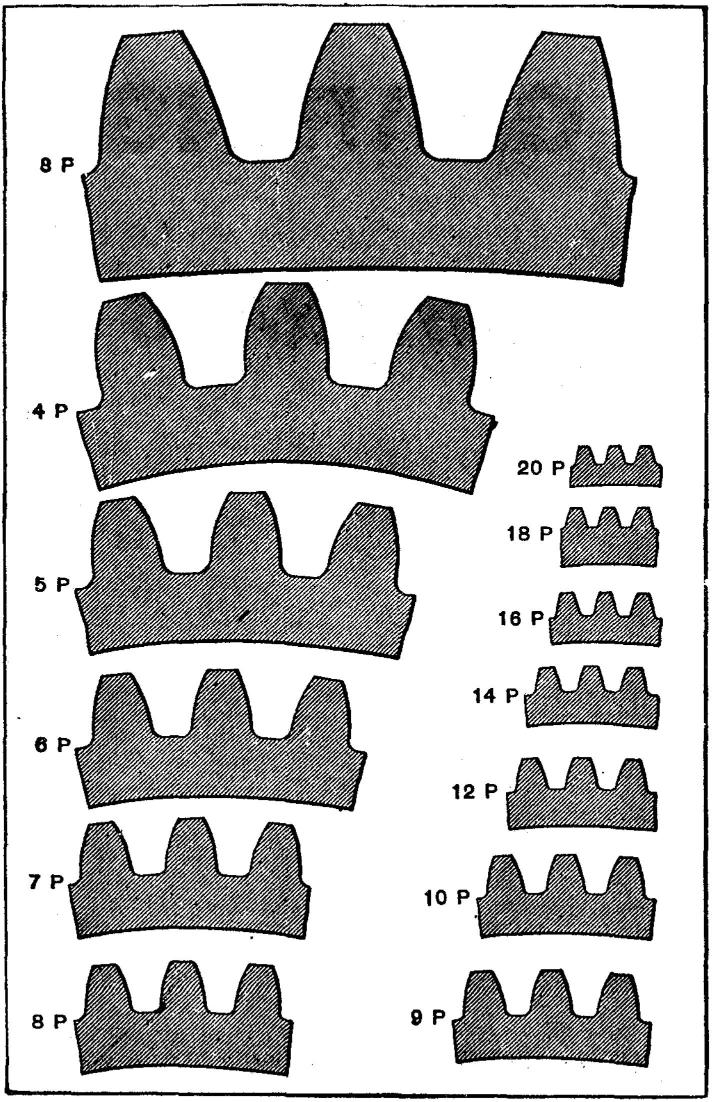
BÁNH RĂNG

BÁNH RĂNG

GEARING

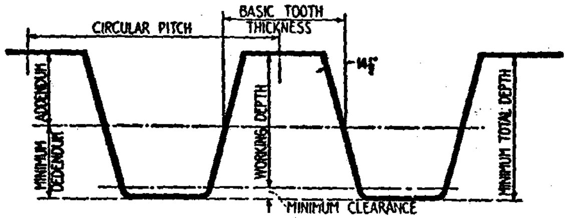
RĂNG VỚI CÁC BƯỚC ĐƯỜNG KÍNH, KÍCH CỠ TOÀN PHẦN

GEAR TEETH OF DIFFERENT DIAMETRAL PITCH, FULL SIZE

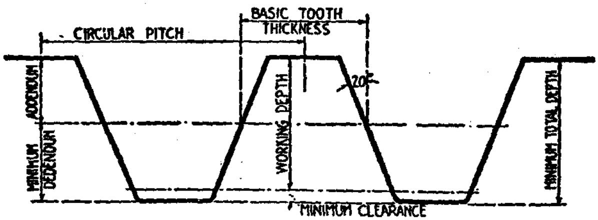


1. BÁNH RĂNG TRỤ THẲNG
SPUR GEARING

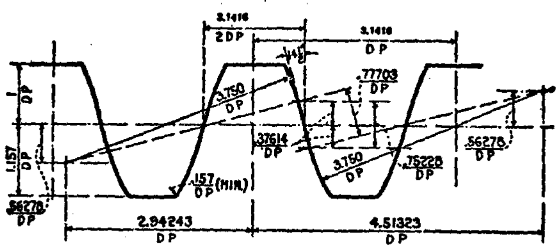
TIÊU CHUẨN MỸ VỀ DẠNG RĂNG TRỤ THẲNG
AMERICAN STANDARD SPUR GEAR TOOTH FORMS



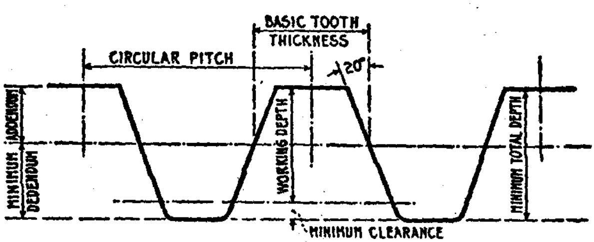
Basic Rack of the 14 1/2-Degree Full-Depth Involute System



Basic Rack of the 20-Degree Full-Depth Involute System



Approximation of Basic Rack for the 14 1/2-Degree Composite System



Basic Rack of the 20-Degree Stub Involute System

CÔNG THỨC RĂNG - DẠNG RĂNG TRỤ THẲNG TIÊU CHUẨN MỸ

FORMULAS FOR TOOTH PARTS - AMERICAN STANDARD SPUR GEAR TOOTH FORMS

To Find	Diametral Pitch, P Known	Circular Pitch, p Known
14½-DEGREE INVOLUTE FULL-DEPTH TEETH 14½-DEGREE COMPOSITE FULL-DEPTH TEETH 20-DEGREE INVOLUTE FULL-DEPTH TEETH		
Addendum	$a = 1.000 \div P$	$a = 0.3183 \times p$
Minimum Dedendum	$b = 1.157 \div P$	$b = 0.3683 \times p$
Working Depth	$h_k = 2.000 \div P$	$h_k = 0.6366 \times p$
Minimum Whole Depth	$h_t = 2.157 \div P$	$h_t = 0.6866 \times p$
Basic Tooth Thickness on Pitch Line	$t = 1.5708 \div P$	$t = 0.500 \times p$
Minimum Clearance	$c = 0.157 \div P$	$c = 0.050 \times p$
20-DEGREE INVOLUTE FINE-PITCH TEETH		
Addendum	$a = 1.000 \div P$	$a = 0.3183 \times p$
Dedendum	$b = (1.200 \div P) + 0.002$	$b = (0.3820 \times p) + 0.002$
Working Depth.	$h_k = (2.000 \div P)$	$h_k = (0.6366 \times p)$
Whole Depth	$h_t = (2.200 \div P) + 0.002$	$h_t = (0.7003 \times p) + 0.002$
Basic Tooth Thickness on Pitch Line	$t = 1.5708 \div P$	$t = 0.500 \times p$
Clearance	$c = (0.200 \div P) + 0.002$	$c = (0.0637 \times p) + 0.002$
20-DEGREE INVOLUTE STUB TEETH		
Addendum	$a = 0.800 \div P$	$a = 0.2546 \times p$
Minimum Dedendum	$b = 1.000 \div P$	$b = 0.3183 \times p$
Working Depth	$h_k = 1.600 \div P$	$h_k = 0.5092 \times p$
Minimum Whole Depth	$h_t = 1.800 \div P$	$h_t = 0.5729 \times p$
Basic Tooth Thickness on Pitch Line	$t = 1.5708 \div P$	$t = 0.500 \times p$
Minimum Clearance	$c = 0.200 \div P$	$c = 0.0637 \times p$

Note: Radius of fillet equals 1⅓ × clearance for 14½-degree full-depth teeth and 1½ × clearance for 20-degree full-depth teeth.

Note: A suitable working tolerance should be considered in connection with all minimum recommendations. Minimum clearance between the top of the gear tooth and the bottom of the mating gear space is specified as minimum so as to allow for necessary cutter clearance for all methods of producing gears.

PHẦN RĂNG - TIÊU CHUẨN MỸ ĐƯỜNG THÂN KHAI

CHIỀU SÂU TOÀN PHẦN $14\frac{1}{2}$ VÀ 20 ĐỘ

(BÁNH RĂNG bước đường kính)

Diametral Pitch	Equivalent Circular Pitch	Standard Circular Thickness	Standard Addendum	Working Depth of Tooth	Standard Dedendum	Whole Depth of Tooth
P	p	t	a	h_k	b	h_t
½	6.2832	3.1416	2.0000	4.0000	2.3142	4.3142
¾	4.1888	2.0944	1.3333	2.6666	1.5428	2.8761
1	3.1416	1.5708	1.0000	2.0000	1.1571	2.1571
1¼	2.5133	1.2566	0.8000	1.6000	0.9257	1.7257
1½	2.0944	1.0472	0.6666	1.3333	0.7714	1.4381
1¾	1.7952	0.8976	0.5714	1.1429	0.6612	1.2326
2	1.5708	0.7854	0.5000	1.0000	0.5785	1.0785
2¼	1.3963	0.6981	0.4444	0.8888	0.5143	0.9587
2½	1.2566	0.6283	0.4000	0.8000	0.4628	0.8628
2¾	1.1424	0.5712	0.3636	0.7273	0.4208	0.7844
3	1.0472	0.5236	0.3333	0.6666	0.3857	0.7190
3½	0.8976	0.4488	0.2857	0.5714	0.3306	0.6163
4	0.7854	0.3927	0.2500	0.5000	0.2893	0.5393
5	0.6283	0.3142	0.2000	0.4000	0.2314	0.4314
6	0.5236	0.2618	0.1666	0.3333	0.1928	0.3595
7	0.4488	0.2244	0.1429	0.2857	0.1653	0.3081
8	0.3927	0.1963	0.1250	0.2500	0.1446	0.2696
9	0.3491	0.1745	0.1111	0.2222	0.1286	0.2397
10	0.3142	0.1571	0.1000	0.2000	0.1157	0.2157
11	0.2856	0.1428	0.0909	0.1818	0.1052	0.1961
12	0.2618	0.1309	0.0833	0.1666	0.0964	0.1798
13	0.2417	0.1208	0.0769	0.1538	0.0890	0.1659
14	0.2244	0.1122	0.0714	0.1429	0.0826	0.1541
15	0.2094	0.1047	0.0666	0.1333	0.0771	0.1438
16	0.1963	0.0982	0.0625	0.1250	0.0723	0.1348
17	0.1848	0.0924	0.0588	0.1176	0.0681	0.1269
18	0.1745	0.0873	0.0555	0.1111	0.0643	0.1198
19	0.1653	0.0827	0.0526	0.1053	0.0609	0.1135
20	0.1571	0.0785	0.0500	0.1000	0.0579	0.1079
22	0.1428	0.0714	0.0455	0.0909	0.0526	0.0980
24	0.1309	0.0654	0.0417	0.0833	0.0482	0.0898
26	0.1208	0.0604	0.0385	0.0769	0.0445	0.0829
28	0.1122	0.0561	0.0357	0.0714	0.0413	0.0770
30	0.1047	0.0524	0.0333	0.0666	0.0386	0.0719
32	0.0982	0.0491	0.0312	0.0625	0.0362	0.0674
34	0.0924	0.0462	0.0294	0.0588	0.0340	0.0634
36	0.0873	0.0436	0.0278	0.0555	0.0321	0.0599
38	0.0827	0.0413	0.0263	0.0526	0.0304	0.0568
40	0.0785	0.0393	0.0250	0.0500	0.0289	0.0539
42	0.0748	0.0374	0.0238	0.0476	0.0275	0.0514
44	0.0714	0.0357	0.0227	0.0455	0.0263	0.0490
46	0.0683	0.0341	0.0217	0.0435	0.0252	0.0469
48	0.0654	0.0327	0.0208	0.0417	0.0241	0.0449
50	0.0628	0.0314	0.0200	0.0400	0.0231	0.0431

* For 20-degree full-depth teeth of 20 diametral pitch and finer see tables beginning on page 659.

PHẦN RĂNG - TIÊU CHUẨN MỸ, ĐƯỜNG THÂN KHAI

CHIỀU SÂU TOÀN PHẦN $14\frac{1}{2}$ VÀ 20 ĐỘ

(BÁNH RĂNG bước chu vi)

Circular Pitch	Equivalent Diametral Pitch	Standard Circular Thickness	Standard Addendum	Working Depth of Tooth	Standard Dedendum	Whole Depth of Tooth
p	P	t	a	h_k	b	h_t
4	0.7854	2.0000	1.2732	2.5464	1.4732	2.7464
3½	0.8976	1.7500	1.1140	2.2281	1.2890	2.4031
3	1.0472	1.5000	0.9549	1.9098	1.1049	2.0598
2¾	1.1424	1.3750	0.8753	1.7506	1.0128	1.8881
2½	1.2566	1.2500	0.7957	1.5915	0.9207	1.7165
2¼	1.3963	1.1250	0.7162	1.4323	0.8287	1.5448
2	1.5708	1.0000	0.6366	1.2732	0.7366	1.3732
1⅞	1.6755	0.9375	0.5968	1.1937	0.6906	1.2874
1¾	1.7952	0.8750	0.5570	1.1141	0.6445	1.2016
1⅝	1.9333	0.8125	0.5173	1.0345	0.5985	1.1158
1½	2.0944	0.7500	0.4775	0.9549	0.5525	1.0299
1 7/16	2.1855	0.7187	0.4576	0.9151	0.5294	0.9870
1⅜	2.2848	0.6875	0.4377	0.8754	0.5064	0.9441
1 5/16	2.3936	0.6562	0.4178	0.8356	0.4834	0.9012
1¼	2.5133	0.6250	0.3979	0.7958	0.4604	0.8583
1 3/16	2.6456	0.5937	0.3780	0.7560	0.4374	0.8154
1⅛	2.7925	0.5625	0.3581	0.7162	0.4143	0.7724
1 1/16	2.9568	0.5312	0.3382	0.6764	0.3913	0.7295
1	3.1416	0.5000	0.3183	0.6366	0.3683	0.6866
15/16	3.3510	0.4687	0.2984	0.5968	0.3453	0.6437
⅞	3.5904	0.4375	0.2785	0.5570	0.3223	0.6007
13/16	3.8666	0.4062	0.2586	0.5173	0.2993	0.5579
¾	4.1888	0.3750	0.2387	0.4775	0.2762	0.5150
11/16	4.5696	0.3437	0.2189	0.4377	0.2532	0.4720
⅔	4.7124	0.3333	0.2122	0.4244	0.2455	0.4577
⅝	5.0265	0.3125	0.1989	0.3979	0.2301	0.4291
9/16	5.5851	0.2812	0.1790	0.3581	0.2071	0.3862
½	6.2832	0.2500	0.1592	0.3183	0.1842	0.3433
7/16	7.1808	0.2187	0.1393	0.2785	0.1611	0.3003
⅖	7.8540	0.2000	0.1273	0.2546	0.1473	0.2746
⅜	8.3776	0.1875	0.1194	0.2387	0.1381	0.2575
⅓	9.4248	0.1666	0.1061	0.2122	0.1228	0.2289
5/16	10.0531	0.1562	0.0995	0.1989	0.1151	0.2146
2/7	10.9956	0.1429	0.0909	0.1819	0.1052	0.1962
¼	12.5664	0.1250	0.0796	0.1591	0.0921	0.1716
2/9	14.1372	0.1111	0.0707	0.1415	0.0818	0.1526
⅕	15.7080	0.1000	0.0637	0.1273	0.0737	0.1373
3/16	16.7552	0.0937	0.0597	0.1194	0.0690	0.1287
⅙	18.8496	0.0833	0.0531	0.1061	0.0614	0.1144
1/7	21.9911	0.0714	0.0455	0.0910	0.0526	0.0981
⅛	25.1327	0.0625	0.0398	0.0796	0.0460	0.0858
1/9	28.2743	0.0555	0.0354	0.0707	0.0409	0.0763
1/10	31.4159	0.0500	0.0318	0.0637	0.0368	0.0687
1/16	50.2655	0.0312	0.0199	0.0398	0.0230	0.0429

* For 20-degree full-depth teeth of 20 diametral pitch and finer see tables beginning on page 659.

PHẦN RĂNG - TIÊU CHUẨN MỸ, HỆ THỐNG 1 - BƯỚC MỊN THÂN KHAI 20 ĐỘ

GEAR TOOTH PARTS - AMERICAN STANDARD 20-DEGREE INVOLUTE FINE-PITCH SYSTEM - I

Diametral Pitch	Circular Pitch	Standard Circular Thickness	Standard Addendum	Working Depth	Standard Dedendum	Whole Depth
P	p	t	a	h_k	b	h_t
20	0.15708	0.07854	0.0500	0.1000	0.0620	0.1120
21	0.14960	0.07480	0.0476	0.0952	0.0591	0.1068
22	0.14280	0.07140	0.0455	0.0909	0.0565	0.1020
23	0.13659	0.06830	0.0435	0.0870	0.0542	0.0977
24	0.13090	0.06545	0.0417	0.0833	0.0520	0.0937
25	0.12566	0.06283	0.0400	0.0800	0.0500	0.0900
26	0.12083	0.06042	0.0385	0.0769	0.0482	0.0866
27	0.11636	0.05818	0.0370	0.0741	0.0464	0.0835
28	0.11220	0.05610	0.0357	0.0714	0.0449	0.0806
29	0.10833	0.05417	0.0345	0.0690	0.0434	0.0779
30	0.10472	0.05236	0.0333	0.0667	0.0420	0.0753
31	0.10134	0.05067	0.0323	0.0645	0.0407	0.0730
32	0.09818	0.04909	0.0313	0.0625	0.0395	0.0708
33	0.09520	0.04760	0.0303	0.0606	0.0384	0.0687
34	0.09240	0.04620	0.0294	0.0588	0.0373	0.0667
35	0.08976	0.04488	0.0286	0.0571	0.0363	0.0649
36	0.08727	0.04363	0.0278	0.0556	0.0353	0.0631
37	0.08491	0.04245	0.0270	0.0541	0.0344	0.0615
38	0.08267	0.04134	0.0263	0.0526	0.0336	0.0599
39	0.08055	0.04028	0.0256	0.0513	0.0328	0.0584
40	0.07854	0.03927	0.0250	0.0500	0.0320	0.0570
41	0.07662	0.03831	0.0244	0.0488	0.0313	0.0557
42	0.07480	0.03740	0.0238	0.0476	0.0306	0.0544
43	0.07306	0.03653	0.0233	0.0465	0.0299	0.0532
44	0.07140	0.03570	0.0227	0.0455	0.0293	0.0520
45	0.06981	0.03491	0.0222	0.0444	0.0287	0.0509
46	0.06830	0.03415	0.0217	0.0435	0.0281	0.0498
47	0.06684	0.03342	0.0213	0.0426	0.0275	0.0488
48	0.06545	0.03272	0.0208	0.0417	0.0270	0.0478
49	0.06411	0.03206	0.0204	0.0408	0.0265	0.0469
50	0.06283	0.03142	0.0200	0.0400	0.0260	0.0460
51	0.06160	0.03080	0.0196	0.0392	0.0255	0.0451
52	0.06042	0.03021	0.0192	0.0385	0.0251	0.0443
53	0.05928	0.02964	0.0189	0.0377	0.0246	0.0435
54	0.05818	0.02909	0.0185	0.0370	0.0242	0.0427
55	0.05712	0.02856	0.0182	0.0364	0.0238	0.0420
56	0.05610	0.02805	0.0179	0.0357	0.0234	0.0413
57	0.05512	0.02756	0.0175	0.0351	0.0231	0.0406
58	0.05417	0.02708	0.0172	0.0345	0.0227	0.0399
59	0.05325	0.02662	0.0169	0.0339	0.0223	0.0393
60	0.05236	0.02618	0.0167	0.0333	0.0220	0.0387
61	0.05150	0.02575	0.0164	0.0328	0.0217	0.0381
62	0.05067	0.02534	0.0161	0.0323	0.0214	0.0375
63	0.04987	0.02493	0.0159	0.0317	0.0210	0.0369
64	0.04909	0.02454	0.0156	0.0312	0.0208	0.0364
65	0.04833	0.02417	0.0154	0.0308	0.0205	0.0358
66	0.04760	0.02380	0.0152	0.0303	0.0202	0.0353
67	0.04689	0.02344	0.0149	0.0299	0.0199	0.0348
68	0.04620	0.02310	0.0147	0.0294	0.0196	0.0344
69	0.04553	0.02277	0.0145	0.0290	0.0194	0.0339
70	0.04488	0.02244	0.0143	0.0286	0.0191	0.0334
71	0.04425	0.02212	0.0141	0.0282	0.0189	0.0330
72	0.04363	0.02182	0.0139	0.0278	0.0187	0.0326
73	0.04304	0.02152	0.0137	0.0274	0.0184	0.0321
74	0.04245	0.02123	0.0135	0.0270	0.0182	0.0317
75	0.04189	0.02094	0.0133	0.0267	0.0180	0.0313
76	0.04134	0.02067	0.0132	0.0263	0.0178	0.0309
77	0.04080	0.02040	0.0130	0.0260	0.0176	0.0306
78	0.04028	0.02014	0.0128	0.0256	0.0174	0.0302
79	0.03977	0.01988	0.0127	0.0253	0.0172	0.0298

All dimensions are in inches.

PHẦN RĂNG - TIÊU CHUẨN MỸ, HỆ THỐNG 2 - BƯỚC THÂN KHAI MỊN

GEAR TOOTH PARTS - AMERICAN STANDARD 20-DEGREE INVOLUTE FINE-PITCH SYSTEM - 2

Diametral Pitch	Circular Pitch	Standard Circular Thickness	Standard Addendum	Working Depth	Standard Dedendum	Whole Depth
P	*p*	*t*	*a*	*hk*	*b*	*ht*
80	0.03927	0.01964	0.0125	0.0250	0.0170	0.0295
81	0.03879	0.01939	0.0123	0.0247	0.0168	0.0292
82	0.03831	0.01916	0.0122	0.0244	0.0166	0.0288
83	0.03785	0.01893	0.0120	0.0241	0.0165	0.0285
84	0.03740	0.01870	0.0119	0.0238	0.0163	0.0282
85	0.03696	0.01848	0.0118	0.0235	0.0161	0.0279
86	0.03653	0.01827	0.0116	0.0233	0.0160	0.0276
87	0.03611	0.01806	0.0115	0.0230	0.0158	0.0273
88	0.03570	0.01785	0.0114	0.0227	0.0156	0.0270
89	0.03530	0.01765	0.0112	0.0225	0.0155	0.0267
90	0.03491	0.01745	0.0111	0.0222	0.0153	0.0264
91	0.03452	0.01726	0.0110	0.0220	0.0152	0.0262
92	0.03415	0.01707	0.0109	0.0217	0.0150	0.0259
93	0.03378	0.01689	0.0108	0.0215	0.0149	0.0257
94	0.03342	0.01671	0.0106	0.0213	0.0148	0.0254
95	0.03307	0.01653	0.0105	0.0211	0.0146	0.0252
96	0.03272	0.01636	0.0104	0.0208	0.0145	0.0249
97	0.03239	0.01619	0.0103	0.0206	0.0144	0.0247
98	0.03206	0.01603	0.0102	0.0204	0.0142	0.0244
99	0.03173	0.01587	0.0101	0.0202	0.0141	0.0242
100	0.03142	0.01571	0.0100	0.0200	0.0140	0.0240
101	0.03110	0.01555	0.0099	0.0198	0.0139	0.0238
102	0.03080	0.01540	0.0098	0.0196	0.0138	0.0236
103	0.03050	0.01525	0.0097	0.0194	0.0137	0.0234
104	0.03021	0.01510	0.0096	0.0192	0.0135	0.0232
105	0.02992	0.01496	0.0095	0.0190	0.0134	0.0230
106	0.02964	0.01482	0.0094	0.0189	0.0133	0.0228
107	0.02936	0.01468	0.0093	0.0187	0.0132	0.0226
108	0.02909	0.01454	0.0093	0.0185	0.0131	0.0224
109	0.02882	0.01441	0.0092	0.0183	0.0130	0.0222
110	0.02856	0.01428	0.0091	0.0182	0.0129	0.0220
111	0.02830	0.01415	0.0090	0.0180	0.0128	0.0218
112	0.02805	0.01402	0.0089	0.0179	0.0127	0.0216
113	0.02780	0.01390	0.0088	0.0177	0.0126	0.0215
114	0.02756	0.01378	0.0088	0.0175	0.0125	0.0213
115	0.02732	0.01366	0.0087	0.0174	0.0124	0.0211
116	0.02708	0.01354	0.0086	0.0172	0.0123	0.0210
117	0.02685	0.01343	0.0085	0.0171	0.0123	0.0208
118	0.02662	0.01331	0.0085	0.0169	0.0122	0.0206
119	0.02640	0.01320	0.0084	0.0168	0.0121	0.0205
120	0.02618	0.01309	0.0083	0.0167	0.0120	0.0203
121	0.02596	0.01298	0.0083	0.0165	0.0119	0.0202
122	0.02575	0.01288	0.0082	0.0164	0.0118	0.0200
123	0.02554	0.01277	0.0081	0.0163	0.0118	0.0199
124	0.02534	0.01267	0.0081	0.0161	0.0117	0.0197
125	0.02513	0.01257	0.0080	0.0160	0.0116	0.0196
126	0.02493	0.01247	0.0079	0.0159	0.0115	0.0195
127	0.02474	0.01237	0.0079	0.0157	0.0114	0.0193
128	0.02454	0.01227	0.0078	0.0156	0.0114	0.0192
129	0.02435	0.01218	0.0078	0.0155	0.0113	0.0191
130	0.02417	0.01208	0.0077	0.0154	0.0112	0.0189
131	0.02398	0.01199	0.0076	0.0153	0.0112	0.0188
132	0.02380	0.01190	0.0076	0.0152	0.0111	0.0187
133	0.02362	0.01181	0.0075	0.0150	0.0110	0.0185
134	0.02344	0.01172	0.0075	0.0149	0.0110	0.0184
135	0.02327	0.01164	0.0074	0.0148	0.0109	0.0183
136	0.02310	0.01155	0.0074	0.0147	0.0108	0.0182
137	0.02293	0.01147	0.0073	0.0146	0.0108	0.0181
138	0.02277	0.01138	0.0072	0.0145	0.0107	0.0179
139	0.02260	0.01130	0.0072	0.0144	0.0106	0.0178

All dimensions are in inches.

PHẦN RĂNG - TIÊU CHUẨN MỸ, HỆ THỐNG 3 - BƯỚC THÂN KHAI MỊN

GEAR TOOTH PARTS - AMERICAN STANDARD 20-DEGREE INVOLUTE FINE-PITCH SYSTEM - 3

Diametral Pitch	Circular Pitch	Standard Circular Thickness	Standard Addendum	Working Depth	Standard Dedendum	Whole Depth
P	*p*	*t*	*a*	*hk*	*b*	*ht*
140	0.02244	0.01122	0.0071	0.0143	0.0106	0.0177
141	0.02228	0.01114	0.0071	0.0142	0.0105	0.0176
142	0.02212	0.01106	0.0070	0.0141	0.0105	0.0175
143	0.02197	0.01098	0.0070	0.0140	0.0104	0.0174
144	0.02182	0.01091	0.0069	0.0139	0.0103	0.0173
145	0.02167	0.01083	0.0069	0.0138	0.0103	0.0172
146	0.02152	0.01076	0.0068	0.0137	0.0102	0.0171
147	0.02137	0.01069	0.0068	0.0136	0.0102	0.0170
148	0.02123	0.01061	0.0068	0.0135	0.0101	0.0169
149	0.02108	0.01054	0.0067	0.0134	0.0101	0.0168
150	0.02094	0.01047	0.0067	0.0133	0.0100	0.0167
151	0.02081	0.01040	0.0066	0.0132	0.0099	0.0166
152	0.02067	0.01033	0.0066	0.0132	0.0099	0.0165
153	0.02053	0.01027	0.0065	0.0131	0.0098	0.0164
154	0.02040	0.01020	0.0065	0.0130	0.0098	0.0163
155	0.02027	0.01013	0.0065	0.0129	0.0097	0.0162
156	0.02014	0.01007	0.0064	0.0128	0.0097	0.0161
157	0.02001	0.01001	0.0064	0.0127	0.0096	0.0160
158	0.01988	0.00994	0.0063	0.0127	0.0096	0.0159
159	0.01976	0.00988	0.0063	0.0126	0.0095	0.0158
160	0.01964	0.00982	0.0063	0.0125	0.0095	0.0158
161	0.01951	0.00976	0.0062	0.0124	0.0095	0.0157
162	0.01939	0.00970	0.0062	0.0123	0.0094	0.0156
163	0.01927	0.00964	0.0061	0.0123	0.0094	0.0155
164	0.01916	0.00958	0.0061	0.0122	0.0093	0.0154
165	0.01904	0.00952	0.0061	0.0121	0.0093	0.0153
166	0.01893	0.00946	0.0060	0.0120	0.0092	0.0153
167	0.01881	0.00941	0.0060	0.0120	0.0092	0.0152
168	0.01870	0.00935	0.0060	0.0119	0.0091	0.0151
169	0.01859	0.00929	0.0059	0.0118	0.0091	0.0150
170	0.01848	0.00924	0.0059	0.0118	0.0091	0.0149
171	0.01837	0.00919	0.0058	0.0117	0.0090	0.0149
172	0.01827	0.00913	0.0058	0.0116	0.0090	0.0148
173	0.01816	0.00908	0.0058	0.0116	0.0089	0.0147
174	0.01806	0.00903	0.0057	0.0115	0.0089	0.0146
175	0.01795	0.00898	0.0057	0.0114	0.0089	0.0146
176	0.01785	0.00893	0.0057	0.0114	0.0088	0.0145
177	0.01775	0.00887	0.0056	0.0113	0.0088	0.0144
178	0.01765	0.00882	0.0056	0.0112	0.0087	0.0144
179	0.01755	0.00878	0.0056	0.0112	0.0087	0.0143
180	0.01745	0.00873	0.0056	0.0111	0.0087	0.0142
181	0.01736	0.00868	0.0055	0.0110	0.0086	0.0142
182	0.01726	0.00863	0.0055	0.0110	0.0086	0.0141
183	0.01717	0.00858	0.0055	0.0109	0.0086	0.0140
184	0.01707	0.00854	0.0054	0.0109	0.0085	0.0140
185	0.01698	0.00849	0.0054	0.0108	0.0085	0.0139
186	0.01689	0.00845	0.0054	0.0108	0.0085	0.0138
187	0.01680	0.00840	0.0053	0.0107	0.0084	0.0138
188	0.01671	0.00836	0.0053	0.0106	0.0084	0.0137
189	0.01662	0.00831	0.0053	0.0106	0.0083	0.0136
190	0.01653	0.00827	0.0053	0.0105	0.0083	0.0136
191	0.01645	0.00822	0.0052	0.0105	0.0083	0.0135
192	0.01636	0.00818	0.0052	0.0104	0.0082	0.0135
193	0.01628	0.00814	0.0052	0.0104	0.0082	0.0134
194	0.01619	0.00810	0.0052	0.0103	0.0082	0.0133
195	0.01611	0.00806	0.0051	0.0103	0.0082	0.0133
196	0.01603	0.00801	0.0051	0.0102	0.0081	0.0132
197	0.01595	0.00797	0.0051	0.0102	0.0081	0.0132
198	0.01587	0.00793	0.0051	0.0101	0.0081	0.0131
199	0.01579	0.00789	0.0050	0.0101	0.0080	0.0131
200	0.01571	0.00785	0.0050	0.0100	0.0080	0.0130

All dimensions are in inches.

TIÊU CHUẨN MỸ, HỆ THỐNG THÂN KHAI CHÂN RĂNG 20 ĐỘ

AMERICAN STANDARD 2-DEGREE INVOLUTE STUB TOOTH SYSTEM

Diametral Pitch	Circular Pitch	Standard Circular Thickness	Standard Addendum	Working Depth of Tooth	Standard Dedendum	Whole Depth of Tooth
P	p	t	a	h_k	b	h_t
½	6.2832	3.1416	1.6000	3.2000	2.0000	3.6000
¾	4.1888	2.0944	1.0667	2.1334	1.3333	2.4000
1	3.1416	1.5708	.8000	1.6000	1.0000	1.8000
1¼	2.5133	1.2566	0.6400	1.2800	0.8000	1.4400
1½	2.0944	1.0472	0.5333	1.0666	0.6667	1.2000
1¾	1.7952	0.8976	0.4571	0.9142	0.5714	1.0285
2	1.5708	0.7854	0.4000	0.8000	0.5000	0.9000
2¼	1.3963	0.6981	0.3556	0.7112	0.4444	0.8000
2½	1.2566	0.6283	0.3200	0.6400	0.4000	0.7200
2¾	1.1424	0.5712	0.2909	0.5818	0.3636	0.6545
3	1.0472	0.5236	0.2667	0.5334	0.3333	0.6000
3½	0.8976	0.4488	0.2286	0.4572	0.2857	0.5143
4	0.7854	0.3927	0.2000	0.4000	0.2500	0.4500
5	0.6283	0.3142	0.1600	0.3200	0.2000	0.3600
6	0.5236	0.2618	0.1333	0.2666	0.1667	0.3000
7	0.4488	0.2244	0.1143	0.2286	0.1428	0.2571
8	0.3927	0.1963	0.1000	0.2000	0.1250	0.2250
9	0.3491	0.1745	0.0889	0.1778	0.1111	0.2000
10	0.3142	0.1571	0.0800	0.1600	0.1000	0.1800
11	0.2856	0.1428	0.0727	0.1454	0.0909	0.1636
12	0.2618	0.1309	0.0667	0.1334	0.0833	0.1500
13	0.2417	0.1208	0.0615	0.1230	0.0769	0.1384
14	0.2244	0.1122	0.0571	0.1142	0.0714	0.1285
15	0.2094	0.1047	0.0533	0.1066	0.0667	0.1200
16	0.1963	0.0982	0.0500	0.1000	0.0625	0.1125
17	0.1848	0.0924	0.0470	0.0940	0.0588	0.1058
18	0.1745	0.0873	0.0444	0.0888	0.0556	0.1000
19	0.1653	0.0827	0.0421	0.0842	0.0526	0.0947
20	0.1571	0.0785	0.0400	0.0800	0.0500	0.0900
22	0.1428	0.0714	0.0364	0.0728	0.0454	0.0818
24	0.1309	0.0654	0.0333	0.0666	0.0417	0.0750
26	0.1208	0.0604	0.0308	0.0616	0.0384	0.0692
28	0.1122	0.0561	0.0286	0.0572	0.0357	0.0643
30	0.1047	0.0524	0.0267	0.0534	0.0333	0.0600
32	0.0982	0.0491	0.0250	0.0500	0.0312	0.0562
34	0.0924	0.0462	0.0236	0.0472	0.0294	0.0530
36	0.0873	0.0436	0.0222	0.0444	0.0278	0.0500
38	0.0827	0.0413	0.0210	0.0420	0.0263	0.0473
40	0.0785	0.0393	0.0200	0.0400	0.0250	0.0450

HỆ THỐNG CHÂN RĂNG ĂN KHỚP

GEAR TOOTH PARTS - FELLOWS STUB TOOTH SYSTEM

Diametral Pitch	Circular Thickness	Addendum	Working Depth	Dedendum	Whole Depth
3/4	0.5236	0.2500	0.5000	0.3125	0.5625
4/5	0.3927	0.2000	0.4000	0.2500	0.4500
5/7	0.3142	0.1429	0.2858	0.1786	0.3215
6/8	0.2618	0.1250	0.2500	0.1563	0.2813
7/9	0.2244	0.1111	0.2222	0.1389	0.2500
8/10	0.1964	0.1000	0.2000	0.1250	0.2250
9/11	0.1745	0.0909	0.1818	0.1137	0.2046
10/12	0.1571	0.0833	0.1666	0.1042	0.1875
11/14	0.1428	0.0714	0.1428	0.0893	0.1607
12/14	0.1309	0.0714	0.1428	0.0893	0.1607
13/16	0.1208	0.0625	0.1250	0.0781	0.1406
14/18	0.1122	0.0556	0.1112	0.0694	0.1250
16/21	0.0982	0.0476	0.0952	0.0591	0.1068
18/24	0.0873	0.0417	0.0834	0.0520	0.0937
20/26	0.0785	0.0385	0.0770	0.0482	0.0866
22/29	0.0714	0.0345	0.0690	0.0434	0.0779
24/32	0.0655	0.0313	0.0626	0.0395	0.0708
26/35	0.0604	0.0286	0.0576	0.0363	0.0649
28/37	0.0561	0.0270	0.0540	0.0344	0.0615
30/40	0.0524	0.0250	0.0500	0.0320	0.0570
32/42	0.0491	0.0238	0.0476	0.0306	0.0544
34/45	0.0462	0.0222	0.0444	0.0287	0.0509
36/48	0.0436	0.0208	0.0416	0.0270	0.0478
38/50	0.0413	0.0200	0.0400	0.0260	0.0460
40/54	0.0393	0.0185	0.0370	0.0242	0.0427

Gear Tooth Parts — Nuttall Stub Tooth System

(Based on: addendum = 0.250 × circular pitch; dedendum = 0.300 × circular pitch.)

Diametral Pitch	Equivalent Circular Pitch	Circular Thickness	Addendum	Working Depth	Dedendum	Whole Depth
1/2	6.2832	3.1416	1.5708	3.1416	1.8849	3.4557
3/4	4.1888	2.0944	1.0472	2.0944	1.2566	2.3038
1	3.1416	1.5708	0.7854	1.5708	0.9424	1.7278
1 1/4	2.5133	1.2566	0.6283	1.2566	0.7539	1.3822
1 1/2	2.0944	1.0472	0.5236	1.0472	0.6283	1.1519
1 3/4	1.7952	0.8976	0.4488	0.8976	0.5385	0.9873
2	1.5708	0.7854	0.3927	0.7854	0.4712	0.8639
2 1/4	1.3963	0.6981	0.3490	0.6981	0.4188	0.7678
2 1/2	1.2566	0.6283	0.3141	0.6283	0.3769	0.6910
2 3/4	1.1424	0.5712	0.2856	0.5712	0.3427	0.6283
3	1.0472	0.5236	0.2618	0.5236	0.3141	0.5759
3 1/2	0.8976	0.4488	0.2244	0.4488	0.2692	0.4936
4	0.7854	0.3927	0.1963	0.3927	0.2355	0.4318
5	0.6283	0.3141	0.1570	0.3142	0.1884	0.3454
6	0.5236	0.2618	0.1309	0.2618	0.1571	0.2880
7	0.4488	0.2244	0.1122	0.2244	0.1346	0.2468
8	0.3927	0.1963	0.0981	0.1963	0.1177	0.2158
9	0.3491	0.1745	0.0872	0.1745	0.1046	0.1918
10	0.3142	0.1571	0.0785	0.1571	0.0942	0.1727
11	0.2856	0.1428	0.0714	0.1428	0.0857	0.1571
12	0.2618	0.1309	0.0654	0.1309	0.0785	0.1439
13	0.2417	0.1208	0.0604	0.1208	0.0725	0.1329
14	0.2244	0.1122	0.0561	0.1122	0.0673	0.1234
15	0.2094	0.1047	0.0523	0.1047	0.0627	0.1150
16	0.1963	0.0982	0.0491	0.0982	0.0589	0.1080
17	0.1848	0.0924	0.0462	0.0924	0.0554	0.1016
18	0.1745	0.0873	0.0436	0.0873	0.0523	0.0959
19	0.1653	0.0827	0.0413	0.0827	0.0495	0.0908
20	0.1571	0.0785	0.0392	0.0785	0.0470	0.0862
22	0.1428	0.0714	0.0357	0.0714	0.0423	0.0785

CÔNG THỨC ĐỂ TÍNH KÍCH THƯỚC BÁNH RĂNG TRỤ THẲNG - 1

FORMULAS FOR DIMESIONS OF STANDARD SPUR GEARS-1

Notation

ϕ = Pressure Angle	F = Face Width
a = Addendum	h_k = Working Depth of Tooth
b = Dedendum	h_t = Whole Depth of Tooth
c = Clearance	N = Number of Teeth
C = Center Distance	If both gear and pinion are referred to:
D = Pitch Diameter	N_G = Number of Teeth in Gear
D_b = Base Circle Diameter	N_P = Number of Teeth in Pinion
D_O = Outside Diameter	p = Circular Pitch
D_R = Root Diameter	P = Diametral Pitch

No.	To Find	Formula	No.	To Find	Formula
		General Formulas			
1	Base Circle Diameter	$D_b = D\cos\phi$	6a	Outside Diameter (Full-depth Teeth)	$D_O = \frac{N+2}{P}$
2a	Circular Pitch	$p = \frac{3.1416D}{N}$	6b	Outside Diameter (Full-depth Teeth)	$D_O = \frac{(N+2)p}{3.1416}$
2b	Circular Pitch	$p = \frac{3.1416}{P}$	7a	Outside Diameter (Amer. Stnd. Stub Teeth)	$D_O = \frac{N+1.6}{P}$
3a	Center Distance	$C = \frac{N_G+N_P}{2P}$	7b	Outside Diameter (Amer. Stnd. Stub Teeth)	$D_O = \frac{(N+1.6)p}{3.1416}$
3b	Center Distance	$C = \frac{(N_G+N_P)p}{6.2832}$	8	Outside Diameter	$D_O = D+2a$
4a	Diametral Pitch	$P = \frac{3.1416}{p}$	9a	Pitch Diameter	$D = \frac{N}{P}$
4b	Diametral Pitch	$P = \frac{N}{D}$	9b	Pitch Diameter	$D = \frac{Np}{3.1416}$
5a	Number of Teeth	$N = P \times D$	10	Root Diameter*	$D_R = D-2b$
5b	Number of Teeth	$N = \frac{3.1416D}{p}$			

CÔNG THỨC ĐỂ TÍNH KÍCH THƯỚC BÁNH RĂNG TRỤ THẲNG - 2

FORMULAS FOR DIMENSIONS OF STANDARD SPUR GEARS - 2

No.	To Find	Formula	No.	To Find	Formula
Formulas for 14½-degree Involute and Composite Full-Depth Teeth and 20-degree Involute Full-Depth Teeth					
11a	Addendum	$a = 1.000 \div P$	14a	Total Depth*	$h_t = 2.157 \div P$
11b	Addendum	$a = 0.3183 \times p$	14b	Total Depth*	$h_t = 0.6866 \times p$
12a	Clearance	$c = 0.157 \div P$	14c	Total Depth*	$h_t = a + b$
12b	Clearance	$c = 0.050 \times p$	15a	Working Depth	$h_k = 2.000 \div P$
13a	Dedendum*	$b = 1.157 \div P$	15b	Working Depth	$h_k = 0.6366 \times p$
13b	Dedendum*	$b = 0.3683 \times p$			
Formulas for 20-degree Involute Fine-Pitch Teeth					
16a	Addendum	$a = 1.000 \div P$	19a	Total Depth*	$h_t = \frac{2.200}{P} + 0.002$
16b	Addendum	$a = 0.3183 \times p$	19b	Total Depth*	$h_t = (0.7003 \times p) + 0.002$
17a	Clearance	$c = \frac{0.200}{P} + 0.002$	19c	Total Depth*	$h_t = a + b$
17b	Clearance	$c = (0.0637 \times p) + 0.002$	20a	Working Depth	$h_k = \frac{2.000}{P}$
18a	Dedendum*	$b = \frac{1.200}{P} + 0.002$	20b	Working Depth	$h_k = 0.6366 \times p$
18b	Dedendum*	$b = (0.3820 \times p) + 0.002$			
Formulas for 20-degree Involute Stub Teeth					
21a	Addendum	$a = 0.800 \div P$	24a	Total Depth*	$h_t = 1.800 \div P$
21b	Addendum	$a = 0.2546 \times p$	24b	Total Depth*	$h_t = 0.5729 \times p$
22a	Clearance	$c = 0.200 \div P$	24c	Total Depth*	$h_t = a + b$
22b	Clearance	$c = 0.0637 \times p$	25a	Working Depth	$h_k = 1.600 \div P$
23a	Dedendum*	$b = 1.000 \div P$	25b	Working Depth	$h_k = 0.5092 \times p$
23b	Dedendum*	$b = 0.3183 \times p$			

BẢNG 1 : CÔNG THỨC TÍNH ĐƯỜNG KÍNH NGOÀI VÀ ĐƯỜNG KÍNH CHÂN RĂNG TRỤ THẲNG

Notation

D = Pitch Diameter	a = Standard Addendum
D_O = Outside Diameter	b = Standard Dedendum
D_R = Root Diameter	b_s = Dedendum for Shaping
P = Diametral Pitch	b_{ps} = Dedendum for Pre-shaving

14½- AND 20-DEGREE INVOLUTE FULL-DEPTH TEETH (19P and coarser)

$$^{4}\ D_O = D + 2a = \frac{N}{P} + \left(2 \times \frac{1}{P}\right)$$

$$D_R = D - 2b = \frac{N}{P} - \left(2 \times \frac{1.157}{P}\right) \quad \text{(Hobbed)}^{*}$$

$$D_R = D - 2b_s = \frac{N}{P} - \left(2 \times \frac{1.25}{P}\right) \quad \text{(Shaped)}$$

$$D_R = D - 2b_{ps} = \frac{N}{P} - \left(2 \times \frac{1.35}{P}\right) \quad \text{(Pre-shaved)}^{1}$$

$$D_R = D - 2b_{ps} = \frac{N}{P} - \left(2 \times \frac{1.45}{P}\right) \quad \text{(Pre-shaved)}^{2}$$

20-DEGREE INVOLUTE FINE-PITCH FULL-DEPTH TEETH (20P and finer)

$$^{4}\ D_O = D + 2a = \frac{N}{P} + \left(2 \times \frac{1}{P}\right)$$

$$D_R = D - 2b = \frac{N}{P} - 2\left(\frac{1.2}{P} + 0.002\right) \quad \text{(Hobbed or Shaped)}$$

$$D_R = D - 2b_{ps} = \frac{N}{P} - 2\left(\frac{1.35}{P} + 0.002\right) \quad \text{(Pre-shaved)}^{3}$$

20-DEGREE INVOLUTE STUB TEETH

$$D_O = D + 2a = \frac{N}{P} + \left(2 \times \frac{0.8}{P}\right)$$

$$D_R = D - 2b = \frac{N}{P} - \left(2 \times \frac{1}{P}\right) \quad \text{(Hobbed)}$$

$$D_R = D - 2b_{ps} = \frac{N}{P} - \left(2 \times \frac{1.35}{P}\right) \quad \text{(Pre-shaved)}^{1}$$

20-DEGREE INVOLUTE FELLOWS STUB TEETH

$$D_O = D + 2a = \frac{N}{P} + \left(2 \times \frac{1}{P'}\right)$$

$$D_R = D - 2b = \frac{N}{P} - \left(2 \times \frac{1.25}{P'}\right) \quad \text{(Shaped)}$$

$$D_R = D - 2b_{ps} = \frac{N}{P} - \left(2 \times \frac{1.35}{P'}\right) \quad \text{Pre-shaved)}^{1}$$

P is the numerator and P' is the denominator in the Fellows stub tooth designation.

* For 14½-degree involute full-depth teeth of 20 diametral pitch and finer, some companies use hobs that produce a dedendum of $(1.200 \div P) + 0.002$.

[1] Using pre-shaved dedendum of $1.35 \div P$ recommended by Michigan Tool Co. An approximate relationship of $1.35 \div P$ for the dedenda of pre-shaved gears is recommended by National Broach & Machine Co. for spur gears. Specific dedendum values based upon clearances recommended by this company for different diametral pitches and different types of teeth will be found in Tables 3, 4, and 6.

[2] Using pre-shaved dedendum of $1.45 \div P$, which provides the additional depth for pre-shaving by shaping, recommended by The Fellows Gear Shaper Co. for gears of 5 to 19 diametral pitch having 13 to 30 teeth with 14½-degrees pressure angle or 13 to 20 teeth with 20-degree pressure angle. For 14½-degree gears with over 30 teeth and for 20-degree gears with over 20 teeth, this company recommends a special protuberance-type cutter for pre-shaving.

[3] Using pre-shaved dedendum of $(1.35 \div P) + 0.002$ indicated in ASA B6.7-1956.

[4] For enlarged pinions having 17 or fewer teeth, see pages 686–690.

BẢNG 2 : ĐƯỜNG KÍNH BƯỚC CHO BÁNH RĂNG

BƯỚC KÍNH

Table 2. PITCH DIAMETERS OF DIAMETRAL PITCH GEARS

No. of Teeth	Diametral Pitch									
	2.5	3	3.5	4	4.5	5	6	7	8	9
	Pitch Diameter									
10	4.0000	3.3333	2.8571	2.5000	2.2222	2.0000	1.6667	1.4286	1.2500	1.1111
11	4.4000	3.6667	3.1429	2.7500	2.4444	2.2000	1.8333	1.5714	1.3750	1.2222
12	4.8000	4.0000	3.4286	3.0000	2.6667	2.4000	2.0000	1.7143	1.5000	1.3333
13	5.2000	4.3333	3.7143	3.2500	2.8889	2.6000	2.1667	1.8571	1.6250	1.4444
14	5.6000	4.6667	4.0000	3.5000	3.1111	2.8000	2.3333	2.0000	1.7500	1.5556
15	6.0000	5.0000	4.2857	3.7500	3.3333	3.0000	2.5000	2.1429	1.8750	1.6667
16	6.4000	5.3333	4.5714	4.0000	3.5556	3.2000	2.6667	2.2857	2.0000	1.7778
17	6.8000	5.6667	4.8571	4.2500	3.7778	3.4000	2.8333	2.4286	2.1250	1.8889
18	7.2000	6.0000	5.1429	4.5000	4.0000	3.6000	3.0000	2.5714	2.2500	2.0000
19	7.6000	6.3333	5.4286	4.7500	4.2222	3.8000	3.1667	2.7143	2.3750	2.1111
20	8.0000	6.6667	5.7143	5.0000	4.4444	4.0000	3.3333	2.8571	2.5000	2.2222
21	8.4000	7.0000	6.0000	5.2500	4.6667	4.2000	3.5000	3.0000	2.6250	2.3333
22	8.8000	7.3333	6.2857	5.5000	4.8889	4.4000	3.6667	3.1429	2.7500	2.4444
23	9.2000	7.6667	6.5714	5.7500	5.1111	4.6000	3.8333	3.2857	2.8750	2.5556
24	9.6000	8.0000	6.8571	6.0000	5.3333	4.8000	4.0000	3.4286	3.0000	2.6667
25	10.0000	8.3333	7.1429	6.2500	5.5556	5.0000	4.1667	3.5714	3.1250	2.7778
26	10.4000	8.6667	7.4286	6.5000	5.7778	5.2000	4.3333	3.7143	3.2500	2.8889
27	10.8000	9.0000	7.7143	6.7500	6.0000	5.4000	4.5000	3.8571	3.3750	3.0000
28	11.2000	9.3333	8.0000	7.0000	6.2222	5.6000	4.6667	4.0000	3.5000	3.1111
29	11.6000	9.6667	8.2857	7.2500	6.4444	5.8000	4.8333	4.1429	3.6250	3.2222
30	12.0000	10.0000	8.5714	7.5000	6.6667	6.0000	5.0000	4.2857	3.7500	3.3333
31	12.4000	10.3333	8.8571	7.7500	6.8889	6.2000	5.1667	4.4286	3.8750	3.4444
32	12.8000	10.6667	9.1429	8.0000	7.1111	6.4000	5.3333	4.5714	4.0000	3.5556
33	13.2000	11.0000	9.4286	8.2500	7.3333	6.6000	5.5000	4.7143	4.1250	3.6667
34	13.6000	11.3333	9.7143	8.5000	7.5556	6.8000	5.6667	4.8571	4.2500	3.7778
35	14.0000	11.6667	10.0000	8.7500	7.7778	7.0000	5.8333	5.0000	4.3750	3.8889
36	14.4000	12.0000	10.2857	9.0000	8.0000	7.2000	6.0000	5.1429	4.5000	4.0000
37	14.8000	12.3333	10.5714	9.2500	8.2222	7.4000	6.1667	5.2857	4.6250	4.1111
38	15.2000	12.6667	10.8571	9.5000	8.4444	7.6000	6.3333	5.4286	4.7500	4.2222
39	15.6000	13.0000	11.1429	9.7500	8.6667	7.8000	6.5000	5.5714	4.8750	4.3333
40	16.0000	13.3333	11.4286	10.0000	8.8889	8.0000	6.6667	5.7143	5.0000	4.4444
41	16.4000	13.6667	11.7143	10.2500	9.1111	8.2000	6.8333	5.8571	5.1250	4.5556
42	16.8000	14.0000	12.0000	10.5000	9.3333	8.4000	7.0000	6.0000	5.2500	4.6667
43	17.2000	14.3333	12.2857	10.7500	9.5556	8.6000	7.1667	6.1429	5.3750	4.7778
44	17.6000	14.6667	12.5714	11.0000	9.7778	8.8000	7.3333	6.2857	5.5000	4.8889
45	18.0000	15.0000	12.8571	11.2500	10.0000	9.0000	7.5000	6.4286	5.6250	5.0000
46	18.4000	15.3333	13.1429	11.5000	10.2222	9.2000	7.6667	6.5714	5.7500	5.1111
47	18.8000	15.6667	13.4286	11.7500	10.4444	9.4000	7.8333	6.7143	5.8750	5.2222
48	19.2000	16.0000	13.7143	12.0000	10.6667	9.6000	8.0000	6.8571	6.0000	5.3333
49	19.6000	16.3333	14.0000	12.2500	10.8889	9.8000	8.1667	7.0000	6.1250	5.4444
50	20.0000	16.6667	14.2857	12.5000	11.1111	10.0000	8.3333	7.1429	6.2500	5.5556
51	20.4000	17.0000	14.5714	12.7500	11.3333	10.2000	8.5000	7.2857	6.3750	5.6667
52	20.8000	17.3333	14.8571	13.0000	11.5556	10.4000	8.6667	7.4286	6.5000	5.7778
53	21.2000	17.6667	15.1429	13.2500	11.7778	10.6000	8.8333	7.5714	6.6250	5.8889
54	21.6000	18.0000	15.4286	13.5000	12.0000	10.8000	9.0000	7.7143	6.7500	6.0000
55	22.0000	18.3333	15.7143	13.7500	12.2222	11.0000	9.1667	7.8571	6.8750	6.1111
56	22.4000	18.6667	16.0000	14.0000	12.4444	11.2000	9.3333	8.0000	7.0000	6.2222
57	22.8000	19.0000	16.2857	14.2500	12.6667	11.4000	9.5000	8.1429	7.1250	6.3333
58	23.2000	19.3333	16.5714	14.5000	12.8889	11.6000	9.6667	8.2857	7.2500	6.4444
59	23.6000	19.6667	16.8571	14.7500	13.1111	11.8000	9.8333	8.4286	7.3750	6.5556
60	24.0000	20.0000	17.1429	15.0000	13.3333	12.0000	10.0000	8.5714	7.5000	6.6667
61	24.4000	20.3333	17.4286	15.2500	13.5556	12.2000	10.1667	8.7143	7.6250	6.7778
62	24.8000	20.6667	17.7143	15.5000	13.7778	12.4000	10.3333	8.8571	7.7500	6.8889
63	25.2000	21.0000	18.0000	15.7500	14.0000	12.6000	10.5000	9.0000	7.8750	7.0000
64	25.6000	21.3333	18.2857	16.0000	14.2222	12.8000	10.6667	9.1429	8.0000	7.1111
65	26.0000	21.6667	18.5714	16.2500	14.4444	13.0000	10.8333	9.2857	8.1250	7.2222
66	26.4000	22.0000	18.8571	16.5000	14.6667	13.2000	11.0000	9.4286	8.2500	7.3333
67	26.8000	22.3333	19.1429	16.7500	14.8889	13.4000	11.1667	9.5714	8.3750	7.4444
68	27.2000	22.6667	19.4286	17.0000	15.1111	13.6000	11.3333	9.7143	8.5000	7.5556
69	27.6000	23.0000	19.7143	17.2500	15.3333	13.8000	11.5000	9.8571	8.6250	7.6667
70	28.0000	23.3333	20.0000	17.5000	15.5556	14.0000	11.6667	10.0000	8.7500	7.7778

Outside diameter of a standard full-depth gear equals the pitch diameter for a gear of the same diametral pitch but with 2 more teeth.

BẢNG 2 : ĐƯỜNG KÍNH BƯỚC CHO BÁNH RĂNG BƯỚC KÍNH

Table 2. PITCH DIAMETERS OF DIAMETRAL PITCH GEARS

No. of Teeth	Diametral Pitch									
	2.5	3	3.5	4	4.5	5	6	7	8	9
	Pitch Diameter									
71	28.4000	23.6667	20.2857	17.7500	15.7778	14.2000	11.8333	10.1429	8.8750	7.8889
72	28.8000	24.0000	20.5714	18.0000	16.0000	14.4000	12.0000	10.2857	9.0000	8.0000
73	29.2000	24.3333	20.8571	18.2500	16.2222	14.6000	12.1667	10.4286	9.1250	8.1111
74	29.6000	24.6667	21.1429	18.5000	16.4444	14.8000	12.3333	10.5714	9.2500	8.2222
75	30.0000	25.0000	21.4286	18.7500	16.6667	15.0000	12.5000	10.7143	9.3750	8.3333
76	30.4000	25.3333	21.7143	19.0000	16.8889	15.2000	12.6667	10.8571	9.5000	8.4444
77	30.8000	25.6667	22.0000	19.2500	17.1111	15.4000	12.8333	11.0000	9.6250	8.5556
78	31.2000	26.0000	22.2857	19.5000	17.3333	15.6000	13.0000	11.1429	9.7500	8.6667
79	31.6000	26.3333	22.5714	19.7500	17.5556	15.8000	13.1667	11.2857	9.8750	8.7778
80	32.0000	26.6667	22.8571	20.0000	17.7778	16.0000	13.3333	11.4286	10.0000	8.8889
81	32.4000	27.0000	23.1429	20.2500	18.0000	16.2000	13.5000	11.5714	10.1250	9.0000
82	32.8000	27.3333	23.4286	20.5000	18.2222	16.4000	13.6667	11.7143	10.2500	9.1111
83	33.2000	27.6667	23.7143	20.7500	18.4444	16.6000	13.8333	11.8571	10.3750	9.2222
84	33.6000	28.0000	24.0000	21.0000	18.6667	16.8000	14.0000	12.0000	10.5000	9.3333
85	34.0000	28.3333	24.2857	21.2500	18.8889	17.0000	14.1667	12.1429	10.6250	9.4444
86	34.4000	28.6667	24.5714	21.5000	19.1111	17.2000	14.3333	12.2857	10.7500	9.5556
87	34.8000	29.0000	24.8571	21.7500	19.3333	17.4000	14.5000	12.4286	10.8750	9.6667
88	35.2000	29.3333	25.1429	22.0000	19.5556	17.6000	14.6667	12.5714	11.0000	9.7778
89	35.6000	29.6667	25.4286	22.2500	19.7778	17.8000	14.8333	12.7143	11.1250	9.8889
90	36.0000	30.0000	25.7143	22.5000	20.0000	18.0000	15.0000	12.8571	11.2500	10.0000
91	36.4000	30.3333	26.0000	22.7500	20.2222	18.2000	15.1667	13.0000	11.3750	10.1111
92	36.8000	30.6667	26.2857	23.0000	20.4444	18.4000	15.3333	13.1429	11.5000	10.2222
93	37.2000	31.0000	26.5714	23.2500	20.6667	18.6000	15.5000	13.2857	11.6250	10.3333
94	37.6000	31.3333	26.8571	23.5000	20.8889	18.8000	15.6667	13.4286	11.7500	10.4444
95	38.0000	31.6667	27.1429	23.7500	21.1111	19.0000	15.8333	13.5714	11.8750	10.5556
96	38.4000	32.0000	27.4286	24.0000	21.3333	19.2000	16.0000	13.7143	12.0000	10.6667
97	38.8000	32.3333	27.7143	24.2500	21.5556	19.4000	16.1667	13.8571	12.1250	10.7778
98	39.2000	32.6667	28.0000	24.5000	21.7778	19.6000	16.3333	14.0000	12.2500	10.8889
99	39.6000	33.0000	28.2857	24.7500	22.0000	19.8000	16.5000	14.1429	12.3750	11.0000
100	40.0000	33.3333	28.5714	25.0000	22.2222	20.0000	16.6667	14.2857	12.5000	11.1111
101	40.4000	33.6667	28.8571	25.2500	22.4444	20.2000	16.8333	14.4286	12.6250	11.2222
102	40.8000	34.0000	29.1429	25.5000	22.6667	20.4000	17.0000	14.5714	12.7500	11.3333
103	41.2000	34.3333	29.4286	25.7500	22.8889	20.6000	17.1667	14.7143	12.8750	11.4444
104	41.6000	34.6667	29.7143	26.0000	23.1111	20.8000	17.3333	14.8571	13.0000	11.5556
105	42.0000	35.0000	30.0000	26.2500	23.3333	21.0000	17.5000	15.0000	13.1250	11.6667
106	42.4000	35.3333	30.2857	26.5000	23.5556	21.2000	17.6667	15.1429	13.2500	11.7778
107	42.8000	35.6667	30.5714	26.7500	23.7778	21.4000	17.8333	15.2857	13.3750	11.8889
108	43.2000	36.0000	30.8571	27.0000	24.0000	21.6000	18.0000	15.4286	13.5000	12.0000
109	43.6000	36.3333	31.1429	27.2500	24.2222	21.8000	18.1667	15.5714	13.6250	12.1111
110	44.0000	36.6667	31.4286	27.5000	24.4444	22.0000	18.3333	15.7143	13.7500	12.2222
111	44.4000	37.0000	31.7143	27.7500	24.6667	22.2000	18.5000	15.8571	13.8750	12.3333
112	44.8000	37.3333	32.0000	28.0000	24.8889	22.4000	18.6667	16.0000	14.0000	12.4444
113	45.2000	37.6667	32.2857	28.2500	25.1111	22.6000	18.8333	16.1429	14.1250	12.5556
114	45.6000	38.0000	32.5714	28.5000	25.3333	22.8000	19.0000	16.2857	14.2500	12.6667
115	46.0000	38.3333	32.8571	28.7500	25.5556	23.0000	19.1667	16.4286	14.3750	12.7778
116	46.4000	38.6667	33.1429	29.0000	25.7778	23.2000	19.3333	16.5714	14.5000	12.8889
117	46.8000	39.0000	33.4286	29.2500	26.0000	23.4000	19.5000	16.7143	14.6250	13.0000
118	47.2000	39.3333	33.7143	29.5000	26.2222	23.6000	19.6667	16.8571	14.7500	13.1111
119	47.6000	39.6667	34.0000	29.7500	26.4444	23.8000	19.8333	17.0000	14.8750	13.2222
120	48.0000	40.0000	34.2857	30.0000	26.6667	24.0000	20.0000	17.1429	15.0000	13.3333
121	48.4000	40.3333	34.5714	30.2500	26.8889	24.2000	20.1667	17.2857	15.1250	13.4444
122	48.8000	40.6667	34.8571	30.5000	27.1111	24.4000	20.3333	17.4286	15.2500	13.5556
123	49.2000	41.0000	35.1429	30.7500	27.3333	24.6000	20.5000	17.5714	15.3750	13.6667
124	49.6000	41.3333	35.4286	31.0000	27.5556	24.8000	20.6667	17.7143	15.5000	13.7778
125	50.0000	41.6667	35.7143	31.2500	27.7778	25.0000	20.8333	17.8571	15.6250	13.8889
126	50.4000	42.0000	36.0000	31.5000	28.0000	25.2000	21.0000	18.0000	15.7500	14.0000
127	50.8000	42.3333	36.2857	31.7500	28.2222	25.4000	21.1667	18.1429	15.8750	14.1111
128	51.2000	42.6667	36.5714	32.0000	28.4444	25.6000	21.3333	18.2857	16.0000	14.2222
129	51.6000	43.0000	36.8571	32.2500	28.6667	25.8000	21.5000	18.4286	16.1250	14.3333
130	52.0000	43.3333	37.1429	32.5000	28.8889	26.0000	21.6667	18.5714	16.2500	14.4444

Outside diameter of a standard full-depth gear equals the pitch diameter for a gear of the same diametral pitch but with 2 more teeth

BẢNG 2 : ĐƯỜNG KÍNH BƯỚC CHO BÁNH RĂNG

BƯỚC KÍNH

Table 2. PITCH DIAMETERS OF DIAMETRAL PITCH GEARS

No. of Teeth	Diametral Pitch										
	10	11	12	14	16	18	20	22	24	28	32
	Pitch Diameter										
10	1.0000	0.9091	0.8333	0.7143	0.6250	0.5556	0.5000	0.4545	0.4167	0.3571	0.3125
11	1.1000	1.0000	0.9167	0.7857	0.6875	0.6111	0.5500	0.5000	0.4583	0.3929	0.3438
12	1.2000	1.0909	1.0000	0.8571	0.7500	0.6667	0.6000	0.5455	0.5000	0.4286	0.3750
13	1.3000	1.1818	1.0833	0.9286	0.8125	0.7222	0.6500	0.5909	0.5417	0.4643	0.4062
14	1.4000	1.2727	1.1667	1.0000	0.8750	0.7778	0.7000	0.6364	0.5833	0.5000	0.4375
15	1.5000	1.3636	1.2500	1.0714	0.9375	0.8333	0.7500	0.6818	0.6250	0.5357	0.4688
16	1.6000	1.4545	1.3333	1.1429	1.0000	0.8889	0.8000	0.7273	0.6667	0.5714	0.5000
17	1.7000	1.5455	1.4167	1.2143	1.0625	0.9444	0.8500	0.7727	0.7083	0.6071	0.5312
18	1.8000	1.6364	1.5000	1.2857	1.1250	1.0000	0.9000	0.8182	0.7500	0.6429	0.5625
19	1.9000	1.7273	1.5833	1.3571	1.1875	1.0556	0.9500	0.8636	0.7917	0.6786	0.5938
20	2.0000	1.8182	1.6667	1.4286	1.2500	1.1111	1.0000	0.9091	0.8333	0.7143	0.6250
21	2.1000	1.9091	1.7500	1.5000	1.3125	1.1667	1.0500	0.9545	0.8750	0.7500	0.6562
22	2.2000	2.0000	1.8333	1.5714	1.3750	1.2222	1.1000	1.0000	0.9167	0.7857	0.6875
23	2.3000	2.0909	1.9167	1.6429	1.4375	1.2778	1.1500	1.0455	0.9583	0.8214	0.7188
24	2.4000	2.1818	2.0000	1.7143	1.5000	1.3333	1.2000	1.0909	1.0000	0.8571	0.7500
25	2.5000	2.2727	2.0833	1.7857	1.5625	1.3889	1.2500	1.1364	1.0417	0.8929	0.7812
26	2.6000	2.3636	2.1667	1.8571	1.6250	1.4444	1.3000	1.1818	1.0833	0.9286	0.8125
27	2.7000	2.4545	2.2500	1.9286	1.6875	1.5000	1.3500	1.2273	1.1250	0.9643	0.8438
28	2.8000	2.5455	2.3333	2.0000	1.7500	1.5556	1.4000	1.2727	1.1667	1.0000	0.8750
29	2.9000	2.6364	2.4167	2.0714	1.8125	1.6111	1.4500	1.3182	1.2083	1.0357	0.9062
30	3.0000	2.7273	2.5000	2.1429	1.8750	1.6667	1.5000	1.3636	1.2500	1.0714	0.9375
31	3.1000	2.8182	2.5833	2.2143	1.9375	1.7222	1.5500	1.4091	1.2917	1.1071	0.9688
32	3.2000	2.9091	2.6667	2.2857	2.0000	1.7778	1.6000	1.4545	1.3333	1.1429	1.0000
33	3.3000	3.0000	2.7500	2.3571	2.0625	1.8333	1.6500	1.5000	1.3750	1.1786	1.0312
34	3.4000	3.0909	2.8333	2.4286	2.1250	1.8889	1.7000	1.5455	1.4167	1.2143	1.0625
35	3.5000	3.1818	2.9167	2.5000	2.1875	1.9444	1.7500	1.5909	1.4583	1.2500	1.0938
36	3.6000	3.2727	3.0000	2.5714	2.2500	2.0000	1.8000	1.6364	1.5000	1.2857	1.1250
37	3.7000	3.3636	3.0833	2.6429	2.3125	2.0556	1.8500	1.6818	1.5417	1.3214	1.1562
38	3.8000	3.4545	3.1667	2.7143	2.3750	2.1111	1.9000	1.7273	1.5833	1.3571	1.1875
39	3.9000	3.5455	3.2500	2.7857	2.4375	2.1667	1.9500	1.7727	1.6250	1.3929	1.2188
40	4.0000	3.6364	3.3333	[illegible]	2.5000	2.2222	2.0000	1.8182	1.6667	1.4286	1.2500
41	4.1000	3.7273	3.4167	2.9286	2.5625	2.2778	2.0500	1.8636	1.7083	1.4643	1.2812
42	4.2000	3.8182	3.5000	3.0000	2.6250	2.3333	2.1000	1.9091	1.7500	1.5000	1.3125
43	4.3000	3.9091	3.5833	3.0714	2.6875	2.3889	2.1500	1.9545	1.7917	1.5357	1.3438
44	4.4000	4.0000	3.6667	3.1429	2.7500	2.4444	2.2000	2.0000	1.8333	1.5714	1.3750
45	4.5000	4.0909	3.7500	3.2143	2.8125	2.5000	2.2500	2.0455	1.8750	1.6071	1.4062
46	4.6000	4.1818	3.8333	3.2857	2.8750	2.5556	2.3000	2.0909	1.9167	1.6429	1.4375
47	4.7000	4.2727	3.9167	3.3571	2.9375	2.6111	2.3500	2.1364	1.9583	1.6786	1.4688
48	4.8000	4.3636	4.0000	3.4286	3.0000	2.6667	2.4000	2.1818	2.0000	1.7143	1.5000
49	4.9000	4.4545	4.0833	3.5000	3.0625	2.7222	2.4500	2.2273	2.0417	1.7500	1.5312
50	5.0000	4.5455	4.1667	3.5714	3.1250	2.7778	2.5000	2.2727	2.0833	1.7857	1.5625
51	5.1000	4.6364	4.2500	3.6429	3.1875	2.8333	2.5500	2.3182	2.1250	1.8214	1.5938
52	5.2000	4.7273	4.3333	3.7143	3.2500	2.8889	2.6000	2.3636	2.1667	1.8571	1.6250
53	5.3000	4.8182	4.4167	3.7857	3.3125	2.9444	2.6500	2.4091	2.2083	1.8929	1.6562
54	5.4000	4.9091	4.5000	3.8571	3.3750	3.0000	2.7000	2.4545	2.2500	1.9286	1.6875
55	5.5000	5.0000	4.5833	3.9286	3.4375	3.0556	2.7500	2.5000	2.2917	1.9643	1.7188
56	5.6000	5.0909	4.6667	4.0000	3.5000	3.1111	2.8000	2.5455	2.3333	2.0000	1.7500
57	5.7000	5.1818	4.7500	4.0714	3.5625	3.1667	2.8500	2.5909	2.3750	2.0357	1.7812
58	5.8000	5.2727	4.8333	4.1429	3.6250	3.2222	2.9000	2.6364	2.4167	2.0714	1.8125
59	5.9000	5.3636	4.9167	4.2143	3.6875	3.2778	2.9500	2.6818	2.4583	2.1071	1.8438
60	6.0000	5.4545	5.0000	4.2857	3.7500	3.3333	3.0000	2.7273	2.5000	2.1429	1.8750
61	6.1000	5.5455	5.0833	4.3571	3.8125	3.3889	3.0500	2.7727	2.5417	2.1786	1.9062
62	6.2000	5.6364	5.1667	4.4286	3.8750	3.4444	3.1000	2.8182	2.5833	2.2143	1.9375
63	6.3000	5.7273	5.2500	4.5000	3.9375	3.5000	3.1500	2.8636	2.6250	2.2500	1.9688
64	6.4000	5.8182	5.3333	4.5714	4.0000	3.5556	3.2000	2.9091	2.6667	2.2857	2.0000
65	6.5000	5.9091	5.4167	4.6429	4.0625	3.6111	3.2500	2.9545	2.7083	2.3214	2.0312
66	6.6000	6.0000	5.5000	4.7143	4.1250	3.6667	3.3000	3.0000	2.7500	2.3571	2.0625
67	6.7000	6.0909	5.5833	4.7857	4.1875	3.7222	3.3500	3.0455	2.7917	2.3929	2.0938
68	6.8000	6.1818	5.6667	4.8571	4.2500	3.7778	3.4000	3.0909	2.8333	2.4286	2.1250
69	6.9000	6.2727	5.7500	4.9286	4.3125	3.8333	3.4500	3.1364	2.8750	2.4643	2.1562
70	7.0000	6.3636	5.8333	5.0000	4.3750	3.8889	3.5000	3.1818	2.9167	2.5000	2.1875

Outside diameter of a standard full-depth gear equals the pitch diameter for a gear of the same diametral pitch but with 2 more teeth.

BẢNG 2 : ĐƯỜNG KÍNH BƯỚC CHO BÁNH RĂNG

BƯỚC KÍNH

Table 2. PITCH DIAMETERS OF DIAMETRAL PITCH GEARS

No. of Teeth	Diametral Pitch 10	11	12	14	16	18	20	22	24	28	32
	Pitch Diameter										
71	7.1000	6.4545	5.9167	5.0714	4.4375	3.9444	3.5500	3.2273	2.9583	2.5357	2.2188
72	7.2000	6.5455	6.0000	5.1429	4.5000	4.0000	3.6000	3.2727	3.0000	2.5714	2.2500
73	7.3000	6.6364	6.0833	5.2143	4.5625	4.0556	3.6500	3.3182	3.0417	2.6071	2.2812
74	7.4000	6.7273	6.1667	5.2857	4.6250	4.1111	3.7000	3.3636	3.0833	2.6429	2.3125
75	7.5000	6.8182	6.2500	5.3571	4.6875	4.1667	3.7500	3.4091	3.1250	2.6786	2.3438
76	7.6000	6.9091	6.3333	5.4286	4.7500	4.2222	3.8000	3.4545	3.1667	2.7143	2.3750
77	7.7000	7.0000	6.4167	5.5000	4.8125	4.2778	3.8500	3.5000	3.2083	2.7500	2.4062
78	7.8000	7.0909	6.5000	5.5714	4.8750	4.3333	3.9000	3.5455	3.2500	2.7857	2.4375
79	7.9000	7.1818	6.5833	5.6429	4.9375	4.3889	3.9500	3.5909	3.2917	2.8214	2.4688
80	8.0000	7.2727	6.6667	5.7143	5.0000	4.4444	4.0000	3.6364	3.3333	2.8571	2.5000
81	8.1000	7.3636	6.7500	5.7857	5.0625	4.5000	4.0500	3.6818	3.3750	2.8929	2.5312
82	8.2000	7.4545	6.8333	5.8571	5.1250	4.5556	4.1000	3.7273	3.4167	2.9286	2.5625
83	8.3000	7.5455	6.9167	5.9286	5.1875	4.6111	4.1500	3.7727	3.4583	2.9643	2.5938
84	8.4000	7.6364	7.0000	6.0000	5.2500	4.6667	4.2000	3.8182	3.5000	3.0000	2.6250
85	8.5000	7.7273	7.0833	6.0714	5.3125	4.7222	4.2500	3.8636	3.5417	3.0357	2.6562
86	8.6000	7.8182	7.1667	6.1429	5.3750	4.7778	4.3000	3.9091	3.5833	3.0714	2.6875
87	8.7000	7.9091	7.2500	6.2143	5.4375	4.8333	4.3500	3.9545	3.6250	3.1071	2.7188
88	8.8000	8.0000	7.3333	6.2857	5.5000	4.8889	4.4000	4.0000	3.6667	3.1429	2.7500
89	8.9000	8.0909	7.4167	6.3571	5.5625	4.9444	4.4500	4.0455	3.7083	3.1786	2.7812
90	9.0000	8.1818	7.5000	6.4286	5.6250	5.0000	4.5000	4.0909	3.7500	3.2143	2.8125
91	9.1000	8.2727	7.5833	6.5000	5.6875	5.0556	4.5500	4.1364	3.7917	3.2500	2.8438
92	9.2000	8.3636	7.6667	6.5714	5.7500	5.1111	4.6000	4.1818	3.8333	3.2857	2.8750
93	9.3000	8.4545	7.7500	6.6429	5.8125	5.1667	4.6500	4.2273	3.8750	3.3214	2.9062
94	9.4000	8.5455	7.8333	6.7143	5.8750	5.2222	4.7000	4.2727	3.9167	3.3571	2.9375
95	9.5000	8.6364	7.9167	6.7857	5.9375	5.2778	4.7500	4.3182	3.9583	3.3929	2.9688
96	9.6000	8.7273	8.0000	6.8571	6.0000	5.3333	4.8000	4.3636	4.0000	3.4286	3.0000
97	9.7000	8.8182	8.0833	6.9286	6.0625	5.3889	4.8500	4.4091	4.0417	3.4643	3.0312
98	9.8000	8.9091	8.1667	7.0000	6.1250	5.4444	4.9000	4.4545	4.0833	3.5000	3.0625
99	9.9000	9.0000	8.2500	7.0714	6.1875	5.5000	4.9500	4.5000	4.1250	3.5357	3.0938
100	10.0000	9.0909	8.3333	7.1429	6.2500	5.5556	5.0000	4.5455	4.1667	3.5714	3.1250
101	10.1000	9.1818	8.4167	7.2143	6.3125	5.6111	5.0500	4.5909	4.2083	3.6071	3.1562
102	10.2000	9.2727	8.5000	7.2857	6.3750	5.6667	5.1000	4.6364	4.2500	3.6429	3.1875
103	10.3000	9.3636	8.5833	7.3571	6.4375	5.7222	5.1500	4.6818	4.2917	3.6786	3.2188
104	10.4000	9.4545	8.6667	7.4286	6.5000	5.7778	5.2000	4.7273	4.3333	3.7143	3.2500
105	10.5000	9.5455	8.7500	7.5000	6.5625	5.8333	5.2500	4.7727	4.3750	3.7500	3.2812
106	10.6000	9.6364	8.8333	7.5714	6.6250	5.8889	5.3000	4.8182	4.4167	3.7857	3.3125
107	10.7000	9.7273	8.9167	7.6429	6.6875	5.9444	5.3500	4.8636	4.4583	3.8214	3.3438
108	10.8000	9.8182	9.0000	7.7143	6.7500	6.0000	5.4000	4.9091	4.5000	3.8571	3.3750
109	10.9000	9.9091	9.0833	7.7857	6.8125	6.0556	5.4500	4.9545	4.5417	3.8929	3.4062
110	11.0000	10.0000	9.1667	7.8571	6.8750	6.1111	5.5000	5.0000	4.5833	3.9286	3.4375
111	11.1000	10.0909	9.2500	7.9286	6.9375	6.1667	5.5500	5.0455	4.6250	3.9643	3.4688
112	11.2000	10.1818	9.3333	8.0000	7.0000	6.2222	5.6000	5.0909	4.6667	4.0000	3.5000
113	11.3000	10.2727	9.4167	8.0714	7.0625	6.2778	5.6500	5.1364	4.7083	4.0357	3.5312
114	11.4000	10.3636	9.5000	8.1429	7.1250	6.3333	5.7000	5.1818	4.7500	4.0714	3.5625
115	11.5000	10.4545	9.5833	8.2143	7.1875	6.3889	5.7500	5.2273	4.7917	4.1071	3.5938
116	11.6000	10.5455	9.6667	8.2857	7.2500	6.4444	5.8000	5.2727	4.8333	4.1429	3.6250
117	11.7000	10.6364	9.7500	8.3571	7.3125	6.5000	5.8500	5.3182	4.8750	4.1786	3.6562
118	11.8000	10.7273	9.8333	8.4286	7.3750	6.5556	5.9000	5.3636	4.9167	4.2143	3.6875
119	11.9000	10.8182	9.9167	8.5000	7.4375	6.6111	5.9500	5.4091	4.9583	4.2500	3.7188
120	12.0000	10.9091	10.0000	8.5714	7.5000	6.6667	6.0000	5.4545	5.0000	4.2857	3.7500
121	12.1000	11.0000	10.0833	8.6429	7.5625	6.7222	6.0500	5.5000	5.0417	4.3214	3.7812
122	12.2000	11.0909	10.1667	8.7143	7.6250	6.7778	6.1000	5.5455	5.0833	4.3571	3.8125
123	12.3000	11.1818	10.2500	8.7857	7.6875	6.8333	6.1500	5.5909	5.1250	4.3929	3.8438
124	12.4000	11.2727	10.3333	8.8571	7.7500	6.8889	6.2000	5.6364	5.1667	4.4286	3.8750
125	12.5000	11.3636	10.4167	8.9286	7.8125	6.9444	6.2500	5.6818	5.2083	4.4643	3.9062
126	12.6000	11.4545	10.5000	9.0000	7.8750	7.0000	6.3000	5.7273	5.2500	4.5000	3.9375
127	12.7000	11.5455	10.5833	9.0714	7.9375	7.0556	6.3500	5.7727	5.2917	4.5357	3.9688
128	12.8000	11.6364	10.6667	9.1429	8.0000	7.1111	6.4000	5.8182	5.3333	4.5714	4.0000
129	12.9000	11.7273	10.7500	9.2143	8.0625	7.1667	6.4500	5.8636	5.3750	4.6071	4.0312
130	13.0000	11.8182	10.8333	9.2857	8.1250	7.2222	6.5000	5.9091	5.4167	4.6429	4.0625

Outside diameter of a standard full-depth gear equals the pitch diameter for a gear of the same diametral pitch but with 2 more teeth.

BẢNG 2 : ĐƯỜNG KÍNH BƯỚC CHO BÁNH RĂNG

BƯỚC KÍNH

Table 2. PITCH DIAMETERS OF DIAMETRAL PITCH GEARS

No. of Teeth	Diametral Pitch										
	36	40	44	48	56	64	72	80	96	120	128
	Pitch Diameter										
10	0.2778	0.2500	0.2273	0.2083	0.1786	0.1562	0.1389	0.1250	0.1042	0.0833	0.0781
11	0.3056	0.2750	0.2500	0.2292	0.1964	0.1719	0.1528	0.1375	0.1146	0.0917	0.0859
12	0.3333	0.3000	0.2727	0.2500	0.2143	0.1875	0.1667	0.1500	0.1250	0.1000	0.0938
13	0.3611	0.3250	0.2955	0.2708	0.2321	0.2031	0.1806	0.1625	0.1354	0.1083	0.1016
14	0.3889	0.3500	0.3182	0.2917	0.2500	0.2188	0.1944	0.1750	0.1458	0.1167	0.1094
15	0.4167	0.3750	0.3409	0.3125	0.2679	0.2344	0.2083	0.1875	0.1562	0.1250	0.1172
16	0.4444	0.4000	0.3636	0.3333	0.2857	0.2500	0.2222	0.2000	0.1667	0.1333	0.1250
17	0.4722	0.4250	0.3864	0.3542	0.3036	0.2656	0.2361	0.2125	0.1771	0.1417	0.1328
18	0.5000	0.4500	0.4091	0.3750	0.3214	0.2812	0.2500	0.2250	0.1875	0.1500	0.1406
19	0.5278	0.4750	0.4318	0.3958	0.3393	0.2969	0.2639	0.2375	0.1979	0.1583	0.1484
20	0.5556	0.5000	0.4545	0.4167	0.3571	0.3125	0.2778	0.2500	0.2083	0.1667	0.1562
21	0.5833	0.5250	0.4773	0.4375	0.3750	0.3281	0.2917	0.2625	0.2187	0.1750	0.1641
22	0.6111	0.5500	0.5000	0.4583	0.3929	0.3438	0.3056	0.2750	0.2292	0.1833	0.1719
23	0.6389	0.5750	0.5227	0.4792	0.4107	0.3594	0.3194	0.2875	0.2396	0.1917	0.1797
24	0.6667	0.6000	0.5455	0.5000	0.4286	0.3750	0.3333	0.3000	0.2500	0.2000	0.1875
25	0.6944	0.6250	0.5682	0.5208	0.4464	0.3906	0.3472	0.3125	0.2604	0.2083	0.1953
26	0.7222	0.6500	0.5909	0.5417	0.4643	0.4062	0.3611	0.3250	0.2708	0.2167	0.2031
27	0.7500	0.6750	0.6136	0.5625	0.4821	0.4219	0.3750	0.3375	0.2812	0.2250	0.2109
28	0.7778	0.7000	0.6364	0.5833	0.5000	0.4375	0.3889	0.3500	0.2917	0.2333	0.2188
29	0.8056	0.7250	0.6591	0.6042	0.5179	0.4531	0.4028	0.3625	0.3021	0.2417	0.2266
30	0.8333	0.7500	0.6818	0.6250	0.5357	0.4688	0.4167	0.3750	0.3125	0.2500	0.2344
31	0.8611	0.7750	0.7045	0.6458	0.5536	0.4844	0.4306	0.3875	0.3229	0.2583	0.2422
32	0.8889	0.8000	0.7273	0.6667	0.5714	0.5000	0.4444	0.4000	0.3333	0.2667	0.2500
33	0.9167	0.8250	0.7500	0.6875	0.5893	0.5156	0.4583	0.4125	0.3437	0.2750	0.2578
34	0.9444	0.8500	0.7727	0.7083	0.6071	0.5312	0.4722	0.4250	0.3542	0.2833	0.2656
35	0.9722	0.8750	0.7955	0.7292	0.6250	0.5469	0.4861	0.4375	0.3646	0.2917	0.2734
36	1.0000	0.9000	0.8182	0.7500	0.6429	0.5625	0.5000	0.4500	0.3750	0.3000	0.2812
37	1.0278	0.9250	0.8409	0.7708	0.6607	0.5781	0.5139	0.4625	0.3854	0.3083	0.2891
38	1.0556	0.9500	0.8636	0.7917	0.6786	0.5938	0.5278	0.4750	0.3958	0.3167	0.2969
39	1.0833	0.9750	0.8864	0.8125	0.6964	0.6094	0.5417	0.4875	0.4062	0.3250	0.3047
40	1.1111	1.0000	0.9091	0.8333	0.7143	0.6250	0.5556	0.5000	0.4167	0.3333	0.3125
41	1.1389	1.0250	0.9318	0.8542	0.7321	0.6406	0.5694	0.5125	0.4271	0.3417	0.3203
42	1.1667	1.0500	0.9545	0.8750	0.7500	0.6562	0.5833	0.5250	0.4375	0.3500	0.3281
43	1.1944	1.0750	0.9773	0.8958	0.7679	0.6719	0.5972	0.5375	0.4479	0.3583	0.3359
44	1.2222	1.1000	1.0000	0.9167	0.7857	0.6875	0.6111	0.5500	0.4583	0.3667	0.3438
45	1.2500	1.1250	1.0227	0.9375	0.8036	0.7031	0.6250	0.5625	0.4687	0.3750	0.3516
46	1.2778	1.1500	1.0455	0.9583	0.8214	0.7188	0.6389	0.5750	0.4792	0.3833	0.3594
47	1.3056	1.1750	1.0682	0.9792	0.8393	0.7344	0.6528	0.5875	0.4896	0.3917	0.3672
48	1.3333	1.2000	1.0909	1.0000	0.8571	0.7500	0.6667	0.6000	0.5000	0.4000	0.3750
49	1.3611	1.2250	1.1136	1.0208	0.8750	0.7656	0.6806	0.6125	0.5104	0.4083	0.3828
50	1.3889	1.2500	1.1364	1.0417	0.8929	0.7812	0.6944	0.6250	0.5208	0.4167	0.3906
51	1.4167	1.2750	1.1591	1.0625	0.9107	0.7969	0.7083	0.6375	0.5312	0.4250	0.3984
52	1.4444	1.3000	1.1818	1.0833	0.9286	0.8125	0.7222	0.6500	0.5417	0.4333	0.4062
53	1.4722	1.3250	1.2045	1.1042	0.9464	0.8281	0.7361	0.6625	0.5521	0.4417	0.4141
54	1.5000	1.3500	1.2273	1.1250	0.9643	0.8438	0.7500	0.6750	0.5625	0.4500	0.4219
55	1.5278	1.3750	1.2500	1.1458	0.9821	0.8594	0.7639	0.6875	0.5729	0.4583	0.4297
56	1.5556	1.4000	1.2727	1.1667	1.0000	0.8750	0.7778	0.7000	0.5833	0.4667	0.4375
57	1.5833	1.4250	1.2955	1.1875	1.0179	0.8906	0.7917	0.7125	0.5937	0.4750	0.4453
58	1.6111	1.4500	1.3182	1.2083	1.0357	0.9062	0.8056	0.7250	0.6042	0.4833	0.4531
59	1.6389	1.4750	1.3409	1.2292	1.0536	0.9219	0.8194	0.7375	0.6146	0.4917	0.4609
60	1.6667	1.5000	1.3636	1.2500	1.0714	0.9375	0.8333	0.7500	0.6250	0.5000	0.4688
61	1.6944	1.5250	1.3864	1.2708	1.0893	0.9531	0.8472	0.7625	0.6354	0.5083	0.4766
62	1.7222	1.5500	1.4091	1.2917	1.1071	0.9688	0.8611	0.7750	0.6458	0.5167	0.4844
63	1.7500	1.5750	1.4318	1.3125	1.1250	0.9844	0.8750	0.7875	0.6562	0.5250	0.4922
64	1.7778	1.6000	1.4545	1.3333	1.1429	1.0000	0.8889	0.8000	0.6667	0.5333	0.5000
65	1.8056	1.6250	1.4773	1.3542	1.1607	1.0156	0.9028	0.8125	0.6771	0.5417	0.5078
66	1.8333	1.6500	1.5000	1.3750	1.1786	1.0312	0.9167	0.8250	0.6875	0.5500	0.5156
67	1.8611	1.6750	1.5227	1.3958	1.1964	1.0469	0.9306	0.8375	0.6979	0.5583	0.5234
68	1.8889	1.7000	1.5455	1.4167	1.2143	1.0625	0.9444	0.8500	0.7083	0.5667	0.5312
69	1.9167	1.7250	1.5682	1.4375	1.2321	1.0781	0.9583	0.8625	0.7187	0.5750	0.5391
70	1.9444	1.7500	1.5909	1.4583	1.2500	1.0938	0.9722	0.8750	0.7292	0.5833	0.5469

Outside diameter of a standard full-depth gear equals the pitch diameter for a gear of the same diametral pitch but with 2 more teeth.

BẢNG 2 : ĐƯỜNG KÍNH BƯỚC CHO BÁNH RĂNG BƯỚC KÍNH

Table 2. PITCH DIAMETERS OF DIAMETRAL PITCH GEARS

No. of Teeth	Diametral Pitch										
	36	40	44	48	56	64	72	80	96	120	128
	Pitch Diameter										
71	1.9722	1.7750	1.6136	1.4792	1.2679	1.1094	0.9861	0.8875	0.7396	0.5917	0.5547
72	2.0000	1.8000	1.6364	1.5000	1.2857	1.1250	1.0000	0.9000	0.7500	0.6000	0.5625
73	2.0278	1.8250	1.6591	1.5208	1.3036	1.1406	1.0139	0.9125	0.7604	0.6083	0.5703
74	2.0556	1.8500	1.6818	1.5417	1.3214	1.1562	1.0278	0.9250	0.7708	0.6167	0.5781
75	2.0833	1.8750	1.7045	1.5625	1.3393	1.1719	1.0417	0.9375	0.7812	0.6250	0.5859
76	2.1111	1.9000	1.7273	1.5833	1.3571	1.1875	1.0556	0.9500	0.7917	0.6333	0.5938
77	2.1389	1.9250	1.7500	1.6042	1.3750	1.2031	1.0694	0.9625	0.8021	0.6417	0.6016
78	2.1667	1.9500	1.7727	1.6250	1.3929	1.2188	1.0833	0.9750	0.8125	0.6500	0.6094
79	2.1944	1.9750	1.7955	1.6458	1.4107	1.2344	1.0972	0.9875	0.8229	0.6583	0.6172
80	2.2222	2.0000	1.8182	1.6667	1.4286	1.2500	1.1111	1.0000	0.8333	0.6667	0.6250
81	2.2500	2.0250	1.8409	1.6875	1.4464	1.2656	1.1250	1.0125	0.8437	0.6750	0.6328
82	2.2778	2.0500	1.8636	1.7083	1.4643	1.2812	1.1389	1.0250	0.8542	0.6833	0.6406
83	2.3056	2.0750	1.8864	1.7292	1.4821	1.2969	1.1528	1.0375	0.8646	0.6917	0.6484
84	2.3333	2.1000	1.9091	1.7500	1.5000	1.3125	1.1667	1.0500	0.8750	0.7000	0.6562
85	2.3611	2.1250	1.9318	1.7708	1.5179	1.3281	1.1806	1.0625	0.8854	0.7083	0.6641
86	2.3889	2.1500	1.9545	1.7917	1.5357	1.3438	1.1944	1.0750	0.8958	0.7167	0.6719
87	2.4167	2.1750	1.9773	1.8125	1.5536	1.3594	1.2083	1.0875	0.9062	0.7250	0.6797
88	2.4444	2.2000	2.0000	1.8333	1.5714	1.3750	1.2222	1.1000	0.9167	0.7333	0.6875
89	2.4722	2.2250	2.0227	1.8542	1.5893	1.3906	1.2361	1.1125	0.9271	0.7417	0.6953
90	2.5000	2.2500	2.0455	1.8750	1.6071	1.4062	1.2500	1.1250	0.9375	0.7500	0.7031
91	2.5278	2.2750	2.0682	1.8958	1.6250	1.4219	1.2639	1.1375	0.9479	0.7583	0.7109
92	2.5556	2.3000	2.0909	1.9167	1.6429	1.4375	1.2778	1.1500	0.9583	0.7667	0.7188
93	2.5833	2.3250	2.1136	1.9375	1.6607	1.4531	1.2917	1.1625	0.9687	0.7750	0.7266
94	2.6111	2.3500	2.1364	1.9583	1.6786	1.4688	1.3056	1.1750	0.9792	0.7833	0.7344
95	2.6389	2.3750	2.1591	1.9792	1.6964	1.4844	1.3194	1.1875	0.9896	0.7917	0.7422
96	2.6667	2.4000	2.1818	2.0000	1.7143	1.5000	1.3333	1.2000	1.0000	0.8000	0.7500
97	2.6944	2.4250	2.2045	2.0208	1.7321	1.5156	1.3472	1.2125	1.0104	0.8083	0.7578
98	2.7222	2.4500	2.2273	2.0417	1.7500	1.5312	1.3611	1.2250	1.0208	0.8167	0.7656
99	2.7500	2.4750	2.2500	2.0625	1.7679	1.5469	1.3750	1.2375	1.0312	0.8250	0.7734
100	2.7778	2.5000	2.2727	2.0833	1.7857	1.5625	1.3889	1.2500	1.0417	0.8333	0.7812
101	2.8056	2.5250	2.2955	2.1042	1.8036	1.5781	1.4028	1.2625	1.0521	0.8417	0.7891
102	2.8333	2.5500	2.3182	2.1250	1.8214	1.5938	1.4167	1.2750	1.0625	0.8500	0.7969
103	2.8611	2.5750	2.3409	2.1458	1.8393	1.6094	1.4306	1.2875	1.0729	0.8583	0.8047
104	2.8889	2.6000	2.3636	2.1667	1.8571	1.6250	1.4444	1.3000	1.0833	0.8667	0.8125
105	2.9167	2.6250	2.3864	2.1875	1.8750	1.6406	1.4583	1.3125	1.0937	0.8750	0.8203
106	2.9444	2.6500	2.4091	2.2083	1.8929	1.6562	1.4722	1.3250	1.1042	0.8833	0.8281
107	2.9722	2.6750	2.4318	2.2292	1.9107	1.6719	1.4861	1.3375	1.1146	0.8917	0.8359
108	3.0000	2.7000	2.4545	2.2500	1.9286	1.6875	1.5000	1.3500	1.1250	0.9000	0.8438
109	3.0278	2.7250	2.4773	2.2708	1.9464	1.7031	1.5139	1.3625	1.1354	0.9083	0.8516
110	3.0556	2.7500	2.5000	2.2917	1.9643	1.7188	1.5278	1.3750	1.1458	0.9167	0.8594
111	3.0833	2.7750	2.5227	2.3125	1.9821	1.7344	1.5417	1.3875	1.1562	0.9250	0.8672
112	3.1111	2.8000	2.5455	2.3333	2.0000	1.7500	1.5556	1.4000	1.1667	0.9333	0.8750
113	3.1389	2.8250	2.5682	2.3542	2.0179	1.7656	1.5694	1.4125	1.1771	0.9417	0.8828
114	3.1667	2.8500	2.5909	2.3750	2.0357	1.7812	1.5833	1.4250	1.1875	0.9500	0.8906
115	3.1944	2.8750	2.6136	2.3958	2.0536	1.7969	1.5972	1.4375	1.1979	0.9583	0.8984
116	3.2222	2.9000	2.6364	2.4167	2.0714	1.8125	1.6111	1.4500	1.2083	0.9667	0.9062
117	3.2500	2.9250	2.6591	2.4375	2.0893	1.8281	1.6250	1.4625	1.2187	0.9750	0.9141
118	3.2778	2.9500	2.6818	2.4583	2.1071	1.8438	1.6389	1.4750	1.2292	0.9833	0.9219
119	3.3056	2.9750	2.7045	2.4792	2.1250	1.8594	1.6528	1.4875	1.2396	0.9917	0.9297
120	3.3333	3.0000	2.7273	2.5000	2.1429	1.8750	1.6667	1.5000	1.2500	1.0000	0.9375
121	3.3611	3.0250	2.7500	2.5208	2.1607	1.8906	1.6806	1.5125	1.2604	1.0083	0.9453
122	3.3889	3.0500	2.7727	2.5417	2.1786	1.9062	1.6944	1.5250	1.2708	1.0167	0.9531
123	3.4167	3.0750	2.7955	2.5625	2.1964	1.9219	1.7083	1.5375	1.2812	1.0250	0.9609
124	3.4444	3.1000	2.8182	2.5833	2.2143	1.9375	1.7222	1.5500	1.2917	1.0333	0.9688
125	3.4722	3.1250	2.8409	2.6042	2.2321	1.9531	1.7361	1.5625	1.3021	1.0417	0.9766
126	3.5000	3.1500	2.8636	2.6250	2.2500	1.9688	1.7500	1.5750	1.3125	1.0500	0.9844
127	3.5278	3.1750	2.8864	2.6458	2.2679	1.9844	1.7639	1.5875	1.3229	1.0583	0.9922
128	3.5556	3.2000	2.9091	2.6667	2.2857	2.0000	1.7778	1.6000	1.3333	1.0667	1.0000
129	3.5833	3.2250	2.9318	2.6875	2.3036	2.0156	1.7917	1.6125	1.3437	1.0750	1.0078
130	3.6111	3.2500	2.9545	2.7083	2.3214	2.0312	1.8056	1.6250	1.3542	1.0833	1.0156

Outside diameter of a standard full-depth gear equals the pitch diameter for a gear of the same diametral pitch but with 2 more teeth.

BẢNG 3 : ĐẦU RĂNG VÀ CHIỀU CAO CHÂN RĂNG CỦA CÁC RĂNG CHIỀU SÂU THÂN KHAI TOÀN PHẦN TIÊU CHUẨN 14 $\frac{1}{2}$ VÀ 20 ĐỘ (19P VÀ THÔ HƠN)

Dia-metral Pitch, P	St'd. Adden.	St'd. Min. Deden.	Shaping Deden.	Pre-shaving Dedendum		
	$\frac{1}{P}$	$\frac{1.157}{P}$	$\frac{1.25}{P}$	$\frac{1.35}{P}$	$\frac{1.45}{P}$	—
		Note 1	Note 2	Note 3	Note 4	Note 5
2.5	0.4000	0.4628	0.5000	0.5400	0.5800	0.4900
3	0.3333	0.3857	0.4167	0.4500	0.4833	0.4163
3.5	0.2857	0.3306	0.3571	0.3857	0.4143	0.3597
4	0.2500	0.2892	0.3125	0.3375	0.3625	0.3180
4.5	0.2222	0.2571	0.2778	0.3000	0.3222	0.2822
5	0.2000	0.2314	0.2500	0.2700	0.2900	0.2560
6	0.1667	0.1928	0.2083	0.2250	0.2417	0.2167
7	0.1429	0.1653	0.1786	0.1929	0.2071	0.1869
8	0.1250	0.1446	0.1562	0.1688	0.1812	0.1650
9	0.1111	0.1286	0.1389	0.1500	0.1611	0.1491
10	0.1000	0.1157	0.1250	0.1350	0.1450	0.1350
11	0.0909	0.1052	0.1136	0.1227	0.1318	0.1229
12	0.0833	0.0964	0.1042	0.1125	0.1208	0.1113
14	0.0714	0.0826	0.0893	0.0964	0.1036	0.0974
16	0.0625	0.0723	0.0781	0.0844	0.0906	0.0855
18	0.0556	0.0643	0.0694	0.0750	0.0806	0.0766

Note 1: Standard Minimum dedendums. Used for finish-hobbed gears.
Note 2: Dedendums recommended for shaped gears.
Note 3: Dedendums recommended by Michigan Tool Co. for pre-shaved gears.
Note 4: Dedendums recommended by the Fellows Gear Shaper Co. for pre-shaved gears of 13 to 30 teeth with 14½-degree pressure angle or 13 to 20 teeth with 20-degree pressure angle. These dedendums provide additional depth for pre-shaving by shaping. For 14½-degree gears with over 30 teeth and 20-degree gears with over 20 teeth this company recommends a special protuberance-type cutter for pre-shaving.
Note 5: Dedendums based upon clearances recommended for pre-shaved gears by National Broach & Machine Co.

BẢNG 4 : ĐẦU RĂNG VÀ CHIỀU CAO CHÂN RĂNG CỦA CÁC RĂNG, CHIỀU SÂU THÂN KHAI TOÀN PHẦN, BƯỚC MỊN. TIÊU CHUẨN 20 ĐỘ (20P VÀ MỊN HƠN)

Dia-metral Pitch, P	St'd. Adden.	St'd. Deden.	Pre-shaving Dedendum		Dia-metral Pitch, P	St'd. Adden.	St'd. Deden.	Pre-shaving Dedendum	
	$\frac{1}{P}$	$\frac{1.2}{P}+.002$	$\frac{1.35}{P}+.002$	—		$\frac{1}{P}$	$\frac{1.2}{P}+.002$	$\frac{1.35}{P}+.002$	—
20	0.0500	0.0620	0.0695	0.0700	48	0.0208	0.0270	0.0301	0.0338
22	0.0454	0.0566	0.0634	0.0654	56	0.0179	0.0234	0.0261	0.0288
24	0.0417	0.0520	0.058[illegible]	0.0617	64	0.0156	0.0208	0.0231	0.0256
28	0.0357	0.0449	0.0502	0.0547	72	0.0139	0.0190	0.0207	0.0239
32	0.0312	0.0395	0.0442	0.0492	80	0.0125	0.0170	0.0189	...
36	0.0278	0.0353	0.0395	0.0438	96	0.0104	0.0145	0.0161	...
40	0.0250	0.0320	0.0357	0.0400	120	0.0083	0.0120	0.0132	...
44	0.0227	0.0293	0.0326	0.0367	128	0.0078	0.0114	0.0125	...

BẢNG 5 : ĐẦU RĂNG VÀ CHIỀU CHÂN RĂNG CỦA CÁC RĂNG GỐC THÂN KHAI TIÊU CHUẨN 20 ĐỘ

Table 5. ADDENDUMS AND DEDENDUMS OF STANDARD 20-DEGREE INVOLUTE STUB TEETH

Diametral Pitch, P	St'd. Adden. $\frac{0.8}{P}$	St'd. Min. Deden. $\frac{1}{P}$ Note 1	Pre-shaving Deden. $\frac{1.35}{P}$ Note 2	Diametral Pitch, P	St'd. Adden. $\frac{0.8}{P}$	St'd. Min. Deden. $\frac{1}{P}$ Note 1	Pre-shaving Deden. $\frac{1.35}{P}$ Note 2
2.5	0.3200	0.4000	0.5400	8	0.1000	0.1250	0.1688
3	0.2667	0.3333	0.4500	9	0.0889	0.1111	0.1500
3.5	0.2286	0.2857	0.3857	10	0.0800	0.1000	0.1350
4	0.2000	0.2500	0.3375	11	0.0727	0.0909	0.1227
4.5	0.1778	0.2222	0.3000	12	0.0667	0.0833	0.1125
5	0.1600	0.2000	0.2700	14	0.0571	0.0714	0.0964
6	0.1333	0.1667	0.2250	16	0.0500	0.0625	0.0844
7	0.1143	0.1429	0.1929	18	0.0444	0.0556	0.0750

BẢNG 6 : ĐẦU RĂNG VÀ CHIỀU CAO CHÂN RĂNG CỦA CÁC RĂNG CHÂN ĂN KHỚP THÂN KHAI TIÊU CHUẨN 20 ĐỘ

Diametral Pitch P/P′	St'd. Adden. $\frac{1}{P'}$	St'd. Deden. $\frac{1.25}{P'}$ Note 1	Pre-shaving Dedendum $\frac{1.35}{P'}$ Note 2	Pre-shaving Dedendum — Note 3	Diametral Pitch P/P′	St'd. Adden. $\frac{1}{P'}$	St'd. Deden. $\frac{1.25}{P'}$ Note 1	Pre-shaving Dedendum $\frac{1.35}{P'}$ Note 2	Pre-shaving Dedendum — Note 3
3/4	0.2500	0.3125	0.3375	0.3330	18/24	0.0417	0.0521	0.0562	0.0627
4/5	0.2000	0.2500	0.2700	0.2680	20/26	0.0385	0.0481	0.0519	0.0585
5/7	0.1429	0.1786	0.1929	0.1989	22/29	0.0345	0.0431	0.0466	0.0545
6/8	0.1250	0.1562	0.1688	0.1750	24/32	0.0312	0.0391	0.0422	0.0513
7/9	0.1111	0.1389	0.1500	0.1551	26/35	0.0286	0.0357	0.0386	0.0476
8/10	0.1000	0.1250	0.1350	0.1400	28/37	0.0270	0.0338	0.0365	0.0460
9/11	0.0909	0.1136	0.1227	0.1289	30/40	0.0250	0.0312	0.0338	0.0430
10/12	0.0833	0.1042	0.1125	0.1183	32/42	0.0238	0.0298	0.0321	0.0418
11/14	0.0714	0.0893	0.0964	0.1014	34/45	0.0222	0.0278	0.0300	0.0392
12/14	0.0714	0.0893	0.0964	0.1014	36/48	0.0208	0.0260	0.0281	0.0368
13/16	0.0625	0.0781	0.0844	....	38/50	0.0200	0.0250	0.0270	0.0360
14/18	0.0556	0.0694	0.0750	0.0816	40/54	0.0185	0.0231	0.0250	0.0335
16/21	0.0476	0.0595	0.0643	0.0706	....	....	....	....	....

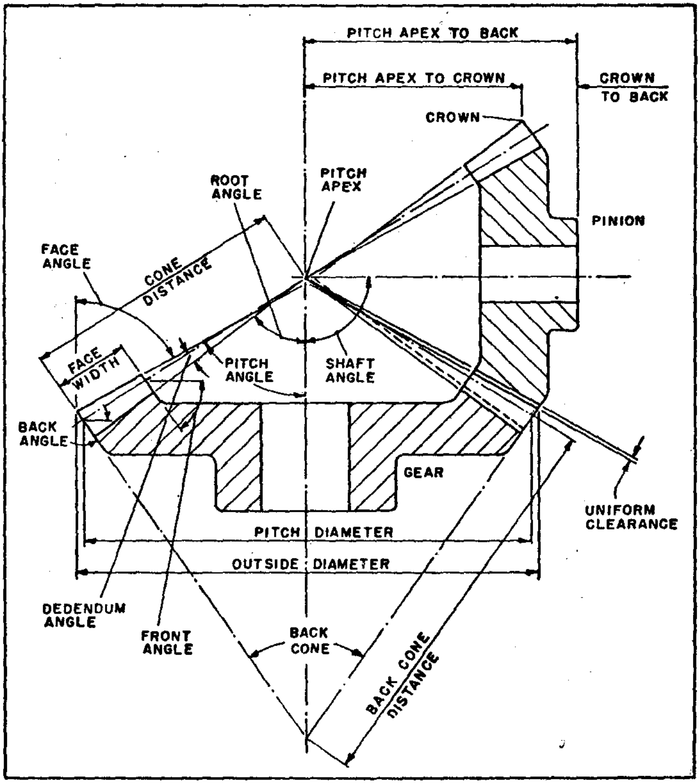
Note 1: Standard dedendums for shaped gears.
Note 2: Dedendums recommended by Michigan Tool Co. for pre-shaved gears.
Note 3: Dedendums based on clearances recommended for pre-shaved gears by National Broach & Machine Co.

2. BÁNH RĂNG CÔN

BEVEL GEARING

CHỈ DANH CỦA BÁNH RĂNG CÔN

BEVEL GEAR NOMENCLATURE



American Standard System for Straight Bevel Gears (ASA B6.13-1955). — This system for the design of straight bevel gears is a development from a system originated by the Gleason Works and adopted by the American Gear Manufacturers Association in 1922 and revised in 1940. The general basis of the system and the formulas used to obtain the tooth proportions and blank dimensions are the same as in the revised (1954) Gleason Straight Bevel Gear System which follows:

Working Depth: The working depth is equal to 2.000 inches ÷ diametral pitch. The use of stub teeth is not recommended because the reduction in contact increases noise and decreases wear resistance.

BẢNG 1 : CÔNG THỨC CỦA BÁNH RĂNG CÔN THẲNG 20 ĐỘ - GÓC TRỤC 90 ĐỘ

Table 1. FORMULAS FOR 20-DEGREE STRAIGHT BEVEL GEARS - 90-DEGREE SHAFT ANGLE

Given			
1	Number of Pinion Teeth, n	4	Face Width, F
2	Number of Gear Teeth, N	5	Pressure Angle, $\phi = 20°$
3	Diametral Pitch, P	6	Shaft Angle, $\Sigma = 90°$

To Find			
No.	Item	Formula: PINION	Formula: GEAR
7	Working Depth	$h_k = \frac{2.000}{P}$	Same as pinion
8	Whole Depth	$h_t = \frac{2.188}{P} + 0.002$	Same as pinion
9	Pitch Diameter	$d = \frac{n}{P}$	$D = \frac{N}{P}$
10	Pitch Angle	$\gamma = \tan^{-1} \frac{n}{N}$	$\Gamma = 90° - \gamma$
11	Cone Distance	$A_O = \frac{D}{2 \sin \Gamma}$	Same as pinion
12	Circular Pitch	$p = \frac{3.1416}{P}$	Same as pinion
13	Addendum	$a_P = h_k - a_G$	$a_G = \frac{\text{Table 2}}{P}$
14	Dedendum (See Note 1)	$b_P = \frac{2.188}{P} - a_P$	$b_G = \frac{2.188}{P} - a_G$
15	Clearance	$c = h_t - h_k$	Same as pinion
16	Dedendum Angle	$\delta_R = \tan^{-1} \frac{b_P}{A_O}$	$\delta_G = \tan^{-1} \frac{b_G}{A_O}$
17	Face Angle of Blank	$\gamma_O = \gamma + \delta_G$	$\Gamma_O = \Gamma + \delta_P$
18	Root Angle	$\gamma_R = \gamma - \delta_P$	$\Gamma_R = \Gamma - \delta_G$
19	Outside Diameter	$d_O = d + 2a_P \cos \gamma$	$D_O = D + 2a_G \cos \Gamma$
20	Pitch Apex to Crown	$x_O = \frac{D}{2} - a_P \sin \gamma$	$X_O = \frac{d}{2} - a_G \sin \Gamma$
21	Circular Thickness	$t = p - T$	$T = \frac{p}{2} - (a_P - a_G) \tan \phi$
22	Backlash (See Note 2)	$B =$ (See Table on page 692)	
23	Chordal Thickness (See Note 2)	$t_C = t - \frac{t^3}{6d^2} - \frac{B}{2}$	$T_C = T - \frac{T^3}{6D^2} - \frac{B}{2}$
24	Chordal Addendum	$a_{CP} = a_P + \frac{t^2 \cos \gamma}{4d}$	$a_{CG} = a_G + \frac{T^2 \cos \Gamma}{4D}$
25	Tooth Angle	$\frac{3438}{A_O}\left(\frac{t}{2} + b_P \tan \phi\right)$ Minutes	Same as pinion
26	Limit Point Width	$\frac{A_O - F}{A_O}(T - 2b_P \tan \phi) - 0.0015$	Same as pinion
27	Tool Advance	0.002	Same as pinion

All linear dimensions are in inches. Calculation of linear dimensions which affect angular values should be carried to 4 or 5 decimal places.

Note 1: The actual dedendum will be 0.002-inch greater than calculated due to Item 27.

Note 2: The American Standard for Fine-pitch Straight Bevel Gears does not indicate values for B since most fine-pitch bevel gears operate with little backlash.

BẢNG 2 : CHIỀU CAO CHÂN RĂNG CỦA CÁC BÁNH RĂNG CÔN THẲNG CHỦ ĐỘNG

Table 2. GEAR ADDENDA FOR GENERATED STRAIGHT BEVEL GEARS

(for i diametral pitch and various gear-to-pinion ratios)

Ratio = Number of teeth in gear ÷ Number of teeth in pinion

Ratios From	Ratios to	Addendum, Inch	Ratios From	Ratios to	Addendum, Inch	Ratios From	Ratios to	Addendum, Inch	Ratios From	Ratios to	Addendum, Inch
1.00	1.00	1.000	1.15	1.17	0.880	1.42	1.45	0.760	2.06	2.16	0.640
1.00	1.02	0.990	1.17	1.19	0.870	1.45	1.48	0.750	2.16	2.27	0.630
1.02	1.03	0.980	1.19	1.21	0.860	1.48	1.52	0.740	2.27	2.41	0.620
1.03	1.04	0.970	1.21	1.23	0.850	1.52	1.56	0.730	2.41	2.58	0.610
1.04	1.05	0.960	1.23	1.25	0.840	1.56	1.60	0.720	2.58	2.78	0.600
1.05	1.06	0.950	1.25	1.27	0.830	1.60	1.65	0.710	2.78	3.05	0.590
1.06	1.08	0.940	1.27	1.29	0.820	1.65	1.70	0.700	3.05	3.41	0.580
1.08	1.09	0.930	1.29	1.31	0.810	1.70	1.76	0.690	3.41	3.94	0.570
1.09	1.11	0.920	1.31	1.33	0.800	1.76	1.82	0.680	3.94	4.82	0.560
1.11	1.12	0.910	1.33	1.36	0.790	1.82	1.89	0.670	4.82	6.81	0.550
1.12	1.14	0.900	1.36	1.39	0.780	1.89	1.97	0.660	6.81	∞	0.540
1.14	1.15	0.890	1.39	1.42	0.770	1.97	2.06	0.650	....	....	....

* Select addendum according to ratio of gearing. In case of choice, use the *larger* addendum.

As in the original system, long and short addenda have been adopted for all ratios except those with equal numbers of teeth. A long-addendum pinion and a short-addendum gear have more action in recess than in approach (with pinion driving), have stronger pinion teeth, and can have a lower pressure angle without undercut.

BẢNG 3 : CÔNG THỨC CHO HỆ GLEASON GÓC ÁP SUẤT 20 ĐỘ, BÁNH RĂNG CÔN XOẮN - GÓC TRỤC 90°

Table 3. FORMULAS FOR GLEASON SYSTEM 20-DEGREE PRESSURE ANGLE, SPIRAL BEVEL GEARS - 90-DEGREE SHAFT ANGLE

Given			
1	Number of Pinion Teeth, n	4	Face Width, F
2	Number of Gear Teeth, N	5	Pressure Angle, $\phi = 20°$
3	Diametral Pitch, P	6	Shaft Angle, $\Sigma = 90°$

To Find

No.	Item	Formula: PINION	Formula: GEAR
7	Working Depth	$h_k = \frac{1.700}{P}$	Same as pinion
8	Whole Depth	$h_t = \frac{1.888}{P}$	Same as pinion
9	Pitch Diameter	$d = \frac{n}{P}$	$D = \frac{N}{P}$
10	Pitch Angle	$\gamma = \tan^{-1} \frac{n}{N}$	$\Gamma = 90 - \gamma$
11	Cone Distance	$A_O = \frac{D}{2 \sin \Gamma}$	Same as pinion
12	Circular Pitch	$p = \frac{3.1416}{P}$	Same as pinion
13	Addendum	$a_P = h_k - a_G$	$a_G = \frac{\text{Table 4}}{P}$
14	Dedendum	$b_P = h_t - a_P$	$b_G = h_t - a_G$
15	Clearance	$c = h_t - h_k$	Same as pinion
16	Dedendum Angle	$\delta_P = \tan^{-1} \frac{b_P}{A_O}$	$\delta_G = \tan^{-1} \frac{b_G}{A_O}$
17	Face Angle of Blank	$\gamma_O = \gamma + \delta_G$	$\Gamma_O = \Gamma + \delta_P$
18	Root Angle	$\gamma_R = \gamma - \delta_P$	$\Gamma_R = \Gamma - \delta_G$
19	Outside Diameter	$d_O = d + 2a_P \cos \gamma$	$D_O = D + 2a_G \cos \Gamma$
20	Pitch Apex to Crown	$x_O = \frac{D}{2} - a_P \sin \gamma$	$X_O = \frac{d}{2} - a_G \sin \Gamma$
21	Circular Thickness	$t = p - T$	$T = \frac{p}{2} - 1.22(a_P - a_G)\tan \phi - \frac{K(\text{Chart 1})}{P}$
22	Backlash*	B = (See table on page 693)	

* When the gear is cut spread-blade, all the backlash is taken from the pinion thickness. When both members are cut single-side, each thickness is reduced by half the backlash.

BẢNG 4 : CHIỀU CAO CHÂN RĂNG CỦA CÁC BÁNH RĂNG CÔN XOẮN HỆ GLEASON

Table 4. GEAR ADDENDA FOR GLEASON SYSTEM SPIRAL BEVEL GEARS

Gearing ratio = Number of gear teeth ÷ Number of pinion teeth

Ratios		Addendum, Inch	Ratios		Addendum, Inch	Ratios		Addendum, Inch	Ratios		Addendum, Inch
From	to		From	to		From	to		From	to	
1.00	1.00	0.850	1.15	1.17	0.750	1.41	1.44	0.650	1.99	2.10	0.550
1.00	1.02	0.840	1.17	1.19	0.740	1.44	1.48	0.640	2.10	2.23	0.540
1.02	1.03	0.830	1.19	1.21	0.730	1.48	1.52	0.630	2.23	2.38	0.530
1.03	1.05	0.820	1.21	1.23	0.720	1.52	1.57	0.620	2.38	2.58	0.520
1.05	1.06	0.810	1.23	1.26	0.710	1.57	1.63	0.610	2.58	2.82	0.510
1.06	1.08	0.800	1.26	1.28	0.700	1.63	1.68	0.600	2.82	3.17	0.500
1.08	1.09	0.790	1.28	1.31	0.690	1.68	1.75	0.590	3.17	3.67	0.490
1.09	1.11	0.780	1.31	1.34	0.680	1.75	1.82	0.580	3.67	4.56	0.480
1.11	1.13	0.770	1.34	1.37	0.670	1.82	1.90	0.570	4.56	7.00	0.470
1.13	1.15	0.760	1.37	1.41	0.660	1.90	1.99	0.560	7.00	∞	0.460

* Select addendum according to ratio of gearing. In case of choice, use the *larger* addendum.

CÔNG THỨC CHO CÁC THÀNH PHẦN TIẾP TUYẾN, TRỤC CỦA TẢI DANH NGHĨA CHO CÁC BÁNH RĂNG CÔN THẲNG VÀ XOẮN

FORMULAS FOR TANGENTIAL, AXIAL, AND SEPARATING COMPONENTS OF THE NORMAL TOOTH LOAD FOR STRAIGHT AND SPIRAL BEBEL GEARS

W_t = tangential load on driving gear at its mean pitch diameter, in pounds; also equal to the tangential load on the driven gear at its mean pitch diameter;
W_x = axial thrust load, in pounds;
W_s = separating component in pounds;
d_m = mean pitch diameter of driving member in inches = $d - F \sin \gamma_d$, where d = pitch diameter of driving member, F = face width, and γ_d = pitch angle;
n = speed of driving member in rpm;
P = horsepower transmitted;
ϕ = normal pressure angle;
ψ = spiral angle;
γ_d = pitch angle of driving member;
γ_D = pitch angle of driven member.

Component of Normal Tooth Load to be Computed	Hand of Spiral and Direction of Rotation of Driving Member: Right-hand Spiral and Clockwise Rotation, or Left-hand Spiral and Counter-clockwise Rotation	Hand of Spiral and Direction of Rotation of Driving Member: Right-hand Spiral and Counter-clockwise Rotation, or Left-hand Spiral and Clockwise Rotation
Tangential, W_t Driving Member and Driven Member	$W_t = \dfrac{126{,}050\,P}{nd_m}$	
*Axial, W_x Driving Member	$W_x = \dfrac{W_t}{\cos\psi}(\tan\phi\sin\gamma_d - \sin\psi\cos\gamma_d)$	$W_x = \dfrac{W_t}{\cos\psi}(\tan\phi\sin\gamma_d + \sin\psi\cos\gamma_d)$
Driven Member	$W_x = \dfrac{W_t}{\cos\psi}(\tan\phi\sin\gamma_D + \sin\psi\cos\gamma_D)$	$W_x = \dfrac{W_t}{\cos\psi}(\tan\phi\sin\gamma_D - \sin\psi\cos\gamma_D)$
†Separating, W_s Driving Member	$W_s = \dfrac{W_t}{\cos\psi}(\tan\phi\cos\gamma_d + \sin\psi\sin\gamma_d)$	$W_s = \dfrac{W_t}{\cos\psi}(\tan\phi\cos\gamma_d - \sin\psi\sin\gamma_d)$
Driven Member	$W_s = \dfrac{W_t}{\cos\psi}(\tan\phi\cos\gamma_D - \sin\psi\sin\gamma_D)$	$W_s = \dfrac{W_t}{\cos\psi}(\tan\phi\cos\gamma_D + \sin\psi\sin\gamma_D)$

* If the computed value of W_x is positive, then the thrust is *away* from the cone center. A negative value indicates the thrust is *toward* the cone center.

† If the computed value of W_s is positive, then the force is *away* from the mating member (separating force). A negative value indicates the *force* is *toward* the mating member (attracting force).

THÉP THƯỜNG DÙNG ĐỂ CHẾ TẠO BÁNH RĂNG CÔN THƯỜNG

REPRESENTATIVE STEELS USED FOR BEVEL GEAR APPLICATIONS

SAE or AISI No.	Type of Steel	Purchase Specifications: Preliminary Heat Treatment	Brinell Hardness Number	ASTM Grain Size	Remarks
CARBURIZING STEELS					
1024	Manganese	Normalize			Low Alloy — oil quench limited to thin sections
2512	Nickel Alloy	Normalize — Anneal	163–228	5–8	Aircraft quality
3310 3312X	Nickel-Chromium (Krupp) Nickel-Chromium	Normalize, then heat to 1450°F, cool in furnace. Reheat to 1170°F — cool in air	163–228	5–8	Used for maximum resistance to wear and fatigue
4028	Molybdenum	Normalize	163–217		Low Alloy
4615 4620	Nickel-Molybdenum Nickel-Molybdenum	Normalize — 1700°F–1750°F	163–217	5–8	Good machining qualities. Well adapted to direct quench — gives tough core with minimum distortion
4815 4820	Nickel-Molybdenum Nickel-Molybdenum	Normalize	163–241	5–8	For aircraft and heavily loaded service
5120	Chromium	Normalize	163–217	5–8	
8615 8620 8715 8720	Chromium-Nickel-Molybdenum	Normalize — cool at hammer	163–217	5–8	Used as an alternate for 4620
OIL HARDENING AND FLAME HARDENING STEELS					
1141	Sulphurized free cutting carbon steel	Normalize Heat treated	179–228 255–269	5 or Coarser	Free cutting steel used for unhardened gears, oil treated gears, and for gears to be surface hardened where stresses are low
4140 4640	Chromium-Molybdenum Nickel-Molybdenum	For oil hardening: Normalize — Anneal For surface hardening: Normalize, reheat, quench and draw	179–212 235–269 269–302 302–341		Used for heat-treated, oil hardened, and surface hardened gears. Machining qualities of 4640 are superior to 4140, and it is the preferred steel for flame hardening
6145	Chromium-Vanadium	Normalize — reheat, quench, and draw	235–269 269–302 302–341		Fair machining qualities. Used for surface hardened gears when 4640 is not available
8640 8739	Chromium-Nickel-Molybdenum	Same as for 4640			Used as an alternate for 4640
NITRIDING STEELS					
Nitralloy H & G	Special Alloy	Anneal	163–192		Normal hardness range for cutting is 20–28 Rockwell C

* Any other steels equivalent to those listed in the table may also be used.

CÁC NGUYÊN LÝ VÀ CÔNG THỨC ĐỂ TÍNH TOÁN KÍCH THƯỚC KHI GIA CÔNG PHAY BÁNH RĂNG CÔN

RULES AND FORMULAS FOR CALCULATING DIMENSIONS OF MILLED BEVEL GEARS

To Find	Rule	Formula
Pitch Cone Angle of Pinion	Divide the sine of the shaft angle by the sum of the cosine of the shaft angle and the quotient obtained by dividing the number of teeth in the gear by the number of teeth in the pinion; this gives the tangent. *Note:* For shaft angles greater than 90° the cosine is negative.	$\tan \alpha_P = \dfrac{\sin \Sigma}{\dfrac{N_G}{N_P} + \cos \Sigma}$ For 90° shaft angle, $\tan \alpha_P = \dfrac{N_P}{N_G}$
Pitch Cone Angle of Gear	Subtract the pitch cone angle of the pinion from the shaft angle.	$\alpha_G = \Sigma - \alpha_P$
Pitch Diameter	Divide the number of teeth by the diametral pitch.	$D = N \div P$
These dimensions are the same for both gear and pinion.		
Addendum	Divide 1 by the diametral pitch.	$S = 1 \div P$
Dedendum	Divide 1.157 by the diametral pitch.	$S + A = 1.157 \div P$
Whole Depth of Tooth	Divide 2.157 by the diametral pitch.	$W = 2.157 \div P$
Thickness of Tooth at Pitch Line	Divide 1.571 by the diametral pitch.	$T = 1.571 \div P$
Pitch Cone Radius	Divide the pitch diameter by twice the sine of the pitch cone angle.	$C = \dfrac{D}{2 \times \sin \alpha}$
Addendum of Small End of Tooth	Subtract the width of face from the pitch cone radius, divide the remainder by the pitch cone radius and multiply by the addendum.	$s = S \times \dfrac{C - F}{C}$
Thickness of Tooth at Pitch Line at Small End	Subtract the width of face from the pitch cone radius, divide the remainder by the pitch cone radius and multiply by the thickness of the tooth at pitch line.	$t = T \times \dfrac{C - F}{C}$
Addendum Angle	Divide the addendum by the pitch cone radius to get the tangent.	$\tan \theta = \dfrac{S}{C}$
Dedendum Angle	Divide the dedendum by the pitch cone radius to get the tangent.	$\tan \phi = \dfrac{S + A}{C}$
Face Width (Max.)	Divide the pitch cone radius by 3 or divide 8 by the diametral pitch, whichever gives the smaller value.	$F = \dfrac{C}{3}$ or $F = \dfrac{8}{P}$
Circular Pitch	Divide 3.1416 by the diametral pitch.	$p = 3.1416 \div P$
Face Angle	Add the addendum angle to the pitch cone angle.	$\gamma = \alpha + \theta$
Compound Rest Angle for Turning Blank	Subtract both the pitch cone angle and the addendum angle from 90 degrees.	$\delta = 90° - \alpha - \theta$
Cutting Angle	Subtract the dedendum angle from the pitch cone angle.	$\zeta = \alpha - \phi$
Angular Addendum	Multiply the addendum by the cosine of the pitch cone angle.	$K = S \times \cos \alpha$
Outside Diameter	Add twice the angular addendum to the pitch diameter.	$O = D + 2K$
Vertex or Apex Distance	Multiply one-half the outside diameter by the cotangent of the face angle.	$J = \dfrac{O}{2} \times \cot \gamma$
Vertex Distance at Small End of Tooth	Subtract the width of face from the pitch cone radius; divide the remainder by the pitch cone radius and multiply by the apex distance.	$j = J \times \dfrac{C - F}{C}$
Number of Teeth for which to Select Cutter	Divide the number of teeth by the cosine of the pitch cone angle.	$N' = \dfrac{N}{\cos \alpha}$

3. BÁNH VÍT - TRỤC VÍT
WORM GEARING

BẢNG 1 : CÔNG THỨC VỀ TỶ SỐ CHO BÁNH VÍT - TRỤC VÍT BƯỚC NHỎ THEO TIÊU CHUẨN MỸ

LETTER SYMBOLS

p = Circular pitch of worm gear = axial pitch of the worm, p_x, in the central plane

p_x = Axial pitch of worm

p_n = Normal circular pitch of worm and worm gear = $p_x \cos \lambda = p \cos \psi$

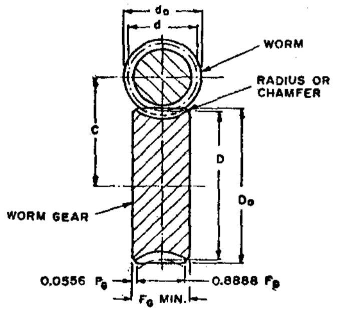
λ = Lead angle of worm

ψ = Helix angle of worm gear

n = Number of threads in worm

N = Number of teeth in worm gear = nm_G

m_G = Ratio of gearing = $N \div n$



Item	Formula	Item	Formula
WORM DIMENSIONS		**WORM GEAR DIMENSIONS****	
Lead	$l = np_x$	Pitch Diameter	$D = Np \div \pi = Np_x \div \pi$
Pitch Diameter	$d = l \div (\pi \tan \lambda)$	Outside Diameter	$D_o = 2C - d + 2a$
Outside Diameter	$d_o = d + 2a$	Face Width	$F_{G_{min}} = 1.125 \times \sqrt{(d_o+2c)^2-(d_o-4a)^2}$
Safe Minimum Length of Threaded Portion of Worm*	$F_W = \sqrt{D_o^2 - D^2}$		
DIMENSIONS FOR BOTH WORM AND WORM GEAR			
Addendum	$a = 0.3183p_n$	Tooth thickness	$t = 0.5p_n$
Whole Depth	$h_t = 0.7003p_n + 0.002$	Approximate normal pressure angle†	$\phi_n = 20$ degrees
Working Depth	$h_k = 0.6366p_n$		
Clearance	$c = h_t - h_k$	Center distance	$C = 0.5\ (d + D)$

All dimensions in inches unless otherwise indicated.

* This formula allows a sufficient length for fine-pitch worms.

** Current practice for fine-pitch worm gearing does not require the use of throated blanks. This results in the much simpler blank shown in the diagram which is quite similar to that for a spur or helical gear. The slight loss in contact resulting from the use of non-throated blanks has little effect on the load-carrying capacity of fine-pitch worm gears.

It is sometimes desirable to use topping hobs for producing worm gears in which the size relation between the outside and pitch diameters must be closely controlled. In such cases the blank is made slightly larger than D_o by an amount (usually from 0.010 to 0.020) depending on the pitch. Topped worm gears will appear to have a small throat which is the result of the hobbing operation. For all intents and purposes, this throating is negligible and a blank so made is not to be considered as being a throated blank.

† As stated in the text on page 775, the actual pressure angle will be slightly greater due to the manufacturing process.

BẢNG 2 : CÁC ĐƯỜNG KÍNH BƯỚC CỦA TRỤC VÍT BƯỚC NHỎ THEO TIÊU CHUẨN MỸ KẾT HỢP GIỮA TẢI TRỌNG VÀ GÓC CHỊU TẢI

Table 2 : PITCH DIAMETERS OF FINE-PITCH WORMS FOR AMERICAN STANDARD

Lead in Inches, l	Number of Threads, n	Lead Angle λ in Degrees							
		0.5	1.0	1.5	2.0	3.0	4.0	5.0	7.0
		Pitch Diameter d in Inches							
0.030	1	1.0937	0.5472	0.3647	0.2735	......	......	......	......
0.040	1	1.4583	0.7297	0.4863	0.3646	0.2429	......	......	......
0.050	1	1.8228	0.9121	0.6079	0.4558	0.3037	0.2276	......	......
0.060	2	2.1874	1.0945	0.7295	0.5469	0.3644	0.2731	......	......
0.065	1	......	1.1857	0.7903	0.5925	0.3948	0.2959	0.2365	......
0.080	1,2	......	1.4593	0.9726	0.7293	0.4859	0.3641	0.2911	......
0.090	3	......	1.6417	1.0942	0.8204	0.5466	0.4097	0.3274	0.2333
0.100	1,2	......	1.8242	1.2158	0.9116	0.6073	0.4552	0.3638	0.2592
0.120	3,4	......	2.1890	1.4590	1.0939	0.7288	0.5462	0.4366	0.3111
0.130	1,2	......	......	1.5805	1.1851	0.7896	0.5917	0.4730	0.3370
0.150	3,5	......	......	1.8237	1.3674	0.9110	0.6828	0.5457	0.3889
0.160	1,2,4	......	......	1.9453	1.4585	0.9718	0.7283	0.5821	0.4148
0.180	6	......	......	2.1884	1.6408	1.0932	0.8193	0.6549	0.4667
0.195	3	......	......	......	1.7776	1.1843	0.8876	0.7095	0.5055
0.200	2,4,5	......	......	......	1.8232	1.2147	0.9104	0.7276	0.5185
0.210	7	......	......	......	1.9143	1.2754	0.9559	0.7640	0.5444
0.240	3,6,8	......	......	......	2.1878	1.4576	1.0924	0.8732	0.6222
0.250	5					1.5184	1.1380	0.9096	0.6481
0.260	2,4					1.5791	1.1835	0.9459	0.6741
0.270	9					1.6398	1.2290	0.9823	0.7000
0.280	7					1.7006	1.2745	1.0187	0.7259
0.300	3,6,10					1.8220	1.3656	1.0915	0.7778
0.320	2,4,8					1.9435	1.4566	1.1642	0.8296
0.325	5					1.9739	1.4794	1.1824	0.8426
0.350	7					2.1257	1.5932	1.2734	0.9074
0.360	9					......	1.6387	1.3098	0.9333
0.390	3,6					......	1.7752	1.4189	1.0111
0.400	4,5,8,10					......	1.8207	1.4553	1.0370
0.450	9					......	2.0483	1.6372	1.1666
0.455	7					......	......	1.6554	1.1796
0.480	3,6					......	......	1.7463	1.2444
0.500	5,10					......	......	1.8191	1.2963
0.520	4,8					......	......	1.8919	1.3481
0.560	7					......	......	2.0374	1.4510
0.585	9					......	......	......	1.5166
0.600	6					......	......	......	1.5555
0.640	4,8					......	......	......	1.6592
0.650	5,10					......	......	......	1.6852
0.700	7					......	......	......	1.8148
0.720	9					......	......	......	1.8666
0.780	6					......	......	......	2.0222

For each lead shown in the first column, the numbers of threads given in the second column are those corresponding to standard axial pitches.

The standard axial pitch for each pitch diameter shown in the body of the table is obtained by dividing the lead given in column 1 by the number of threads given in column 2. Thus, where more than one number of threads is given in column 2, there will be more than one standard axial pitch for the corresponding pitch diameter.

Example: For a lead angle of 2.0 degrees and a lead of 0.240 inch, the corresponding pitch diameter is given in the table as 2.1878 inches.

Since there are three values of n given in column 2, namely, 3, 6, and 8, there will also be three standard axial pitches available for this pitch diameter. These pitches are: $0.240 \div 3 = 0.080$; $0.240 \div 6 = 0.040$; and $0.240 \div 8 = 0.030$.

BẢNG 2 : CÁC ĐƯỜNG KÍNH BƯỚC CỦA TRỤC VÍT BƯỚC NHỎ THEO TIÊU CHUẨN MỸ KẾT HỢP GIỮA TẢI TRỌNG VÀ GÓC CHỊU TẢI

Table 2 : PITCH DIAMETERS OF FINE-PITCH WORMS FOR AMERICAN STANDARD

Lead in Inches, l	Number of Threads, n	Lead Angle λ in Degrees						
		9.0	11.0	14.0	17.0	21.0	25.0	30.0
		Pitch Diameter d in Inches						
0.120	3,4	0.2412	......	......	......	......	......	......
0.130	1,2	0.2613	......	......	......	......	......	......
0.150	3,5	0.3015	0.2456	......	......	......	......	......
0.160	1,2,4	0.3216	0.2620	......	......	......	......	......
0.180	6	0.3618	0.2948	......	......	......	......	......
0.195	3	0.3919	0.3193	0.2490	......	......	......	......
0.200	2,4,5	0.4020	0.3275	0.2553	......	......	......	......
0.210	7	0.4221	0.3439	0.2681	......	......	......	......
0.240	3,6,8	0.4823	0.3930	0.3064	0.2499	......	......	......
0.250	5	0.5024	0.4094	0.3192	0.2603	......	......	......
0.260	2,4	0.5225	0.4258	0.3319	0.2707	......	......	......
0.270	9	0.5426	0.4421	0.3447	0.2811	......	......	......
0.280	7	0.5627	0.4585	0.3575	0.2915	......	......	......
0.300	3,6,10	0.6029	0.4913	0.3830	0.3123	0.2488	......	......
0.320	2,4,8	0.6431	0.5240	0.4085	0.3332	0.2654	......	......
0.325	5	0.6532	0.5322	0.4149	0.3384	0.2695	......	......
0.350	7	0.7034	0.5731	0.4468	0.3644	0.2902	......	......
0.360	9	0.7235	0.5895	0.4596	0.3748	0.2985	0.2457	......
0.390	3,6	0.7838	0.6387	0.4979	0.4060	0.3234	0.2662	......
0.400	4,5,8,10	0.8039	0.6550	0.5107	0.4165	0.3317	0.2730	......
0.450	9	0.9044	0.7369	0.5745	0.4685	0.3732	0.3072	0.2481
0.455	7	0.9144	0.7451	0.5809	0.4737	0.3773	0.3106	0.2509
0.480	3,6	0.9647	0.7860	0.6128	0.4998	0.3980	0.3277	0.2646
0.500	5,10	1.0049	0.8188	0.6383	0.5206	0.4146	0.3413	0.2757
0.520	4,8	1.0451	0.8515	0.6639	0.5414	0.4312	0.3550	0.2867
0.560	7	1.1255	0.9170	0.7149	0.5830	0.4644	0.3823	0.3087
0.585	9	1.1757	0.9580	0.7469	0.6091	0.4851	0.3993	0.3225
0.600	6	1.2059	0.9825	0.7660	0.6247	0.4975	0.4096	0.3308
0.640	4,8	1.2863	1.0480	0.8171	0.6663	0.5307	0.4369	0.3529
0.650	5,10	1.3064	1.0644	0.8298	0.6767	0.5390	0.4437	0.3584
0.700	7	1.4068	1.1463	0.8937	0.7288	0.5805	0.4778	0.3859
0.720	9	1.4470	1.1791	0.9192	0.7496	0.5971	0.4915	0.3970
0.780	6	1.5676	1.2773	0.9958	0.8121	0.6468	0.5324	0.4300
0.800	5,8,10	1.6078	1.3101	1.0213	0.8329	0.6634	0.5461	0.4411
0.900	9	1.8088	1.4738	1.1490	0.9370	0.7463	0.6144	0.4962
0.910	7	1.8289	1.4902	1.1618	0.9474	0.7546	0.6212	0.5017
0.960	6	1.9294	1.5721	1.2256	0.9995	0.7961	0.6553	0.5293
1.000	10	2.0098	1.6376	1.2767	1.0412	0.8292	0.6826	0.5513
1.040	8	......	1.7031	1.3277	1.0828	0.8624	0.7099	0.5734
1.120	7	......	1.8341	1.4299	1.1661	0.9287	0.7645	0.6175
1.170	9	......	1.9160	1.4937	1.2181	0.9720	0.7987	0.6451
1.280	8	......	2.0961	1.6341	1.3327	1.0614	0.8738	0.7057
1.300	10	......	......	1.6597	1.3535	1.0780	0.8874	0.7167
1.440	9	......	......	1.8384	1.4993	1.1941	0.9830	0.7939
1.600	10	......	......	2.0427	1.6658	1.3268	1.0922	0.8821

BẢNG 3 : TỶ SỐ RĂNG CỦA TRỤC VỊT BƯỚC NHỎ - BÁNH VỊT THEO TIÊU CHUẨN MỸ

Standard Axial Pitch in Inches, p_x	Tooth Parts*	Lead Angle λ in Degrees														
		0.5	1	1.5	2	3	4	5	7	9	11	14	17	21	25	30
		Dimensions of Tooth Parts in Inches†														
0.030	a	.0095	.0095	.0095	.0095	.0095	.0095	.0095	.0095	.0094	.0094	.0093	.0091	.0089	.....	.....
	h_t	.0229	.0229	.0229	.0229	.0229	.0229	.0229	.0229	.0227	.0227	.0225	.0220	.0216	.....	.....
	p_n	.0300	.0300	.0300	.0300	.0300	.0299	.0299	.0298	.0296	.0294	.0291	.0287	.0280	.....	.....
0.040	a	.0127	.0127	.0127	.0127	.0127	.0127	.0127	.0126	.0126	.0125	.0124	.0122	.0119	.0115	.....
	h_t	.0299	.0299	.0299	.0299	.0299	.0299	.0299	.0297	.0297	.0295	.0293	.0288	.0282	.0273	.....
	p_n	.0400	.0400	.0400	.0400	.0399	.0399	.0398	.0397	.0395	.0393	.0388	.0383	.0373	.0363	.....
0.050	a	.0159	.0159	.0159	.0159	.0159	.0159	.0159	.0158	.0157	.0156	.0154	.0152	.0149	.0144	.0138
	h_t	.0370	.0370	.0370	.0370	.0370	.0370	.0370	.0368	.0365	.0363	.0359	.0354	.0348	.0337	.0324
	p_n	.0500	.0500	.0500	.0500	.0499	.0499	.0498	.0496	.0494	.0491	.0485	.0478	.0467	.0453	.0433
0.065	a	.....	.0207	.0207	.0207	.0207	.0206	.0206	.0205	.0204	.0203	.0201	.0198	.0193	.0188	.0179
	h_t	.....	.0475	.0475	.0475	.0475	.0473	.0473	.0471	.0469	.0467	.0462	.0456	.0445	.0434	.0414
	p_n	.....	.0650	.0650	.0650	.0649	.0648	.0648	.0645	.0642	.0638	.0631	.0622	.0607	.0589	.0563
0.080	a	.....	.0255	.0255	.0254	.0254	.0254	.0254	.0253	.0252	.0250	.0247	.0244	.0238	.0231	.0221
	h_t	.....	.0581	.0581	.0579	.0579	.0579	.0579	.0577	.0574	.0570	.0563	.0557	.0544	.0528	.0506
	p_n	.....	.0800	.0800	.0800	.0799	.0798	.0797	.0794	.0790	.0785	.0776	.0765	.0747	.0725	.0693
0.100	a	.....	.0318	.0318	.0318	.0318	.0318	.0317	.0316	.0314	.0312	.0309	.0304	.0297	.0288	.0276
	h_t	.....	.0720	.0720	.0720	.0720	.0720	.0717	.0716	.0711	.0706	.0700	.0689	.0673	.0654	.0627
	p_n	.....	.1000	.1000	.0999	.0999	.0998	.0996	.0993	.0988	.0982	.0970	.0956	.0934	.0906	.0866
0.130	a	.....	.....	.0414	.0414	.0413	.0413	.0412	.0411	.0409	.0406	.0402	.0396	.0386	.0375	.0358
	h_t	.....	.....	.0931	.0931	.0929	.0929	.0926	.0924	.0920	.0913	.0904	.0891	.0869	.0845	.0808
	p_n	.....	.....	.1300	.1299	.1298	.1297	.1295	.1290	.1284	.1276	.1261	.1243	.1214	.1178	.1126
0.160	a	.....	.....	.0509	.0509	.0509	.0508	.0507	.0506	.0503	.0500	.0494	.0487	.0475	.0462	.0441
	h_t	.....	.....	.1140	.1140	.1140	.1138	.1135	.1133	.1127	.1120	.1107	.1091	.1065	.1036	.0990
	p_n	.....	.....	.1599	.1599	.1598	.1596	.1594	.1588	.1580	.1571	.1552	.1530	.1494	.1450	.1386

* a = addendum; h_t = whole depth; and p_n = normal circular pitch.
† Tooth proportions are based on the formulas given in Table 1.

NGUYÊN LÝ VÀ CÔNG THỨC CHO BÁNH VIT - 1

RULES AND FORMULAS FOR WORM GEARING - I

No.	To Find	Rule	Formula
1	Addendum	Addendum may be affected by lead angle. See paragraph, Addendum and Dedendum.	
2	Center Distance	Add pitch diameter of worm-wheel to pitch diameter of worm, and divide sum by 2.	$C = \frac{(D + d)}{2}$
3		Divide number of worm threads by tangent lead angle, add number of wheel teeth and multiply sum by quotient obtained by dividing pitch by 6.2832.	$C = \frac{P}{6.2832}\left(\frac{t}{\tan L_a} + T\right)$
4	Dedendum	Dedendum may be affected by lead angle. See paragraph, Addendum and Dedendum.	
5	Clearance	British Standard — multiply cosine lead angle by 0.2 times module.	$c \doteq 0.2\, m \cos L_a$
6	Face Width, Worm-wheel	For single and double thread worms, multiply pitch by 2.38 and add 0.25. (Shell type worm.)	$F = 2.38\, P + 0.25$
7		For triple and quadruple thread worm, multiply pitch by 2.15 and add 0.2. (Shell type.)	$F = 2.15\, P + 0.2$
8		When worm threads are integral with shaft, face width of worm-wheel may equal $C^{0.875}$ divided by 3.	$F = \frac{C^{0.875}}{3}$
9	Lead of Worm Thread	Multiply pitch by number of worm threads or " starts."	$L = tP$
10		Multiply pitch circumference of worm by tangent of lead angle.	$L = \pi d \times \tan L_a$
11		Divide pitch circumference of worm-wheel by ratio.	$L = \pi D \div R$
12	Lead Angle, Worm	Divide lead by pitch circumference of worm; quotient is tangent of lead angle.	$\tan L_a = \frac{L}{3.1416\, d}$
13	Outside Diam., Worm	Add to pitch diameter twice the addendum. See paragraph, Pitch Diameter of Worm; also Addendum and Dedendum.	$d_0 = d + 2a$
14	Outside Diam., Worm-wheel	For outside or over-all diameter of worm-wheel, see paragraph, Outside Diameter of Worm-wheel.	
15	Pitch of Worm and Wheel	Divide lead by number of threads or " starts " on worm = axial pitch of worm and circular pitch of worm-wheel.	$P = \frac{L}{t}$
16		Subtract the worm pitch diameter from twice the center distance. Multiply by 3.1416 and divide by number of wheel teeth.	$P = \frac{(2C - d) \times 3.1416}{T}$

NGUYÊN LÝ VÀ CÔNG THỨC CHO BÁNH VIT - 2

RULES AND FORMULAS FOR WORM GEARING - 2

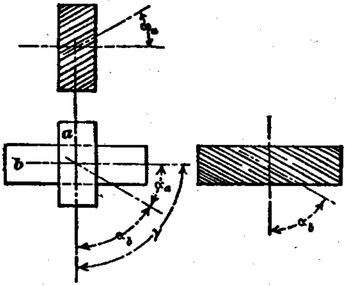
No.	To Find	Rule	Formula
17	Pitch of Worm, Normal	Multiply axial pitch by cosine of lead angle to find normal pitch.	$P_n = P \times \cos L_a$
18	Pitch Diam., Worm	Subtract pitch diameter of worm-wheel from twice the center distance.	$d = 2C - D$
19		Subtract twice the addendum from outside diameter. See Addendum and Dedendum.	$d = d_0 - 2a$
20		Multiply lead by cotangent lead angle and divide product by 3.1416.	$d = \frac{L \times \cot L_a}{3.1416}$
21	Pitch Diam., Worm-wheel	Subtract pitch diameter of worm from twice the center distance.	$D = 2C - d$
22		Multiply number of wheel teeth by axial pitch of worm and divide product by 3.1416.	$D = \frac{TP}{3.1416}$
23	Radius of Rim Corner, Wheel	Multiply pitch by 0.25	Rad. $= 0.25\,P$
24		British Standard: Radius = 0.5 module.	Rad. $= 0.5\,m$
25	Ratio	Divide number of wheel teeth by number of worm threads.	$R = T \div t$
26	Rubbing Speed, Ft. per Minute	Divide wheel pitch diameter by ratio; square quotient and add to square of worm pitch diameter; multiply square root of this sum by 0.262 × R.P.M. of worm.	$V = 0.262\,n\sqrt{d^2 + \left(\frac{D}{R}\right)^2}$
27		Multiply 0.262 × pitch diameter of worm by R.P.M. of worm; then multiply product by secant of lead angle.	$V = 0.262\,dn \times \sec L_a$
28	Throat Diam., Worm-wheel	Add twice the addendum to pitch diameter — see paragraph, Addendum and Dedendum.	$D_t = D + 2A$
29	Throat Radius, Worm-wheel	Subtract twice worm addendum from outside radius of worm.	$U = \frac{d_0}{2} - 2a$
30	Tooth Depth	Whole depth equals addendum + dedendum. See paragraph, Addendum and Dedendum.	$W = a + b$ or $A + B$
31	Worm Thread Length	Multiply the number of wheel teeth by 0.02, add 4.5 and multiply sum by pitch.	$G = P(4.5 + 0.02\,T)$
32		British Standard — Subtract square of worm-wheel pitch diameter from square of outside diameter and extract square root of remainder.	$G = \sqrt{D_0^2 - D^2}$

4. BÁNH RĂNG XOẮN

HELICAL GEARING

NGUYÊN LÝ CƠ BẢN VÀ CÔNG THỨC TÍNH BÁNH RĂNG XOẮN

BASIC RULES AND FORMULAS FOR HELICAR GEAR CALCULATIONS



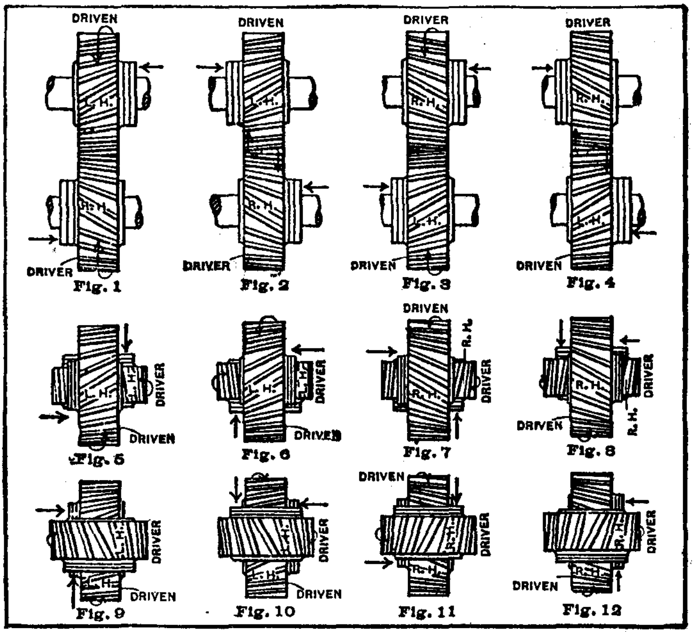
In the formulas, N, α, etc., are the numbers of teeth, helix angle, etc., for *either* gear or pinion; the notations N_a, N_b, α_a, α_b, etc., refer to the teeth or angles in the pinion or gear, respectively, in a pair of gears a and b.

No.	To Find	Rule	Formula
1	Relation between Shaft and Tooth Angles.	See rules at bottom of page 809.	
2	Pitch Diameter.	Divide the number of teeth by the product of the normal pitch and the cosine of the tooth angle.	$D = \frac{N}{P_n \cos \alpha}$
3	Center Distance.	Add together the pitch diameters of the two gears and divide by 2.	$C = \frac{D_a + D_b}{2}$
4	Checking Calculations in (2) and (3); for use when angle between shafts is 90 degrees.	To prove the calculations for pitch diameters and center distance, multiply the number of teeth in the first gear by the tangent of the tooth angle of that gear, and add the number of teeth in the second gear to the product; the sum should equal twice the product of the center distance multiplied by the normal diametral pitch, multiplied by the sine of the tooth angle of the first gear.	$N_b + (N_a \times \tan \alpha_a) = 2\,CP_n \times \sin \alpha_a$
5	Number of Teeth for which to Select Formed Cutter.	Follow procedure outlined under heading "Selecting Cutter for Milling Helical Gears," page 827.	
6	Lead of Tooth Helix.	Multiply the pitch diameter by 3.1416 times the cotangent of the tooth angle.	$L = \pi D \times \cot \alpha$
7	Addendum.	Divide 1 by the normal diametral pitch.	$S = \frac{1}{P_n}$
8	Whole Depth of Tooth.	Divide 2.157 by the normal diametral pitch.*	$W = \frac{2.157}{P_n}$
9	Normal Tooth Thickness at Pitch Line.	Divide 1.571 by the normal diametral pitch.	$T_n = \frac{1.571}{P_n}$
10	Outside Diameter.	Add twice the addendum to the pitch diameter.	$O = D + 2S$

* For hobbed 20° pressure angle gears of 20 diametral pitch and finer, $W = (2.200 + P_n) + 0.002$.

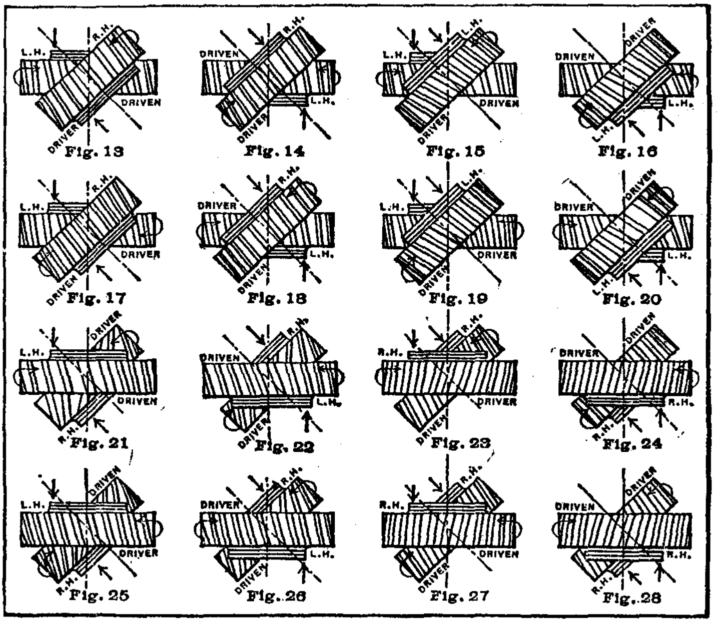
HÌNH 1 - 12 : SƠ ĐỒ LỰC ĐẨY CỦA BÁNH RĂNG XOẮN - HƯỚNG CỦA LỰC TÙY THUỘC VÀO CHIỀU QUAY, VỊ TRÍ TƯƠNG ĐỐI GIỮA BÁNH BỊ ĐỘNG - CHỦ ĐỘNG, HƯỚNG XOẮN

FIGS. 1 TO 12. THRUST DIAGRAMS FOR HELICAL GEARS - DIRECTION OF THRUST DEPENDS UPON DIRECTION OF ROTATION, RELATIVE POSITION OF DRIVER AND DRIVEN GEAR, AND DIRECTION OF HELIX



HÌNH 13 - 28 : SƠ ĐỒ LỰC ĐẨY CỦA BÁNH RĂNG XOẮN - HƯỚNG CỦA LỰC TÙY THUỘC VÀO CHIỀU QUAY, VỊ TRÍ TƯƠNG ĐỐI GIỮA BÁNH BỊ ĐỘNG - CHỦ ĐỘNG, HƯỚNG XOẮN

FIGS. 13 TO 28. THRUST DIAGRAMS FOR HELICAL GEARS - DIRECTION OF THRUST DEPENDS UPON DIRECTION OF ROTATION. RELATIVE POSITION OF DRIVER AND DRIVEN GEAR, AND DIRECTION OF HELIX



5. BÁNH RĂNG HÀNH TINH

PLANETARY GEARING

CÁC TỶ SỐ HÀNH TINH HOẶC ĂN KHỚP EPICYCLIC

RATIOS OF PLANETARY OR EPICYCLIC GEARING

D = rotation of *driver* per revolution of follower or driven member.

F = rotation of *follower* or driven member per revolution of driver. (In Figs. 1 to 4, inclusive, F = rotation of planet type follower about its axis.)

A = size of driving gear (use either number of teeth or pitch diameter). Note: When follower derives its motion both from A and from a secondary driving member, A = size of *initial* driving gear, and formula gives speed relationship between A and follower.

B = size of *driven gear or follower* (use either pitch diameter or number of teeth).

C = size of *fixed gear* (use either pitch diameter or number of teeth).

x = size of *planet gear* as shown by diagram (use either pitch diameter or number of teeth).

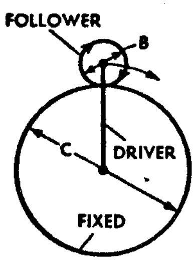
y = size of *planet gear* as shown by diagram (use either pitch diameter or number of teeth).

z = size of secondary or *auxiliary driving gear*, when follower derives its motion from two driving members.

S = rotation of *secondary driver*, per revolution of *initial* driver. S is negative when secondary and initial drivers rotate in opposite directions. (Formulas in which S is used, give speed relationship between follower and the initial driver.)

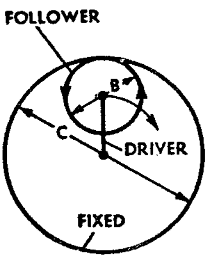
Note: In all cases, if D is known, $F = 1 \div D$, or, if F is known, $D = 1 \div F$.

Fig. 1



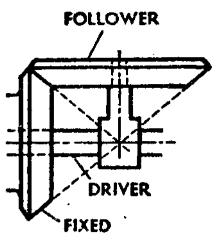
$$F = 1 + \frac{C}{B}$$

Fig. 2



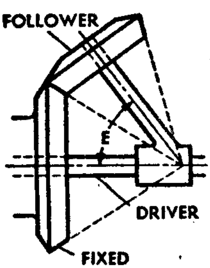
$$F = 1 - \frac{C}{B}$$

Fig. 3



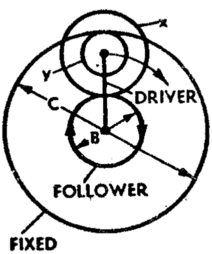
$$F = \frac{C}{B}$$

Fig. 4



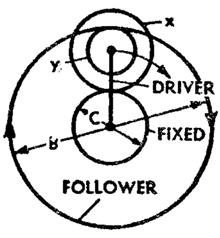
$$F = \cos E + \frac{C}{B}$$

Fig. 5



$$F = 1 + \frac{x \times C}{y \times B}$$

Fig. 6

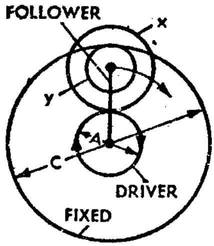


$$F = 1 + \frac{y \times C}{x \times B}$$

CÁC TỶ SỐ HÀNH TINH HOẶC ĂN KHỚP EPICYCLIC

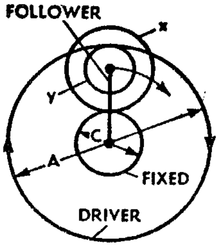
RATIOS OF PLANETARY OR EPICYCLIC GEARING

Fig. 7



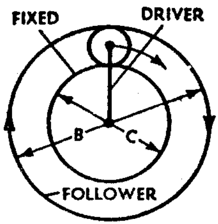
$$D = 1 + \frac{x \times C}{y \times A}$$

Fig. 8



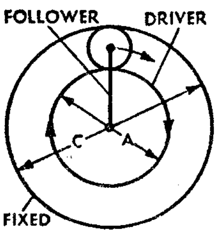
$$D = 1 + \frac{y \times C}{x \times A}$$

Fig. 9



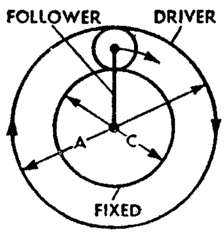
$$F = 1 + \frac{C}{B}$$

Fig. 10



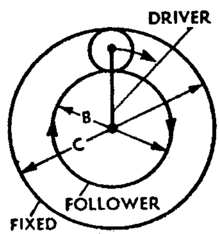
$$D = 1 + \frac{C}{A}$$

Fig. 11



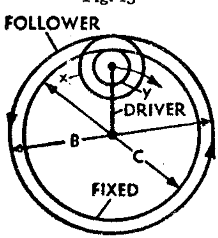
$$D = 1 + \frac{C}{A}$$

Fig. 12



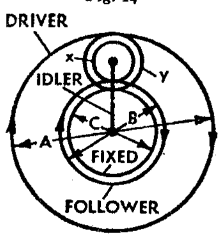
$$F = 1 + \frac{C}{B}$$

Fig. 13



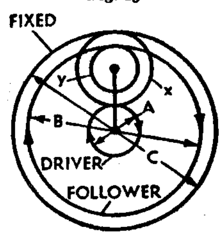
$$F = 1 - \left(\frac{C \times x}{y \times B}\right)$$

Fig. 14



$$D = \frac{1 + \frac{C}{A}}{1 - \left(\frac{C \times x}{y \times B}\right)}$$

Fig. 15

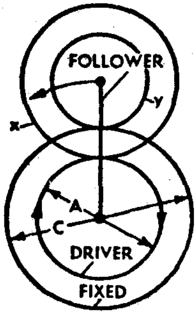


$$D = \frac{1 + \frac{C}{A}}{1 - \left(\frac{C \times y}{x \times B}\right)}$$

CÁC TỶ SỐ HÀNH TINH HOẶC ĂN KHỚP EPICYCLIC

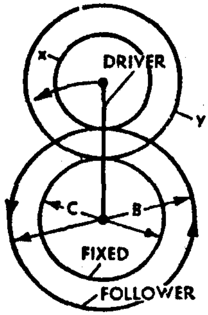
RATIOS OF PLANETARY OR EPICYCLIC GEARING

Fig. 16



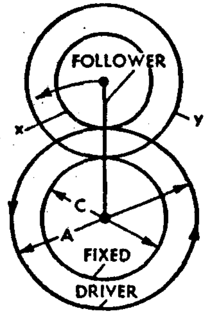
$$D = 1 - \left(\frac{C \times x}{y \times A}\right)$$

Fig. 17



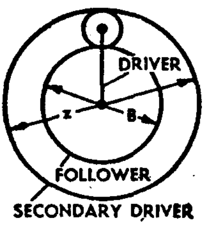
$$F = 1 - \left(\frac{C \times x}{y \times B}\right)$$

Fig. 18



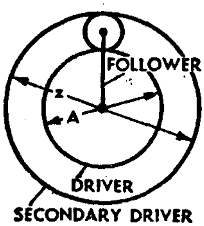
$$D = 1 - \left(\frac{C \times x}{y \times A}\right)$$

Fig. 19



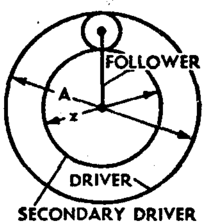
$$F = 1 + \frac{z \times (1 - S)}{B}$$

Fig. 20



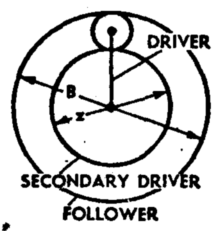
$$D = \frac{A + z}{A + (S \times z)}$$

Fig. 21



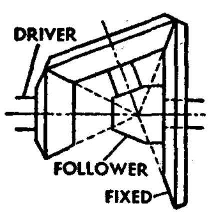
$$D = \frac{A + z}{A + (S \times z)}$$

Fig. 22



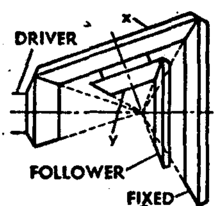
$$F = 1 + \frac{z \times (1 - S)}{B}$$

Fig. 23



$$D = 1 + \frac{C}{A}$$

Fig. 24



$$D = \frac{1 + \frac{C}{A}}{1 - \left(\frac{C \times y}{x \times B}\right)}$$

TRANSMISSIONS

SỰ TRUYỀN ĐỘNG

ĐAI PHẲNG VÀ RÒNG RỌC

FLAT BELTS AND PULLEYS

BẢNG 1 : HỆ SỐ DUNG LƯỢNG ĐAI : K

Table 1. BELT CAPACITY FACTOR, K-FLAT LEATHER BELTING

Belt Speed, Feet per Minute	SINGLE PLY		DOUBLE PLY			TRIPLE PLY	
	*11/64"	*13/64"	*18/64"	*20/64"	*23/64"	*30/64"	*34/64"
	Medium	Heavy	Light	Medium	Heavy	Medium	Heavy
	Horsepower per Inch of Width, *K* — to be Corrected by Factors from Table 2						
600	1.1	1.2	1.5	1.8	2.2	2.5	2.8
800	1.4	1.7	2.0	2.4	2.9	3.3	3.6
1000	1.8	2.1	2.6	3.1	3.6	4.1	4.5
1200	2.1	2.5	3.1	3.7	4.3	4.9	5.4
1400	2.5	2.9	3.5	4.3	4.9	5.7	6.3
1600	2.8	3.3	4.0	4.9	5.6	6.5	7.1
1800	3.2	3.7	4.5	5.4	6.2	7.3	8.0
2000	3.5	4.1	4.9	6.0	6.9	8.1	8.9
2200	3.9	4.5	5.4	6.6	7.6	8.8	9.7
2400	4.2	4.9	5.9	7.1	8.2	9.5	10.5
2600	4.5	5.3	6.3	7.7	8.9	10.3	11.4
2800	4.9	5.6	6.8	8.2	9.5	11.0	12.1
3000	5.2	5.9	7.2	8.7	10.0	11.6	12.8
3200	5.4	6.3	7.6	9.2	10.6	12.3	13.5
3400	5.7	6.6	7.9	9.7	11.2	12.9	14.2
3600	5.9	6.9	8.3	10.1	11.7	13.4	14.8
3800	6.2	7.1	8.7	10.5	12.2	14.0	15.4
4000	6.4	7.4	9.0	10.9	12.6	14.5	16.0
4200	6.7	7.7	9.3	11.3	13.0	15.0	16.5
4400	6.9	7.9	9.6	11.7	13.4	15.4	16.9
4600	7.1	8.1	9.8	12.0	13.8	15.8	17.4
4800	7.2	8.3	10.1	12.3	14.1	16.2	17.8
5000	7.4	8.4	10.3	12.5	14.3	16.5	18.2
5200	7.5	8.6	10.5	12.8	14.6	16.8	18.5
5400	7.6	8.7	10.6	12.9	14.8	17.1	18.8
5600	7.7	8.8	10.8	13.1	15.0	17.3	19.0
5800	7.7	8.9	10.9	13.2	15.1	17.5	19.2
†6000	7.8	8.9	10.9	13.2	15.2	17.6	19.3
Belt Speed, fpm	Minimum Allowable Pulley Diameter, Inch, For Belt Thicknesses Listed Above						
Up to 2500	2½	3	4	5[1]	8[1]	16[2]	20[2]
2500 to 4000	3	3½	4½	6[1]	9[1]	18[2]	22[2]
4000 to 6000	3½	4	5	7[1]	10[1]	20[2]	24[2]

* The belt thicknesses are average thicknesses. See paragraph on Thicknesses of Flat Leather Belting.

† For belt speeds over 6000 feet per minute, consult a leather belting manufacturer.

[1] For belts 8 inches wide and over, add 2 inches to minimum pulley diameter shown.

[2] For belts 8 inches wide and over, add 4 inches to minimum pulley diameter shown.

Tolerances: Allowable tolerances for thicknesses of single and double ply belts are plus or minus 1/64 inch, based on the nominal thickness. At no point shall single-ply belting be more than 3/64 inch thicker or 2/64 inch thinner than the average thickness. For double-ply belting, the variation in thickness shall not be greater than 2/64 inch thicker or thinner than the average.

Triple-ply Belts: Most triple-ply belts are constructed for particular drive conditions. The manufacturer should be consulted for specific information concerning thickness and construction.

Pulleys. — On step-cone pulleys use a narrow, thick belt rather than a wide, thin belt of the same horsepower capacity. It is good practice to use pulleys with faces from ½ to 2 inches (depending upon their diameters) wider than the belt required for the drive.

Use with Tension-Controlling Motor Base. — When used with an electric motor drive, a flat leather belt will give best results if the motor is mounted on some kind of a tension controlling base. Three types are generally available. Two of these are pivoted; one uses the weight of the motor to maintain the proper belt tension; the other utilizes the reaction torque of the motor to accomplish this. The third type has a sliding action and controls the belt tension by means of springs. The effect of all three types is to cause the belt to maintain a uniform pull around and across the pulleys.

BẢNG 2 : CÁC HỆ SỐ SỬ DỤNG M, P, F DÙNG ĐỂ XÁC ĐỊNH CÔNG SUẤT TIÊU THỤ

Table 2. SERVICE CORRECTION FACTORS M, P AND F USED IN DETEMINING HORSEPOWER RATING

Motor type and Starting Method		*M*
	Squirrel cage, compensator starting	1.5
	Squirrel cage, line starting	2.0
	Slip ring and high starting torque	2.5
Diameter of Small Pulley		*P*
	4 inches and under	0.5
	4½ to 8 inches	0.6
	9 to 12 inches	0.7
	13 to 16 inches	0.8
	17 to 30 inches	0.9
	Over 30 inches	1.0
Operating Conditions		*F*
	Oily, wet, or dusty atmosphere	1.35
	Vertical drives	1.2
	Jerky loads	1.2
	Shock and reversing loads	1.4

Horsepower Rating. — In Table 1 are given belt capacity factors for various types and thicknesses of flat leather belting and for various belt speeds in feet per minute. These factors are expressed in terms of horsepower per inch of width and are modified by service correction factors given in Table 2 as shown in the formula below. Where the pulley speed is known in terms of revolutions per minute, the corresponding belt speed in feet per minute can be found from Table 3.

The following formula is used to obtain the horsepower rating, H, of flat leather belt:

$$H = \frac{W \times K \times P}{M \times F} \qquad (1)$$

BẢNG 3 : CHUYỂN ĐỔI TỐC ĐỘ RÒNG RỌC TỪ VÒNG/PHÚT - FT/MINUTE

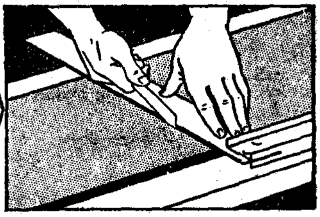
Pulley Diam. in Inches	Revolutions per Minute																				
	100	200	300	400	435	490	500	600	690	700	800	900	1000	1150	1200	1400	1500	1600	1750	1800	3600
	Velocity in Feet per Minute																				
1	26	52	79	105	114	128	131	157	181	183	209	236	262	301	314	367	393	419	458	471	942
2	52	105	157	209	228	257	262	314	361	367	419	471	524	602	628	733	785	838	916	942	1885
3	79	157	236	314	342	385	393	471	542	550	628	707	785	903	942	1100	1178	1257	1374	1414	2827
4	105	209	314	419	456	513	524	628	722	733	838	942	1047	1204	1257	1466	1571	1676	1833	1885	3770
5	131	262	393	524	570	641	654	785	903	916	1047	1178	1309	1505	1571	1833	1964	2094	2291	2356	4712
6	157	314	471	628	683	770	785	942	1084	1100	1257	1414	1571	1806	1885	2199	2356	2513	2749	2827	5655
7	183	367	550	733	797	898	916	1100	1264	1283	1466	1649	1833	2107	2199	2566	2749	2932	3207	3299	....
8	209	419	628	838	911	1026	1047	1257	1445	1466	1676	1885	2094	2409	2513	2932	3142	3351	3665	3770	....
9	236	471	707	942	1025	1154	1178	1414	1625	1649	1885	2121	2356	2710	2827	3299	3534	3770	4123	4241	....
10	262	524	785	1048	1139	1283	1309	1571	1806	1833	2094	2356	2618	3011	3142	3665	3927	4189	4582	4712	....
20	524	1047	1571	2094	2278	2566	2618	3142	3612	3665	4189	4712	5236	....	....	....	....	....	....	....	....
30	785	1571	2356	3142	3416	3848	3927	4712	5418	5498	....	....	....	....	....	....	....	....	....	....	....
0.1	3	5	8	10	11	13	13	16	18	18	21	24	26	30	31	37	39	42	46	47	94
0.2	5	10	16	21	23	26	26	31	36	37	42	47	52	60	63	73	79	84	92	94	188
0.3	8	16	24	31	34	38	39	47	54	55	63	71	79	90	94	110	118	126	137	141	283
0.4	10	21	31	42	46	51	52	63	72	73	84	94	105	120	126	147	157	168	183	188	377
0.5	13	26	39	52	57	64	65	79	90	92	105	118	131	151	157	183	196	209	229	236	471
0.6	16	31	47	63	68	77	78	94	108	110	126	141	157	181	188	220	236	251	275	283	565
0.7	18	37	55	73	80	90	92	110	126	128	147	165	183	211	220	257	275	293	321	330	660
0.8	21	42	63	84	91	103	105	126	144	147	168	189	209	241	251	293	314	335	367	377	754
0.9	24	47	71	94	102	115	118	141	163	165	188	212	236	271	283	330	353	377	412	424	848

CẮT VÀ NỐI ĐAI PHẲNG

1. Shorten pulley centers to the minimum.
2. Take a steel tape measurement around the pulleys.

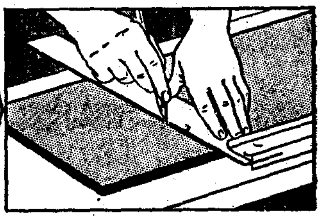
The ends of the belt should be cut square with its edge, using either a knife or a good belt cutter.

3. Prepare belt lap.

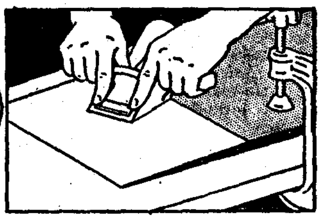


For Single Ply Belt

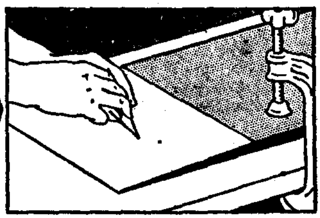
(a) Draw a line across the heel of the lap. The lap should be planned to point in the same direction as the other laps in the belt.



(b) Shave down belt ends tapering evenly from heels to points. Begin shaving at heel and work toward point.



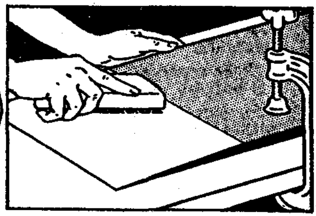
(c) Remove high spots with belt scraper and finish to feather edge so that the completed lap will be same thickness as body of the belt.



Splicing Flat Leather Belt

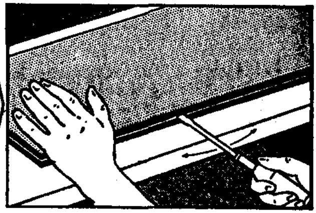
(d) Roughen belt fibres with scratcher. (Card clothing approximately No. 26 or 28).

(e) Brush off loose fibres.



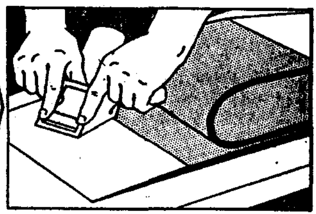
Double Ply Belt

(a) Separate plies on female end of belt for distance approximately three inches longer than overall lap length.



(b) Cut back the bottom ply an amount equal to the break. (For ease in splicing, the long leg of the female end should always be made on the top ply of the endless or field lap.)

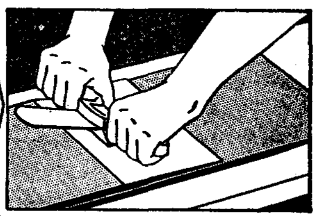
(c) Shave female end as shown in sketch.



(d) Shave outer surface of male end so that it matches in length with female end.

(e) Continue preparation of lap as for single-ply belt.

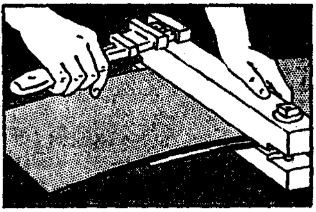
4. Place prepared belt around pulleys so as to run in the proper direction.



Splicing Flat Leather Belt (*Continued*)

5. Mark belt, using square, immediately beyond where clamps will be applied. This mark serves as a guide in keeping clamps at right angles to the belt edge, and as a check against any slippage of clamps.

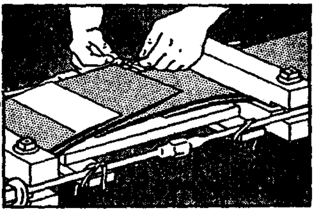
6. Place belt clamps centrally on belt and as far back as possible to allow ample takeup on rods.



7. Tighten rods making one turn at a time on each rod so that length on both edges of belt will be kept equal. Where possible rock or turn pulleys to work out all belt slack.

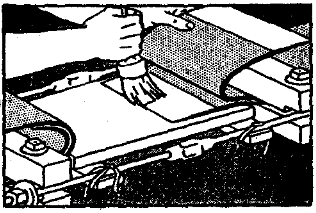
8. Fasten working platform.

9. If belt is drawn up further than anticipated, cut back male end to make laps match.



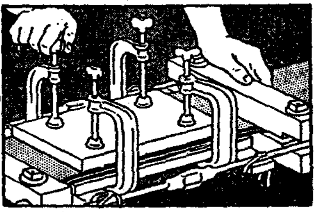
10. Apply waterproof cement sizing coat and let dry, usually about 30 minutes.

11. Apply the final or sticking coat of cement. Quickly place cemented ends together, matching carefully, and press between boards with C clamps. A few tacks hammered in splice will help to keep ends from shifting.



12. Let dry for 20 minutes before removing C clamps and boards. Take care not to disturb points of lap.

13. After allowing splice to dry thoroughly, for at least five hours, remove belt clamps and rods, as well as any tacks that might have been used.



Splicing Flat Leather Belt (*Continued*)

It may not be necessary or convenient to make certain belts, particularly those under six inches in width, endless with a cemented joint. In selecting the type of fastener to use, bear in mind that the joint should approximate as nearly as possible the endless belt.

Where joints are not cemented, lacing with rawhide or Indian tanned lace, explained in the following paragraph, makes one of the best joints for leather belts.

ĐAI V VÀ RÃNH RÒNG RỌC

BẢNG 1 : KÍCH THƯỚC TIẾT DIỆN ĐAI-V TẢI NHẸ

Table 1. LIGHT-DUTY V-BELT CROSS-SECTION DIMENSIONS

Cross Section	2L*	3L	4L	5L
Nominal Top Width	1/4	3/8	1/2	21/32
Nominal Thickness	5/32	7/32	5/16	3/8

* The 2L cross section is in limited usage and is not made by all manufacturers. All dimensions in inches.

BẢNG 2 : CHIỀU DÀI PHÍA NGOÀI TIÊU CHUẨN ĐAI V - TẢI NHẸ

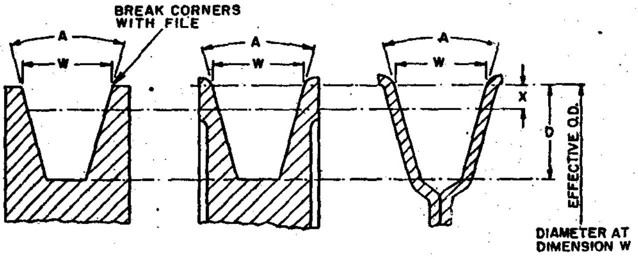
Table 2. LIGHT-DUTY V-BELT STANDARD OUTSIDE LENGTHS

Nom. Outside Length, Inches	Standard Outside Lengths 2L	3L	4L	Effect. Outside Length Variations, Inches
8	•	..	..	+1/8, −3/8
9	•	..	..	+1/8, −3/8
10	•	..	..	+1/8, −3/8
11	•	..	..	+1/8, −3/8
12	•	..	..	+1/8, −3/8
13	•	..	..	+1/8, −3/8
14	•	•	..	+1/8, −3/8
15	•	•	..	+1/8, −3/8
16	•	•	..	+1/8, −3/8
17	•	•	..	+1/8, −3/8
18	•	•	•	+1/8, −3/8
19	•	•	•	+1/8, −3/8
20	•	•	•	+1/8, −3/8
	3L	4L	5L	
21	•	•	..	+1/4, −5/8
22	•	•	..	+1/4, −5/8
23	•	•	..	+1/4, −5/8
24	•	•	..	+1/4, −5/8
25	•	•	•	+1/4, −5/8
26	•	•	•	+1/4, −5/8
27	•	•	•	+1/4, −5/8
28	•	•	•	+1/4, −5/8
29	•	•	•	+1/4, −5/8
30	•	•	•	+1/4, −5/8
31	•	•	•	+1/4, −5/8
32	•	•	•	+1/4, −5/8
33	•	•	•	+1/4, −5/8

Nom. Outside Length, Inches	Standard Outside Lengths 3L	4L	5L	Effect. Outside Length Variations, Inches
34	•	•	•	+1/4, −5/8
35	•	•	•	+1/4, −5/8
36	•	•	•	+1/4, −5/8
37	•	•	•	+1/4, −5/8
38	•	•	•	+1/4, −5/8
39	•	•	•	+1/4, −5/8
40	•	•	•	+1/4, −5/8
41	•	•	•	+1/4, −5/8
42	•	•	•	+1/4, −5/8
43	•	•	•	+1/4, −5/8
44	•	•	•	+1/4, −5/8
45	•	•	•	+1/4, −5/8
46	•	•	•	+1/4, −5/8
47	•	•	•	+1/4, −5/8
48	•	•	•	+1/4, −5/8
49	•	•	•	+1/4, −5/8
50	•	•	•	+1/4, −5/8
51	..	•	•	+1/4, −5/8
52	•	•	•	+1/4, −5/8
53	..	•	•	+1/4, −5/8
54	•	•	•	+1/4, −5/8
55	..	•	•	+1/4, −5/8
56	•	•	•	+1/4, −5/8
57	..	•	•	+1/4, −5/8
58	•	•	•	+1/4, −5/8
59	..	•	•	+1/4, −5/8
60	•	•	•	+1/4, −5/8
61	..	•	•	+5/16, −11/16
62	..	•	•	+5/16, −11/16

Nom. Outside Length, Inches	Standard Outside Lengths 3L	4L	5L	Effect. Outside Length Variations, Inches
63	..	•	•	+5/16, −11/16
64	..	•	•	+5/16, −11/16
65	..	•	•	+5/16, −11/16
66	..	•	•	+5/16, −11/16
67	..	•	•	+5/16, −11/16
68	..	•	•	+5/16, −11/16
69	..	•	•	+5/16, −11/16
70	..	•	•	+5/16, −11/16
71	..	•	•	+5/16, −11/16
72	..	•	•	+5/16, −11/16
73	..	•	•	+5/16, −11/16
74	..	•	•	+5/16, −11/16
75	..	•	•	+5/16, −11/16
76	..	•	•	+5/16, −11/16
77	..	•	•	+5/16, −11/16
78	..	•	•	+5/16, −11/16
79	..	•	•	+5/16, −11/16
80	..	•	•	+5/8, −7/8
82	..	•	•	+5/8, −7/8
84	..	•	•	+5/8, −7/8
86	..	•	•	+5/8, −7/8
88	..	•	•	+5/8, −7/8
90	..	•	•	+5/8, −7/8
92	..	•	•	+5/8, −7/8
94	..	•	•	+5/8, −7/8
96	..	•	•	+5/8, −7/8
98	..	•	•	+5/8, −7/8
100	..	•	•	+5/8, −7/8

BẢNG 3 : KÍCH THƯỚC RÃNH RÒNG RỌC CHO ĐAI V TẢI NHẸ



V-belt Cross Section	Effective Outside Diameter, Inches	Groove Angle	*W*	*D*	2*X*	V-belt Cross Section	Effective Outside Diameter, Inches	Groove Angle	*W*	*D*	2*X*
2L	Under 1.5 1.5–1.99 2.0–2.5 Over 2.5	32° 34° 36° 38°	.240 .243 .246 .250	.250	.10	4L	Under 2.65 2.65–3.24 3.25–5.65 Over 5.65	30° 32° 34° 38°	.485 .490 .494 .504	.490	.20
3L	Under 2.2 2.2–3.19 3.2–4.2 Over 4.20	32° 34° 36° 38°	.360 .364 .368 .372	.406	.15	5L	Under 3.95 3.95–4.94 4.95–7.35 Over 7.35	30° 32° 34° 38°	.624 .630 .637 .650	.580	.30

All dimensions in inches except where otherwise indicated.

BẢNG 4. KHOẢNG CÁCH TÂM CHO PHÉP TỐI THIỂU ĐỂ LẮP ĐẶT VÀ THÁO ĐAI V TẢI NHẸ

Lengths	Minimum Allowance Below (−) and Above (+) Standard Center Distance, Inches			
	2L	3L	4L	5L
8 to 18	−3/8, +1/8	−5/8, +1/2	....	....
18 to 25	−3/8, +1/2	−5/8, +1/2	−3/4, +1/2	....
25 to 38	....	−3/4, +1/2	−3/4, +1/2	−1, +1/2
38 to 61	....	−3/4, +3/4	−7/8, +3/4	−1, +3/4
61 to 80	....	....	−1, +1 1/8	−1 1/8, +1 1/8
80 to 100, incl.	....	....	−1 1/8, +1 1/2	−1 1/4, +1 1/2

Note: Minus values are for shortening center distance for installation. Plus values are for lengthening center distance to compensate for stretch and wear.

BẢNG 5 : TỶ SỐ CÔNG SUẤT TIÊU THỤ CỦA ĐAI V TẢI NHẸ

Table 5. HORSEPOWER RATINGS FOR LIGHT-DUTY V-BELTS

Belt Speed, Ft. per Min.	Effective Outside Diameter of Small Sheave, Inches																							
	1½	1¾	2		2¼		2½		2¾		3			3¼		3½		3¾		4		4¼	4½	4¾	5
	3L	3L	3L	4L	3L	4L	3L	4L	3L	4L	3L*	4L	5L	4L	5L	4L	5L	4L	5L	4L*	5L	5L	5L	5L	5L
	Horsepower Ratings																								
200	.05	.07	.08	.07	.09	.09	.10	.13	.10	.14	.11	.16	.13	.17	.16	.18	.19	.19	.21	.21	.24	.26	.27	.29	.30
400	.08	.12	.14	.12	.16	.17	.18	.23	.19	.27	.20	.31	.23	.34	.29	.36	.35	.38	.40	.40	.45	.49	.52	.55	.58
600	.11	.16	.20	.15	.23	.24	.25	.32	.27	.38	.29	.43	.30	.48	.41	.51	.49	.54	.57	.57	.64	.69	.75	.79	.83
800	.12	.19	.24	.17	.28	.30	.31	.40	.33	.48	.36	.54	.36	.60	.50	.64	.62	.69	.72	.73	.80	.88	.95	1.01	1.07
1000	.13	.22	.28	.18	.33	.33	.37	.46	.40	.56	.43	.65	.40	.71	.57	.78	.72	.83	.84	.88	.95	1.05	1.14	1.21	1.28
1200	.14	.24	.32	.17	.38	.36	.43	.51	.47	.64	.50	.74	.42	.83	.63	.89	.80	.96	.96	1.01	1.09	1.20	1.31	1.40	1.48
1400	.15	.27	.35	.16	.42	.39	.48	.56	.52	.71	.56	.82	.43	.92	.67	1.01	.87	1.08	1.05	1.14	1.20	1.34	1.46	1.57	1.67
1600	.15	.28	.38	.14	.46	.40	.52	.60	.58	.77	.62	.90	.42	1.01	.69	1.11	.93	1.19	1.13	1.26	1.31	1.46	1.60	1.72	1.84
1800	.14	.29	.41	.11	.50	.40	.57	.62	.63	.81	.67	.96	.40	1.09	.71	1.19	.97	1.29	1.20	1.37	1.40	1.57	1.73	1.87	1.99
2000	.13	.30	.43	.08	.53	.39	.60	.64	.67	.86	.72	1.02	.36	1.16	.70	1.28	1.00	1.38	1.25	1.47	1.47	1.67	1.84	1.99	2.13
2200	.12	.30	.44	.04	.55	.39	.64	.67	.71	.90	.77	1.08	.31	1.24	.69	1.37	1.01	1.48	1.29	1.58	1.54	1.75	1.94	2.11	2.26
2400	.10	.30	.45	...	.57	.37	.66	.68	.74	.92	.81	1.12	.25	1.29	.66	1.43	1.01	1.55	1.32	1.66	1.58	1.81	2.02	2.21	2.37
2600	.07	.29	.46	...	.58	.34	.69	.66	.77	.93	.84	1.16	.17	1.33	.62	1.50	1.00	1.63	1.33	1.75	1.62	1.87	2.09	2.29	2.47
2800	.04	.28	.46	...	.59	.29	.70	.65	.79	.94	.87	1.18	.08	1.38	.56	1.54	.97	1.68	1.32	1.81	1.63	1.91	2.15	2.36	2.56
3000	.01	.26	.45	...	.60	.25	.72	.63	.81	.94	.89	1.19	...	1.40	.49	1.58	.93	1.74	1.31	1.87	1.64	1.93	2.19	2.42	2.63
3200	...	.23	.44	...	.59	.19	.72	.60	.82	.92	.91	1.20	...	1.42	.40	1.61	.87	1.78	1.27	1.92	1.63	1.94	2.21	2.46	2.68
3400	...	.20	.42	...	.59	.11	.72	.55	.83	.90	.92	1.19	...	1.43	.29	1.63	.79	1.80	1.22	1.96	1.60	1.92	2.22	2.48	2.72
3600	...	.16	.39	...	.57	.04	.71	.50	.83	.86	.92	1.16	...	1.42	.16	1.64	.69	1.82	1.15	1.98	1.54	1.89	2.20	2.48	2.73
3800	...	.12	.36	...	.54	...	.69	.43	.82	.81	.92	1.13	...	1.40	.17	1.63	.57	1.83	1.05	2.00	1.47	1.84	2.17	2.46	2.72
4000	...	.06	.31	...	.51	...	.67	.35	.80	.76	.91	1.09	...	1.38	...	1.61	.43	1.82	.93	2.00	1.37	1.76	2.11	2.42	2.69
4200	...	...	.26	...	.47	...	.64	.24	.77	.67	.89	1.03	...	1.32	...	1.58	.26	1.79	.80	1.98	1.26	1.67	2.03	2.35	2.64
4400	...	...	.21	...	.42	...	.60	.14	.74	.58	.86	.96	...	1.27	...	1.53	.08	1.76	.64	1.95	1.12	1.55	1.93	2.27	2.57
4600	...	...	.14	...	.37	...	.55	.01	.70	.48	.82	.87	...	1.19	...	1.46	...	1.70	.46	1.91	.97	1.41	1.81	2.16	2.48
4800	...	...	.06	...	.30	...	.49	...	.64	.36	.77	.76	...	1.10	...	1.39	...	1.64	.25	1.85	.78	1.25	1.66	2.03	2.36
5000	...	...	...	...	.22	...	.42	...	.58	.23	.72	.65	...	1.00	...	1.30	...	1.56	.02	1.78	.58	1.06	1.49	1.88	2.22
5200	...	...	...	...	.14	...	.34	...	.51	.08	.65	.51	...	.88	...	1.19	...	1.45	...	1.70	.34	.85	1.30	1.70	2.06
5400	...	...	...	...	.04	...	.26	...	.43	...	.58	.36	...	.74	...	1.07	...	1.35	...	1.59	.08	.61	1.07	1.49	1.86
5600	...	...	...	...	...	...	.16	...	.34	...	.49	.18	...	.58	...	.91	...	1.20	...	1.46	...	.34	.82	1.25	1.64
5800	...	...	...	...	...	...	.05	...	.24	...	.39	...	...	.38	...	.72	...	1.03	...	1.29	...	.04	.54	.99	1.39
6000	...	...	...	...	...	...	...	...	.12	...	.29	...	...	.18	...	.54	...	.84	...	1.11	...	...	.23	.69	1.11

* These horsepower ratings also hold for this belt size when used with sheaves of larger effective outside diameters.

BẢNG 6 : CHIỀU DÀI BƯỚC TIÊU CHUẨN KHI DÙNG ĐAI V NHIỀU ĐAI

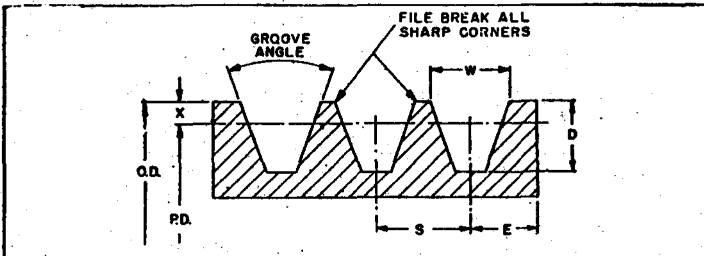
Table 6. STANDARD PITCH LENGTHS FOR MULTIPLE V-BELTS

Standard Length Desig-nation*	Standard V-Belt Cross Sections					Permissible Deviations from Std. Pitch Length, Inches	Matching Limits for One Set†, Inch
	A	B	C	D	E		
	Standard Pitch Lengths, Inches						
26	27.3	.....	.....	.....	.....	+ .7,− .3	.10
31	32.3	.....	.....	.....	.....	+ .7,− .3	.10
33	34.3	.....	.....	.....	.....	+ .8,− .4	.10
35	36.3	36.8	.....	.....	.....	+ .8,− .4	.10
38	39.3	39.8	.....	.....	.....	+ .8,− .4	.10
42	43.3	43.8	.....	.....	.....	+ .8,− .4	.10
46	47.3	47.8	.....	.....	.....	+ .8,− .4	.10
48	49.3	49.8	.....	.....	.....	+ .9,− .5	.10
51	52.3	52.8	53.9	.....	.....	+ .9,− .5	.10
53	54.3	54.8	.....	.....	.....	+ .9,− .5	.10
55	56.3	56.8	.....	.....	.....	+ .9,− .5	.10
60	61.3	61.8	62.9	.....	.....	+ .9,− .5	.20
62	63.3	63.8	.....	.....	.....	+ .9,− .5	.20
64	65.3	65.8	.....	.....	.....	+ .9,− .5	.20
66	67.3	67.8	.....	.....	.....	+ .9,− .5	.20
68	69.3	69.8	70.9	.....	.....	+ .9,− .5	.20
71	72.3	72.8	.....	.....	.....	+ .9,− .5	.20
75	76.3	76.8	77.9	.....	.....	+ .9,− .5	.20
78	79.3	79.8	.....	.....	.....	+1.0,− .5	.30
80	81.3	.....	.....	.....	.....	+1.0,− .5	.30
81	.....	82.8	83.9	.....	.....	+1.0,− .5	.30
83	.....	84.8	.....	.....	.....	+1.0,− .5	.30
85	86.3	86.8	87.9	.....	.....	+1.0,− .5	.30
90	91.3	91.8	92.9	.....	.....	+1.0,− .5	.30
96	97.3	.....	98.9	.....	.....	+1.0,− .5	.30
97	.....	98.8	.....	.....	.....	+1.0,− .5	.30
105	106.3	106.8	107.9	.....	.....	+1.1,− .5	.40
112	113.3	113.8	114.9	.....	.....	+1.1,− .5	.40
120	121.3	121.8	122.9	123.3	.....	+1.2,− .5	.40
128	129.3	129.8	130.9	131.3	.....	+1.3,− .6	.40
136	.....	137.8	138.9	.....	.....	+1.3,− .6	.40
144	.....	145.8	146.9	147.3	.....	+1.4,− .6	.40
158	.....	159.8	160.9	161.3	.....	+1.5,− .6	.40
162	.....	.....	164.9	165.3	.....	+1.6,− .6	.40
173	.....	174.8	175.9	176.3	.....	+1.7,− .7	.50
180	.....	181.8	182.9	183.3	184.5	+1.7,− .7	.50
195	.....	196.8	197.9	198.3	199.5	+1.8,− .8	.50
210	.....	211.8	212.9	213.3	214.5	+2.0,− .8	.50
240	.....	240.3	240.9	240.8	241.0	+2.2,− .9	.50
270	.....	270.3	270.9	270.8	271.0	+2.4,−1.0	.50
300	.....	300.3	300.9	300.8	301.0	+2.5,−1.2	.60
330	.....	.....	330.9	330.8	331.0	+2.5,−1.2	.60
360	.....	.....	360.9	360.8	361.0	+2.5,−1.2	.60
390	.....	.....	390.9	390.8	391.0	+3.0,−1.5	.70
420	.....	.....	420.9	420.8	421.0	+3.5,−2.0	.70
480	.....	.....	.....	480.8	481.0	+4.0,−2.5	.70
540	.....	.....	.....	540.8	541.0	+4.5,−3.0	.70
600	.....	.....	.....	600.8	601.0	+5.0,−3.5	.70
660	.....	.....	.....	660.8	661.0	+6.0,−4.0	.70

* To specify belt size use the Standard Length Designation prefixed by the letter indicating cross section, for example: B90.

† Maximum allowable difference in actual pitch lengths of longest and shortest V-belts in a given set.

BẢNG 7 : KÍCH THƯỚC RÃNH VÀ DUNG SAI CHO RÒNG RỌC NHIỀU ĐAI V



Belt	Pitch Diameter: Minimum Recommended	Pitch Diameter: Range	Groove Angle	Standard Groove Dimensions: W	D	X	S[1]	E	Deep Groove Dimensions: W	D	X	S[1]	E
			±½°	(2)	±.031	....	±.031	(3)	(2)	±.031	....	±.031	(3)
A	3.0	2.6 to 5.4 Over 5.4	34° 38°	.494 .504	.490	.125	5/8	3/8	.589 .611	.645	.280	3/4	7/16
B	5.4	4.6 to 7.0 Over 7.0	34° 38°	.637 .650	.580	.175	3/4	1/2	.747 .774	.760	.355	7/8	9/16
C	9.0	7.0 to 7.99 8.0 to 12.0 Over 12.0	34° 36° 38°	.879 .887 .895	.780	.200	1	1 1/16	1.066 1.085 1.105	1.085	.505	1 1/4	13/16
D	13.0	12.0 to 12.99 13.0 to 17.0 Over 17.0	34° 36° 38°	1.259 1.271 1.283	1.050	.300	1 7/16	7/8	1.513 1.541 1.569	1.465	.715	1 3/4	1 1/16
E	21.0	18.0 to 24.0 Over 24.0	36° 38°	1.527 1.542	1.300	.400	1 3/4	1 1/8	1.816 1.849	1.745	.845	2 1/16	1 5/16

All dimensions in inches except groove angles are in degrees.

[1] Summation of the deviations from S for all grooves in any one sheave shall not exceed ±0.063 inch.

[2] Tolerances for W: for A and B belts are ±.005 inch; for C and D belts, ±.007 inch; and for E belt, ±.010 inch.

[3] Tolerances for E: for A belts are, +.070, −.000 inch; for B and C belts, +.150, −.000 inch; and for D and E belts, +.250, −.000 inch.

Outside Diameter Tolerances: Under 12 inches, ±.020 inch; 12.0 up to 24.0 inches, ±.040 inch; 24 up to 58 inches, .060 inch; 58.0 up to 72.0 inches, ±.120 inch; and for 72 inches and above, ±.250 inch.

Outside Diameter Eccentricity: For 10.0-inch pitch diameter and under, .010 inch. Add .0005 inch for each additional inch of pitch diameter up to and including 60.0-inch pitch diameter. Add .001 inch for each additional inch of pitch diameter above 60 inches.

Side Wobble and Runout: .001 inch per inch of pitch diameter up to 20 inches. Add .0005 inch for each additional inch of pitch diameter up to and including 60.0 inches. Add .001 inch for each additional inch of pitch diameter above 60.0 inches.

For standard key and keyway dimensions, see pages 869 and 870.

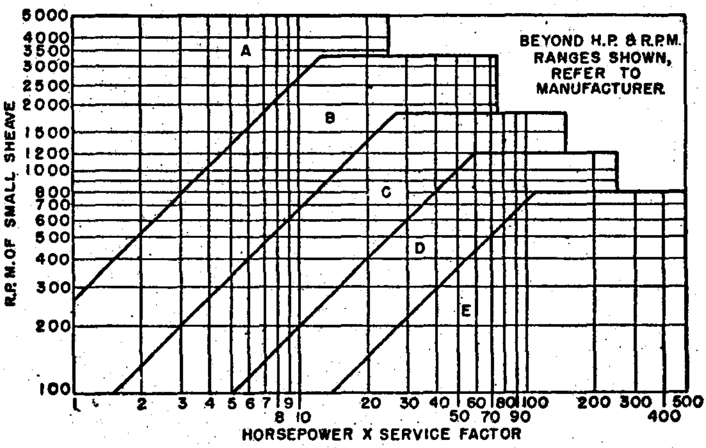
BẢNG 8 : KHOẢNG CÁCH TÂM TỐI THIỂU CHO PHÉP ĐỂ LẮP VÀ THÁO ĐAI V NHIỀU ĐAI

Table 8. MINIMUM CENTER DISTANCE ALLOWANCES FOR INSTALLATION AND TAKE-UP OF MULTIPLE V-BELTS

Range of Standard Lengths	Minimum Allowance Below (−) and Above (+) Standard Center Distance				
	A	B	C	D	E
26 to 38	−¾, +1	−1, +1	....	....	....
38 to 60	−¾, +1½	−1, +1½	−1½, +1½	....	....
60 to 90	−¾, +2	−1¼, +2	−1½, +2	....	....
90 to 120	−1, +2½	−1¼, +2½	−1½, +2½	....	....
120 to 158	−1, +3	−1¼, +3	−1½, +3	−2, +3	....
158 to 195	....	−1¼, +3½	−2, +3½	−2, +3½	−2½, +3½
195 to 240	....	−1½, +4	−2, +4	−2, +4	−2½, +4
240 to 270	....	....	−2, +4½	−2½, +4½	−2½, +4½
270 to 330	....	....	−2, +5	−2½, +5	−3, +5
330 to 420	....	....	−2, +6	−2½, +6	−3, +6
420 and over	....	....	....	−3, *	−3½, *

All dimensions in inches.

* For this belt size and lengths, 1.5 per cent of belt length above standard center distance for stretch and wear.



ĐỒ THỊ ĐỂ CHỌN ĐAI V VỚI TRUYỀN ĐỘNG CHO TRƯỚC

CHART FOR SELECTION OF V-BELT FOR GIVEN DRIVE

BẢNG 9 : ỨNG DỤNG CÁC HỆ SỐ HOẠT ĐỘNG CỦA ĐAI V NHIỀU ĐAI

Table 9. SERVICE FACTORS FOR MULTIPE V-BELT APPLICATIONS

Applications	Electric Motors										
	A.C.								D.C.		
	Squirrel Cage				Synchronous		Single Phase				
	Normal Torque Line Start	Normal Torque Compensator Start	High Torque	Wound Rotor (Slip Ring)	Normal Torque	High Torque	Repulsion and Split-Phase	Capacitor	Shunt Wound	Compound Wound	Line Shaft and Clutch Shifting
	Service Factors										
Agitators —											
Paddle-Propeller											
Liquid	1.0	1.0	1.2	...	...	...	...	...	...	...	...
Semi-Liquid	1.2	1.0	1.4	1.2	...	...	...	...	...	...	...
Brick and Clay Machinery											
Auger Machines	...	1.2	1.4	1.4	...	...	...	...	1.4	...	2.0
De-Airing Machines	...	1.2	1.4	1.4	...	...	...	...	1.4	...	2.0
Cutting Table	...	1.2	1.4	1.4	...	...	...	...	...	...	2.0
Pug Mill	1.5	1.3	1.8	1.5	...	...	...	...	...	...	...
Mixer	...	1.2	1.6	1.4	...	...	...	...	...	...	...
Granulator	...	1.2	1.4	1.4	...	...	...	...	...	...	...
Dry Press	...	1.2	1.6	1.4	...	...	...	...	...	...	...
Rolls	...	1.2	1.4	1.4	...	...	...	...	...	...	...
Bakery Machinery											
Dough Mixer	1.2	...	...	...	...	...	1.2	1.0	...	...	...
Compressors											
Centrifugal	1.2	1.2	...	1.4	1.4	...	...	...	1.2	...	...
Rotary	1.2	1.2	...	1.4	1.4	...	1.2	1.2	1.2	...	...
Reciprocating —											
3 or More Cyl	1.2	1.2	...	1.4	1.4	...	...	...	1.2	...	...
1 or 2 Cyl	1.4	1.4	...	1.5	1.5	...	...	...	1.2	...	...
Conveyors											
Apron	...	1.4	1.6	...	...	...	...	...	1.4	...	1.6
Belt(Ore, Coal, Sand)	...	1.2	1.4	...	...	...	...	...	1.2	...	1.4
Belt(Light Package)	...	1.0	1.1	...	...	...	...	...	1.0	...	1.2

BẢNG 9 : ỨNG DỤNG CÁC HỆ SỐ HOẠT ĐỘNG CỦA ĐAI V NHIỀU ĐAI

Applications	Electric Motors										
	A.C.								D.C.		
	Squirrel Cage				Synchronous		Single Phase				
	Normal Torque Line Start	Normal Torque Compensator Start	High Torque	Wound Rotor (Slip Ring)	Normal Torque	High Torque	Repulsion and Split-Phase	Capacitor	Shunt Wound	Compound Wound	Line Shaft and Clutch Shifting
	Service Factors										
Oven	...	1.0	1.1	...	...	...	...	...	1.0	...	1.2
Screw	...	1.6	1.8	...	...	...	...	...	1.6	...	1.8
Bucket	...	1.4	1.6	...	...	...	...	...	1.4	...	1.6
Pan	...	1.4	1.6	...	...	...	...	...	1.4	...	1.6
Flight	...	1.6	1.8	...	...	...	...	...	1.6	...	1.8
Elevator	...	1.4	1.6	...	...	...	...	...	1.4	...	1.6
Crushing Machinery											
Jaw Crushers	...	1.4	1.6	1.4	...	...	...	...	...	1.4	1.6
Gyratory Crushers	...	1.4	1.6	1.4	1.4	1.6	...	...	...	1.4	1.6
Cone Crushers	...	1.4	1.6	1.4	...	...	...	...	...	1.6	1.6
Crushing Rolls	...	1.4	1.6	1.4	...	...	...	...	...	1.4	1.6
Ball-Pebble and	...	1.4	1.6	1.4	1.4	1.6	...	...	...	1.4	1.6
Tube Mills	...	1.4	1.6	1.4	1.4	...	...	...	...	1.4	1.6
Fan and Blowers											
Centrifugal	1.2	1.2	...	1.4	...	...	...	...	1.2	...	...
Propeller	1.4	1.4	2.0	1.6	...	2.0	...	...	1.4	...	...
Induced Draft	1.2	1.2	...	1.4	...	...	...	...	1.4	...	...
Positive Blowers	1.6	1.6	...	2.0	2.0	2.0	...	...	...	...	...
Exhausters	1.2	1.2	...	1.4	...	...	...	...	1.4	...	1.5
Line Shafts	1.4	1.4	...	1.4	1.4	2.0	1.4	1.4	1.4	1.4	1.6
Machine Tools											
Grinders	1.2	...	...	1.4	...	...	1.2	1.0	1.2	1.2	...
Boring Mills	1.2	...	...	1.4	...	...	...	...	1.2	1.2	...
Lathes	1.0	...	...	1.2	...	...	1.0	1.0	1.0	1.0	...
Milling Machines	1.2	...	...	1.4	...	...	...	...	1.2	1.2	...
Screw Machines	1.0	...	...	1.0	...	...	1.0	1.0	1.0	1.0	...
Cam Cutters	1.0	...	...	1.0	...	...	...	...	1.0	1.0	...
Planers	1.2	...	...	1.4	...	...	1.2	1.0	1.2	1.2	...
Shapers	1.0	...	...	1.0	...	...	1.0	1.0	1.0	1.0	...
Drill Press	1.0	...	...	1.0	...	...	1.0	1.0	1.0	1.0	...
Drop Hammers	1.0	...	...	1.0	...	...	1.0	1.0	1.0	1.0	...
Shears	1.2	...	...	1.4	...	...	1.2	1.2	1.2	1.0	...
Mills											
Pebble	...	1.4	1.6	1.4	...	...	...	...	...	1.4	1.6
Rod	...	1.4	1.6	1.4	...	...	...	...	...	1.4	1.6
Ball	...	1.4	1.6	1.4	...	...	...	...	...	1.4	1.6
Roller Mills	...	1.4	1.6	1.4	...	...	...	...	...	1.4	1.6
Flaking Mills	...	1.6	1.6	1.4	...	...	...	...	...	1.4	1.6
Tumbling Barrels	...	1.6	1.6	1.4	...	...	...	...	...	1.4	1.6

Table 9 (*Continued*). Service Factors for Multiple V-Belt Applications

Applications	Electric Motors										
	A.C.								D.C.		
	Squirrel Cage				Synchronous		Single Phase				
	Normal Torque Line Start	Normal Torque Compensator Start	High Torque	Wound Rotor (Slip Ring)	Normal Torque	High Torque	Repulsion and Split-Phase	Capacitor	Shunt Wound	Compound Wound	Line Shaft and Clutch Shifting
	Service Factors										
Paper Machinery											
Jordan Engines	1.5	1.3	1.8	1.5	1.6	1.8	...	...	1.5	1.5	...
Beaters	1.4	1.4	...	1.4	...	...	...	...	1.4	1.4	1.8
Calenders	1.2	1.2	...	1.2	...	...	...	...	1.2	1.2	...
Agitators	1.2	1.0	1.4	1.2	...	...	...	...	1.2	1.2	1.6
Dryers	1.2	1.2	...	1.2	...	...	...	...	1.2	1.2	...
Paper Machines	1.4	1.4	...	1.5	...	...	...	...	1.5	1.5	1.6
Pumps											
Centrifugal	1.2	1.2	1.4	1.4	...	...	1.2	1.2	...	...	...
Gear	1.2	1.2	1.4	1.4	...	...	1.2	1.2	...	...	...
Rotary	1.2	1.2	1.4	1.4	...	...	1.2	1.2	1.2	...	...
Reciprocating —											
3 or more Cyl	1.2	1.2	...	1.4	1.4	1.6	...	...	...	...	...
1 or 2 Cyl	1.4	1.4	...	1.6	1.6	1.8	...	...	...	...	...

V-BELTS AND SHEAVES

Factors X, Y, and Z for Use in Formula 4

Factor	Regular Quality Belts					Premium Quality Belts				
	Belt Cross Section									
	A	B	C	D	E	A	B	C	D	E
	Values of X, Y, and Z to be Used in H.P. Formula									
X	1.945	3.434	6.372	13.616	19.914	2.684	4.737	8.792	18.788	24.478
Y	3.801	9.830	26.948	93.899	177.74	5.326	13.962	38.819	137.70	263.04
Z	0.0136	0.0234	0.0416	0.0848	0.1222	0.0136	0.0234	0.0416	0.0848	0.1222

Example: Find the horsepower capacity of a standard quality A60 size V-belt for a drive in which the pitch diameter of the small sheave is 3 inches and that of the large, 9 inches.

The small sheave is to rotate at 1750 R.P.M.

1. Find center distance C (Formula 3, page 956)

$$C = \frac{b + \sqrt{b^2 - 32(D - d)^2}}{16}$$

where $b = 4L - 6.28\,(D + d)$

$L = 61.3$ inches (Table 8)

$b = 4 \times 61.3 - 6.28(9 + 3) = 169.8$

$$C = \frac{169.8 + \sqrt{169.8^2 - 32(9 - 3)^2}}{16} = 21.0 \text{ inches}$$

2. Find arc of contact, A (Formula 5, page 964)

$$A = 180^\circ - \frac{(D - d)60^\circ}{C} = 180^\circ - \frac{(9 - 3)60^\circ}{21.0} = 163^\circ$$

3. Find correction factors
   Length correction factor = 0.98 (Table 12)
   Arc of contact correction factor = 0.96 (Table 13)
   Small diameter factor (Speed ratio = 9 ÷ 3 = 3) = 1.14 (Table 14)
4. Compute belt speed in thousands of feet per minute:

$$S = \frac{3.14 \times \text{P.D.} \times \text{R.P.M.}}{12 \times 1000} = \frac{3.14 \times 3 \times 1750}{12 \times 1000} = 1.38$$

5. Compute equivalent diameter of small sheave

$$d_e = 3 \times 1.14 = 3.42 \text{ inches}$$

6. Compute belt H.P. using Formula 4:

$$\text{H.P.} = 1.945S^{.91} - \frac{3.801S}{d_e} - .0136S^3$$

$$= 1.945 \times 1.38^{.91} - \frac{3.801 \times 1.38}{3.42} - .0136 \times 1.38^3$$

$$= 1.945 \times 1.34 - 1.535 - .034 = 1.04$$

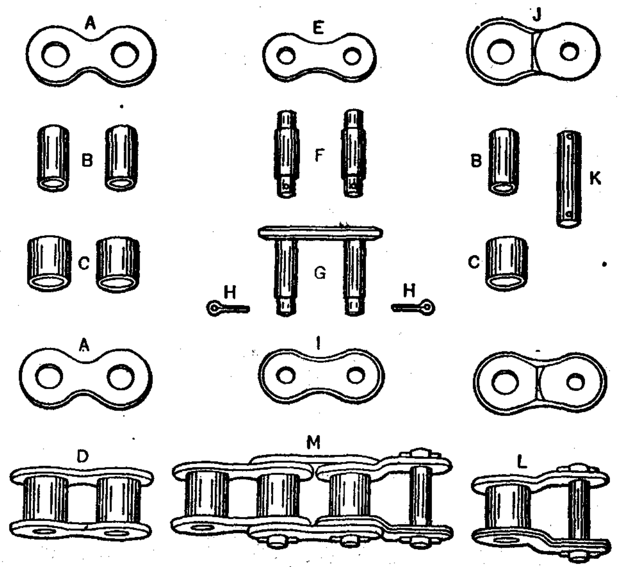
7. Apply length and arc of contact correction factors to get horsepower capacity:

$$1.04 \times 0.98 \times 0.96 = 0.98 \text{ H.P.}$$

8. Divide horsepower capacity into horsepower to be transmitted to obtain number of belts required for drive.

2. TRUYỀN ĐỘNG XÍCH
TRANSMISSION ROLLER CHAIN

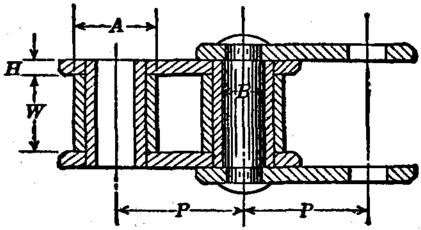
BẢNG 1 : CHỈ DANH THEO TIÊU CHUẨN MỸ CHO CÁC CHI TIẾT XÍCH LĂN



Roller Link D. — An inside link consisting of two inside plates, two bushings, and two rollers.
Pin Link G and E. — An outside link consisting of two pin-link plates assembled with two pins.
Inside Plate A. — One of the plates forming the tension members of a roller link.
Pin Link Plate E. — One of the plates forming the tension members of a pin link.
Pin F. — A stud articulating within a bushing of an inside link and secured at its ends by the pin-link plates.
Bushing B. — A cylindrical bearing in which the pin turns.
Roller C. — A ring or thimble which turns over a bushing.
Assembled Pins G. — Two pins assembled with one pin-link plate.
Connecting-Link G and I. — A pin link having one side plate detachable.
Connecting-Link Plate I. — The detachable pin-link plate belonging to a connecting link.
Offset Link L. — A link consisting of two offset plates assembled with a bushing and roller at one end and an offset link pin at the other.
Offset Plate J. — One of the plates forming the tension members of the offset link.
Offset Link Pin K. — A pin used in offset links.

BẢNG 2 : CÁC KÍCH THƯỚC TIÊU CHUẨN MỸ CỦA XÍCH LĂN

Table 2. AMERICAN STANDARD ROLLER CHAIN DIMENSIONS (ASA B29.1957)



Roller Diameters A are approximately $\frac{5}{8}$ *P*.

The *width W* is defined as the minimum distance between the link plates. In the wide series the width is the nearest common fraction to $\frac{5}{8}$ *P*.

Pin Diameters B are approximately $\frac{5}{16}$ *P* or $\frac{1}{2}$ of the roller diameter.

Thickness H of Inside and Outside Link Plates for the standard series is approximately $\frac{1}{8}$ *P*.

Thickness of Link Plates for the heavy series of any pitch is approximately that of the next larger pitch standard series chain.

Maximum Width of Roller Link Plates = 0.95 Pitch.

Maximum Width of Pin Link Plates = 0.82 Pitch.

Maximum Pin Diameter = nominal pin diameter + 0.0005 inch.

Minimum Hole in Bushing = nominal pin diameter + 0.0015 inch.

Maximum Width of Roller Link = nominal width of chain + (2.12 × nominal link plate thickness.)

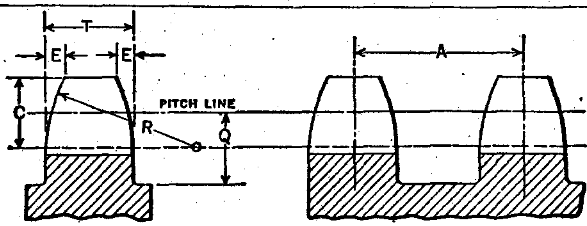
Minimum Distance between Pin Link Plates = maximum width of roller link + 0.002 inch.

Pitch *P*	Max. Roller Diameter *A*	Standard Series					Heavy Series
		Standard Chain No.	Width *W*	Pin Diameter *B*	Thickness of Link Plates *H*	Measuring Load, Lb.	Thickness of Link Plates *H*
$\frac{1}{4}$	*0.130	25	$\frac{1}{8}$	0.0905	0.030	18	.....
$\frac{3}{8}$	*0.200	35	$\frac{3}{16}$	0.141	0.050	18	.....
$\frac{1}{2}$	$\frac{5}{16}$	40	$\frac{5}{16}$	0.156	0.060	31	.....
$\frac{5}{8}$	0.400	50	$\frac{3}{8}$	0.200	0.080	49	.....
$\frac{3}{4}$	$\frac{15}{32}$	60	$\frac{1}{2}$	0.234	0.094	70	0.125
1	$\frac{5}{8}$	80	$\frac{5}{8}$	0.312	0.125	125	0.156
$1\frac{1}{4}$	$\frac{3}{4}$	100	$\frac{3}{4}$	0.375	0.156	195	0.187
$1\frac{1}{2}$	$\frac{7}{8}$	120	1	0.437	0.187	281	0.219
$1\frac{3}{4}$	1	140	1	0.500	0.219	383	0.250
2	$1\frac{1}{8}$	160	$1\frac{1}{4}$	0.562	0.250	500	0.281
$2\frac{1}{4}$	$1\frac{13}{32}$	180	$1\frac{13}{32}$	0.687	0.281	633	0.375
$2\frac{1}{2}$	$1\frac{9}{16}$	200	$1\frac{1}{2}$	0.781	0.312	781	0.375
3	$1\frac{7}{8}$	240	$1\frac{7}{8}$	0.937	0.375	1125	0.500

* This size chain has no rollers.

BẢNG 3 : CÁC TIẾT DIỆN RĂNG TIÊU CHUẨN MỸ CỦA ĐĨA XÍCH LĂN

Table 3. AMERICAN STANDARD ROLLER-CHAIN SPROCKET TOOTH SECTIONS (ASA B29.1-1957)



SINGLE WIDTH MULTIPLE WIDTH

Width of Chain W	Max. Sprocket Thickness (T)			Sprocket Chamfer			
	Single Strand	Double, Triple Strand	4 Strand and Over	Pitch P	Depth of Chamfer C	Width of Chamfer E	Minimum Radius R
1/8	0.110	0.107	0.096	1/4	1/8	1/32	0.265
3/16	0.168	0.162	0.149	3/8	3/16	3/64	0.398
1/4	0.227	.....	.....	1/2	1/4	1/16	0.531
5/16	0.284	0.275	0.256	5/8	5/16	5/64	0.664
3/8	0.343	0.332	0.311	3/4	3/8	3/32	0.796
1/2	0.459	0.444	0.418	1	1/2	1/8	1.062
5/8	0.575	0.557	0.526	1 1/4	5/8	5/32	1.327
3/4	0.692	0.669	0.633	1 1/2	3/4	3/16	1.593
1	0.924	0.894	0.848	1 3/4	7/8	7/32	1.858
1 1/4	1.156	1.119	1.063	2	1	1/4	2.124
1 13/32	1.301	1.259	1.197	2 1/4	1 1/8	9/32	2.392
1 1/2	1.389	1.344	1.278	2 1/2	1 1/4	5/16	2.654
1 7/8	1.738	1.682	1.601	3	1 1/2	3/8	3.187

P = pitch of chain; W = chain width; H = nominal thickness of link plates (Table 4)

$T = 0.93W - 0.006$ inch (maximum for single-width chains)

$T = 0.90W - 0.006$ inch (maximum for double- and triple-width chains)

$T = 0.86W - 0.012$ inch (maximum for quadruple-width chains and over)

$C = 0.5P$ = depth of chamfer; $E = \frac{1}{8}P$ approximately, but not to exceed $\frac{W}{3}$

R (minimum) $= 1.063P$ = chamfer radius; Maximum fillet radius $= 0.04P$.

$A = W + 4.22H$ = transverse pitch for multiple strand chains

Minus tolerance for overall measurement across one or more flange teeth $= 0.01\,W + 0.006$ in. Maximum variation in thickness of any individual flange = ½ tolerance for overall measurement.

H.2 : CÁC ĐƯỜNG KÍNH CỦA ĐĨA XÍCH

Fig 2. SPROCKET, DIAMETERS

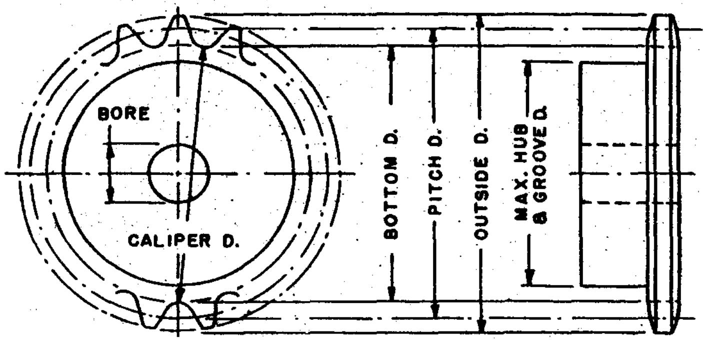


Fig. 2. Sprocket Diameters

BẢNG 4 : CÁC ĐƯỜNG KÍNH ĐĨA XÍCH LĂN THEO TIÊU CHUẨN MỸ

Table 4. AMERICAN STANDARD ROLLER CHAIN SPROCKET DIAMETERS (ASA B29.1.1957)

These diameters apply only to chains of 1-inch pitch. For any other pitch diameter or outside diameter, multiply the diameter given below by the pitch.

Caliper Diam. (even teeth) = Pitch Diameter − Roller Diam.

Caliper Diam. (odd teeth) = Caliper factor × Pitch − Roller Diam.

See Table 5 for tolerances on Caliper Diameters.

No. Teeth	Pitch Diameter	Outside Diameter	Caliper Factor	No. Teeth	Pitch Diameter	Outside Diameter	Caliper Factor
9	2.9238	3.348	2.8794	59	18.7892	19.363	18.7825
10	3.2361	3.678		60	19.1073	19.681	
11	3.5495	4.006	3.5133	61	19.4255	20.000	19.4190
12	3.8637	4.332		62	19.7437	20.318	
13	4.1786	4.657	4.1481	63	20.0618	20.637	20.0556
14	4.4940	4.981		64	20.3800	20.956	
15	4.8097	5.304	4.7834	65	20.6982	21.274	20.6921
16	5.1258	5.627		66	21.0164	21.593	
17	5.4422	5.949	5.4190	67	21.3346	21.911	21.3287
18	5.7588	6.271		68	21.6528	22.230	
19	6.0755	6.593	6.0548	69	21.9710	22.548	21.9653
20	6.3924	6.914		70	22.2892	22.867	
21	6.7095	7.235	6.6907	71	22.6074	23.185	22.6018
22	7.0267	7.555		72	22.9256	23.504	
23	7.3439	7.876	7.3268	73	23.2438	23.822	23.2384
24	7.6613	8.196		74	23.5620	24.141	
25	7.9787	8.516	7.9630	75	23.8802	24.459	23.8750
26	8.2962	8.836		76	24.1984	24.778	
27	8.6138	9.156	8.5992	77	24.5166	25.096	24.5116
28	8.9314	9.475		78	24.8349	25.415	
29	9.2491	9.795	9.2355	79	25.1531	25.733	25.1481
30	9.5668	10.114		80	25.4713	26.052	
31	9.8845	10.434	9.8718	81	25.7896	26.370	25.7847
32	10.2023	10.753		82	26.1078	26.689	
33	10.5201	11.073	10.5082	83	26.4260	27.007	26.4213
34	10.8379	11.392		84	26.7443	27.326	
35	11.1558	11.711	11.1446	85	27.0625	27.644	27.0579
36	11.4737	12.030		86	27.3807	27.962	
37	11.7916	12.349	11.7810	87	27.6990	28.281	27.6945
38	12.1095	12.668		88	28.0172	28.599	
39	12.4275	12.987	12.4174	89	28.3354	28.918	28.3310
40	12.7455	13.306		90	28.6537	29.236	
41	13.0635	13.625	13.0539	91	28.9719	29.555	28.9676
42	13.3815	13.944		92	29.2902	29.873	
43	13.6995	14.263	13.6904	93	29.6084	30.192	29.6042
44	14.0175	14.582		94	29.9267	30.510	
45	14.3355	14.901	14.3269	95	30.2449	30.828	30.2408
46	14.6536	15.219		96	30.5632	31.147	
47	14.9717	15.538	14.9634	97	30.8815	31.465	30.8774
48	15.2898	15.857		98	31.1997	31.784	
49	15.6079	16.176	15.5999	99	31.5180	32.102	31.5140
50	15.9260	16.495		100	31.8362	32.421	
51	16.2441	16.813	16.2364	101	32.1545	32.739	32.1506
52	16.5622	17.132		102	32.4727	33.057	
53	16.8803	17.451	16.8729	103	32.7910	33.376	32.7872
54	17.1984	17.769		104	33.1093	33.694	
55	17.5165	18.088	17.5094	105	33.4275	34.013	33.4238
56	17.8347	18.407		106	33.7458	34.331	
57	18.1528	18.725	18.1459	107	34.0641	34.649	34.0604
58	18.4710	19.044		108	34.3823	34.968	

BẢNG 5 : DUNG SAI ÂM ĐƯỜNG KÍNH ĐÁY CỦA ĐĨA XÍCH ĐƯỢC GIA CÔNG CẮT

TABLE 5. MINUS TOLERANCES ON THE BOTTOM DIAMETERS OF CUT SPROCKETS

Pitch	Number of Teeth				
	Up to 16	16–24	25–35	36–48	49–63
1/4	0.004	0.004	0.004	0.005	0.005
3/8	0.004	0.004	0.004	0.005	0.005
1/2	0.004	0.005	0.0055	0.006	0.0065
5/8	0.005	0.0055	0.006	0.007	0.008
3/4	0.005	0.006	0.007	0.008	0.009
1	0.006	0.007	0.008	0.009	0.010
1 1/4	0.007	0.008	0.009	0.010	0.012
1 1/2	0.007	0.009	0.0105	0.012	0.013
1 3/4	0.008	0.010	0.012	0.013	0.015
2	0.009	0.011	0.013	0.015	0.017
2 1/4	0.010	0.012	0.014	0.016	0.018
2 1/2	0.010	0.013	0.015	0.018	0.020
3	0.012	0.015	0.018	0.021	0.024

Pitch	Number of Teeth				
	64–80	81–99	100–120	121–143	144 up
1/4	0.005	0.005	0.006	0.006	0.006
3/8	0.006	0.006	0.006	0.007	0.007
1/2	0.007	0.0075	0.008	0.0085	0.009
5/8	0.009	0.009	0.009	0.010	0.011
3/4	0.010	0.010	0.011	0.012	0.013
1	0.011	0.012	0.013	0.014	0.015
1 1/4	0.013	0.014	0.016	0.017	0.018
1 1/2	0.015	0.016	0.018	0.019	0.021
1 3/4	0.017	0.019	0.020	0.022	0.024
2	0.019	0.021	0.023	0.025	0.027
2 1/4	0.021	0.023	0.025	0.028	0.030
2 1/2	0.023	0.025	0.028	0.030	0.033
3	0.027	0.030	0.033	0.036	0.039

BẢNG 6 : CÁC ĐƯỜNG KÍNH Ổ TRỤC CỰC ĐẠI NÊN DÙNG CHO ĐĨA XÍCH LĂN

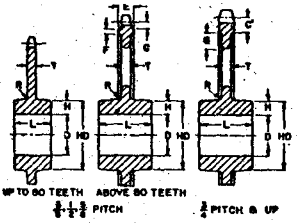
Table 6. RECOMMENDED ROLLER CHAIN SPROCKET MAXIMUM BOTE AND HUB DIAMETERS

No. of Teeth	Silent Chain Pitch 3/8		1/2		5/8		3/4		1	
	Max. Bore	Max. Hub Dia.	Max. Bore	Max. Hub Dia.	Max. Bore	Max. Hub Dia.	Max. Bore	Max. Hub Dia.	Max. Bore	Max. Hub Dia.
11	19/32	55/64	25/32	1 11/64	31/32	1 15/32	1 1/4	1 49/64	1 5/8	2 3/8
12	5/8	63/64	7/8	1 21/64	1 5/32	1 43/64	1 9/32	2 1/64	1 25/32	2 45/64
13	3/4	1 7/64	1	1 1/2	1 9/32	1 7/8	1 1/2	2 1/4	2	3 1/64
14	7/8	1 15/64	1 5/32	1 21/32	1 5/16	2 5/64	1 3/4	2 1/2	2 9/32	3 11/32
15	7/8	1 23/64	1 1/4	1 13/16	1 17/32	2 9/32	1 25/32	2 3/4	2 13/32	3 43/64
16	31/32	1 15/32	1 9/32	1 63/64	1 11/16	2 31/64	1 31/32	2 63/64	2 23/32	3 63/64
17	1 3/32	1 19/32	1 3/8	2 9/64	1 25/32	2 11/16	2 7/32	3 7/32	2 13/16	4 5/16
18	1 7/32	1 23/32	1 17/32	2 19/64	1 7/8	2 57/64	2 9/32	3 15/32	3 1/8	4 41/64
19	1 1/4	1 27/32	1 11/16	2 29/64	2 1/16	3 5/64	2 7/16	3 45/64	3 5/16	4 61/64
20	1 9/32	1 61/64	1 25/32	2 5/8	2 1/4	3 9/32	2 11/16	3 61/64	3 1/2	5 9/32
21	1 5/16	2 5/64	1 25/32	2 25/32	2 9/32	3 31/64	2 13/16	4 3/16	3 3/4	5 19/32
22	1 7/16	2 13/16	1 15/16	2 15/16	2 7/16	3 11/16	2 15/16	4 7/16	3 7/8	5 59/64
23	1 9/16	2 5/16	2 3/32	3 3/32	2 5/8	3 57/64	3 1/8	4 43/64	4 3/16	6 15/64
24	1 11/16	2 7/16	2 1/4	3 17/64	2 13/16	4 5/64	3 1/4	4 29/32	4 9/16	6 9/16
25	1 3/4	2 9/16	2 9/32	3 27/64	2 27/32	4 9/32	3 3/8	5 5/32	4 11/16	6 7/8

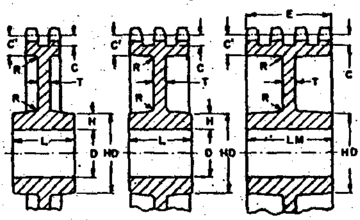
No. of Teeth	Silent Chain Pitch 1 1/4		1 1/2		1 3/4		2		2 1/2	
	Max. Bore	Max. Hub Dia.	Max. Bore	Max. Hub Dia.	Max. Bore	Max. Hub Dia.	Max. Bore	Max. Hub Dia.	Max. Bore	Max. Hub Dia.
11	1 31/32	2 31/32	2 5/16	3 37/64	2 13/16	4 11/64	3 9/32	4 25/32	3 15/16	5 63/64
12	2 9/32	3 3/8	2 3/4	4 1/16	3 1/4	4 3/4	3 5/8	5 27/64	4 23/32	6 51/64
13	2 17/32	3 25/32	3 1/16	4 35/64	3 9/16	5 5/16	4 1/16	6 5/64	5 3/32	7 39/64
14	2 11/16	4 3/16	3 5/16	5 1/32	3 7/8	5 7/8	4 11/16	6 23/32	5 23/32	8 27/64
15	3 3/32	4 19/32	3 3/4	5 33/64	4 7/16	6 29/64	4 7/8	7 3/8	6 1/4	9 7/32
16	3 9/32	5	4	6	4 11/16	7 1/64	5 1/8	8 1/64	7	10 1/32
17	3 21/32	5 13/32	4 15/32	6 31/64	5 1/16	7 37/64	5 11/16	8 21/32	7 7/16	10 27/32
18	3 25/32	5 51/64	4 21/32	6 31/32	5 5/8	8 9/64	6 1/4	9 5/16	8 1/8	11 41/64
19	4 3/16	6 13/64	4 15/16	7 29/64	5 11/16	8 45/64	6 7/8	9 61/64	9	12 7/16
20	4 19/32	6 39/64	5 7/16	7 15/16	6 1/4	9 17/64	7	10 19/32	9 3/4	13 1/4
21	4 11/16	7	5 11/16	8 27/64	6 13/16	9 53/64	7 3/4	11 15/64	10	14 3/64
22	4 7/8	7 13/32	5 7/8	8 57/64	7 1/4	10 25/64	8 3/8	11 7/8	10 7/8	14 27/32
23	5 5/16	7 13/16	6 3/8	9 3/8	7 7/16	10 15/16	9	12 33/64	11 5/8	15 21/32
24	5 11/16	8 13/64	6 13/16	9 55/64	8	11 1/2	9 5/8	13 5/32	13	16 29/64
25	5 23/32	8 39/64	7 1/4	10 11/32	8 9/16	12 1/16	10 1/4	13 51/64	13 1/2	17 1/4

* Association of Roller and Silent Chain Manufacturers.
All dimensions in inches.
For standard key dimensions see pages 868 to 870.

BẢNG 7 : CÁC TỶ SỐ ĐẶC TRƯNG CHO CÁC ĐĨA ĐÚC MỘT HÀNG VÀ NHIỀU HÀNG RĂNG



Single Strand



Multiple Strand

Sprocket Web Thickness, T, for Various Pitches P

Single Strand								Multiple Strand							
P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
$\frac{3}{8}$	.312	$\frac{3}{4}$	.437	$1\frac{1}{2}$	.625	$2\frac{1}{4}$	1.000	$\frac{3}{8}$	.375	$\frac{3}{4}$	.500	$1\frac{1}{2}$	.750	$2\frac{1}{4}$	1.125
$\frac{1}{2}$	.375	1	.500	$1\frac{3}{4}$	.750	$2\frac{1}{2}$	1.125	$\frac{1}{2}$	.406	1	.562	$1\frac{3}{4}$	.875	$2\frac{1}{2}$	1.250
$\frac{5}{8}$	.406	$1\frac{1}{4}$	.562	2	.875	3	1.250	$\frac{5}{8}$	.437	$1\frac{1}{4}$	.625	2	1.000	3	1.500

Formulas for Dimensions of Single and Multiple Sprockets

$H = 0.375 + \dfrac{D}{6} + 0.01PD$

$L = 4H$ for semi-steel castings

$C = 0.5P$

$C' = 0.9P$

All dimensions in inches.

$E = 0.625P + 0.93W$

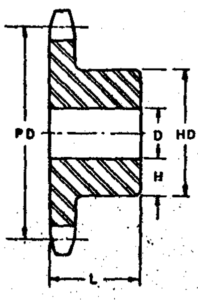
$F = 0.156 + 0.25P$

$G = 2T$

$R = 0.04P$ for single-strand sprockets

$R = 0.5T$ for multiple-strand sprockets

BẢNG 8 : CÁC TỶ SỐ ĐẶC TRƯNG CỦA ĐĨA XÍCH BẰNG THÉP



$H = Z + D/6 + 0.01PD$

For PD up to 2 inches, $Z = 0.125$ inch; for 2–4 inches, $Z = 0.187$ inch; for 4–6 inches, 0.25 inch; and for over 6 inches, 0.375 inch.

Hub length $L = 3.3H$, normally, with a minimum of $2.6H$.

Hub diameter $HD = D + 2H$, but not more than the maximum hub diameter MHD given by the formula:

$$MHD = P\left(\cot\frac{180^\circ}{N} - 1\right) - 0.030$$

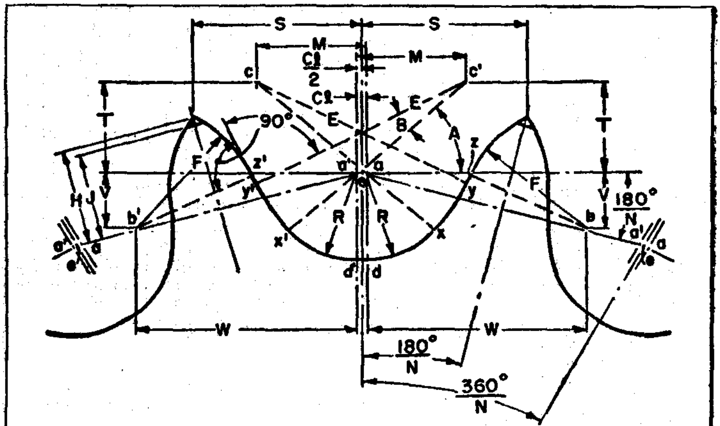
where: P = Chain pitch, in inches
N = Number of sprocket teeth

keyways to eliminate all backlash, especially on the fluctuating loads. A set screw should be located over a flat key to secure it against longitudinal displacement.

Where a set screw is to be used with a parallel key, the following sizes are recommended by the Association of Roller and Silent Chain Manufacturers. For a sprocket bore and shaft diameter in the range of $\frac{1}{2}$ through $\frac{7}{8}$ inch, a $\frac{1}{4}$-inch set screw; for a range of $\frac{15}{16}$ through $1\frac{3}{4}$ inches, a $\frac{3}{8}$-inch set screw; for a range of $1\frac{13}{16}$ through $2\frac{1}{4}$ inches, a $\frac{1}{2}$-inch set screw; for a range of $2\frac{5}{16}$ through $3\frac{1}{4}$ inches, a $\frac{5}{8}$-inch set screw; for a range of $3\frac{3}{8}$ through $4\frac{1}{2}$ inches, a $\frac{3}{4}$-inch set screw; for a range of $4\frac{3}{4}$ through $5\frac{1}{2}$ inches, a $\frac{7}{8}$-inch set screw; for a range of $5\frac{3}{4}$ through $7\frac{1}{4}$ inches, a 1-inch set screw; and for $7\frac{1}{2}$ through $12\frac{1}{4}$ inches, a $1\frac{1}{4}$-inch set screw.

BẢNG 9 : DẠNG RĂNG ĐĨA TIÊU CHUẨN MỸ CHO XÍCH LĂN

Table 9. AMERICAN STANDARD SPROCKET TOOTH FORM FOR ROLLER CHAIN (ASA B29.1-1957)



P = pitch (ee); N = number of teeth; D_r = nominal roller diameter

D_s = seating curve diameter = $1.005\ D_r + 0.003$; $R = \frac{1}{2} D_s$

†Cl = pitch line clearance = $0.07\ (P - D_r) + 0.002$

D_s and Cl have only plus tolerance, which equals $0.003\ D_r + 0.005$

$A = 35° + (60° \div N)$; $B = 18° - (56° \div N)$; $ac = 0.8\ D_r$

$M = 0.8\ D_r \cos\ (35° + (60° \div N))$

$T = 0.8\ D_r \sin\ (35° + (60° \div N))$; $E = 1.3025\ D_r + 0.0015$

Chord $xy = (2.605\ D_r + 0.003) \sin\ (9° - (28° \div N))$

$yz = D_r\ [1.24 \sin\ (17° - (64° \div N)) - 0.8 \sin\ (18° - (56° \div N))]$

Length of a line between a and b = $1.24\ D_r$ (This line is parallel to ee)

Angle that line between a and b would make with horizontal = $180° \div N$

$W = 1.24\ D_r \cos\ (180° \div N)$; $V = 1.24\ D_r \sin\ (180° + N)$

$F = D_r\ [0.8 \cos\ (18° - (56° \div N)) + 1.24 \cos\ (17° - (64° + N)) - 1.3025] - 0.0015$

$H = \sqrt{F^2 - [1.24\ D_r - 0.5P + 0.5\ Cl \cos\ (180° + N)]^2} + 0.5\ Cl \sin\ (180° + N)$

$S = 0.5\ P \cos\ (180° + N) + H \sin\ (180° \div N)$

Approximate O.D. of sprocket when J is $0.3\ P = P\ [0.6 + \cot\ (180° + N)]$

O.D. of sprocket when tooth is pointed = $P \cot\ (180° \div N) + 2\ H$

Pressure angle for new chain = $xab = 35° - (120° + N)$

Minimum pressure angle = $xab - B = 17° - (64° + N)$; Average pressure angle = $26° - (92° \div N)$

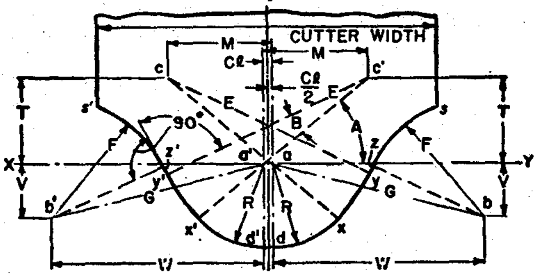
Seating Curve Data — Inches

P	D_r	Min. R	Min. Cl†	D_s, Cl Tol.*	P	D_r	Min. R	Min. Cl†	D_s, Cl Tol.*
1/4	0.130	0.0670	0.010	0.0055	1 1/4	3/4	0.3785	0.037	0.0070
3/8	0.200	0.1020	0.014	0.0055	1 1/2	7/8	0.4410	0.046	0.0075
1/2	0.306	0.1585	0.015	0.0060	1 3/4	1	0.5040	0.055	0.0080
1/2	5/16	0.1585	0.015	0.0060	2	1 1/8	0.5670	0.063	0.0085
5/8	0.400	0.2025	0.018	0.0060	2 1/4	1 13/32	0.7080	0.061	0.0090
3/4	15/32	0.2370	0.022	0.0065	2 1/2	1 9/16	0.7870	0.068	0.0095
1	5/8	0.3155	0.028	0.0070	3	1 7/8	0.9435	0.081	0.0105

*** Tolerance on D_s and Cl is plus only. † Sprockets with pitch line clearance are known as Type I. Type II sprockets have zero pitch line clearance but otherwise are the same as Type I.**

BẢNG 10 : DỤNG CỤ CẮT ĐỊNH HÌNH TIÊU CHUẨN ĐỂ CẮT ĐĨA XÍCH LĂN

Table 10. STANDARD SPACE CUTTERS FOR ROLLER-CHAIN SPROKETS (ASA B29.1-1957)



Construction: Draw XY. With a as a center and a radius equal to R draw circular arc xd; with a' as a center and with same radius draw circular arc $x'd'$. To complete seating curve xx', draw $d'd$ tangent to $d'x'$ and dx. Locate c and c' from dimensions M and T in table below. With c and c' as centers describe arcs xy and $x'y'$. Draw yz perpendicular to cy and $y'z'$ perpendicular to $c'y'$. Locate b and b' from dimensions W and V. Draw bs parallel to cy and $b's'$ parallel to $c'y'$. With radii bz and $b'z'$ equal to F draw topping curves zs and $z's'$. The line yz is a common tangent to the two circular arcs xy and zs, similarly $y'z'$ is tangent to $x'y'$ and $z's'$.

Angle Yab is equal to $180° + N$ when the cutter is made for a specific number of teeth, but has the values shown in the table below for cutters covering a given range of teeth. The following formulas are for cutters covering the standard ranges of teeth where N_a equals intermediate values given on page 979.

$W = 1.24\, D_r \cos Yab$; $V = 1.24\, D_r \sin Yab$

$$yz = D_r\left[1.24 \sin\left(17° + \frac{116°}{N_a} - Yab\right) - 0.8 \sin\left(18° - \frac{56°}{N_a}\right)\right]$$

$$F = D_r\left[0.8 \cos\left(18° - \frac{56°}{N_a}\right) + 1.24 \cos\left(17° + \frac{116°}{N_a} - Yab\right) - 1.3025\right] - 0.0015 \text{ in.}$$

For other points, use the value of N_a for N in the standard formulas in Table 8.

Data for Laying Out Space Cutter

Range of Teeth	M	T	W	V
7–8	$0.5848\, D_r$	$0.5459\, D_r$	$1.1328\, D_r$	$0.5044\, D_r$
9–11	$0.6032\, D_r$	$0.5255\, D_r$	$1.1782\, D_r$	$0.3866\, D_r$
12–17	$0.6194\, D_r$	$0.5063\, D_r$	$1.2129\, D_r$	$0.2578\, D_r$
18–34	$0.6343\, D_r$	$0.4875\, D_r$	$1.2353\, D_r$	$0.1081\, D_r$
35 up	$0.6466\, D_r$	$0.4710\, D_r$	$1.2400\, D_r$	0

Range of Teeth	F	Chord xy	yz	Angle Yab
7–8	$0.7104\, D_r - 0.0015$	$0.2384\, D_r + 0.0003$	$0.0382\, D_r$	24°
9–11	$0.6981\, D_r - 0.0015$	$0.2800\, D_r + 0.0003$	$0.0561\, D_r$	18°10′
12–17	$0.6807\, D_r - 0.0015$	$0.3181\, D_r + 0.0004$	$0.0905\, D_r$	12°
18–34	$0.6542\, D_r - 0.0015$	$0.3540\, D_r + 0.0004$	$0.1455\, D_r$	5°
35 up	$0.6345\, D_r - 0.0015$	$0.3850\, D_r + 0.0004$	$0.1713\, D_r$	0°

E (same for all ranges) $= 1.3025\, D_r + 0.0015$; G (same for all ranges) $= 1.24\, D_r$

BẢNG 11 : CÁC KÍCH CỠ DỤNG CỤ CẮT NÊN DÙNG ĐỂ GIA CÔNG ĐĨA XÍCH LĂN

Table 11. RECOMMENDED SPACE CUTTER SIZES FOR ROLLER-CHAIN SPROCKETS

Pitch	Roller Diam.	Number of Teeth					
		6	7–8	9–11	12–17	18–34	35 up
		Cutter Diameter (Minimum)					
1/4	0.130	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
3/8	0.200	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
1/2 to 5/8	0.313	3	3	3 1/8	3 1/8	3 1/8	3 1/8
5/8	0.400	3 1/8	3 1/8	3 1/4	3 1/4	3 1/4	3 1/4
3/4	0.469	3 1/4	3 1/4	3 3/8	3 3/8	3 3/8	3 3/8
1 to 1 1/4	0.625	3 7/8	4	4 1/8	4 1/8	4 1/4	4 1/4
1 1/4 to 1 1/2	0.750	4 1/4	4 3/8	4 1/2	4 1/2	4 5/8	4 5/8
1 1/2	0.875	4 3/8	4 1/2	4 5/8	4 5/8	4 3/4	4 3/4
1 3/4	1.000	5	5 1/8	5 1/4	5 3/8	5 1/2	5 1/2
2	1.125	5 3/8	5 1/2	5 5/8	5 3/4	5 7/8	5 7/8
2 1/4	1.406	5 7/8	6	6 1/4	6 3/8	6 1/2	6 1/2
2 1/2	1.563	6 3/8	6 5/8	6 3/4	6 7/8	7	7 1/8
3	1.875	7 1/2	7 3/4	7 7/8	8	8	8 1/4

Pitch	Roller Diam.	Cutter Width (Minimum)					
1/4	0.130	5/16	5/16	5/16	5/16	9/32	9/32
3/8	0.200	15/32	15/32	15/32	7/16	7/16	13/32
1/2 to 5/8	0.313	3/4	3/4	3/4	3/4	23/32	11/16
5/8	0.400	3/4	3/4	3/4	3/4	23/32	11/16
3/4	0.469	29/32	29/32	29/32	7/8	27/32	13/16
1 to 1 1/4	0.625	1 1/2	1 1/2	1 15/32	1 15/32	1 13/32	1 11/32
1 1/4 to 1 1/2	0.750	1 13/16	1 13/16	1 25/32	1 3/4	1 11/16	1 5/8
1 1/2	0.875	1 13/16	1 13/16	1 25/32	1 3/4	1 11/16	1 5/8
1 3/4	1.000	2 3/32	2 3/32	2 1/16	2 1/32	1 31/32	1 7/8
2	1.125	2 13/32	2 13/32	2 3/8	2 5/16	2 1/4	2 5/32
2 1/4	1.406	2 11/16	2 11/16	2 21/32	2 19/32	2 15/32	2 13/32
2 1/2	1.563	3	3	2 15/16	2 29/32	2 3/4	2 11/16
3	1.875	3 19/32	3 19/32	3 17/32	3 15/32	3 11/32	3 7/32

Where the same roller diameter is commonly used with chains of two different pitches it is recommended that stock cutters be made wide enough to cut sprockets for both chains.

Marking of Cutters. — All cutters are to be marked, giving pitch, roller diameter and range of teeth to be cut.

Bores for Sprocket Cutters (recommended practice) are approximately as calculated from the formula:

$$\text{Bore} = 0.7\sqrt{(\text{Width of Cutter} + \text{Roller Diameter} + 0.7\ \text{Pitch})}$$

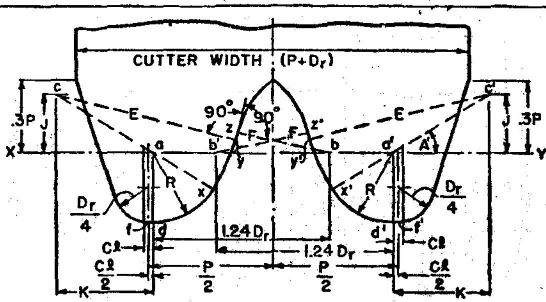
and are equal to 1 inch for 1/4- through 3/4-inch pitches; 1 1/4 inches for 1- through 1 1/2-inch pitches; 1 1/2 inches for 1 3/4- through 2 1/4-inch pitches; 1 3/4 inches for 2 1/2-inch pitch; and 2 inches for 3-inch pitch.

Minimum Outside Diameters of Space Cutters for 35 teeth and over (recommended practice) are approximately as calculated from the formula:

$$\text{Outside Diameter} = 1.2\ (\text{Bore} + \text{Roller Diameter} + 0.7\ \text{Pitch}) + 1\ \text{in.}$$

BẢNG 12 : DAO CẮT LÚP TIÊU CHUẨN MỸ ĐỂ GIA CÔNG ĐĨA XÍCH LĂN

Table 12. AMERICAN STANDARD STRADDLE CUTTERS FOR ROLLER-CHAIN SPROCKETS



Construction. — P = Pitch, D_r = roller diameter, and N = number of teeth on which cutter is based. Draw XY and the two seating-curve circles xd and $x'd'$ as explained in Table 9. Locate c and c' from the dimensions K and J as given in this table. Locate b and b'. Draw cax and $c'a'x'$, and with centers c and c' draw the working curves xy and $x'y'$. Draw yz and $y'z'$ perpendicular to cy and $c'y'$ respectively. Draw bz and $b'z'$ parallel to cy and $c'y'$ respectively. With b and b' as centers and radius bz equal to F (see table), strike the arcs of the topping curves. Cutter width is $P + D_r$. Cutter diameters are as given in Table 11 for 35 and over teeth.

N = number of teeth on which cutter is based; $A' = 35° - \frac{120°}{N}$

$K = 0.8\, D_r \cos A'$; $J = 0.8\, D_r \sin A'$; $E = cx = 1.3025\, D_r + 0.0015$

$$F = D_r\left[0.8\cos\left(18° - \frac{56°}{N}\right) + 1.24\cos\left(17° - \frac{64°}{N}\right) - 1.3025\right] - 0.0015$$

Maximum pressure angle (new chain) $xab = 35° - \frac{120°}{N} = 24.1°$ for "B" cutter and 32° for "A" cutter.

Minimum pressure angle $= xab - acy = 17° - \frac{64°}{N} = 11.2°$ for "B" cutter and 15.4° for "A" cutter.

Average pressure angle $= 26° - \frac{92°}{N} = 17.6°$ for "B" and 23.7° for "A" cutter.

There will be on the sprocket bottom diameter slight indentations for smaller, and slight projections for larger sprockets than the specific sprockets (11 and 40 teeth) for which cutters are designed.

Data for Laying Out Straddle Cutter

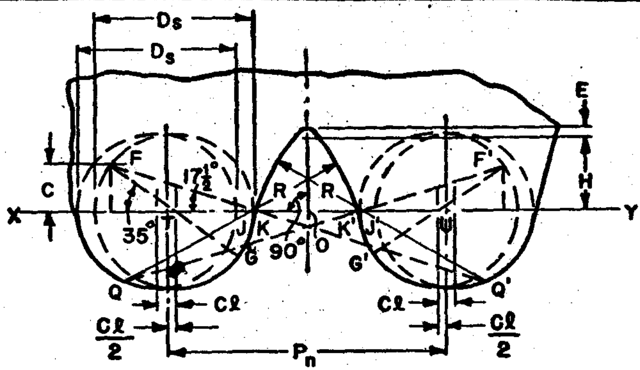
Cutter*	No. of Teeth to be Cut	K	J	F
B	17 and under	$0.730\, D_r$	$0.327\, D_r$	$0.6937\, D_r - 0.0015$
A	18 and over	$0.678\, D_r$	$0.424\, D_r$	$0.6596\, D_r - 0.0015$

Cutter*	No. of Teeth to be Cut	Chord xy	yz	E
B	17 and under	$0.2928\, D_r + 0.0003$	$0.0617\, D_r$	$1.3025\, D_r + 0.0015$
A	18 and over	$0.3762\, D_r + 0.0004$	$0.1007\, D_r$	$1.3025\, D_r + 0.0015$

* Only two cutters of this type are required to cover the entire range of teeth.
† Not recommended for Type II (see footnote to Table 9) sprockets.

BẢNG 13 : THIẾT KẾ DAO PHAY PHÁC HÌNH ĐỂ GIA CÔNG ĐĨA XÍCH LĂN

Table 13. STANDARD HOB DESIGN FOR ROLLER-CHAIN SPROCKETS (ASA B29.1-1957)



SECTION NORMAL TO HOB TEETH

Hobs designed for a given roller diameter (D_r) and chain pitch (P) will cut any number of teeth.

P = Pitch of Chain; P_n = Normal Pitch of Hob = 1.011 P inches

D_s = Minimum Diameter of Seating Curve = 1.005 D_r + 0.003

Cl = 0.07 ($P - D_r$) + 0.002; C = 0.287 D_s

F = Radius Center for Arc GK; $TO = OU = P_n \div 2$

H = 0.27 P; E = 0.03 P = Radius of Fillet Circle

Q' is located on line passing through F and J. Point J is intersection of line XY with circle of diameter D_s. R is found by trial and the arc of this radius is tangent to arc KG at K and to fillet radius.

OD = Outside Diameter = 1.7 (Bore + D_r + 0.7 P) approx.

D_h = Pitch Diameter = $OD - D_s$; M = Helix Angle; $\sin M = P_n \div \pi D_h$

L = Lead = $P_n \div \cos M$; W = Width = Not less than 2 × Bore, or 6 D_r, or 3.2 P

Data for Laying Out Hob Outlines — Inches

P	P_n	H	E	O.D.	W	Bore	Keyway	No. Gashes
1/4	0.2527	0.0675	0.0075	2.640	2 1/2	1.250	1/4 × 1/8	13
3/8	0.379	0.101	0.012	3.125	2 1/2	1.250	1/4 × 1/8	13
1/2	0.506	0.135	0.015	3.375	2 1/2	1.250	1/4 × 1/8	12
5/8	0.632	0.170	0.018	3.625	2 1/2	1.250	1/4 × 1/8	12
3/4	0.759	0.202	0.023	3.750	2 7/8	1.250	1/4 × 1/8	11
1	1.011	0.270	0.030	4.375	3 3/4	1.250	1/4 × 1/8	11
1 1/4	1.264	0.337	0.038	4.750	4 1/2	1.250	1/4 × 1/8	10
1 1/2	1.517	0.405	0.045	5.375	5 1/4	1.250	1/4 × 1/8	10
1 3/4	1.770	0.472	0.053	6.375	6	1.500	3/8 × 3/16	9
2	2.022	0.540	0.060	6.875	6 3/4	1.500	3/8 × 3/16	9
2 1/4	2.275	0.607	0.068	8.000	8 1/2	1.750	3/8 × 3/16	8
2 1/2	2.528	0.675	0.075	8.625	9 5/8	1.750	3/8 × 3/16	8
3	3.033	0.810	0.090	9.750	11 1/4	2.000	1/2 × 3/16	8

BẢNG 14 : SỐ VÒNG QUAY/PHÚT TỐI ĐA NÊN DÙNG CHO CÁC ĐĨA XÍCH LĂN

Table 14. RECOMMENDED MAXIMUM R.P.M. OF SPROCKETS

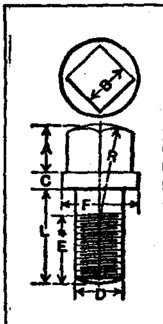
No. of Teeth	Chain No.						
	25	35	41	40	50	60	80
	Pitch						
	1/4	3/8	1/2	1/2	5/8	3/4	1
	Sprocket R.P.M.						
11	4310	2260	1020	1690	1220	920	580
12	4960	2590	1170	1940	1400	1050	670
13	5540	2900	1310	2180	1570	1180	750
14	6070	3170	1430	2380	1720	1290	820
15	6530	3420	1540	2560	1850	1390	880
16	6940	3630	1630	2720	1960	1480	935
17	7290	3810	1720	2860	2060	1550	985
18	7590	3970	1790	2980	2150	1610	1020
19	7840	4100	1850	3080	2220	1670	1060
20	8050	4210	1890	3160	2280	1720	1090
21	8230	4300	1940	3230	2330	1750	1110
22	8370	4380	1970	3290	2370	1780	1130
23	8480	4430	2000	3330	2400	1800	1150
24	8560	4480	2020	3360	2420	1820	1160
25	8610	4510	2030	3380	2440	1830	1160
30	8580	4490	2020	3370	2430	1830	1160
35	8200	4290	1930	3220	2320	1740	1110
40	7580	3970	1780	2970	2140	1610	1020
45	6820	3570	1600	2670	1930	1450	920
50	5950	3110	1400	2330	1680	1270	805
55	5010	2620	1180	1970	1420	1070	675
60	4020	2100	950	1580	1140	860	545
No. of Teeth	Chain No.						
	100	120	140	160	180	200	240
	Pitch						
	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	3
	Sprocket R.P.M.						
11	415	325	235	200	165	145	110
12	475	375	270	230	190	165	125
13	535	415	305	260	215	185	140
14	585	455	335	280	235	205	155
15	630	490	360	305	255	220	165
16	670	520	380	325	270	235	175
17	700	550	400	340	285	245	185
18	730	570	415	355	295	255	195
19	755	590	430	365	305	265	200
20	775	605	440	375	315	270	205
21	790	620	450	385	320	280	210
22	805	630	460	390	325	280	215
23	815	640	465	395	330	285	215
24	825	645	470	400	330	290	220
25	830	650	475	400	335	290	220
30	825	645	470	400	335	290	220
35	790	615	450	380	320	275	210
40	73[illegible]	570	415	355	295	255	195
45	655	515	375	320	265	230	175
50	575	450	325	275	230	200	150
55	480	375	275	235	195	170	125
60	390	305	220	185	155	135	100

MACHINE DETAILS

CHI TIẾT MÁY

CHI TIẾT MÁY
MACHINE DETAILS

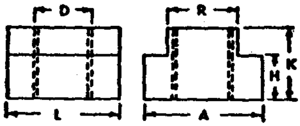
VIT CÓ CỔ
COLLAR SCREWS



Outside Diameter of Screw, *D*	Number of Threads per Inch	Length of Head, *A*	Size of Square, *B*	Thickness of Collar, *C*	Diameter of Collar, *F*	Radius of Head, *R*
1/8	40	1/8	1/8	1/16	1/4	1/4
3/16	24	3/16	3/16	5/64	11/32	3/8
1/4	20	1/4	1/4	5/64	7/16	1/2
5/16	18	5/16	5/16	7/64	1/2	5/8
3/8	16	3/8	3/8	1/8	5/8	3/4
7/16	14	7/16	7/16	1/8	11/16	7/8
1/2	12 or 13	1/2	1/2	3/16	13/16	1
9/16	12	9/16	9/16	7/32	15/16	1 1/8
5/8	11	5/8	5/8	15/64	1	1 1/4
3/4	10	3/4	3/4	9/32	1 1/4	1 1/2

* On all screws four inches long and under, threads are cut 3/4 of the length *L*; longer than four inches, threads are cut half of the length *L*.

1. ĐAI ỐC - T TIÊU CHUẨN MỸ



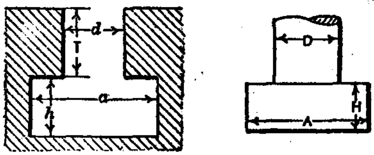
Note: No definite provision has been made for the chamfering of corners. Chamfering or rounding is left to manufacturer's discretion.

Thread Diameter D*	Width of T-slot Throat	Width of Tongue R		Width of Nut A		Height of Nut H		Total Thickness K	Length of Nut L
		Maximum (Basic)	Minimum	Maximum (Basic)	Minimum	Maximum (Basic)	Minimum		
1/4	11/32	0.330	0.320	9/16	17/32	3/16	11/64	9/32	9/16
5/16	7/16	0.418	0.408	11/16	21/32	1/4	15/64	3/8	11/16
3/8	9/16	0.543	0.533	7/8	27/32	5/16	19/64	17/32	7/8
1/2	11/16	0.668	0.658	1 1/8	1 3/32	13/32	25/64	5/8	1 1/8
5/8	13/16	0.783	0.773	1 5/16	1 9/32	17/32	1/2	25/32	1 5/16
3/4	1 1/16	1.033	1.018	1 11/16	1 21/32	11/16	21/32	1	1 11/16
1	1 5/16	1.273	1.258	2 1/16	2 1/32	15/16	29/32	1 5/16	2 1/16
1 1/4	1 9/16	1.523	1.508	2 1/2	2 15/32	1 3/16	1 5/32	1 5/8	2 1/2

* Thread diameter in T-nut is made smaller than corresponding T-bolt, to insure full strength of T-nut. A T-nut of given thread diameter requires the next size wider T-slot throat than does a T-bolt of the same thread diameter.

2. RÃNH T VÀ BU LÔNG T TIÊU CHUẨN MỸ

T-BOLTS AND SLOTS
AMERICAN STANDARD T-SLOTS AND T-BOLTS (ASA B5.1-1949)



Provision is made in this Standard for optional rounding or breaking of corners in slot and on bolt.

Diameter of T-bolt*	Width of Throat d*†	Depth of Throat T		Head Space Dimensions and Tolerances					
				Width a			Depth h		
		Maximum	Minimum	Maximum (Basic)	Tolerance (Minus)	Minimum	Maximum (Basic)	Tolerance (Minus)	Minimum
1/4	9/32	3/8	1/8	9/16	0.063	1/2	15/64	0.031	13/64
5/16	11/32	7/16	5/32	21/32	0.063	19/32	17/64	0.031	15/64
3/8	7/16	9/16	7/32	25/32	0.063	23/32	21/64	0.031	19/64
1/2	9/16	11/16	5/16	31/32	0.063	29/32	25/64	0.031	23/64
5/8	11/16	7/8	7/16	1 1/4	0.063	1 3/16	31/64	0.031	29/64
3/4	13/16	1 1/16	9/16	1 15/32	0.094	1 3/8	5/8	0.031	19/32
1	1 1/16	1 1/4	3/4	1 27/32	0.094	1 3/4	53/64	0.047	25/32
1 1/4	1 5/16	1 9/16	1	2 7/32	0.094	2 1/8	1 3/32	0.063	1 1/32
1 1/2	1 9/16	1 15/16	1 1/4	2 21/32	0.094	2 9/16	1 11/32	0.063	1 9/32

All dimensions in inches.

* In addition to the width of throat given, a secondary standard is recognized, having the width of throat the same as the nominal diameter of the T-bolt. This is to provide for the use, during the transition period, of this standard on machine tools where it is already established.

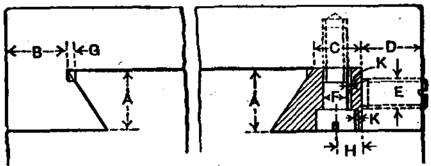
† A tolerance of plus 0.001 is allowed for width of throat when tongues or other parts must fit.

Diameter of T-bolt D	Threads per Inch	Bolt Head Dimensions and Tolerances						
		Width across Flats A			Width across Corners	Height H		
		Maximum (Basic)	Tolerance (Minus)	Minimum		Maximum (Basic)	Tolerance (Minus)	Minimum
1/4	20	15/32	0.031	7/16	0.663	5/32	0.016	9/64
5/16	18	9/16	0.031	17/32	0.796	3/16	0.016	11/64
3/8	16	11/16	0.031	21/32	0.972	1/4	0.016	15/64
1/2	13	7/8	0.031	27/32	1.238	5/16	0.016	19/64
5/8	11	1 1/8	0.031	1 3/32	1.591	13/32	0.016	25/64
3/4	10	1 5/16	0.031	1 9/32	1.856	17/32	0.031	1/2
1	8	1 11/16	0.031	1 21/32	2.387	11/16	0.031	21/32
1 1/4	7	2 1/16	0.031	2 1/32	2.917	15/16	0.031	29/32
1 1/2	6	2 1/2	0.031	2 15/32	3.536	1 3/16	0.031	1 5/32

BĂNG TRƯỢT, SỐNG TRƯỢT
MACHINE SLIDES

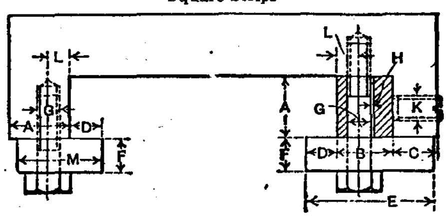
CÁC KÍCH THƯỚC CỦA BĂNG TRƯỢT
DIMENSIONS OF MACHINE SLIDES

Bedded Strips



A	B	C	D	E	F	G	H	K
1/4	5/16	3/8	1/4	1/8	3/16	1/64	1/4	1/32
3/8	7/16	1/2	5/16	3/16	1/4	3/128	5/16	1/32
1/2	5/8	5/8	3/8	1/4	5/16	1/32	3/8	1/32
5/8	3/4	3/4	1/2	5/16	3/8	1/32	1/2	1/32
3/4	7/8	7/8	5/8	5/16	3/8	3/64	5/8	1/32
7/8	1	1	3/4	3/8	1/2	3/64	1 1/16	1/16
1	1 1/4	1 1/8	7/8	3/8	1/2	1/16	13/16	1/16
1 1/4	1 3/8	1 1/4	1	1/2	5/8	5/64	7/8	1/16
1 1/2	1 5/8	1 3/8	1 1/4	5/8	5/8	3/32	1	1/16
1 3/4	1 7/8	1 1/2	1 3/8	5/8	3/4	7/64	1	1/16
2	2 1/4	1 3/4	1 1/2	3/4	7/8	1/8	1 1/4	1/16
2 1/4	2 1/2	2	1 3/4	3/4	1	1/8	1 3/8	1/8
2 1/2	2 3/4	2 1/4	2	7/8	1	5/32	1 1/2	1/8
2 3/4	3	2 1/2	2 1/4	7/8	1 1/8	5/32	1 3/4	1/8
3	3 1/4	2 3/4	2 1/2	1	1 1/8	3/16	2	1/8

Square Strips

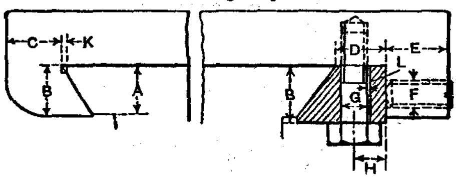


A	B	C	D	E	F	G	H	K	L	M
1/2	5/8	3/8	3/8	1 5/16	5/16	1/4	1/32	1/4	3/16	1 3/16
5/8	3/4	1/2	1/2	1 11/16	3/8	5/16	1/32	5/16	7/32	1 1/16
3/4	7/8	5/8	5/8	2 1/16	1/2	3/8	1/32	5/16	5/16	1 5/16
7/8	1	3/4	3/4	2 7/16	5/8	1/2	1/16	3/8	3/8	1 9/16
1	1 1/8	7/8	7/8	2 3/4	3/4	1/2	1/16	3/8	7/16	1 3/4
1 1/4	1 1/4	1	1	3 1/8	7/8	5/8	1/16	1/2	7/16	2 1/8
1 1/2	1 3/8	1 1/8	1 1/8	3 1/2	1	5/8	1/16	1/2	1/2	2 1/2
1 3/4	1 1/2	1 1/4	1 1/4	3 7/8	1 1/8	3/4	1/16	5/8	9/16	2 7/8
2	1 3/4	1 1/2	1 1/2	4 3/8	1 1/4	7/8	1/16	3/4	5/8	3 3/8
2 1/4	2	1 5/8	1 5/8	5	1 3/8	7/8	1/8	3/4	11/16	3 5/8
2 1/2	2 1/4	1 3/4	1 3/4	5 1/2	1 1/2	1	1/8	7/8	3/4	4
2 3/4	2 1/2	1 7/8	1 7/8	6	1 5/8	1	1/8	7/8	13/16	4 3/8
3	2 3/4	2	2	6 1/2	1 3/4	1 1/8	1/8	1	7/8	4 3/4
3 1/2	3 1/8	2 1/4	2 1/4	7 1/4	1 7/8	1 1/4	1/8	1 1/8	1	5 3/8
4	3 1/2	2 1/2	2 1/2	8	2	1 1/2	1/8	1 1/4	1 1/8	6

CÁC KÍCH THƯỚC CỦA BĂNG TRƯỢT

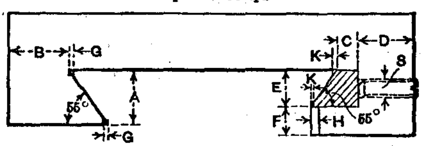
DIMENSIONS OF MACHINE SLIDES

Overhung Strips



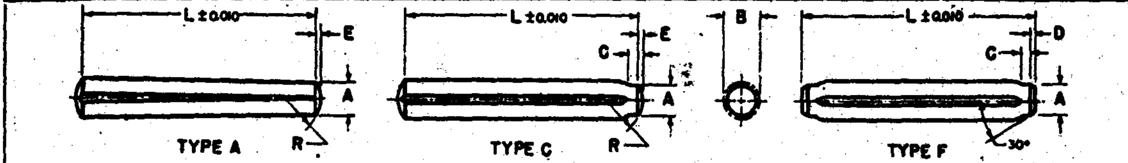
A	B	C	D	E	F	G	H	K	L
1/4	9/32	5/16	3/8	1/4	1/8	3/16	1/4	1/64	1/32
3/8	13/32	7/16	1/2	5/16	3/16	1/4	5/16	3/128	1/32
1/2	9/16	5/8	5/8	3/8	1/4	5/16	3/8	1/32	1/32
5/8	11/16	3/4	3/4	1/2	5/16	3/8	1/2	1/32	1/32
3/4	13/16	3/4	15/16	5/8	5/16	1/2	5/8	3/64	1/32
7/8	15/16	1	1	3/4	3/8	1/2	11/16	3/64	1/16
1	1 1/8	1 1/4	1	7/8	3/8	1/2	11/16	1/16	1/16
1 1/4	1 3/8	1 1/2	1 1/8	1	1/2	5/8	3/4	5/64	1/16
1 1/2	1 5/8	1 3/4	1 1/4	1 1/8	1/2	5/8	7/8	3/32	1/16
1 3/4	1 7/8	2	1 1/2	1 1/4	5/8	3/4	1	3/32	1/16
2	2 3/16	2 1/4	1 3/4	1 1/2	3/4	7/8	1 1/4	1/8	1/16
2 1/4	2 1/2	2 1/2	2	1 5/8	3/4	7/8	1 1/2	1/8	1/8
2 1/2	2 3/4	2 3/4	2 1/4	1 3/4	7/8	1	1 7/8	5/32	1/8
2 3/4	3	3	2 1/2	1 7/8	7/8	1	1 7/8	5/32	1/8
3	3 1/4	3 1/4	2 3/4	2	1	1 1/8	2	3/16	1/8

Special Strips

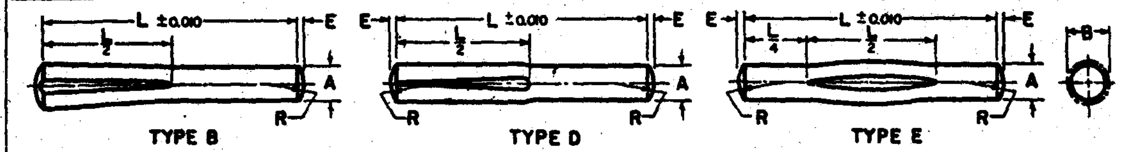


A	B	C	D	E	F	G	H	K	S
1	1 1/16	1/2	5/8	3/4	1/2	1/16	3/16	3/64	3/8
1 1/8	1 3/16	9/16	11/16	7/8	9/16	1/16	3/16	3/64	3/8
1 1/4	1 5/16	5/8	13/16	15/16	5/8	1/16	3/16	3/64	3/8
1 3/8	1 7/16	11/16	7/8	1 1/16	11/16	3/32	1/4	3/64	1/2
1 1/2	1 9/16	3/4	15/16	1 1/8	3/4	3/32	1/4	3/64	1/2
1 5/8	1 11/16	13/16	1	1 1/4	13/16	3/32	1/4	3/64	1/2
1 3/4	1 13/16	7/8	1 1/8	1 5/16	7/8	1/8	3/8	3/32	5/8
1 7/8	1 15/16	15/16	1 3/16	1 7/16	15/16	1/8	3/8	3/32	5/8
2	2 1/8	1	1 1/4	1 1/2	1	1/8	3/8	3/32	3/4
2 1/4	2 3/8	1 1/8	1 3/8	1 11/16	1 1/8	1/8	1/2	3/32	3/4
2 1/2	2 5/8	1 1/4	1 9/16	1 7/8	1 1/4	3/16	1/2	1/8	7/8
2 3/4	2 7/8	1 3/8	1 3/4	2 1/16	1 3/8	3/16	9/16	1/8	7/8
3	3 3/16	1 1/2	1 7/8	2 1/4	1 1/2	3/16	9/16	1/8	1
3 1/4	3 7/16	1 5/8	2	2 7/16	1 5/8	3/16	5/8	1/8	1 1/8
3 1/2	3 11/16	1 3/4	2 3/16	2 5/8	1 3/4	1/4	5/8	3/16	1 1/4
3 3/4	3 15/16	1 7/8	2 3/8	2 13/16	1 7/8	1/4	3/4	3/16	1 1/4
4	4 1/4	2	2 1/2	3	2	1/4	3/4	3/16	1 1/2

American Standard Grooved Pins (ASA B5.20-1958)



Nominal Size, In.	3/64	1/16	5/64	3/32	7/64	1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2
Diameter, *A*, Max. In.	0.0469	0.0625	0.0781	0.0938	0.1094	0.1250	0.1563	0.1875	0.2188	0.2500	0.3125	0.3750	0.4375	0.5000
Diameter, *A*, Min. In.	0.0459	0.0615	0.0771	0.0928	0.1084	0.1230	0.1543	0.1855	0.2168	0.2480	0.3105	0.3730	0.4355	0.4980
Recommended Hole, Max. In.	0.0478	0.0640	0.0798	0.0956	0.1113	0.1271	0.1587	0.1903	0.2219	0.2534	0.3166	0.3797	0.4428	0.5060
Recommended Hole, Min. In.	0.0465	0.0625	0.0781	0.0938	0.1094	0.1250	0.1563	0.1875	0.2188	0.2500	0.3125	0.3750	0.4375	0.5000
Crown Height, *E*, In.	0.0000	0.0065	0.0087	0.0091	0.0110	0.0130	0.0170	0.0180	0.0220	0.0260	0.0340	0.0390	0.0470	0.0520
Radius, *R*, In., ±0.010	......	5/64	3/32	1/8	9/64	5/32	3/16	1/4	9/32	5/16	3/8	15/32	17/32	5/8
Pilot Length, *C*, In.	......	1/32	1/32	1/32	1/32	1/32	1/16	1/16	1/16	1/16	3/32	3/32	3/32	3/32
Chamfer Length, *D*, In.†	......	1/64	1/64	1/64	1/64	1/64	1/32	1/32	1/32	1/32	3/64	3/64	3/64	3/64



Nominal Size, In.	3/64	1/16	5/64	3/32	7/64	1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2
Diameter, *A*, Max. In.	0.0469	0.0625	0.0781	0.0938	0.1094	0.1250	0.1563	0.1875	0.2188	0.2500	0.3125	0.3750	0.4375	0.5000
Diameter, *A*, Min. In.	0.0459	0.0615	0.0771	0.0928	0.1084	0.1230	0.1543	0.1855	0.2178	0.2480	0.3105	0.3730	0.4355	0.4980
Recommended Hole, Max. In.	0.0478	0.0640	0.0798	0.0956	0.1113	0.1271	0.1587	0.1903	0.2219	0.2534	0.3166	0.3797	0.4428	0.5040
Recommended Hole, Min. In.	0.0465	0.0625	0.0781	0.0938	0.1094	0.1250	0.1563	0.1875	0.2188	0.2500	0.3125	0.3750	0.4375	0.5000
Crown Height, *E*, In.	0.0000	0.0065	0.0087	0.0091	0.0110	0.0130	0.0170	0.0180	0.0220	0.0260	0.0340	0.0390	0.0470	0.0520
Radius, *R*, In., ±0.010	......	5/64	3/32	1/8	9/64	5/32	3/16	1/4	9/32	5/16	3/8	15/32	17/32	5/8

All dimensions in inches. * Type F is for hopper feeding. † For 1/4-inch size and below, a suitable radius may be substituted by agreement between user and supplier.

CÁC CHỐT CÓ RÃNH

GROOVED PINS

CHIỀU DÀI CHỐT RÃNH TIÊU CHUẨN MỸ

AMERICAN STANDARD GROOVED PIN LENGTHS

(ASA B5.20-1958)

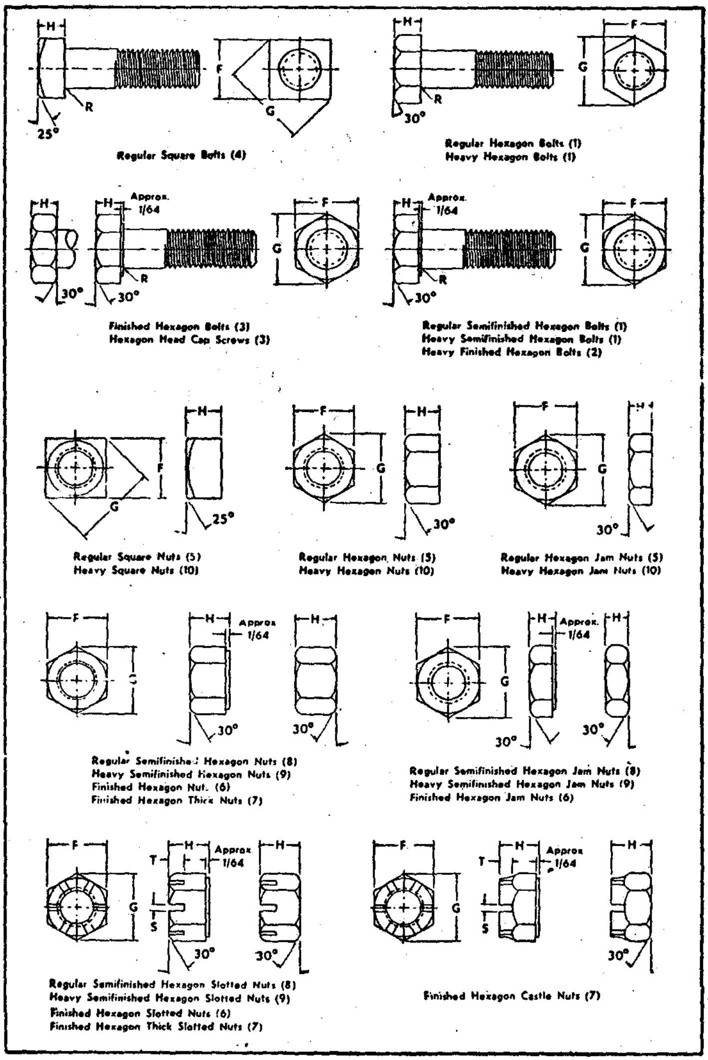
Length, Inches	Nominal Size, Inch													
	3/64	1/16	5/64	3/32	7/64	1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2
1/4	X	X	X	X	X	X	...	...	...	...	...	...	...	...
3/8	X	X	X	X	X	X	X	X	...	...	...	...	...	...
1/2	X	X	X	X	X	X	X	X	X	X	...	...	...	...
5/8	X	X	X	X	X	X	X	X	X	X	X	...	...	...
3/4	...	X	X	X	X	X	X	X	X	X	X	X	...	...
7/8	...	X	X	X	X	X	X	X	X	X	X	X	X	...
1	...	X	X	X	X	X	X	X	X	X	X	X	X	X
1 1/4	...	...	...	X	X	X	X	X	X	X	X	X	X	X
1 1/2	...	...	...	...	...	X	X	X	X	X	X	X	X	X
1 3/4	...	...	...	...	...	...	X	X	X	X	X	X	X	X
2	...	...	...	...	...	...	X	X	X	X	X	X	X	X
2 1/4	...	...	...	...	...	...	...	X	X	X	X	X	X	X
2 1/2	...	...	...	...	...	...	...	...	X	X	X	X	X	X
2 3/4	...	...	...	...	...	...	...	...	X	X	X	X	X	X
3	...	...	...	...	...	...	...	...	X	X	X	X	X	X
3 1/4	...	...	...	...	...	...	...	...	...	X	X	X	X	X
3 1/2						...	...	...	...	...	X	X	X	X
3 3/4						...	...	...	...	...	...	X	X	X
4						...	...	...	...	...	...	X	X	X
4 1/4						...	...	...	...	...	...	X	X	X
4 1/2						...	...	...	...	...	...	...	X	X

In 3/64-inch size, Types A, C, and F are available in 1/8- and 3/16-inch lengths.

BU LÔNG VÀ ĐAI ỐC

BOLTS AND NUTS

BU LÔNG - ĐAI ỐC ĐẦU VUÔNG VÀ ĐẦU LỤC GIÁC TIÊU CHUẨN MỸ



Numbers in parentheses are table numbers.

BẢNG 1 : TIÊU CHUẨN MỸ : BU LÔNG LỤC GIÁC ĐỀU, BU LÔNG LỤC GIÁC BÁN TINH, BU LÔNG LỤC GIÁC CHỊU LỰC, BU LÔNG LỤC GIÁC CHỊU LỰC BÁN TINH

Table 1. AMERICAN STANDARD REGULAR HEXAGON BOLTS, REGULAR SEMIFINISHED HEXAGON BOLTS, HEAVY HEXAGON BOLTS, AND HEAVY SEMIFINISHED HEXAGON BOLTS

(ASA B18.2-1960 INCORPORATING APPENDIX V-1962)

Nominal Size, D	Body Diam., Max.†	Width Across Flats		Width Across Corners		Height of Head			
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
REGULAR BOLTS AND REGULAR SEMIFINISHED BOLTS						REGULAR BOLTS		REG. SEMI-FIN. BOLTS	
1/4	0.260	7/16	0.425	0.505	0.484	0.188	0.150	0.163	0.150
5/16	0.324	1/2	0.484	0.577	0.552	0.235	0.195	0.211	0.195
3/8	0.388	9/16	0.544	0.650	0.620	0.268	0.226	0.243	0.226
7/16	0.452	5/8	0.603	0.722	0.687	0.316	0.272	0.291	0.272
1/2	0.515	3/4	0.725	0.866	0.826	0.364	0.302	0.323	0.302
5/8	0.642	15/16	0.906	1.083	1.033	0.444	0.378	0.403	0.378
3/4	0.768	1 1/8	1.088	1.299	1.240	0.524	0.455	0.483	0.455
7/8	0.895	1 5/16	1.269	1.516	1.447	0.604	0.531	0.563	0.531
1	1.022	1 1/2	1.450	1.732	1.653	0.700	0.591	0.627	0.591
1 1/8	1.149	1 11/16	1.631	1.949	1.859	0.780	0.658	0.718	0.658
1 1/4	1.277	1 7/8	1.812	2.165	2.066	0.876	0.749	0.813	0.749
1 3/8	1.404	2 1/16	1.994	2.382	2.273	0.940	0.810	0.878	0.810
1 1/2	1.531	2 1/4	2.175	2.598	2.480	1.036	0.902	0.974	0.902
1 3/4	1.785	2 5/8	2.538	3.031	2.893	1.196	1.054	1.134	1.054
2	2.039	3	2.900	3.464	3.306	1.388	1.175	1.263	1.175
2 1/4	2.305	3 3/8	3.262	3.897	3.719	1.548	1.327	1.423	1.327
2 1/2	2.559	3 3/4	3.625	4.330	4.133	1.708	1.479	1.583	1.479
2 3/4	2.827	4 1/8	3.988	4.763	4.546	1.869	1.632	1.744	1.632
3	3.081	4 1/2	4.350	5.196	4.959	2.060	1.815	1.935	1.815
3 1/4	3.335	4 7/8	4.712	5.629	5.372	2.251	1.936	2.064	1.936
3 1/2	3.589	5 1/4	5.075	6.062	5.786	2.380	2.057	2.193	2.057
3 3/4	3.858	5 5/8	5.437	6.495	6.198	2.572	2.241	2.385	2.241
4	4.111	6	5.800	6.928	6.612	2.764	2.424	2.576	2.424
HEAVY BOLTS AND HEAVY SEMIFINISHED BOLTS						HEAVY BOLTS		HEAVY SEMI-FIN. BOLTS	
1/2	0.515	7/8	0.850	1.010	0.969	0.364	0.302	0.323	0.302
5/8	0.642	1 1/16	1.031	1.227	1.175	0.444	0.378	0.403	0.378
3/4	0.768	1 1/4	1.212	1.443	1.383	0.524	0.455	0.483	0.455
7/8	0.895	1 7/16	1.394	1.660	1.589	0.604	0.531	0.563	0.531
1	1.022	1 5/8	1.575	1.876	1.796	0.700	0.591	0.627	0.591
1 1/8	1.149	1 13/16	1.756	2.093	2.002	0.780	0.591	0.718	0.658
1 1/4	1.277	2	1.938	2.309	2.209	0.876	0.749	0.813	0.749
1 3/8	1.404	2 3/16	2.119	2.526	2.416	0.940	0.810	0.878	0.810
1 1/2	1.531	2 3/8	2.300	2.742	2.622	1.036	0.902	0.974	0.902
††1 5/8	1.658	2 9/16	2.481	2.959	2.828	1.100	0.962	.....	.....
1 3/4	1.785	2 3/4	2.662	3.175	3.035	1.196	1.054	1.134	1.054
††1 7/8	1.912	2 15/16	2.844	3.392	3.242	1.260	1.114	.....	.....
2	2.039	3 1/8	3.025	3.608	3.449	1.388	1.175	1.263	1.175
2 1/4	2.305	3 1/2	3.388	4.041	3.862	1.548	1.327	1.423	1.327
2 1/2	2.559	3 7/8	3.750	4.474	4.275	1.708	1.479	1.583	1.479
2 3/4	2.827	4 1/4	4.112	4.907	4.688	1.869	1.632	1.744	1.632
3	3.081	4 5/8	4.475	5.340	5.102	2.060	1.815	1.935	1.815

BẢNG 2 : TIÊU CHUẨN MỸ BU LÔNG LỤC GIÁC CHỊU LỰC TINH

Table 2. AMERICAN STANDARD HEAVY FINISHED HEXAGON BOLTS (ASA B18.2-1960)

Dimensions of these bolts are the same as for *Heavy Semifinished Hexagon Bolts* (see lower half of Table 1) except that:

Maximum body diameter = nominal bolt size.

Minimum body diameter = nominal bolt size *minus:* 0.007 for 1/2-inch bolts; 0.008 for 5/8-inch bolts; 0.009 for 3/4- and 7/8-inch bolts; 0.010 for 1-inch bolts; 0.011 for 1 1/8- and 1 1/4-inch bolts; and 0.012 for 1 3/8-inch and larger bolts.

Threads are Coarse-, Fine-, 8-thread series, Class 2A for plain (unplated) bolts. For plated bolts the diameters may be increased by the amount of Class 2A allowance.

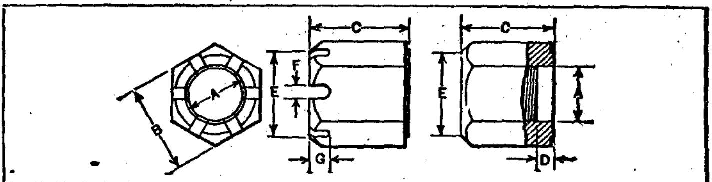
BẢNG 3 : TIÊU CHUẨN MỸ BU LÔNG LỤC GIÁC TINH ; CÁC VIT MŨ ĐẦU LỤC GIÁC

Table 3. AMERICAN STANDARD FINISHED HEXAGON BOLTS (ASA B18.2-1960) AND AMERICAN STANDARD HEXAGON HEAD CAP SCREWS (ASA B18.6.2-1956)

Nominal Size, D	Body Diam., Min.†	Width Across Flats		Width Across Corners		Height of Head	
		Max.	Min.††	Max.	Min.	Max.	Min.
FINISHED HEXAGON BOLTS AND HEXAGON HEAD CAP SCREWS							
1/4	0.2450	7/16	0.428	0.505	0.488	0.163	0.150
5/16	0.3065	1/2	0.489	0.577	0.557	0.211	0.195
3/8	0.3690	9/16	0.551	0.650	0.628	0.243	0.226
7/16	0.4305	5/8	0.612	0.722	0.698	0.291	0.272
1/2	0.4930	3/4	0.736	0.866	0.840	0.323	0.302
9/16	0.5545	13/16	0.798	0.938	0.910	0.371	0.348
5/8	0.6170	15/16	0.922	1.083	1.051	0.403	0.378
3/4	0.7410	1 1/8	1.100	1.299	1.254	0.483	0.455
7/8	0.8660	1 5/16	1.285	1.516	1.465	0.563	0.531
1	0.9900	1 1/2	1.469	1.732	1.675	0.627	0.591
1 1/8	1.1140	1 11/16	1.631	1.949	1.859	0.718	0.658
1 1/4	1.2390	1 7/8	1.812	2.165	2.066	0.813	0.749
1 3/8	1.3630	2 1/16	1.994	2.382	2.273	0.878	0.810
1 1/2	1.4880	2 1/4	2.175	2.598	2.480	0.974	0.902
FINISHED HEXAGON BOLTS ONLY							
1 3/4	1.7380	2 5/8	2.538	3.031	2.893	1.134	1.054
2	1.9880	3	2.900	3.464	3.306	1.263	1.175
2 1/4	2.2380	3 3/8	3.262	3.897	3.719	1.423	1.327
2 1/2	2.4880	3 3/4	3.625	4.330	4.133	1.583	1.479
2 3/4	2.7380	4 1/8	3.988	4.763	4.546	1.744	1.632
3	2.9880	4 1/2	4.350	5.196	4.959	1.935	1.815

ĐAI ỐC
NUTS

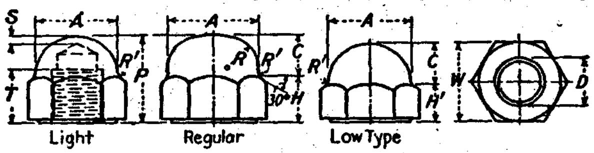
ĐAI ỐC TIÊU CHUẨN S.A.E. CAO
HIGH NUTS - S.A.E. STANDARD



Nut Size *A*	Width Across Flats *B*	Nut Height *C*	Counter-bore Depth *D**	Diam. at Top *E*	Slot Width *F*	Slot Depth *G*
1/4	7/16	3/8	1/16	25/64	5/64	3/32
5/16	1/2	29/64	5/64	29/64	3/32	3/32
3/8	9/16	17/32	3/32	33/64	1/8	1/8
7/16	5/8	39/64	7/64	37/64	1/8	5/32
1/2	3/4	11/16	1/8	11/16	5/32	5/32
9/16	7/8	49/64	9/64	51/64	5/32	3/16
5/8	1	27/32	5/32	55/64	3/16	7/32
3/4	1 1/8	1	3/16	63/64	3/16	1/4
7/8	1 5/16	1 5/32	7/32	1 5/32	3/16	1/4
1	1 1/2	1 5/16	1/4	1 21/64	1/4	9/32

* The counterbore indicated at the bottom of the nut is optional. All screw threads are to be in accordance with the Free Fit or Class 2 of the American Standard. (See pages 1147 to 1150 for the Fine-thread Series and the Coarse thread Series. See also page 1103.) The angle of chamfer shall not exceed 40 degrees with the top face of the nut.

MŨ ĐAI ỐC - NÊN DÙNG THEO S.A.E



Nut Size *D*	Crown *C*	Width *W* Light	Width *W* Regular	Rad. *R*	*S* Min.	Thread Depth *T*	Height *P*	Diameter *A*
No. 6	3/16	5/16	.....	9/64	1/32	9/64	19/64	Hex. Size Minus 1/32 in.
No. 8	3/16	5/16	.....	9/64	1/32	5/32	5/16	
No. 10	15/64	3/8	.....	11/64	1/32	3/16	25/64	
No. 12	15/64	3/8	.....	11/64	1/32	7/32	27/64	
1/4	1/4	7/16	7/16	3/16	3/64	1/4	15/32	
5/16	17/64	1/2	9/16	13/64	3/64	5/16	17/32	
3/8	19/64	9/16	5/8	15/64	3/64	3/8	5/8	
7/16	11/32	5/8	3/4	9/32	3/64	7/16	23/32	
1/2	3/8	3/4	13/16	5/16	3/64	1/2	13/16	Hex. Size Minus 1/16 in.
9/16	7/16	7/8	7/8	3/8	1/16	9/16	15/16	
5/8	7/16	15/16	1	3/8	1/16	5/8	63/64	
3/4	17/32	1 1/16	1 1/8	7/16	1/16	3/4	1 3/16	
7/8	39/64	1 1/4	1 5/16	33/64	3/32	7/8	1 3/8	
1	11/16	1 7/16	1 1/2	19/32	3/32	1	1 9/16	
1 1/8	25/32	1 5/8	1 11/16	43/64	3/32	1 1/8	1 25/32	
1 1/4	27/32	1 13/16	1 7/8	47/64	3/32	1 1/4	1 15/16	

Height $H = D$ for No. 6 to No. 10 sizes, inc., and 7/8 D for larger sizes. Height H' for low nuts of the light series = 3/4 D.

For low nuts, reduce usable thread depth T an amount equal to H minus H'.

Radius R' = 1/64 inch for sizes Nos. 6 to 7/16, inc., and 1/32 inch for larger sizes.

CHÌA KHÓA ĐÓNG - MỞ BU LÔNG - ĐAI ỐC

WRENCH CLEARANCES

TIÊU CHUẨN MỸ ĐỐI VỚI CHÌA KHÓA

Max.* Width Across Flats of Nut	Wrench Opening		Max.* Width Across Flats of Nut	Wrench Opening		Max.* Width Across Flats of Nut	Wrench Opening	
	Min.	Max.		Min.	Max.		Min.	Max.
5/32	0.158	0.163	1 1/8	1.132	1.142	2 13/16	2.827	2.845
3/16	0.190	0.195	1 1/4	1.257	1.267	2 15/16	2.954	2.973
7/32	0.220	0.225	1 5/16	1.320	1.331	3	3.016	3.035
1/4	0.252	0.257	1 3/8	1.383	1.394	3 1/8	3.142	3.162
9/32	0.283	0.288	1 7/16	1.446	1.457	3 3/8	3.393	3.414
5/16	0.316	0.322	1 1/2	1.508	1.520	3 1/2	3.518	3.540
11/32	0.347	0.353	1 5/8	1.634	1.646	3 3/4	3.770	3.793
3/8	0.378	0.384	1 11/16	1.696	1.708	3 7/8	3.895	3.918
7/16	0.440	0.446	1 13/16	1.822	1.835	4 1/8	4.147	4.172
1/2	0.504	0.510	1 7/8	1.885	1.898	4 1/4	4.272	4.297
9/16	0.566	0.573	2	2.011	2.025	4 1/2	4.524	4.550
5/8	0.629	0.636	2 1/16	2.074	2.088	4 5/8	4.649	4.676
11/16	0.692	0.699	2 3/16	2.200	2.215	4 7/8	4.900	4.928
3/4	0.755	0.763	2 1/4	2.262	2.277	5	5.026	5.055
13/16	0.818	0.826	2 3/8	2.388	2.404	5 1/4	5.277	5.307
7/8	0.880	0.888	2 7/16	2.450	2.466	5 3/8	5.403	5.434
15/16	0.944	0.953	2 9/16	2.576	2.593	5 5/8	5.654	5.686
1	1.006	1.015	2 5/8	2.639	2.656	5 3/4	5.780	5.813
1 1/16	1.068	1.077	2 3/4	2.766	2.783	6	6.031	6.065

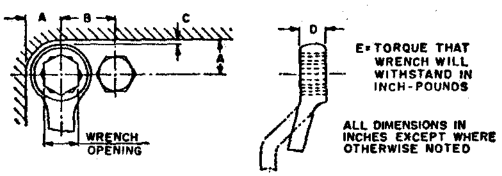
All dimensions given in inches.

* Wrenches shall be marked with the "Nominal Size of Wrench" which is equal to the basic or maximum width across flats of the corresponding bolt head or nut.

Minimum wrench opening equals $(1.005W + 0.001)$. Tolerance on wrench opening equals plus $(0.005W + 0.004)$ from minimum, where W equals nominal size of wrench.

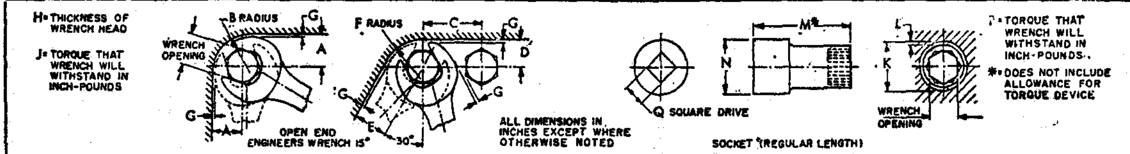
Wrench Clearance Dimensions. — Wrench clearances are given in Tables 1 and 2. They are based on a wrench opening corresponding to the dimension across the flats of the fastener. The listed values were obtained from a composite study of the alloy steel wrenches that are commercially available and military specifications. They are suitable for general use as minimum requirements.

Table 1. Wrench Clearances for Box Wrench — 12 Point
(From SAE Aeronautical Drafting Manual)



Wrench Opening	*A* Min.	*B* Min.	*C* Ref.	*D* Max.	*E* Min.	Wrench Opening	*A* Min.	*B* Min.	*C* Ref.	*D* Max.	*E* Min.
.156	.190	.280	.030	.156	100	.781	.690	1.140	.030	.594	2600
.188	.200	.309	.030	.172	150	.812	.720	1.190	.030	.594	3000
.250	.270	.410	.030	.250	150	.875	.750	1.260	.030	.594	3300
.312	.300	.480	.030	.281	210	.938	.780	1.320	.030	.656	4100
.344	.300	.500	.030	.281	250	1.000	.810	1.390	.030	.718	4900
.375	.340	.560	.030	.344	370	1.062	.840	1.450	.030	.781	5400
.438	.400	.650	.030	.359	650	1.125	.950	1.600	.030	.844	5900
.500	.450	.740	.030	.375	1020	1.250	.980	1.700	.030	.875	7200
.562	.500	.830	.030	.406	1200	1.312	1.090	1.850	.030	.906	8000
.594	.530	.870	.030	.469	1200	1.438	1.220	2.050	.030	1.000	8400
.625	.560	.920	.030	.469	2000	1.500	1.270	2.140	.030	1.062	10450
.688	.590	.990	.030	.531	2300	1.625	1.340	2.280	.030	1.156	11750
.750	.660	1.090	.030	.594	2600	.....	.....	.....	....	.....	.....

BẢNG 2 : MIỆNG CHÌA KHÓA ĐỂ MỞ CỦA CHÌA KHÓA 15O VÀ CHÌA KHÓA ỐNG

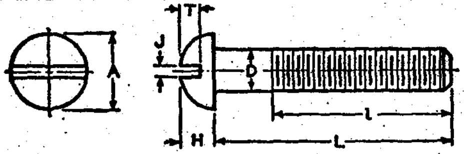


Wrench Opening	Open End Engineers Wrench 15°									Socket (Regular Length)														Wrench Opening
												Q = .250			Q = .375			Q = .500			Q = .750			
	A Min.	B Max.	C Min.	D Min.	E Min.	F Max.	G Ref.	H Max.	J Min.	K Min.	L Ref.	M Max.	N Max.	P Min.	M Max.	N Max.	P Min.	M Max.	N Max.	P Min.	M Max.	N Max.	P Min.	
.156	.220	.250	.390	.160	.250	.200	.030	.094	25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
.188	.250	.280	.430	.190	.270	.230	.030	.172	40	.370	.030	1.000	.510	125	...	...	...	...	...	...	...	...	...	.188
.250	.280	.340	.530	.270	.310	.310	.030	.172	60	.470	.030	1.000	.510	200	1.250	.690	250	...	...	...	...	...	...	.250
.312	.380	.470	.6[illegible]	.280	.390	.390	.050	.203	125	.550	.030	1.000	.510	300	1.250	.690	400	...	...	...	...	...	...	.312
.344	.420	.500	.750	.340	.450	.450	.050	.203	175	.580	.030	1.000	.519	450	1.250	.690	675	...	...	...	...	...	...	.344
.375	.420	.500	.780	.360	.450	.520	.050	.219	250	.620	.030	1.000	.580	550	1.250	.690	900	1.500	.880	1600	...	...	...	.375
.438	.470	.590	.890	.420	.520	.640	.050	.250	375	.750	.030	1.000	.683	550	1.250	.880	1250	1.500	.940	1700	...	...	...	.438
.500	.520	.640	1.000	.470	.580	.660	.050	.266	490	.810	.030	1.000	.692	600	1.250	.880	1450	1.500	.940	2000	...	...	...	.500
.562	.590	.770	1.130	.520	.660	.700	.050	.297	700	.870	.030	...	...	...	1.250	.932	1600	1.500	.940	2700	...	...	...	.562
.594	.640	.830	1.210	.530	.700	.700	.050	.344	800	.920	.030	...	...	...	1.250	.963	1750	1.562	.970	3000	...	...	...	.594
.625	.640	.830	1.230	.550	.700	.700	.050	.344	935	.950	.030	...	...	...	1.250	.995	2000	1.562	1.000	3600	...	...	...	.625
.688	.770	.920	1.470	.660	.880	.800	.060	.375	1250	1.030	.030	...	...	...	1.250	1.058	2000	1.562	1.065	4300	...	...	...	.688
.750	.770	.920	1.510	.670	.880	.800	.060	.375	1500	1.120	.030	...	...	...	1.250	1.120	2000	1.562	1.130	5000	...	...	...	.750
.781	.830	.950	1.550	.690	.890	.840	.060	.375	1615	1.150	.030	...	...	...	1.250	1.126	2000	1.625	1.130	5000	...	...	...	.781
.812	.910	1.120	1.660	.720	.970	.860	.060	.406	1710	1.200	.030	...	...	...	1.250	1.213	2000	1.625	1.222	5000	...	...	...	.812
.875	.970	1.150	1.810	.800	1.060	.910	.060	.438	2250	1.280	.030	...	...	...	...	...	...	1.750	1.285	5000	...	...	...	.875
.938	.970	1.150	1.850	.810	1.060	.950	.060	.438	2750	1.370	.030	...	...	...	...	...	...	1.750	1.410	5000	...	...	...	.938
1.000	1.050	1.230	2.000	.880	1.160	1.060	.060	.500	3250	1.470	.030	...	...	...	...	...	...	1.750	1.410	5000	...	...	...	1.000
1.062	1.090	1.250	2.100	.970	1.200	1.200	.080	.500	3500	1.550	.030	...	...	...	...	...	...	1.844	1.505	5000	...	...	...	1.062
1.125	1.140	1.370	2.210	1.000	1.270	1.230	.080	.500	4000	1.610	.030	...	...	...	...	...	...	1.938	1.567	5000	...	...	...	1.125
1.250	1.270	1.420	2.440	1.080	1.390	1.310	.080	.562	5250	1.890	.030	...	...	...	...	...	...	2.000	1.723	5000	2.375	1.855	7250	1.250
1.312	1.390	1.690	2.630	1.170	1.520	1.340	.080	.562	6000	1.980	.030	...	...	...	...	...	...	...	...	...	2.500	1.920	8000	1.312
1.438	1.470	1.720	2.800	1.250	1.590	1.340	.090	.641	7500	2.140	.030	...	...	...	...	...	...	...	...	...	2.625	2.075	9550	1.438
1.500	1.470	1.720	2.840	1.270	1.590	1.450	.090	.641	8250	2.200	.030	...	...	...	...	...	...	...	...	...	2.625	2.170	10450	1.500
1.625	1.560	1.880	3.100	1.380	1.750	1.560	.090	.641	9000	2.390	.030	...	...	...	...	...	...	...	...	...	2.750	2.325	11750	1.625

ĐINH VIT

CAP SCREWS

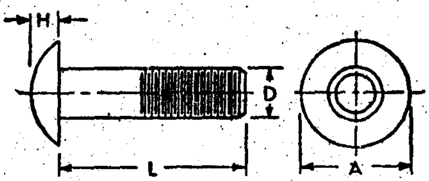
TIÊU CHUẨN MỸ VỀ ĐINH VIT ĐẦU MŨ TRÒN



Nominal Size	Body Diam. D		Head Diam. A		Head Ht. H		Slot Width J		T Max.
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
1/4	0.250	0.245	0.437	0.418	0.191	0.175	0.075	0.064	0.117
5/16	0.3125	0.307	0.562	0.540	0.245	0.226	0.084	0.072	0.151
3/8	0.375	0.369	0.625	0.603	0.273	0.252	0.094	0.081	0.168
7/16	0.4375	0.431	0.750	0.725	0.328	0.302	0.094	0.081	0.202
1/2	0.500	0.493	0.812	0.786	0.354	0.327	0.106	0.091	0.218
9/16	0.5625	0.555	0.937	0.909	0.409	0.378	0.118	0.102	0.252
5/8	0.625	0.617	1.000	0.970	0.437	0.405	0.133	0.116	0.270
3/4	0.750	0.742	1.250	1.215	0.546	0.507	0.149	0.131	0.338

Threads are Coarse-, Fine-, or 8-thread series, Class 2A. Minimum thread length $l = 2D + 1/4$ inch.

TIÊU CHUẨN MỸ VỀ VIT ĐẦU TRÒN



Size, D	Threads per Inch†	Body Diam.*	Diameter of Head, A		Height of Head, H	
		Max.	Max.	Min.	Max.	Min.
No. 10	24	0.199	0.469	0.438	0.114	0.094
1/4	20	0.260	0.594	0.563	0.145	0.125
5/16	18	0.324	0.719	0.688	0.176	0.156
3/8	16	0.388	0.844	0.782	0.208	0.188
7/16	14	0.452	0.969	0.907	0.239	0.219
1/2	13	0.515	1.094	1.032	0.270	0.250
5/8	11	0.642	1.344	1.219	0.344	0.313
3/4	10	0.768	1.594	1.469	0.406	0.375
7/8	9	0.895	1.844	1.719	0.469	0.438
1	8	1.022	2.094	1.969	0.531	0.500

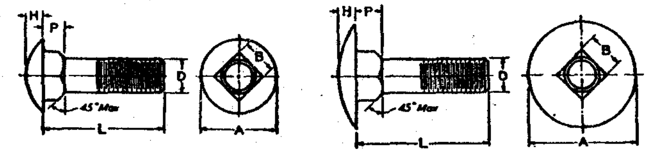
All dimensions are in inches.

* Full-size body bolts are furnished unless user specifies undersize body bolts, in which case the body diameter approximately equals the pitch diameter of the thread.

† Threads are Coarse-thread series, Class 2A. Minimum thread length is $2D$ plus 1/4 inch for bolts up to 6 inches long and $2D$ plus 1/2 inch for bolts longer than 6 inches. For bolts shorter than $2D$ plus 1/4 inch, thread is made as close to the head as practical.

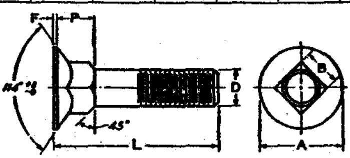
TIÊU CHUẨN MỸ VỀ VIT ĐẦU TRÒN, CỔ VUÔNG, CÓ BẬC, VIT CHÌM

AMERICAN STANDARD ROUND HEAD SQUARE NECK CARRIAGE BOLTS, STEP BOLTS, AND 114 DEGREE COUNTERSUNK SQUATE NECK BOLTS (ASA B18.5-1952)



CARRIAGE BOLT STEP BOLT

Size D	Thds. per Inch†	Body Diam.*	Diameter of Head A		Height of Head H		Depth of Square P		Width of Square B	
		Max.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
					CARRIAGE BOLTS					
No. 10	24	0.199	0.469	0.438	0.114	0.094	0.125	0.094	0.199	0.185
¼	20	0.260	0.594	0.563	0.145	0.125	0.156	0.125	0.260	0.245
5/16	18	0.324	0.719	0.688	0.176	0.156	0.187	0.156	0.324	0.307
⅜	16	0.388	0.844	0.782	0.208	0.188	0.219	0.188	0.388	0.368
7/16	14	0.452	0.969	0.907	0.239	0.219	0.250	0.219	0.452	0.431
½	13	0.515	1.094	1.032	0.270	0.250	0.281	0.250	0.515	0.492
⅝	11	0.642	1.344	1.219	0.344	0.313	0.344	0.313	0.642	0.616
¾	10	0.768	1.594	1.469	0.406	0.375	0.406	0.375	0.768	0.741
⅞	9	0.895	1.844	1.719	0.469	0.438	0.469	0.438	0.895	0.865
1	8	1.022	2.094	1.969	0.531	0.500	0.531	0.500	1.022	0.990
					STEP BOLTS					
No. 10	24	0.199	0.656	0.625	0.114	0.094	0.125	0.094	0.199	0.185
¼	20	0.260	0.844	0.813	0.145	0.125	0.156	0.125	0.260	0.245
5/16	18	0.324	1.031	1.000	0.176	0.156	0.187	0.156	0.324	0.307
⅜	16	0.388	1.219	1.188	0.208	0.188	0.219	0.188	0.388	0.368
7/16	14	0.452	1.406	1.375	0.239	0.219	0.250	0.219	0.452	0.431
½	13	0.515	1.594	1.563	0.270	0.250	0.281	0.250	0.515	0.492



114 DEGREE COUNTERSUNK SQUARE NECK BOLTS

Size D	Thds. per Inch†	Body Diam.*	Diameter of Head A		Feed Thickness F	Depth of Square and Countersink P		Width of Square B	
		Max.	Max.	Min.		Max.	Min.	Max.	Min.
No. 10	24	0.199	0.520	0.500	0.016	0.250	0.219	0.199	0.185
¼	20	0.260	0.645	0.625	0.016	0.312	0.281	0.260	0.245
5/16	18	0.324	0.770	0.750	0.031	0.375	0.344	0.324	0.307
⅜	16	0.388	0.895	0.875	0.031	0.437	0.406	0.388	0.368
7/16	14	0.452	1.020	1.000	0.031	0.500	0.469	0.452	0.431
½	13	0.515	1.145	1.125	0.031	0.562	0.531	0.515	0.492
⅝	11	0.642	1.400	1.375	0.031	0.687	0.656	0.642	0.616
¾	10	0.768	1.650	1.625	0.047	0.812	0.781	0.768	0.741

* Full-size body bolts are furnished unless user specifies undersize body bolts.
† Threads are Coarse-thread series, Class 2A. Minimum thread length is 2D plus ¼ inch for bolts up to 6 inches long and 2D plus ½ inch for bolts longer than 6 inches.

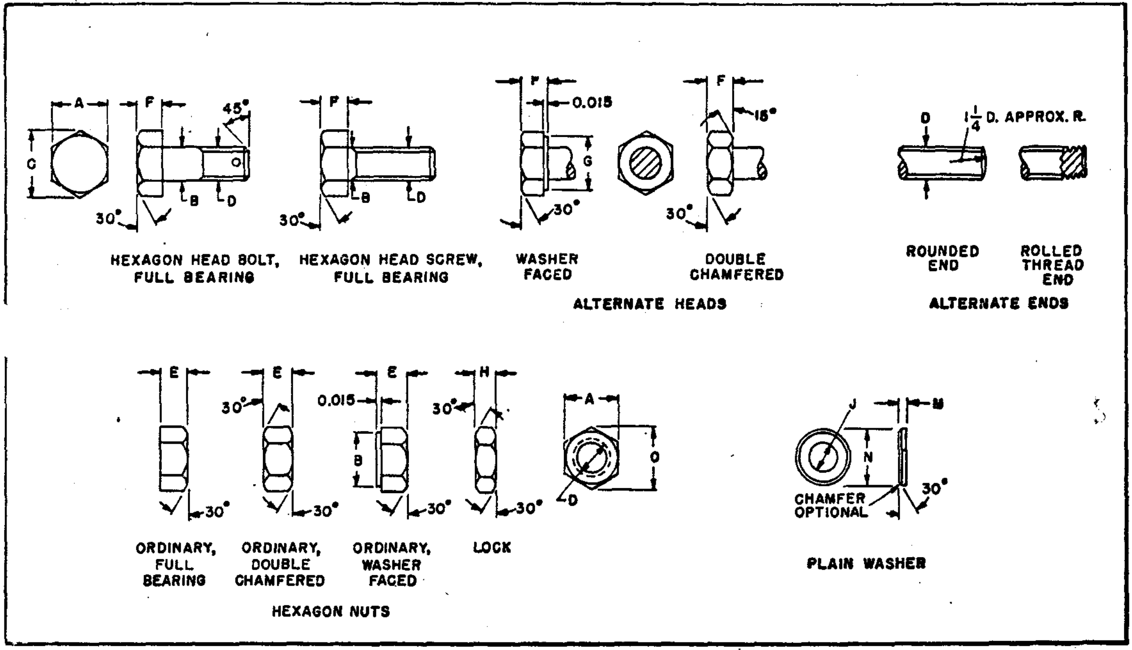
CHIỀU DÀI BU LÔNG

LENGTHS OF MACHINE BOLTS

Lengths, Inches	Diameters, Inch									
	¼	5/16	⅜	7/16	½	⅝	¾	⅞	1	1⅛
Square-head Machine Bolts — Stock Sizes (See footnote)										
½	**	**	....	....	....	....	....	....	....	....
⅝	....	**	....	....	....	....	....	....	....	....
¾	*	*	*	....	....	....	....	....	....	....
1	*	*	*	*	*	*	**	....	....	....
1¼	*	*	*	*	*	*	*	....	....	....
1½	*	*	*	*	*	*	*	**	....	....
1¾	*	*	*	*	*	*	*	**	....	....
2	*	*	*	*	*	*	*	*	**	....
2¼	*	*	*	**	*	*	*	*	....	....
2½	*	*	*	*	*	*	*	*	*	....
2¾	*	*	*	....	*	*	*	*	....	....
3	*	*	*	*	*	*	*	*	*	....
3¼	**	**	*	....	*	*	*	*	....	....
3½	*	*	*	*	*	*	*	*	*	....
3¾	....	....	*	....	*	*	*	**	**	....
4	*	*	*	*	*	*	*	*	*	**
4¼	....	....	....	....	**	**	*	**	....	....
4½	*	*	*	*	*	*	*	*	*	**
4¾	....	....	....	....	**	**	**	....	....	....
5	*	*	*	*	*	*	*	*	*	**
5½	*	*	*	*	*	*	*	*	*	**
6	*	*	*	*	*	*	*	*	*	*
6½	**	**	*	**	*	*	*	*	*	....
7	**	*	*	**	*	*	*	*	*	**
7½	....	....	*	....	*	*	*	*	*	....
8	**	**	*	**	*	*	*	*	*	**
8½	....	....	*	....	*	*	*	**	....	....
9	....	....	*	**	*	*	*	*	*	**
9½	....	....	**	....	*	*	*	....	....	....
10	....	....	*	....	*	*	*	*	*	**
10½	....	....	....	....	*	*	*	....	....	....
11	....	....	*	....	*	*	*	*	*	**
11½	....	....	....	....	**	**	**	....	....	....
12	....	....	*	....	*	*	*	*	*	**
13	....	....	....	....	*	*	*	**	*	....
14	....	....	....	....	*	*	*	*	*	**
15	....	....	....	....	*	*	*	*	*	**
16	....	....	....	....	*	*	*	*	*	**
17	....	....	....	....	**	*	*	**	**	**
18	....	....	....	....	*	*	*	*	*	**
19	....	....	....	....	**	**	*	**	**	**
20	....	....	....	....	*	*	*	*	*	**
22	....	....	....	....	**	*	*	**	**	....
24	....	....	....	....	**	*	*	**	**	....
Hexagon-head Machine Bolts — Stock Sizes (See footnote)										
½	**	....	....	....	....	....	....	....	....	....
¾	*	*	*	....	**	....	....	....	....	....
1	*	*	*	....	*	....	....	....	....	....
1¼	*	*	*	....	*	**	**	....	....	....
1½	*	*	*	....	*	*	*	....	....	....
1¾	**	**	*	....	*	*	*	....	....	....
2	*	**	*	....	*	*	*	**	....	....
2¼	....	....	....	....	**	**	**	....	....	....
2½	**	**	*	....	*	**	*	**	....	....
2¾	....	....	....	....	**	....	....	....	....	....
3	....	**	**	....	**	*	**	**	....	....
3½	....	....	**	....	**	*	**	**	....	....
4	....	....	**	....	**	**	*	**	....	....
4½	....	....	....	....	**	**	**	**	....	....
5	....	....	....	....	**	*	*	**	....	....
5½	....	....	....	....	**	**	**	....	....	....
6	....	....	....	....	**	**	**	**	....	....

One asterisk (*) represents stock sizes of maximum demand, and two asterisks (**) stock sizes least frequently used. All other sizes are considered specials.

BU LÔNG LỤC GIÁC, ĐAI ỐC, VÒNG ĐỆM THEO TIÊU CHUẨN WHITWORTH (B.S.W.) CỦA ANH



For dimensions see table on opposite page.

BU LÔNG LỤC GIÁC, ĐAI ỐC, VÒNG ĐỆM THEO TIÊU CHUẨN WHITWORTH (B.S.W.) CỦA ANH

Nominal Size D	Number of Threads per Inch		Bolts, Screws, and Nuts					Bolts and Screws				Nuts				Washers				
			Width			Diameter of Washer Face[1] G		Diameter of Unthreaded Portion of Shank B		Thickness						Diameter of Hole J		Outside Dia. N	Thickness (approx.)[2] M	
			Across Flats A		Across Corners C					Head F		Ordinary E		Lock H						
	B.S.W.	B.S.F.	Max.	Min.	Max.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.		S.W.G.	Equiv.
2B.A.	....	..	0.324	0.319	0.37	0.319	0.309	0.1850	0.1820	0.139	0.132	0.167	0.157	0.123	0.113	0.202	0.197	1/2	18	0.048
2B.A.	....	..	.....	.....	....	.....	.....	......	......	.....	.....	.....	.....	.....	.....	0.202	0.197	25/64	21	0.032
1/4	20	26	0.445	0.438	0.51	0.428	0.418	0.2500	0.2465	0.19	0.18	0.200	0.190	0.133	0.123	0.270	0.265	9/16	17	0.056
5/16	18	22	0.525	0.518	0.61	0.508	0.498	0.3125	0.3090	0.22	0.21	0.250	0.240	0.166	0.156	0.333	0.328	5/8	15	0.072
3/8	16	20	0.600	0.592	0.69	0.582	0.572	0.3750	0.3715	0.27	0.26	0.312	0.302	0.208	0.198	0.395	0.390	3/4	15	0.072
7/16	14	18	0.710	0.702	0.82	0.690	0.680	0.4375	0.4335	0.33	0.32	0.375	0.365	0.250	0.240	0.458	0.453	7/8	13	0.092
1/2	12	16	0.820	0.812	0.95	0.800	0.790	0.5000	0.4960	0.38	0.37	0.437	0.427	0.291	0.281	0.520	0.515	1	13	0.092
9/16	12	16	0.920	0.912	1.06	0.900	0.890	0.5625	0.5585	0.44	0.43	0.500	0.490	0.333	0.323	0.593	0.588	1 1/8	12	0.104
5/8	11	14	1.010	1.000	1.17	0.985	0.975	0.6250	0.6190	0.49	0.48	0.562	0.552	0.375	0.365	0.656	0.651	1 1/4	11	0.116
3/4	10	12	1.200	1.190	1.39	1.175	1.165	0.7500	0.7440	0.60	0.59	0.687	0.677	0.458	0.448	0.781	0.776	1 1/2	9	0.144
7/8	9	11	1.300	1.288	1.50	1.273	1.263	0.8750	0.8670	0.66	0.65	0.750	0.740	0.500	0.490	0.906	0.901	1 5/8	9	0.144
1	8	10	1.480	1.468	1.71	1.453	1.443	1.0000	0.9920	0.77	0.76	0.875	0.865	0.583	0.573	1.031	1.026	1 7/8	8	0.160
1 1/8	7	9	1.670	1.658	1.93	1.638	1.628	1.1250	1.1170	0.88	0.87	1.000	0.990	0.666	0.656	1.156	1.151	2 1/8	7	0.176
1 1/4	7	9	1.860	1.845	2.15	1.825	1.815	1.2500	1.2420	0.98	0.96	1.125	1.105	0.750	0.730	1.281	1.276	2 3/8	7	0.176
1 3/8	....	8	2.050	2.035	2.37	2.015	2.005	1.3750	1.3650	1.09	1.07	1.250	1.230	0.833	0.813	1.406	1.401	2 5/8	6	0.192
1 1/2	6	8	2.220	2.200	2.56	2.180	2.170	1.5000	1.4900	1.20	1.18	1.375	1.355	0.916	0.896	1.531	1.526	2 7/8	6	0.192
1 3/4	5	7	2.580	2.555	2.98	2.530	2.520	1.7500	1.7400	1.42	1.40	1.625	1.605	1.083	1.063	1.781	1.776	3 3/8	5	0.212
2	4.5	7	2.760	2.735	3.19	2.710	2.700	2.0000	1.9900	1.53	1.51	1.750	1.730	1.166	1.146	2.031	2.026	3 5/8	5	0.212

All dimensions in inches except where otherwise noted. [1] Does not apply to nuts of 2 B.A. thread. [2] The dimensions given for the thickness of the washers shall be subject to the normal manufacturing tolerances on sheet or strip. Thicknesses are given in Standard Wire Gage numbers and their decimal inch equivalents.

VÍT CẤY

STUDS

TIÊU CHUẨN ANH VỀ VIT CẤY ĐA CÔNG DỤNG

LIMITS FOR END SCREWED INTO COMPONENT (All threads except B.A.)

Nom. Diam. D	Major Diam. Max.	Threads per Inch	Major Diam. Min.	Effective Diameter Max.	Effective Diameter Min.	Minor Diameter Max.	Minor Diameter Min.	Threads per Inch	Major Diam. Min.	Effective Diameter Max.	Effective Diameter Min.	Minor Diameter Max.	Minor Diameter Min.
UN TH'DS.		UNF THREADS						UNC THREADS					
1/4	.2500	28	.2435	.2294	.2265	.2088	.2037	20	.2419	.2201	.2172	.1913	.1849
5/16	.3125	24	.3053	.2883	.2852	.2643	.2586	18	.3038	.2793	.2762	.2472	.2402
3/8	.3750	24	.3678	.3510	.3478	.3270	.3211	16	.3656	.3375	.3343	.3014	.2936
7/16	.4375	20	.4294	.4084	.4050	.3796	.3729	14	.4272	.3945	.3911	.3533	.3447
1/2	.5000	20	.4919	.4712	.4675	.4424	.4356	13	.4891	.4537	.4500	.4093	.4000
9/16	.5625	18	.5538	.5302	.5264	.4981	.4907	12	.5511	.5122	.5084	.4641	.4542
5/8	.6250	18	.6163	.5929	.5889	.5608	.5533	11	.6129	.5700	.5660	.5175	.5069
3/4	.7500	16	.7406	.7137	.7094	.6776	.6693	10	.7371	.6893	.6850	.6316	.6200
7/8	.8750	14	.8647	.8332	.8286	.7920	.7828	9	.8611	.8074	.8028	.7433	.7306
1	1.0000	12	.9886	.9510	.9459	.9029	.8925	8	.9850	.9239	.9188	.8517	.8376
1 1/8	1.1250	12	1.1136	1.0762	1.0709	1.0281	1.0176	7	1.1086	1.0375	1.0322	.9550	.9393
1 1/4	1.2500	12	1.2386	1.2014	1.1959	1.1533	1.1427	7	1.2336	1.1627	1.1572	1.0802	1.0644
1 3/8	1.3750	12	1.3636	1.3265	1.3209	1.2784	1.2677	6	1.3568	1.2723	1.2667	1.1761	1.1581
1 1/2	1.5000	12	1.4886	1.4517	1.4459	1.4036	1.3928	6	1.4818	1.3975	1.3917	1.3013	1.2832
B.S. TH'DS.		B.S.F. THREADS						B.S.W. THREADS					
1/4	.2500	26	.2455	.2280	.2251	.2034	.1984	20	.2452	.2206	.2177	.1886	.1831
5/16	.3125	22	.3077	.2863	.2832	.2572	.2517	18	.3073	.2798	.2767	.2442	.2383
3/8	.3750	20	.3699	.3461	.3429	.3141	.3083	16	.3695	.3381	.3349	.2981	.2919
7/16	.4375	18	.4320	.4053	.4019	.3697	.3635	14	.4316	.3952	.3918	.3495	.3428
1/2	.5000	16	.4942	.4637	.4600	.4237	.4172	12	.4937	.4503	.4466	.3969	.3897
9/16	.5625	16	.5566	.5263	.5225	.4863	.4797	12	.5560	.5129	.5091	.4595	.4521
5/8	.6250	14	.6187	.5833	.5793	.5376	.5305	11	.6183	.5708	.5668	.5126	.5050
3/4	.7500	12	.7432	.7009	.6966	.6475	.6398	10	.7428	.6903	.6860	.6263	.6182
7/8	.8750	11	.8678	.8214	.8168	.7632	.7551	9	.8674	.8085	.8039	.7374	.7288
1	1.0000	10	.9924	.9411	.9360	.8771	.8686	8	.9920	.9251	.9200	.8451	.8360
1 1/8	1.1250	9	1.1171	1.0592	1.0539	.9881	.9792	7	1.1164	1.0388	1.0335	.9473	.9376
1 1/4	1.2500	9	1.2419	1.1844	1.1789	1.1133	1.1042	7	1.2413	1.1640	1.1585	1.0725	1.0627
1 3/8	1.3750	8	1.3665	1.3006	1.2950	1.2206	1.2110	..	......	......	......	......	......
1 1/2	1.5000	8	1.4913	1.4258	1.4200	1.3458	1.3360	6	1.4906	1.3991	1.3933	1.2924	1.2818

LIMITS FOR END SCREWED INTO COMPONENT (B.A. Threads)[1]

Designation No.	Pitch	Major Diameter Max.	Major Diameter Min.	Effective Diameter Max.	Effective Diameter Min.	Minor Diameter Max.	Minor Diameter Min.
2	.8100 mm	4.700 mm	4.580 mm	4.275 mm	4.200 mm	3.790 mm	3.620 mm
	.03189 in.	.1850 in.	.1803 in.	.1683 in.	.1654 in.	.1492 in.	.1425 in.
4	.6600 mm	3.600 mm	3.500 mm	3.260 mm	3.190 mm	2.865 mm	2.720 mm
	.02598 in.	.1417 in.	.1378 in.	.1283 in.	.1256 in.	.1128 in.	.1071 in.

MINIMUM NOMINAL LENGTHS OF STUDS[2]

Nom. Stud Diam.	For Thread Length (Component End) of 1D	1.5D	Nom. Stud Diam.	For Thread Length (Component End) of 1D	1.5D	Nom. Stud Diam.	For Thread Length (Component End) of 1D	1.5D
1/4	[illegible]	1	9/16	2	2 3/8	1 1/8	4	4 5/8
5/16	[illegible]	1 3/8	5/8	2 1/4	2 5/8	1 1/4	4 3/4	5 1/4
3/8	[illegible]	1 5/8	3/4	2 5/8	3	1 3/8	5	5 3/4
7/16	1 5/8	1 7/8	7/8	3 1/8	3 5/8	1 1/2	5 1/4	6
1/2	1 3/4	2	1	3 1/2	4	...	...	...

All dimensions are in inches except where otherwise noted.

[1] Approximate inch equivalents are shown below the dimensions given in mm.

[2] The standard also gives preferred and standard lengths of studs:

Preferred lengths of studs: 7/8, 1, 1 1/8, 1 1/4, 1 3/8, 1 1/2, 1 3/4, 2, 2 1/4, 2 1/2, 2 3/4, 3, 3 1/4, 3 1/2 and for lengths above 3 1/2 the preferred increment is 1/2.

Standard lengths of studs: 7/8, 1, 1 1/8, 1 1/4, 1 3/8, 1 1/2, 1 5/8, 1 3/4, 1 7/8, 2, 2 1/8, 2 1/4, 2 3/8, 2 1/2, 2 5/8, 2 3/4, 2 7/8, 3, 3 1/8, 3 1/4, 3 3/8, 3 1/2 and for lengths above 3 1/2 the standard increment is 1/4.

Tolerance for length is ±1/32 for all lengths up to and including 4 and ±1/16 over 4.

American Standard Plain Washers. — The Standard (ASA B27.2-1958) covers two types of general-purpose plain washers (Type A and Type B). Table 1 gives Type A washers listed in ascending order of inside diameters, outside diameters, and thicknesses, without reference to the nominal screw or bolt size. Type B washers are listed in Table 2, which gives dimensions for narrow, regular, and wide washers for each screw or bolt size.

The inside diameter tolerances for Type A washers are approximately double those for Type B washers for sizes up to 1 inch; for sizes 1 inch and above they are the same. In general, the outside diameter tolerances for Type A washers are twice those for Type B washers for sizes up to 1/4 inch and the same for other sizes. For actual tolerances consult the footnotes of the tables.

Plain washers are made of ferrous or non-ferrous metals, plastics or other materials. The tolerances indicated in the tables are for metal washers only.

BẢNG 1 : TIÊU CHUẨN MỸ VỀ CÁC VÒNG ĐỆM PHẲNG KIỂU A

Inside Diameter[1]	Outside Diameter[2]	Thickness			Inside Diameter[1]	Outside Diameter[2]	Thickness		
		Nom.	Max.	Min.			Nom.	Max.	Min.
5/64	3/16	0.020	0.025	0.016	5/8	1 1/2	0.109	0.132	0.086
3/32	7/32	0.020	0.025	0.016	5/8	2 1/8	0.134	0.160	0.108
3/32	1/4	0.020	0.025	0.016	21/32	1 5/16	0.095	0.121	0.074
1/8	1/4	0.022	0.028	0.017	11/16	1 1/2	0.134	0.160	0.108
1/8	5/16	0.032	0.040	0.025	11/16	1 3/4	0.134	0.160	0.108
5/32	5/16	0.035	0.048	0.027	11/16	2 3/8	0.165	0.192	0.136
5/32	3/8	0.049	0.065	0.036	13/16	1 1/2	0.134	0.160	0.108
11/64	13/32	0.049	0.065	0.036	13/16	1 3/4	0.148	0.177	0.122
3/16	3/8	0.049	0.065	0.036	13/16	2	0.148	0.177	0.122
3/16	7/16	0.049	0.065	0.036	13/16	2 7/8	0.165	0.192	0.136
13/64	15/32	0.049	0.065	0.036	15/16	1 3/4	0.134	0.160	0.108
7/32	7/16	0.049	0.065	0.036	15/16	2	0.165	0.192	0.136
7/32	1/2	0.049	0.065	0.036	15/16	2 1/4	0.165	0.192	0.136
15/64	17/32	0.049	0.065	0.036	15/16	3 3/8	0.180	0.213	0.153
1/4	1/2	0.049	0.065	0.036	1 1/16	2	0.134	0.160	0.108
1/4*	9/16	0.049	0.065	0.036	1 1/16	2 1/4	0.165	0.192	0.136
1/4*	9/16	0.065	0.080	0.051	1 1/16	2 1/2	0.165	0.192	0.136
17/64	5/8	0.049	0.065	0.036	1 1/16	3 7/8	0.238	0.280	0.210
9/32	5/8	0.065	0.080	0.051	1 3/16	2 1/2	0.165	0.192	0.136
5/16	3/4	0.065	0.080	0.051	1 1/4	2 3/4	0.165	0.192	0.136
5/16	7/8	0.065	0.080	0.051	1 5/16	2 3/4	0.165	0.192	0.136
11/32	11/16	0.065	0.080	0.051	1 3/8	3	0.165	0.192	0.136
3/8	3/4	0.065	0.080	0.051	1 7/16	3	0.180	0.213	0.153
3/8	7/8	0.083	0.104	0.064	1 1/2	3 1/4	0.180	0.213	0.153
3/8	1 1/8	0.065	0.080	0.051	1 9/16	3 1/4	0.180	0.213	0.153
13/32	13/16	0.065	0.080	0.051	1 5/8	3 1/2	0.180	0.213	0.153
7/16	7/8	0.083	0.104	0.064	1 11/16	3 1/2	0.180	0.213	0.153
7/16	1	0.083	0.104	0.064	1 3/4	3 3/4	0.180	0.213	0.153
7/16	1 3/8	0.083	0.104	0.064	1 13/16	3 3/4	0.180	0.213	0.153
15/32	59/64	0.065	0.080	0.051	1 7/8	4	0.180	0.213	0.153
1/2	1 1/8	0.083	0.104	0.064	1 15/16	4	0.180	0.213	0.153
1/2	1 1/4	0.083	0.104	0.064	2	4 1/4	0.180	0.213	0.153
1/2	1 5/8	0.083	0.104	0.064	2 1/16	4 1/4	0.180	0.213	0.153
17/32	1 1/16	0.095	0.121	0.074	2 1/8	4 1/2	0.180	0.213	0.153
9/16	1 1/4	0.109	0.132	0.086	2 3/8	4 3/4	0.220	0.248	0.193
9/16	1 3/8	0.109	0.132	0.086	2 5/8	5	0.238	0.280	0.210
9/16	1 7/8	0.109	0.132	0.086	2 7/8	5 1/4	0.259	0.310	0.228
19/32	1 3/16	0.095	0.121	0.074	3 1/8	5 1/2	0.284	0.327	0.249
5/8	1 3/8	0.109	0.132	0.086	......	.....	......	.....	.....

All dimensions are given in inches.

[1] Tolerance is ±0.005 inch for inside diameters up to 7/32 inch, inclusive, and also for the two 1/4-inch inside diameters marked with an asterisk (*). Tolerance for all other inside diameters larger than 7/32 inch is ±0.010 inch.

[2] Tolerance is ±0.010 inch for all outside diameters.

VÒNG ĐỆM

WASHERS

BẢNG 2 : TIÊU CHUẨN MỸ VỀ VÒNG ĐỆM PHẲNG KIỂU B

Screw or Bolt Size[1]	Series[4]	Inside Diam.[2]	Outside Diam.[3]	Thickness Nom.	Thickness Max.	Thickness Min.	Screw or Bolt Size[1]	Series[4]	Inside Diam.[2]	Outside Diam.[3]	Thickness Nom.	Thickness Max.	Thickness Min.
.060	N	.068	1/8	.025	.028	.022	1/2	N	.540	1	.063	.071	.056
	R		3/16	.025	.028	.022		R		1 1/4	.100	.112	.090
	W		1/4	.025	.028	.022		W		1 3/4	.100	.112	.090
.073	N	.084	5/32	.025	.028	.022	9/16	N	.604	1 1/8	.063	.071	.056
	R		7/32	.025	.028	.022		R		1 15/32	.100	.112	.090
	W		9/32	.032	.036	.028		W		2	.100	.112	.090
.086	N	.094	3/16	.025	.028	.022	5/8	N	.666	1 1/4	.100	.112	.090
	R		1/4	.032	.036	.028		R		1 3/4	.100	.112	.090
	W		11/32	.032	.036	.028		W		2 1/4	.160	.174	.146
.099	N	.109	7/32	.025	.028	.022	3/4	N	.812	1 3/8	.100	.112	.090
	R		5/16	.032	.036	.028		R		2	.100	.112	.090
	W		13/32	.040	.045	.036		W		2 1/2	.160	.174	.146
.112	N	.125	1/4	.032	.036	.028	7/8	N	.938	1 15/32	.100	.112	.090
	R		3/8	.040	.045	.036		R		2 1/4	.160	.174	.146
	W		7/16	.040	.045	.036		W		2 3/4	.160	.174	.146
.125	N	.141	9/32	.032	.036	.028	1	N	1 1/16	1 3/4	.100	.112	.090
	R		13/32	.040	.045	.036		R		2 1/2	.160	.174	.146
	W		1/2	.040	.045	.036		W		3	.160	.174	.146
.138	N	.156	5/16	.032	.036	.028	1 1/8	N	1 3/16	2	.100	.112	.090
	R		7/16	.040	.045	.036		R		2 3/4	.160	.174	.146
	W		9/16	.040	.045	.036		W		3 1/4	.160	.174	.146
.164	N	.188	3/8	.040	.045	.036	1 1/4	N	1 5/16	2 1/4	.160	.174	.146
	R		1/2	.040	.045	.036		R		3	.160	.174	.146
	W		5/8	.063	.071	.056		W		3 1/2	.250	.266	.234
.190	N	.208	13/32	.040	.045	.036	1 3/8	N	1 7/16	2 1/2	.160	.174	.146
	R		9/16	.040	.045	.036		R		3 1/4	.160	.174	.146
	W		47/64	.063	.071	.056		W		3 3/4	.250	.266	.234
.216	N	.240	7/16	.040	.045	.036	1 1/2	N	1 9/16	2 3/4	.160	.174	.146
	R		5/8	.063	.071	.056		R		3 1/2	.250	.266	.234
	W		7/8	.063	.071	.056		W		4	.250	.266	.234
1/4	N	.281	1/2	.063	.071	.056	1 5/8	N	1 3/4	3	.160	.174	.146
	R		47/64	.063	.071	.056		R		3 3/4	.250	.266	.234
	W		1	.063	.071	.056		W		4 1/4	.250	.266	.234
5/16	N	.344	5/8	.063	.071	.056	1 3/4	N	1 7/8	3 1/4	.160	.174	.146
	R		7/8	.063	.071	.056		R		4	.250	.266	.234
	W		1 1/8	.063	.071	.056		W		4 1/2	.250	.266	.234
3/8	N	.406	47/64	.063	.071	.056	1 7/8	N	2	3 1/2	.250	.266	.234
	R		1	.063	.071	.056		R		4 1/4	.250	.266	.234
	W		1 1/4	.100	.112	.090		W		4 3/4	.250	.266	.234
7/16	N	.480	7/8	.063	.071	.056	2	N	2 1/8	3 3/4	.250	.266	.234
	R		1 1/8	.063	.071	.056		R		4 1/2	.250	.266	.234
	W		1 15/32	.100	.112	.090		W		5	.250	.266	.234

All dimensions in inches. The standard also includes data on washers for screw or bolt sizes 2 1/4 to 3 in., incl. [1] The .060-, .073-, .086-, .099-, .112-, .125-, .138-, .164-, .190-, and .216-inch sizes are also known as No. 0, 1, 2, 3, 4, 5, 6, 8, 10, and 12 sizes, respectively. [2] The inside diameter has a tolerance of −.005 in. for sizes .060 to .190 in., incl.; −.010 for sizes .216 to 7/8 in., incl.; and ±.010 in. for all other sizes. [3] The outside diameter has a tolerance of ±.005 in. for narrow series sizes .060 to 5/16 in., incl.; regular series sizes .060 to .216 in., incl.; and wide series sizes .060 to .164 in., incl. All other outside diameters have a tolerance of ±.010 in. [4] The letters N, R, W signify narrow, regular and wide, respectively.

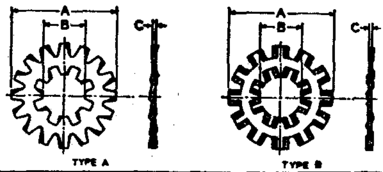
TIÊU CHUẨN MỸ VỀ VÒNG ĐỆM LÒ XO XOẮN

Nom. Size	Outside Diam. Max.				Inside Diam.	Clearance Bolt Size		Light		Med.		Heavy		Extra Heavy	
	Light	Med.	Heavy	Extra Heavy	Min.	Min.	Max.	Width	Thick-ness	Width	Thick-ness	Width	Thick-ness	Width	Thick-ness
0.086(No.2)	0.165	0.175	0.185	0.211	0.088	0.002	0.011	0.030	0.015	0.035	0.020	0.040	0.025	0.053	0.027
0.099(No.3)	0.188	0.198	0.212	0.242	0.101	0.002	0.011	0.035	0.020	0.040	0.025	0.047	0.031	0.062	0.034
0.112(No.4)	0.202	0.212	0.226	0.256	0.115	0.003	0.012	0.035	0.020	0.040	0.025	0.047	0.031	0.062	0.034
0.125(No.5)	0.225	0.239	0.255	0.303	0.128	0.003	0.012	0.040	0.025	0.047	0.031	0.055	0.040	0.079	0.045
0.138(No.6)	0.239	0.253	0.269	0.317	0.141	0.003	0.013	0.040	0.025	0.047	0.031	0.055	0.040	0.079	0.045
0.164(No.8)	0.280	0.296	0.310	0.378	0.168	0.004	0.014	0.047	0.031	0.055	0.040	0.062	0.047	0.096	0.057
0.190(No.10)	0.323	0.337	0.353	0.437	0.194	0.004	0.015	0.055	0.040	0.062	0.047	0.070	0.056	0.112	0.068
0.216(No.12)	0.364	0.380	0.394	0.500	0.221	0.005	0.016	0.062	0.047	0.070	0.056	0.077	0.063	0.130	0.080
1/4	0.489	0.493	0.495	0.539	0.255	0.005	0.017	0.107	0.047	0.109	0.062	0.110	0.077	0.132	0.084
5/16	0.575	0.591	0.601	0.627	0.319	0.006	0.020	0.117	0.056	0.125	0.078	0.130	0.097	0.143	0.108
3/8	0.678	0.688	0.696	0.746	0.382	0.007	0.023	0.136	0.070	0.141	0.094	0.145	0.115	0.170	0.123
7/16	0.780	0.784	0.792	0.844	0.446	0.008	0.026	0.154	0.085	0.156	0.109	0.160	0.133	0.186	0.143
1/2	0.877	0.879	0.889	0.945	0.509	0.009	0.029	0.170	0.099	0.171	0.125	0.176	0.151	0.204	0.162
9/16	0.975	0.979	0.989	1.049	0.573	0.010	0.032	0.186	0.113	0.188	0.141	0.193	0.170	0.223	0.182
5/8	1.082	1.086	1.100	1.164	0.636	0.011	0.035	0.201	0.126	0.203	0.156	0.210	0.189	0.242	0.202
11/16	1.178	1.184	1.200	1.266	0.700	0.012	0.038	0.216	0.138	0.219	0.172	0.227	0.207	0.260	0.221
3/4	1.277	1.279	1.299	1.369	0.763	0.013	0.041	0.233	0.153	0.234	0.188	0.244	0.226	0.279	0.241
13/16	1.375	1.377	1.401	1.473	0.827	0.014	0.044	0.249	0.168	0.250	0.203	0.262	0.246	0.298	0.261
7/8	1.470	1.474	1.504	1.586	0.890	0.015	0.047	0.264	0.179	0.266	0.219	0.281	0.266	0.322	0.285
15/16	1.562	1.570	1.604	1.698	0.954	0.016	0.050	0.277	0.191	0.281	0.234	0.298	0.284	0.345	0.308
1	1.656	1.672	1.716	1.810	1.017	0.017	0.053	0.289	0.202	0.297	0.250	0.319	0.306	0.366	0.330
1 1/16	1.746	1.768	1.820	1.922	1.081	0.018	0.056	0.301	0.213	0.312	0.266	0.338	0.326	0.389	0.352
1 1/8	1.837	1.865	1.921	2.031	1.144	0.019	0.059	0.314	0.224	0.328	0.281	0.356	0.345	0.411	0.375
1 3/16	1.923	1.963	2.021	2.137	1.208	0.020	0.062	0.324	0.234	0.344	0.297	0.373	0.364	0.431	0.396
1 1/4	2.012	2.058	2.126	2.244	1.271	0.021	0.065	0.336	0.244	0.359	0.312	0.393	0.384	0.452	0.417
1 5/16	2.098	2.156	2.226	2.350	1.335	0.022	0.068	0.346	0.254	0.375	0.328	0.410	0.403	0.472	0.438
1 3/8	2.183	2.253	2.325	2.453	1.398	0.023	0.071	0.356	0.264	0.391	0.344	0.427	0.422	0.491	0.458
1 7/16	2.269	2.349	2.421	2.555	1.462	0.024	0.074	0.366	0.273	0.406	0.359	0.442	0.440	0.509	0.478
1 1/2	2.352	2.446	2.518	2.654	1.525	0.025	0.077	0.375	0.282	0.422	0.375	0.458	0.458	0.526	0.496
1 5/8	2.509	.....	2.709	.....	1.650	0.025	0.077	0.391	0.344	.....	.....	0.491	0.458	.....	.....
1 3/4	2.634	.....	2.834	.....	1.775	0.025	0.077	0.391	0.344	.....	.....	0.491	0.458	.....	.....
1 7/8	2.763	.....	2.959	.....	1.900	0.025	0.077	0.393	0.384	.....	.....	0.491	0.458	.....	.....
2	2.888	.....	3.084	.....	2.025	0.025	0.077	0.393	0.384	.....	.....	0.491	0.458	.....	.....
2 1/4	3.206	.....	3.404	.....	2.275	0.025	0.077	0.427	0.422	.....	.....	0.526	0.496	.....	.....
2 1/2	3.456	.....	3.654	.....	2.525	0.025	0.077	0.427	0.422	.....	.....	0.526	0.496	.....	.....
2 3/4	3.768	.....	3.904	.....	2.775	0.025	0.077	0.458	0.458	.....	.....	0.526	0.496	.....	.....
3	4.018	.....	4.154	.....	3.025	0.025	0.077	0.458	0.458	.....	.....	0.526	0.496	.....	.....

TIÊU CHUẨN MỸ VỀ VÒNG ĐỆM KHÓA CÓ RĂNG TRONG - NGOÀI

AMERICAN STANDARD INTERNAL-EXTERNAL TOOTH LOCK WASHERS (ASA B27.1-1958)

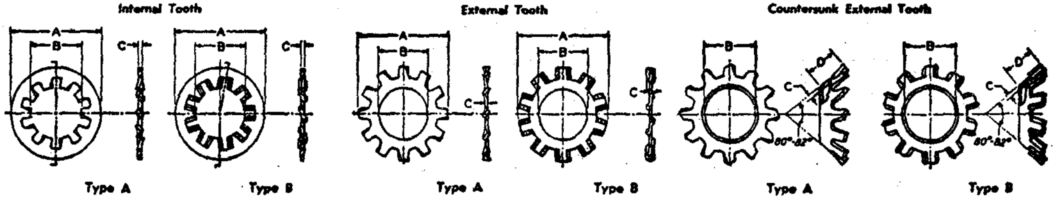
All dimensions are given in inches except whole numbers under "Size"



Size	A Outside Diameter Max.	A Outside Diameter Min.	B Inside Diameter Max.	B Inside Diameter Min.	C Thickness Max.	C Thickness Min.
No. 4	.475	.460	.123	.115	.021	.017
	.510	.495				
	.610	.580				
No. 6	.510	.495	.150	.141	.028	.023
	.610	.580				
	.690	.670				
No. 8	.610	.580	.176	.168	.034	.028
	.690	.670				
	.760	.740				
No. 10	.610	.580	.204	.195	.034	.028
	.690	.670	.204	.195	.040	.032
	.760	.740				
	.900	.880				
No. 12	.690	.670	.231	.221	.040	.032
	.760	.725				
	.900	.880				
	.985	.965	.231	.221	.045	.037
1/4	.760	.725	.267	.256	.040	.032
	.900	.880				
	.985	.965	.267	.256	.045	.037
	1.070	1.045				

Size	A Outside Diameter Max.	A Outside Diameter Min.	B Inside Diameter Max.	B Inside Diameter Min.	C Thickness Max.	C Thickness Min.
5/16	.900	.865	.332	.320	.040	.032
	.985	.965	.332	.320	.045	.037
	1.070	1.045	.332	.320	.050	.042
	1.155	1.130				
3/8	.985	.965	.398	.384	.045	.037
	1.070	1.045	.398	.384	.050	.042
	1.155	1.130				
	1.260	1.220				
7/16	1.070	1.045	.464	.448	.050	.042
	1.155	1.130				
	1.260	1.220	.464	.448	.055	.047
	1.315	1.290				
1/2	1.260	1.220	.530	.512	.055	.047
	1.315	1.290				
	1.410	1.380	.530	.512	.060	.052
	1.620	1.590	.530	.512	.067	.059
9/16	1.315	1.290	.596	.576	.055	.047
	1.430	1.380	.596	.576	.060	.052
	1.620	1.590	.596	.576	.067	.059
	1.830	1.797				
5/8	1.410	1.380	.663	.640	.060	.052
	1.620	1.590	.663	.640	.067	.059
	1.830	1.797				
	1.975	1.935				

TIÊU CHUẨN MỸ VỀ VÒNG ĐỆM CHỈ CÓ RĂNG TRONG VÀ CHỈ CÓ RĂNG NGOÀI



Internal Tooth Lock Washers

	Size	#2	#3	#4	#5	#6	#8	#10	#12	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	1	1 1/8	1 1/4
A	Max	0.200	0.232	0.270	0.280	0.295	0.340	0.381	0.410	0.478	0.610	0.692	0.789	0.900	0.985	1.071	1.166	1.245	1.315	1.410	1.637	1.830	1.975
	Min	0.175	0.215	0.255	0.245	0.275	0.325	0.365	0.394	0.460	0.594	0.670	0.740	0.867	0.957	1.045	1.130	1.220	1.290	1.364	1.590	1.799	1.921
B	Max	0.095	0.109	0.123	0.136	0.150	0.176	0.204	0.231	0.267	0.332	0.398	0.464	0.530	0.596	0.663	0.728	0.795	0.861	0.927	1.060	1.192	1.325
	Min	0.089	0.102	0.115	0.129	0.141	0.168	0.195	0.221	0.256	0.320	0.384	0.448	0.512	0.576	0.640	0.704	0.769	0.832	0.894	1.019	1.144	1.275
C	Max	0.015	0.019	0.019	0.021	0.021	0.023	0.025	0.025	0.028	0.034	0.040	0.040	0.045	0.045	0.050	0.050	0.055	0.055	0.060	0.067	0.067	0.067
	Min	0.010	0.012	0.015	0.017	0.017	0.018	0.020	0.020	0.023	0.028	0.032	0.032	0.037	0.037	0.042	0.042	0.047	0.047	0.052	0.059	0.059	0.059

External Tooth Lock Washers

	Size	#2	#3	#4	#5	#6	#8	#10	#12	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	1	1 1/8	1 1/4
A	Max	.....	.....	0.260	.....	0.320	0.381	0.410	0.475	0.510	0.610	0.694	0.760	0.900	0.985	1.070	1.155	1.260	1.315	1.410	1.620	.....	.....
	Min	.....	.....	0.245	.....	0.305	0.365	0.395	0.460	0.494	0.588	0.670	0.740	0.880	0.960	1.045	1.130	1.220	1.290	1.380	1.590	.....	.....
B	Max	.....	.....	0.123	.....	0.150	0.176	0.204	0.231	0.267	c.332	0.398	0.464	0.530	0.596	0.663	0.728	0.795	0.861	0.927	1.060	.....	.....
	Min	.....	.....	0.115	.....	0.141	0.168	0.195	0.221	0.256	0.320	0.384	0.448	0.513	0.576	0.641	0.704	0.768	0.833	0.897	1.025	.....	.....
C	Max	.....	.....	0.019	.....	0.022	0.023	0.025	0.028	0.028	0.034	0.040	0.040	0.045	0.045	0.050	0.050	0.055	0.055	0.060	0.067	.....	.....
	Min	.....	.....	0.015	.....	0.016	0.018	0.020	0.023	0.023	0.028	0.032	0.032	0.037	0.037	0.042	0.042	0.047	0.047	0.052	0.059	.....	.....

Heavy Internal Tooth Lock Washers

	Size	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8
A	Max	0.536	0.607	0.748	0.858	0.924	1.034	1.135	1.265	1.447
	Min	0.500	0.590	0.700	0.800	0.880	0.990	1.100	1.240	1.400
B	Max	0.267	0.332	0.398	0.464	0.530	0.596	0.663	0.795	0.927
	Min	0.256	0.320	0.384	0.448	0.512	0.576	0.640	0.768	0.894
C	Max	0.045	0.050	0.050	0.067	0.067	0.067	0.067	0.084	0.084
	Min	0.035	0.040	0.042	0.050	0.055	0.055	0.059	0.070	0.075

Countersunk External Tooth Lock Washers

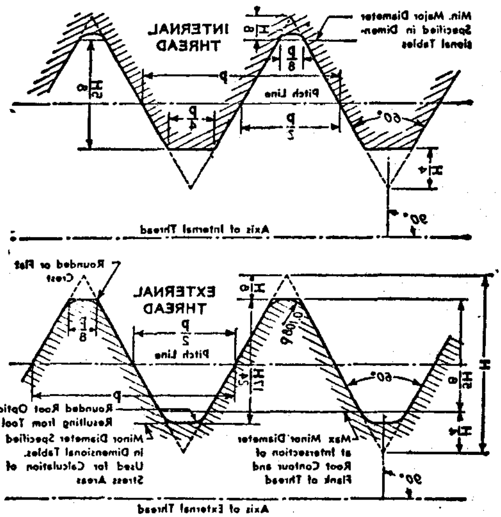
	Size	#4	#6	#8	#10	#12	1/4	#16	5/16	3/8	7/16	1/2
B	Max	0.123	0.150	0.177	0.205	0.231	0.267	0.287	0.333	0.398	0.463	0.529
	Min	0.113	0.140	0.167	0.195	0.220	0.255	0.273	0.318	0.383	0.448	0.512
C	Max	0.019	0.021	0.021	0.025	0.025	0.025	0.028	0.028	0.034	0.045	0.045
	Min	0.015	0.017	0.017	0.020	0.020	0.020	0.023	0.023	0.028	0.037	0.037
D	Max	0.065	0.092	0.105	0.099	0.128	0.128	0.147	0.192	0.255	0.270	0.304
	Min	0.050	0.082	0.088	0.083	0.118	0.113	0.137	0.165	0.242	0.260	0.294

All dimensions are given in inches.

TIÊU CHUẨN MỸ VỀ DẠNG REN TRONG VÀ REN NGOÀI THỐNG NHẤT

AMERICAN STANDARD UNIFIED INTERNAL AND EXTERNAL SCREW THREAD DESIGN FORMST

(maximum material condition)



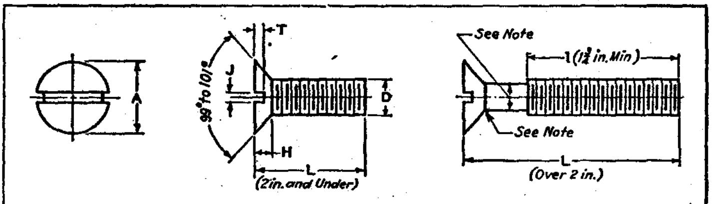
(H = height of sharp V-thread = 0.86603 × pitch)

Pitch = 1 / No. of threads per inch	Crest truncation, external thread = 0.10825 × pitch = H ÷ 8
Depth, external thread = 0.61343 × pitch = 17H ÷ 24	Crest truncation, internal thread = 0.21651 × pitch = H ÷ 4
Depth, internal thread = 0.54127 × pitch = 5H ÷ 8	*Root truncation, external thread = 0.14434 × pitch = H ÷ 6
Flat at crest, external thread = 0.125 × pitch	Root truncation, internal thread = 0.10825 × pitch = H ÷ 8
Flat at crest, internal thread = 0.25 × pitch	Addendum, external thread = 0.32476 × pitch = 3H ÷ 8
Flat at root, internal thread = 0.125 × pitch	

† For numerical values given by the formulas, see Table 1.
* Used in calculating minor diameter and stress area values in the accompanying tables. See stress area formulas on page 1051.

BẢNG 1 : TIÊU CHUẨN MỸ VỀ VIT ĐẦU BẰNG 100 ĐỘ CÓ RÃNH

Table 1. AMERICAN STANDARD SLOTTED 100-DEGREE FLAT HEAD MACHINE SCREWS (ASA B18.6.3-1962)

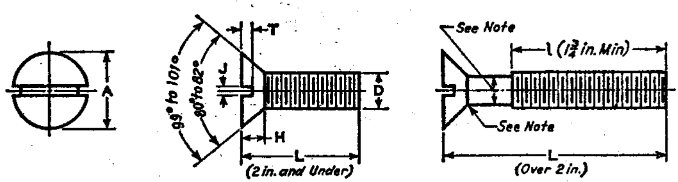


Nom. Size	Basic D	Max. A Sharp	Min. A Sharp	Abs. Min. A	Max. H	Max. J	Min. J	Max. T	Min. T
4	.1120	.225	.207	.191	.049	.039	.031	.024	.017
6	.1380	.279	.257	.238	.060	.048	.039	.030	.022
8	.1640	.332	.308	.285	.072	.054	.045	.036	.027
10	.1900	.385	.359	.333	.083	.060	.050	.042	.031
1/4	.2500	.507	.477	.442	.110	.075	.064	.055	.042
5/16	.3125	.635	.600	.556	.138	.084	.072	.069	.053
3/8	.3750	.762	.722	.670	.165	.094	.081	.083	.065

All dimensions in inches. Edges of head may be rounded. Radius of fillet at base of head should be no greater than 40 per cent of the basic screw diameter. Diameter of unthreaded part should not be less than minimum pitch diameter nor more than the basic major diameter of thread.

BẢNG 2 : TIÊU CHUẨN MỸ VỀ DUNG SAI VIT ĐẦU BẰNG 100 ĐỘ VÀ VIT ĐẦU BẰNG CÓ RÃNH

Table 2. AMERICAN STANDARD SLOTED CLOSE TOLERANCE 100-DEGREE FLAT HEAD AND SLOTTED FLAT HEAD MACHINE SCREWS (ASA B18.6.3-1962)



Close Tolerance 100-Degree Flat Head Machine Screws

Nom. Size	Basic *D*	Max. *A* Sharp	Min. *A* Sharp	Abs. Min. *A*	Max. *H*	Max. *J*	Min. *J*	Max. *T*	Min. *T*
4	.1120	.225	.215	.191	.049	.039	.031	.024	.017
6	.1380	.279	.267	.238	.060	.048	.039	.030	.022
8	.1640	.332	.319	.285	.072	.054	.045	.036	.027
10	.1900	.385	.371	.333	.083	.060	.050	.042	.031
¼	.2500	.507	.491	.442	.110	.075	.064	.055	.042
5/16	.3125	.635	.616	.556	.138	.084	.072	.069	.053
3/8	.3750	.762	.741	.670	.165	.094	.081	.083	.065
7/16	.4375	.890	.866	.783	.193	.094	.081	.097	.076
½	.5000	1.017	.991	.897	.221	.106	.091	.111	.088
9/16	.5625	1.145	1.116	1.011	.249	.118	.102	.125	.099
5/8	.6250	1.272	1.241	1.124	.276	.133	.116	.139	.111

Flat Head Machine Screws*

Nom. Size	Basic *D*	Max. *A* Sharp	Min. *A* Sharp	Abs. Min. *A*	Max. *H*	Max. *J*	Min. *J*	Max. *T*	Min. *T*
0	.0600	.119	.105	.099	.035	.023	.016	.015	.010
1	.0730	.146	.130	.123	.043	.026	.019	.019	.012
2	.0860	.172	.156	.147	.051	.031	.023	.023	.015
3	.0990	.199	.181	.171	.059	.035	.027	.027	.017
4	.1120	.225	.207	.195	.067	.039	.031	.030	.020
5	.1250	.252	.232	.220	.075	.043	.035	.034	.022
6	.1380	.279	.257	.244	.083	.048	.039	.038	.024
8	.1640	.332	.308	.292	.100	.054	.045	.045	.029
10	.1900	.385	.359	.340	.116	.060	.050	.053	.034
12	.2160	.438	.410	.389	.132	.067	.056	.060	.039
¼	.2500	.507	.477	.452	.153	.075	.064	.070	.046
5/16	.3125	.635	.600	.568	.191	.084	.072	.088	.058
3/8	.3750	.762	.722	.685	.230	.094	.081	.106	.070
7/16	.4375	.812	.767	.723	.223	.094	.081	.103	.066
½	.5000	.875	.831	.775	.223	.106	.091	.103	.065
9/16	.5625	1.000	.950	.889	.260	.118	.102	.120	.077
5/8	.6250	1.125	1.069	1.002	.298	.133	.116	.137	.088
¾	.7500	1.375	1.306	1.230	.372	.149	.131	.171	.111

All dimensions in inches.
Edges of head may be rounded.
Radius of fillet at base of head should be no greater than 40 per cent of the basic screw diameter.
Diameter of unthreaded part should not be less than minimum pitch diameter nor more than the basic major diameter of thread.
* Has 80 to 82 degree head angle. Short flat head machine screws are undercut. See Table 3 on page 1064 for limiting lengths of undercut screws and their dimensions.

BẢNG 1 : CÁC THÔNG SỐ DẠNG REN THỐNG NHẤT THEO TIÊU CHUẨN MỸ

Threads per Inch	Pitch	Depth of Sharp V-Thread	Depth of External Thread	Depth of Internal Thread	Depth of Thread Engagement	Flat at External Thread Crest	Truncation of External Thread Crest	Truncation of External Thread Root	Flat at Internal Thread Crest	Truncation of Internal Thread Crest	Flat at Internal Thread Root	Truncation of Internal Thread Root	Addendum of External Thread
n	p	$0.86603p$	$0.61343p$	$0.54127p$	$0.54127p$	$0.125p$	$0.10825p$	$0.14434p$	$0.25p$	$0.21651p$	$0.125p$	$0.10825p$	$0.32476p$
80	0.01250	0.01083	0.00767	0.00677	0.00677	0.00156	0.00135	0.00180	0.00312	0.00271	0.00156	0.00135	0.00406
72	0.01389	0.01203	0.00852	0.00752	0.00752	0.00174	0.00150	0.00200	0.00347	0.00301	0.00174	0.00150	0.00451
64	0.01563	0.01353	0.00958	0.00846	0.00846	0.00195	0.00169	0.00226	0.00391	0.00338	0.00195	0.00169	0.00507
56	0.01786	0.01546	0.01095	0.00967	0.00967	0.00223	0.00193	0.00258	0.00446	0.00387	0.00223	0.00193	0.00580
48	0.02083	0.01804	0.01278	0.01128	0.01128	0.00260	0.00226	0.00301	0.00521	0.00451	0.00260	0.00226	0.00677
44	0.02273	0.01968	0.01394	0.01230	0.01230	0.00284	0.00246	0.00328	0.00568	0.00492	0.00284	0.00246	0.00738
40	0.02500	0.02165	0.01534	0.01353	0.01353	0.00312	0.00271	0.00361	0.00625	0.00541	0.00312	0.00271	0.00812
36	0.02778	0.02406	0.01704	0.01504	0.01504	0.00347	0.00301	0.00401	0.00694	0.00601	0.00347	0.00301	0.00902
32	0.03125	0.02706	0.01917	0.01691	0.01691	0.00391	0.00338	0.00451	0.00781	0.00677	0.00391	0.00338	0.01015
28	0.03571	0.03093	0.02191	0.01933	0.01933	0.00446	0.00387	0.00515	0.00893	0.00773	0.00446	0.00387	0.01160
24	0.04167	0.03608	0.02556	0.02255	0.02255	0.00521	0.00451	0.00601	0.01042	0.00902	0.00521	0.00451	0.01353
20	0.05000	0.04330	0.03067	0.02706	0.02706	0.00625	0.00541	0.00722	0.01250	0.01083	0.00625	0.00541	0.01624
18	0.05556	0.04811	0.03408	0.03007	0.03007	0.00694	0.00601	0.00802	0.01389	0.01203	0.00694	0.00601	0.01804
16	0.06250	0.05413	0.03834	0.03383	0.03383	0.00781	0.00677	0.00902	0.01562	0.01353	0.00781	0.00677	0.02030
14	0.07143	0.06186	0.04382	0.03866	0.03866	0.00893	0.00773	0.01031	0.01786	0.01546	0.00893	0.00773	0.02320
13	0.07692	0.06662	0.04719	0.04164	0.04164	0.00962	0.00833	0.01110	0.01923	0.01665	0.00962	0.00833	0.02498
12	0.08333	0.07217	0.05112	0.04511	0.04511	0.01042	0.00902	0.01203	0.02083	0.01804	0.01042	0.00902	0.02706
11½	0.08696	0.07531	0.05334	0.04707	0.04707	0.01087	0.00941	0.01255	0.02174	0.01883	0.01087	0.00941	0.02824
11	0.09091	0.07873	0.05577	0.04921	0.04921	0.01136	0.00984	0.01312	0.02273	0.01968	0.01136	0.00984	0.02952
10	0.10000	0.08660	0.06134	0.05413	0.05413	0.01250	0.01083	0.01443	0.02500	0.02165	0.01250	0.01083	0.03248
9	0.11111	0.09623	0.06816	0.06014	0.06014	0.01389	0.01203	0.01604	0.02778	0.02406	0.01389	0.01203	0.03608
8	0.12500	0.10825	0.07668	0.06766	0.06766	0.01562	0.01353	0.01804	0.03125	0.02706	0.01562	0.01353	0.04059
7	0.14286	0.12372	0.08763	0.07732	0.07732	0.01786	0.01546	0.02062	0.03571	0.03093	0.01786	0.01546	0.04639
6	0.16667	0.14434	0.10224	0.09021	0.09021	0.02083	0.01804	0.02406	0.04167	0.03608	0.02083	0.01804	0.05413
5	0.20000	0.17321	0.12269	0.10825	0.10825	0.02500	0.02165	0.02887	0.05000	0.04330	0.02500	0.02165	0.06495
4½	0.22222	0.19245	0.13632	0.12028	0.12028	0.02778	0.02406	0.03208	0.05556	0.04811	0.02778	0.02406	0.07217
4	0.25000	0.21651	0.15336	0.13532	0.13532	0.03125	0.02706	0.03608	0.06250	0.05413	0.03125	0.02706	0.08119

Twice the external thread addendum (last column) is equivalent to the "basic height" of the original American National form.

BẢNG 2 : TỔNG LƯỢNG BƯỚC ĐƯỜNG KÍNH CỦA CHUỖI TIÊU CHUẨN CÁC REN THỐNG NHẤT

Table 2. DIAMETER-PITCH COMBINATIONS FOR STANDARD SERIES OF UNIFIED THREADS

Sizes†	Basic Major Diam.	Threads per Inch: Series with Graded Pitches: Coarse UNC	Fine[a] UNF	Extra-fine[b] UNEF	Series with Uniform (Constant) Pitches: 4UN	6UN	8UN	12UN	16UN	20UN	28UN	32UN
0	0.0600	..	80	..	..	..	..	..	..	..	..	..
(1)	0.0730	64	72	..	..	..	..	..	..	..	..	..
2	0.0860	56	64	..	..	..	..	..	..	..	..	..
(3)	0.0990	48	56	..	..	..	..	..	..	..	..	..
4	0.1120	40	48	..	..	..	..	..	..	..	..	..
5	0.1250	40	44	..	..	..	..	..	..	..	..	..
6	0.1380	32	40	..	..	..	..	..	..	..	..	UNC
8	0.1640	32	36	..	..	..	..	..	..	..	..	UNC
10	0.1900	24	32	..	..	..	..	..	..	..	..	UNF
(12)	0.2160	24	28	32	..	..	..	..	..	..	UNF	UNEF
¼	0.2500	20	28	32	..	..	..	..	..	UNC	UNF	UNEF
5/16	0.3125	18	24	32	..	..	..	..	..	20	28	UNEF
⅜	0.3750	16	24	32	..	..	..	..	UNC	20	28	UNEF
7/16	0.4375	14	20	28	..	..	..	..	16	UNF	UNEF	32
½	0.5000	13	20	28	..	..	..	..	16	UNF	UNEF	32
9/16	0.5625	12	18	24	..	..	..	UNC	16	20	28	32
⅝	0.6250	11	18	24	..	..	..	12	16	20	28	32
(11/16)	0.6875	..	..	24	..	..	..	12	16	20	28	32
¾	0.7500	10	16	20	..	..	..	12	UNF	UNEF	28	32
(13/16)	0.8125	..	..	20	..	..	..	12	16	UNEF	28	32
⅞	0.8750	9	14	20	..	..	..	12	16	UNEF	28	32
(15/16)	0.9375	..	..	20	..	..	..	12	16	UNEF	28	32
1	1.0000	8	12	20	..	..	UNC	UNF	16	UNEF	28	32
(1 1/16)	1.0625	..	..	18	..	..	8	12	16	20	28	..
1⅛	1.1250	7	12	18	..	..	8	UNF	16	20	28	..
(1 3/16)	1.1875	..	..	18	..	..	8	12	16	20	28	..
1¼	1.2500	7	12	18	..	..	8	UNF	16	20	28	..
(1 5/16)	1.3125	..	..	18	..	..	8	12	16	20	28	..
1⅜	1.3750	6	12	18	..	UNC	8	UNF	16	20	28	..
(1 7/16)	1.4375	..	..	18	..	6	8	12	16	20	28	..
1½	1.5000	6	12	18	..	UNC	8	UNF	16	20	28	..
(1 9/16)	1.5625	..	..	18	..	6	8	12	16	20	..	..
1⅝	1.6250	..	..	18	..	6	8	12	16	20	..	..
(1 11/16)	1.6875	..	..	18	..	6	8	12	16	20	..	..
1¾	1.7500	5	..	..	..	6	8	12	16	20	..	..
(1 13/16)	1.8125	..	..	..	..	6	8	12	16	20	..	..
1⅞	1.8750	..	..	..	..	6	8	12	16	20	..	..
(1 15/16)	1.9375	..	..	..	..	6	8	12	16	20	..	..
2	2.0000	4½	..	..	..	6	8	12	16	20	..	..
(2⅛)	2.1250	..	..	..	..	6	8	12	16	20	..	..
2¼	2.2500	4½	..	..	..	6	8	12	16	20	..	..
(2⅜)	2.3750	..	..	..	..	6	8	12	16	20	..	..
2½	2.5000	4	..	..	UNC	6	8	12	16	20	..	..
(2⅝)	2.6250	..	..	..	4	6	8	12	16	20	..	..
2¾	2.7500	4	..	..	UNC	6	8	12	16	20	..	..
(2⅞)	2.8750	..	..	..	4	6	8	12	16	20	..	..
3	3.0000	4	..	..	UNC	6	8	12	16	20	..	..
(3⅛)	3.1250	..	..	..	4	6	8	12	16	..	..	..
3¼	3.2500	4	..	..	UNC	6	8	12	16	..	..	..
(3⅜)	3.3750	..	..	..	4	6	8	12	16	..	..	..
3½	3.5000	4	..	..	UNC	6	8	12	16	..	..	..
(3⅝)	3.6250	..	..	..	4	6	8	12	16	..	..	..
3¾	3.7500	4	..	..	UNC	6	8	12	16	..	..	..
(3⅞)	3.8750	..	..	..	4	6	8	12	16	..	..	..
4	4.0000	4	..	..	UNC	6	8	12	16	..	..	..

* Dimensions of these Standard Series threads for sizes up to 4 inches are given in Table 4.
† Sizes shown in parentheses are secondary sizes. Primary sizes of 4¼, 4½, 4¾, 5, 5¼, 5½, 5¾ and 6 inches also are in the 4, 6, 8, 12, and 16 thread series; secondary sizes of 4⅛, 4⅜, 4⅝, 4⅞, 5⅛, 5⅜, 5⅝, and 5⅞ also are in the 4, 6, 8, 12, and 16 thread series.
[a] For diameters over 1½ inches, use 12-thread series.
[b] For diameters over 1 11/16 inches, use 16-thread series.

BẢNG 3A : CÁC KÍCH THƯỚC CƠ BẢN CỦA CHUỖI REN THÔ, REN UNC VÀ REN NC

Table 3A. COARSE-THREAD SERIES, UNC AND NC - BASIC DIMENSIONS

Sizes	Basic Major Diam., D	Thds. per Inch, n	Basic Pitch Diam.,[a] E	Minor Diameter[c] Ext. Thds., K_s	Minor Diameter[c] Int. Thds., K_n	Lead Angle at Basic P.D. Deg.	Lead Angle at Basic P.D. Min.	Area of Minor Diam. at $D-2h_b$	Tensile Stress Area[b]
	Inches		Inches	Inches	Inches	Deg.	Min.	Sq. In.	Sq. In.
1 (.073)*	0.0730	64	0.0629	0.0538	0.0561	4	31	0.00218	0.00263
2 (.086)	0.0860	56	0.0744	0.0641	0.0667	4	22	0.00310	0.00370
3 (.099)*	0.0990	48	0.0855	0.0734	0.0764	4	26	0.00406	0.00487
4 (.112)	0.1120	40	0.0958	0.0813	0.0849	4	45	0.00496	0.00604
5 (.125)	0.1250	40	0.1088	0.0943	0.0979	4	11	0.00672	0.00796
6 (.138)	0.1380	32	0.1177	0.0997	0.1042	4	50	0.00745	0.00909
8 (.164)	0.1640	32	0.1437	0.1257	0.1302	3	58	0.01196	0.0140
10 (.190)	0.1900	24	0.1629	0.1389	0.1449	4	39	0.01450	0.0175
12 (.216)*	0.2160	24	0.1889	0.1649	0.1709	4	1	0.0206	0.0242
1/4	0.2500	20	0.2175	0.1887	0.1959	4	11	0.0269	0.0318
5/16	0.3125	18	0.2764	0.2443	0.2524	3	40	0.0454	0.0524
3/8	0.3750	16	0.3344	0.2983	0.3073	3	24	0.0678	0.0775
7/16	0.4375	14	0.3911	0.3499	0.3602	3	20	0.0933	0.1063
1/2	0.5000	13	0.4500	0.4056	0.4167	3	7	0.1257	0.1419
9/16	0.5625	12	0.5084	0.4603	0.4723	2	59	0.162	0.182
5/8	0.6250	11	0.5660	0.5135	0.5266	2	56	0.202	0.226
3/4	0.7500	10	0.6850	0.6273	0.6417	2	40	0.302	0.334
7/8	0.8750	9	0.8028	0.7387	0.7547	2	31	0.419	0.462
1	1.0000	8	0.9188	0.8466	0.8647	2	29	0.551	0.606
1 1/8	1.1250	7	1.0322	0.9497	0.9704	2	31	0.693	0.763
1 1/4	1.2500	7	1.1572	1.0747	1.0954	2	15	0.890	0.969
1 3/8	1.3750	6	1.2667	1.1705	1.1946	2	24	1.054	1.155
1 1/2	1.5000	6	1.3917	1.2955	1.3196	2	11	1.294	1.405
1 3/4	1.7500	5	1.6201	1.5046	1.5335	2	15	1.74	1.90
2	2.0000	4 1/2	1.8557	1.7274	1.7594	2	11	2.30	2.50
2 1/4	2.2500	4 1/2	2.1057	1.9774	2.0094	1	55	3.02	3.25
2 1/2	2.5000	4	2.3376	2.1933	2.2294	1	57	3.72	4.00
2 3/4	2.7500	4	2.5876	2.4433	2.4794	1	46	4.62	4.93
3	3.0000	4	2.8376	2.6933	2.7294	1	36	5.62	5.97
3 1/4	3.2500	4	3.0876	2.9433	2.9794	1	29	6.72	7.10
3 1/2	3.5000	4	3.3376	3.1933	3.2294	1	22	7.92	8.33
3 3/4	3.7500	4	3.5876	3.4133	3.4794	1	16	9.21	9.66
4	4.0000	4	3.8376	3.6933	3.7294	1	11	10.61	11.08

* Secondary sizes.
[a] British: Effective Diameter.
[b] See formula, page 1051.
[c] Design form. See diagram, page 1107.

Constant Pitch Series: The various constant-pitch series, UN, with 4, 6, 8, 12, 16, 20, 28 and 32 threads per inch, given in Table 4, offer a comprehensive range of diameter-pitch combinations for those purposes where the threads in the Coarse, Fine, and Extra-Fine series do not meet the particular requirements of the design.

When selecting threads from these constant-pitch series, preference should be given wherever possible to those tabulated in the 8, 12, or 16 thread series.

8-Thread Series: The 8-thread series (8UN) is a uniform-pitch series for large diameters. Although originally intended for high-pressure-joint bolts and nuts, it is now widely used as a substitute for the Coarse-Thread Series for diameters larger than 1 inch.

12-Thread Series: The 12-thread series (12UN) is a uniform pitch series for large diameters requiring threads of medium-fine pitch. Although originally intended for boiler practice, it is now used as a continuation of the Fine-Thread Series for diameters larger than 1½ inches.

BẢNG 3B : CÁC KÍCH THƯỚC CƠ BẢN CỦA CHUỖI REN MỊN, REN UNP VÀ REN NF

Table 3B. FINE-THREAD SERIES, UNF AND NF - BASIC DIMENSIONS

Sizes	Basic Major Diam., D	Thds. per Inch, n	Basic Pitch Diam.,[a] E	Minor Diameter[c]		Lead Angle at Basic P.D.		Area of Minor Diam. at D-$2h_b$	Tensile Stress Area[b]
				Ext. Thds., K_s	Int. Thds., K_n				
	Inches		Inches	Inches	Inches	Deg.	Min.	Sq. In.	Sq. In.
0 (.060)	0.0600	80	0.0519	0.0447	0.0465	4	23	0.00151	0.00180
1 (.073)*	0.0730	72	0.0640	0.0560	0.0580	3	57	0.00237	0.00278
2 (.086)	0.0860	64	0.0759	0.0668	0.0691	3	45	0.00339	0.00394
3 (.099)*	0.0990	56	0.0874	0.0771	0.0797	3	43	0.00451	0.00523
4 (.112)	0.1120	48	0.0985	0.0864	0.0894	3	51	0.00566	0.00661
5 (.125)	0.1250	44	0.1102	0.0971	0.1004	3	45	0.00716	0.00830
6 (.138)	0.1380	40	0.1218	0.1073	0.1109	3	44	0.00874	0.01015
8 (.164)	0.1640	36	0.1460	0.1299	0.1339	3	28	0.01285	0.01474
10 (.190)	0.1900	32	0.1697	0.1517	0.1562	3	21	0.0175	0.0200
12 (.216)*	0.2160	28	0.1928	0.1722	0.1773	3	22	0.0226	0.0258
1/4	0.2500	28	0.2268	0.2062	0.2113	2	52	0.0326	0.0364
5/16	0.3125	24	0.2854	0.2614	0.2674	2	40	0.0524	0.0580
3/8	0.3750	24	0.3479	0.3239	0.3299	2	11	0.0809	0.0878
7/16	0.4375	20	0.4050	0.3762	0.3834	2	15	0.1090	0.1187
1/2	0.5000	20	0.4675	0.4387	0.4459	1	57	0.1486	0.1599
9/16	0.5625	18	0.5264	0.4943	0.5024	1	55	0.189	0.203
5/8	0.6250	18	0.5889	0.5568	0.5649	1	43	0.240	0.256
3/4	0.7500	16	0.7094	0.6733	0.6823	1	36	0.351	0.373
7/8	0.8750	14	0.8286	0.7874	0.7977	1	34	0.480	0.509
1	1.0000	12	0.9459	0.8978	0.9098	1	36	0.625	0.663
1 1/8	1.1250	12	1.0709	1.0228	1.0348	1	25	0.812	0.856
1 1/4	1.2500	12	1.1959	1.1478	1.1598	1	16	1.024	1.073
1 3/8	1.3750	12	1.3209	1.2728	1.2848	1	9	1.260	1.315
1 1/2	1.5000	12	1.4459	1.3978	1.4098	1	3	1.521	1.581

* Secondary sizes.
[a] British: Effective Diameter.
[b] See formula, page 1051.
[c] Design form. See diagram, page 1107.

16-Thread Series: The 16-thread series (16UN) is a uniform pitch series for large diameters requiring fine-pitch threads. It is suitable for adjusting collars and retaining nuts, and also serves as a continuation of the Extra-fine Thread Series for diameters larger than 1 11/16 inches.

4-, 6-, 20-, 28-, and 32-Thread Series: These thread series have been used more or less widely in industry for various applications where the Standard Coarse, Fine or Extra-fine Series were not as applicable. They are now given recognition as Standard Unified Thread Series in a specified selection of diameters for each pitch as shown in Table 2.

Whenever a thread in a constant-pitch series also appears in the UNC, UNF, or UNEF series, the symbols and tolerances for limits of size of UNC, UNF, or UNEF series are applicable, as will be seen in Tables 2 and 4.

Fine Threads for Thin-Wall Tubing: Dimensions for a 27-thread series, ranging from 1/4- to 1-inch nominal size, also are included in Table 4. These threads are recommended for general use on thin-wall tubing. The minimum length of complete thread is one-third of the basic major diameter plus 5 threads (+0.185 in.).

High-Temperature, High-Strength Applications: For these applications the Coarse Thread Series is recommended in sizes from 1/4 to 1 inch and the 8-thread Series in sizes over 1 inch. Some high-temperature applications involving special physical characteristics or conditions may require modification of dimensions, and it is recommended that when such are necessary they be applied to the external thread.

MEASUREMENTS

ĐO LƯỜNG

1. *Các ký hiệu chuẩn về cơ khí, kỹ thuật xây dựng và vật liệu thử nghiệm.*

2. *Đo lường theo hệ Mét và hệ các nước Anh Mỹ .*

American Standard Symbols for Mechanics, Structural Engineering and Testing Materials

Acceleration, angular	α (alpha)
Acceleration, due to gravity	g
Acceleration, linear	a
Angular distance	θ (theta)
Angular velocity	ω (omega)
Area	A
Axes, through any point	X-X, Y-Y, Z-Z
Breadth	b
Center of rotation	O
Coefficient of sliding friction	f
Concentrated load (same as force)	F
Constants	C
Curvature, radius of	ρ (rho)
Deflection	y
Deflection of a panel point of a truss	Δ (delta)
Density	ρ (rho) or d
Depth	d
Diameter	D
Distance, linear	s
Eccentricity of application of load	e
Efficiency (hydraulic, mechanical, volumetric)	e_h, e_m, e_v
Elasticity, modulus of	E
Elongation, unit	δ (delta)
Force	F
Force in any bar of a framed structure due to a load of unity applied at any point in any direction	u
Frequency (harmonic motion)	f or n
Gyration, radius of	k
Head	H or h
Height	h
Inertia, rectangular moment of	I
Inertia, polar moment of	J
Length	L
Load per unit distance	w
Load, total	W
Mass	m
Modulus of rupture	R
Moment in inch-pounds at any section of a girder due to the moment of one inch-pound applied to the girder at any point	m
Moment of force, including bending moment	M
Neutral axis, distance to extreme fiber	c
Number of revolutions per unit of time	n
Period (harmonic motion)	T
Power, horsepower	P
Pressure per unit of area	p
Radius	r
Ratio between modulus of elasticity of steel and modulus of elasticity of concrete	n
Ratio of the distance from the neutral axis to the outer fiber of a reinforced concrete beam to the distance from the outer fiber to the point of application of the resultant tensile stress	k
Ratio of the lever arm of the resisting couple in a reinforced concrete beam to the distance between the outer compressive fiber and the point of application of the resultant tensile stress	j
Reactions	R
Section modulus	Z or S
Statical moment of any area about a given axis	Q
Steel ratio, in reinforced concrete beams	p
Stress, unit	s
Stress, unit compressive	s_c
Stress, unit tensile	s_t
Stress, unit shear	s_s
Stress, total tensile or total steel, in reinforced concrete	T
Stress, total compressive or total concrete, in reinforced concrete	C
Stress, total shear	V
Stress, unit concrete, in reinforced concrete	f_c
Stress, unit steel, in reinforced concrete	f_s
Stress, unit shear of concrete	v
Temperature, absolute	T
Temperature, ordinary	t
Thickness	d or t
Time	t
Torque	T
Velocity, linear	V or v
Volume	V
Work, or energy	W

Approved by American Standards Association and sponsored by the American Society of Mechanical Engineers; American Association for the Advancement of Science; American Institute of Electrical Engineers; American Society of Civil Engineers; Society for the Promotion of Engineering Education.

WEIGHTS AND MEASURES

Measures of Length

1 mile = 1760 yards = 5280 feet.
1 yard = 3 feet = 36 inches. 1 foot = 12 inches.
1 mil = 0.001 inch. 1 fathom = 2 yards = 6 feet.
1 rod = 5.5. yards = 16.5 feet. 1 hand = 4 inches. 1 span = 9 inches.
1 micro-inch = one millionth inch or 0.000001 inch. (1 micron = one millionth meter = 0.00003937 inch.)

Surveyor's Measure

1 mile = 8 furlongs = 80 chains.
1 furlong = 10 chains = 220 yards.
1 chain = 4 rods = 22 yards = 66 feet = 100 links.
1 link = 7.92 inches.

Nautical Measure

1 league = 3 nautical miles.
1 nautical mile = 6076.10 feet = 1.1508 statute miles. (The *knot*, which is a nautical unit of speed, is equivalent to a speed of 1 nautical mile per hour.)
One degree at the equator = 60 nautical miles = 69.047 statute miles. 360 degrees = 21,600 nautical miles = 24,856.8 statute miles = circumference at equator.

Square Measure

1 square mile = 640 acres = 6400 square chains.
1 acre = 10 square chains = 4840 square yards = 43,560 square feet.
1 square chain = 16 square rods = 484 square yards = 4356 square feet.
1 square rod = 30.25 square yards = 272.25 square feet = 625 square links.
1 square yard = 9 square feet.
1 square foot = 144 square inches.
An acre is equal to a square, the side of which is 208.7 feet.

Measure used for Diameters and Areas of Electric Wires

1 circular inch = area of circle 1 inch in diameter = 0.7854 square inch.
1 circular inch = 1,000,000 circular mils.
1 square inch = 1.2732 circular inch = 1,273,239 circular mils.
A circular mil is the area of a circle 0.001 inch in diameter.

Cubic Measure

1 cubic yard = 27 cubic feet.
1 cubic foot = 1728 cubic inches.
The following measures are also used for wood and masonry:
1 cord of wood = $4 \times 4 \times 8$ feet = 128 cubic feet.
1 perch of masonry = $16\frac{1}{2} \times 1\frac{1}{2} \times 1$ foot = $24\frac{3}{4}$ cubic feet.

Shipping Measure

For measuring entire internal capacity of a vessel:
1 register ton = 100 cubic feet.
For measurement of cargo:
Approximately 40 cubic feet of merchandise is considered a shipping ton, unless that bulk would weigh more than 2000 pounds, in which case the freight charge may be based upon weight.
40 cubic feet = 32.143 U. S. bushels = 31.16 Imperial bushels.

WEIGHTS AND MEASURES

Dry Measure

1 bushel (U. S. or Winchester struck bushel) = 1.2445 cubic foot = 2150.42 cubic inches.
1 bushel = 4 pecks = 32 quarts = 64 pints.
1 peck = 8 quarts = 16 pints.
1 quart = 2 pints.
1 heaped bushel = $1\frac{1}{4}$ struck bushel.
1 cubic foot = 0.8036 struck bushel.
1 British Imperial bushel = 8 Imperial gallons = 1.2837 cubic foot = 2218.19 cubic inches.

Liquid Measure

1 U. S. gallon = 0.1337 cubic foot = 231 cubic inches = 4 quarts = 8 pints.
1 quart = 2 pints = 8 gills.
1 pint = 4 gills.
1 British Imperial gallon = 1.2009 U. S. gallon = 277.42 cubic inches.
1 cubic foot = 7.48 U. S. gallons.

Old Liquid Measure

1 tun = 2 pipes = 3 puncheons.
1 pipe or butt = 2 hogsheads = 4 barrels = 126 gallons.
1 puncheon = 2 tierces = 84 gallons.
1 hogshead = 2 barrels = 63 gallons.
1 tierce = 42 gallons.
1 barrel = $31\frac{1}{2}$ gallons.

Apothecaries' Fluid Measure

1 U. S. fluid ounce = 8 drachms = 1.805 cubic inch = 1/128 U. S. gallon.
1 fluid drachm = 60 minims.
1 British fluid ounce = 1.732 cubic inch.

Measures of Weight

Avoirdupois or Commercial Weight

1 gross or long ton = 2240 pounds.
1 net or short ton = 2000 pounds.
1 pound = 16 ounces = 7000 grains.
1 ounce = 16 drachms = 437.5 grains.

The following measures for weight are now seldom used in the United States:
1 hundred-weight = 4 quarters = 112 pounds (1 gross or long ton = 20 hundred-weights); 1 quarter = 28 pounds; 1 stone = 14 pounds; 1 quintal = 100 pounds.

Troy Weight, used for Weighing Gold and Silver

1 pound = 12 ounces = 5760 grains.
1 ounce = 20 pennyweights = 480 grains.
1 pennyweight = 24 grains.
1 carat (used in weighing diamonds) = 3.086 grains.
1 grain Troy = 1 grain avoirdupois = 1 grain apothecaries' weight.

WEIGHTS AND MEASURES

Apothecaries' Weight

1 pound = 12 ounces = 5760 grains.
1 ounce = 8 drachms = 480 grains.
1 drachm = 3 scruples = 60 grains.
1 scruple = 20 grains.

Measures of Pressure

1 pound per square inch = 144 pounds per square foot = 0.068 atmosphere = 2.042 inches of mercury at 62 degrees F. = 27.7 inches of water at 62 degrees F. = 2.31 feet of water at 62 degrees F.

1 atmosphere = 30 inches of mercury at 62 degrees F. = 14.7 pounds per square inch = 2116.3 pounds per square foot = 33.95 feet of water at 62 degrees F.

1 foot of water at 62 degrees F. = 62.355 pounds per square foot = 0.433 pound per square inch.

1 inch of mercury at 62 degrees F. = 1.132 foot of water = 13.58 inches of water = 0.491 pound per square inch.

Miscellaneous

1 great gross = 12 gross = 144 dozen.
1 gross = 12 dozen = 144 units.
1 dozen = 12 units.
1 score = 20 units.
1 quire = 24 sheets.
1 ream = 20 quires = 480 sheets.
1 ream printing paper = 500 sheets.

Decimal Equivalents of Fractions of an Inch

1/64	0.015 625	11/32	0.343 75	43/64	0.671 875
1/32	0.031 25	23/64	0.359 375	11/16	0.687 5
3/64	0.046 875	3/8	0.375	45/64	0.703 125
1/16	0.062 5	25/64	0.390 625	23/32	0.718 75
5/64	0.078 125	13/32	0.406 25	47/64	0.734 375
3/32	0.093 75	27/64	0.421 875	3/4	0.750
7/64	0.109 375	7/16	0.437 5	49/64	0.765 625
1/8	0.125	29/64	0.453 125	25/32	0.781 25
9/64	0.140 625	15/32	0.468 75	51/64	0.796 875
5/32	0.156 25	31/64	0.484 375	13/16	0.812 5
11/64	0.171 875	1/2	0.500	53/64	0.828 125
3/16	0.187 5	33/64	0.515 625	27/32	0.843 75
13/64	0.203 125	17/32	0.531 25	55/64	0.859 375
7/32	0.218 75	35/64	0.546 875	7/8	0.875
15/64	0.234 375	9/16	0.562 5	57/64	0.890 625
1/4	0.250	37/64	0.578 125	29/32	0.906 25
17/64	0.265 625	19/32	0.593 75	59/64	0.921 875
9/32	0.281 25	39/64	0.609 375	15/16	0.937 5
19/64	0.296 875	5/8	0.625	61/64	0.953 125
5/16	0.312 5	41/64	0.640 625	31/32	0.968 75
21/64	0.328 125	21/32	0.656 25	63/64	0.984 375

Table of Decimal Equivalents of a Foot Corresponding to Inches and Fractions of Inches. — Assume, for example, that it is required to find the equivalent of 6 7/32 inches in decimals of a foot. Locate 7/32 in the left-hand column and follow the horizontal line until the column headed "6" is reached. The figures 0.5182 read off in this column are the decimals of a foot corresponding to 6 7/32; in other words, 6 7/32 inches equals 0.5182 foot.

Inches into Decimals of a Foot

Inch	Inches 0	1	2	3	4	5	6	7	8	9	10	11
	Decimals of a Foot											
....	....	0.0833	0.1667	0.2500	0.3333	0.4167	0.5000	0.5833	0.6667	0.7500	0.8333	0.9167
1/32	0.0026	0.0859	0.1693	0.2526	0.3359	0.4193	0.5026	0.5859	0.6693	0.7526	0.8359	0.9193
1/16	0.0052	0.0885	0.1719	0.2552	0.3385	0.4219	0.5052	0.5885	0.6719	0.7552	0.8385	0.9219
3/32	0.0078	0.0911	0.1745	0.2578	0.3411	0.4245	0.5078	0.5911	0.6745	0.7578	0.8411	0.9245
1/8	0.0104	0.0938	0.1771	0.2604	0.3438	0.4271	0.5104	0.5938	0.6771	0.7604	0.8438	0.9271
5/32	0.0130	0.0964	0.1797	0.2630	0.3464	0.4297	0.5130	0.5964	0.6797	0.7630	0.8464	0.9297
3/16	0.0156	0.0990	0.1823	0.2656	0.3490	0.4323	0.5156	0.5990	0.6823	0.7656	0.8490	0.9323
7/32	0.0182	0.1016	0.1849	0.2682	0.3516	0.4349	0.5182	0.6016	0.6849	0.7682	0.8516	0.9349
1/4	0.0208	0.1042	0.1875	0.2708	0.3542	0.4375	0.5208	0.6042	0.6875	0.7708	0.8542	0.9375
9/32	0.0234	0.1068	0.1901	0.2734	0.3568	0.4401	0.5234	0.6068	0.6901	0.7734	0.8568	0.9401
5/16	0.0260	0.1094	0.1927	0.2760	0.3594	0.4427	0.5260	0.6094	0.6927	0.7760	0.8594	0.9427
11/32	0.0286	0.1120	0.1953	0.2786	0.3620	0.4453	0.5286	0.6120	0.6953	0.7786	0.8620	0.9453
3/8	0.0313	0.1146	0.1979	0.2813	0.3646	0.4479	0.5313	0.6146	0.6979	0.7813	0.8646	0.9479
13/32	0.0339	0.1172	0.2005	0.2839	0.3672	0.4505	0.5339	0.6172	0.7005	0.7839	0.8672	0.9505
7/16	0.0365	0.1198	0.2031	0.2865	0.3698	0.4531	0.5365	0.6198	0.7031	0.7865	0.8698	0.9531
15/32	0.0391	0.1224	0.2057	0.2891	0.3724	0.4557	0.5391	0.6224	0.7057	0.7891	0.8724	0.9557
1/2	0.0417	0.1250	0.2083	0.2917	0.3750	0.4583	0.5417	0.6250	0.7083	0.7917	0.8750	0.9583
17/32	0.0443	0.1276	0.2109	0.2943	0.3776	0.4609	0.5443	0.6276	0.7109	0.7943	0.8776	0.9609
9/16	0.0469	0.1302	0.2135	0.2969	0.3802	0.4635	0.5469	0.6302	0.7135	0.7969	0.8802	0.9635
19/32	0.0495	0.1328	0.2161	0.2995	0.3828	0.4661	0.5495	0.6328	0.7161	0.7995	0.8828	0.9661
5/8	0.0521	0.1354	0.2188	0.3021	0.3854	0.4688	0.5521	0.6354	0.7188	0.8021	0.8854	0.9688
21/32	0.0547	0.1380	0.2214	0.3047	0.3880	0.4714	0.5547	0.6380	0.7214	0.8047	0.8880	0.9714
11/16	0.0573	0.1406	0.2240	0.3073	0.3906	0.4740	0.5573	0.6406	0.7240	0.8073	0.8906	0.9740
23/32	0.0599	0.1432	0.2266	0.3099	0.3932	0.4766	0.5599	0.6432	0.7266	0.8099	0.8932	0.9766
3/4	0.0625	0.1458	0.2292	0.3125	0.3958	0.4792	0.5625	0.6458	0.7292	0.8125	0.8958	0.9792
25/32	0.0651	0.1484	0.2318	0.3151	0.3984	0.4818	0.5651	0.6484	0.7318	0.8151	0.8984	0.9818
13/16	0.0677	0.1510	0.2344	0.3177	0.4010	0.4844	0.5677	0.6510	0.7344	0.8177	0.9010	0.9844
27/32	0.0703	0.1536	0.2370	0.3203	0.4036	0.4870	0.5703	0.6536	0.7370	0.8203	0.9036	0.9870
7/8	0.0729	0.1563	0.2396	0.3229	0.4063	0.4896	0.5729	0.6563	0.7396	0.8229	0.9063	0.9896
29/32	0.0755	0.1589	0.2422	0.3255	0.4089	0.4922	0.5755	0.6589	0.7422	0.8255	0.9089	0.9922
15/16	0.0781	0.1615	0.2448	0.3281	0.4115	0.4948	0.5781	0.6615	0.7448	0.8281	0.9115	0.9948
31/32	0.0807	0.1641	0.2474	0.3307	0.4141	0.4974	0.5807	0.6641	0.7474	0.8307	0.9141	0.9974

Decimal Equivalents of 6ths, 12ths, and 24ths of an Inch

1/24	0.041 667	9/24	0.375	17/24	0.708 333
1/12 . . .	0.083 333	5/12	0.416 667	9/12 . . .	0.75
3/24	0.125	11/24	0.458 333	19/24	0.791 667
1/6	0.166 667	3/6	0.5	5/6	0.833 333
5/24	0.208 333	13/24	0.541 667	21/24	0.875
3/12 . . .	0.25	7/12	0.583 333	11/12 . . .	0.916 667
7/24	0.291 667	15/24	0.625	23/24	0.958 333
2/6	0.333 333	4/6	0.666 667	. . . . . .	. . . .

Decimal Equivalents of 7ths, 14ths, and 28ths of an Inch

1/28	0.035 714	5/14 . .	0.357 143	19/28	0.678 571
1/14 . .	0.071 429	11/28	0.392 857	5/7	0.714 286
3/28	0.107 143	3/7	0.428 571	21/28	0.75
1/7	0.142 857	13/28	0.464 286	[illegible]	[illegible]

U. S. Gallons into Cubic Feet

Gallons	Cubic Feet	Gallons	Cubic Feet	Gallons	Cubic Feet	Gallons	Cubic Feet
1	0.134	20	2.674	300	40.10	4,000	534.72
2	0.267	30	4.010	400	53.47	5,000	668.40
3	0.401	40	5.347	500	66.84	6,000	802.08
4	0.535	50	6.684	600	80.21	7,000	935.76
5	0.668	60	8.021	700	93.58	8,000	1,069.44
6	0.802	70	9.358	800	106.94	9,000	1,203.12
7	0.936	80	10.694	900	120.31	10,000	1,336.81
8	1.069	90	12.031	1000	133.68	50,000	6,684.03
9	1.203	100	13.368	2000	267.36	100,000	13,368.06
10	1.337	200	26.736	3000	401.04	500,000	66,840.28

Cubic Feet into Gallons

(1 cubic foot = 7.4805 U. S. gallons; 1 gallon = 231 cubic inches = 0.13368 cubic foot.)

Cubic Feet	Gallons	Cubic Feet	Gallons	Cubic Feet	Gallons	Cubic Feet	Gallons
0.1	0.75	2	14.96	30	224.4	400	2,992.2
0.2	1.50	3	22.44	40	299.2	500	3,740.3
0.3	2.24	4	29.92	50	374.0	600	4,488.3
0.4	2.99	5	37.40	60	448.8	700	5,236.4
0.5	3.74	6	44.88	70	523.6	800	5,984.4
0.6	4.49	7	52.36	80	598.4	900	6,732.5
0.7	5.24	8	59.84	90	673.2	1,000	7,480.5
0.8	5.98	9	67.32	100	748.1	5,000	37,402.6
0.9	6.73	10	74.81	200	1496.1	10,000	74,805
1.0	7.48	20	149.61	300	2244.2	50,000	374,02 inches

WEIGHTS AND MEASURES

Contents in Cubic Feet and U. S. Gallons of Pipes and Cylinders One Foot in Length

Diam. in Inches	For 1 Foot in Length		Diam. in Inches	For 1 Foot in Length		Diam. in Inches	For 1 Foot in Length	
	Cubic Feet	U. S. Gallons		Cubic Feet	U. S. Gallons		Cubic Feet	U. S. Gallons
¼	0.0003	0.0025	6¾	0.2485	1.859	19	1.969	14.73
5/16	0.0005	0.0040	7	0.2673	1.999	19½	2.074	15.51
⅜	0.0008	0.0057	7¼	0.2867	2.145	20	2.182	16.32
7/16	0.0010	0.0078	7½	0.3068	2.295	20½	2.292	17.15
½	0.0014	0.0102	7¾	0.3276	2.450	21	2.405	17.99
9/16	0.0017	0.0129	8	0.3491	2.611	21½	2.521	18.86
⅝	0.0021	0.0159	8¼	0.3712	2.777	22	2.640	19.75
11/16	0.0026	0.0193	8½	0.3941	2.948	22½	2.761	20.66
¾	0.0031	0.0230	8¾	0.4176	3.125	23	2.885	21.58
13/16	0.0036	0.0269	9	0.4418	3.305	23½	3.012	22.53
⅞	0.0042	0.0312	9¼	0.4667	3.491	24	3.142	23.50
15/16	0.0048	0.0359	9½	0.4922	3.682	25	3.409	25.50
1	0.0055	0.0408	9¾	0.5185	3.879	26	3.687	27.58
1¼	0.0085	0.0638	10	0.5454	4.080	27	3.976	29.74
1½	0.0123	0.0918	10¼	0.5730	4.286	28	4.276	31.99
1¾	0.0167	0.1249	10½	0.6013	4.498	29	4.587	34.31
2	0.0218	0.1632	10¾	0.6303	4.715	30	4.909	36.72
2¼	0.0276	0.2066	11	0.6600	4.937	31	5.241	39.21
2½	0.0341	0.2550	11¼	0.6903	5.164	32	5.585	41.78
2¾	0.0412	0.3085	11½	0.7213	5.396	33	5.940	44.43
3	0.0491	0.3672	11¾	0.7530	5.633	34	6.305	47.16
3¼	0.0576	0.4309	12	0.7854	5.875	35	6.681	49.98
3½	0.0668	0.4998	12½	0.8522	6.375	36	7.069	52.88
3¾	0.0767	0.5738	13	0.9218	6.895	37	7.467	55.86
4	0.0873	0.6528	13½	0.9940	7.436	38	7.876	58.92
4¼	0.0985	0.7369	14	1.069	7.997	39	8.296	62.06
4½	0.1104	0.8263	14½	1.147	8.578	40	8.727	65.28
4¾	0.1231	0.9206	15	1.227	9.180	41	9.168	68.58
5	0.1364	1.020	15½	1.310	9.801	42	9.621	71.97
5¼	0.1503	1.125	16	1.396	10.44	43	10.085	75.44
5½	0.1650	1.234	16½	1.485	11.11	44	10.559	78.99
5¾	0.1803	1.349	17	1.576	11.79	45	11.045	82.62
6	0.1963	1.469	17½	1.670	12.49	46	11.541	86.33
6¼	0.2131	1.594	18	1.767	13.22	47	12.048	90.13
6½	0.2304	1.724	18½	1.867	13.96	48	12.566	94.00

One cubic foot of water at 39.1 degrees F. weighs 62.4245 pounds.

One cubic foot of air at 32 degrees F., atmospheric pressure, weighs 0.08073 pound.

One pound of water at 39.1 degrees F. has a volume of 0.01602 cubic foot.

One pound of air at 32 degrees F., atmospheric pressure, has a volume of 12.387 cubic feet.

One gallon of water at 62 degrees F. weighs 8.336 pounds.

One pound of water at 62 degrees F has a volume of 0.1199 U. S. gallon.

Contents of Cylindrical Tanks in U. S. Gallons

Depth of Tank, Feet	Diameter of Tank, Feet								
	5	6	7	8	9	10	11	12	13
	Contents of Tank, U. S. Gallons								
5	734	1058	1439	1880	2379	2,938	3,555	4,230	4,965
6	881	1269	1727	2256	2855	3,525	4,265	5,076	5,957
7	1028	1481	2015	2632	3331	4,113	4,976	5,922	6,950
8	1175	1692	2303	3008	3807	4,700	5,687	6,768	7,943
9	1322	1904	2591	3384	4283	5,288	6,398	7,614	8,936
10	1469	2115	2879	3760	4759	5,875	7,109	8,460	9,929
11	1616	2327	3167	4136	5235	6,463	7,820	9,306	10,922
12	1763	2538	3455	4512	5711	7,050	8,531	10,152	11,915
13	1909	2750	3742	4888	6187	7,638	9,242	10,998	12,808
14	2056	2961	4030	5264	6662	8,225	9,953	11,844	13,801
15	2203	3173	4318	5640	7138	8,813	10,664	12,690	14,894
16	2350	3384	4606	6016	7614	9,400	11,374	13,536	15,887
17	2497	3596	4894	6392	8090	9,988	12,085	14,383	16,879
18	2644	3807	5182	6768	8566	10,575	12,796	15,229	17,872
19	2791	4019	5480	7144	9042	11,163	13,507	16,075	18,865
20	2938	4230	5758	7520	9518	11,750	14,218	16,921	19,858

Depth of Tank, Feet	Diameter of Tank, Feet							
	14	15	16	18	20	22	24	25
	Contents of Tank, U. S. Gallons							
5	5,758	6,610	7,521	9,518	11,751	14,218	16,921	18,360
6	6,909	7,931	9,025	11,422	14,101	17,062	20,305	22,032
7	8,061	9,253	10,529	13,325	16,451	19,905	23,689	25,704
8	9,212	10,575	12,033	15,229	18,801	22,749	27,073	29,376
9	10,364	11,897	13,537	17,132	21,151	25,592	30,457	33,048
10	11,515	13,219	15,041	19,036	23,501	28,436	33,841	36,720
11	12,667	14,541	16,545	20,940	25,851	31,280	37,225	40,392
12	13,818	15,863	18,049	22,843	28,201	34,123	40,609	44,064
13	14,970	17,185	19,553	24,747	30,551	36,967	43,993	47,736
14	16,121	18,507	21,057	26,650	32,901	39,819	47,377	51,408
15	17,273	19,829	22,562	28,554	35,252	42,654	50,762	55,080
16	18,424	21,150	24,066	30,458	37,602	45,498	54,146	58,752
17	19,576	22,472	25,570	32,361	39,952	48,341	57,530	62,424
18	20,727	23,794	27,074	34,265	42,302	51,185	60,914	66,096
19	21,879	25,116	28,578	36,168	44,652	54,028	64,298	69,768
20	23,030	26,438	30,082	38,072	47,002	56,872	67,682	73,440

A cylinder 7 inches in diameter and 6 inches high contains one gallon within 0.1 of a cubic inch.

The volume, in U. S. gallons, of a cylinder, equals the square of the diameter in inches × height of cylinder in inches × 0.0034.

Circular Mil Gage for Electrical Wires*

A.W.G. or B. & S. Gage	Diam. Mils	Circular Mils	A.W.G. or B. & S. Gage	Diam. Mils	Circular Mils	A.W.G. or B. & S. Gage	Diam. Mils	Circular Mils
0000	460	212,000	12	81	6530	27	14.2	202.
000	410	168,000	13	72	5180	28	12.6	160.
00	365	133,000	14	64	4110	29	11.3	127.
0	325	106,000	15	57	3260	30	10.0	101.
1	289	83,700	16	51	2580	31	8.9	79.7
2	258	66,400	17	45	2050	32	8.0	63.2
3	229	52,600	18	40	1620	33	7.1	50.1
4	204	41,700	19	36	1290	34	6.3	39.8
5	182	33,100	20	32	1020	35	5.6	31.5
6	162	26,300	21	28.5	810	36	5.0	25.0
7	144	20,800	22	25.3	642	37	4.5	19.8
8	128	16,500	23	22.6	509	38	4.0	15.7
9	114	13,100	24	20.1	404	39	3.5	12.5
10	102	10,400	25	17.9	320	40	3.1	9.9
11	91	8,230	26	15.9	254	..	....	....

* A circular mil is a unit of area that is applied to electrical wires and cables and is equal to the area of a circle one mil (.001 inch) in diameter. The area of any circle in circular mils is equal to the square of its diameter in mils.

METRIC SYSTEM OF MEASUREMENTS

In the metric system of measurements, the principal unit for length is the meter; the principal unit for capacity, the liter; and the principal unit for weight, the gram. The following prefixes are used for sub-divisions and multiples: milli = 1/1000; centi = 1/100; deci = 1/10; deka = 10; hecto = 100; kilo = 1000. In abbreviations, both the sub-divisions and the multiples are used with a small or lower case letter. At one time the multiples were used with a capital letter in some places where the metric system was used.

All the multiples and sub-divisions are not used commercially. Those ordinarily used for length are kilometer, meter, centimeter and millimeter; for capacity, square meter, square centimeter and square millimeter; for cubic measures, cubic meter, cubic decimeter (liter), cubic centimeter, and cubic millimeter. The most commonly used weights are the kilogram and gram. The metric system was legalized in the United States by an Act of Congress in 1866.

Measures of Length

10 millimeters (mm)	= 1 centimeter (cm).
10 centimeters	= 1 decimeter (dm).
10 decimeters	= 1 meter (m).
1000 meters	= 1 kilometer (km).

Square Measure

100 square millimeters (mm^2)	= 1 square centimeter (cm^2).
100 square centimeters	= 1 square decimeter (dm^2).
100 square decimeters	= 1 square meter (m^2).

Surveyor's Square Measure

100 square meters (m^2)	= 1 are (a).
100 ares	= 1 hectare (ha).
100 hectares	= 1 square kilometer (km^2).

WEIGHTS AND MEASURES

Cubic Measure

1000 cubic millimeters (mm^3) = 1 cubic centimeter (cm^3).
1000 cubic centimeters = 1 cubic decimeter (dm^3).
1000 cubic decimeters = 1 cubic meter (m^3).

Dry and Liquid Measure

10 milliliters (ml) = 1 centiliter (cl).
10 centiliters = 1 deciliter (dl).
10 deciliters = 1 liter (l).
100 liters = 1 hectoliter (hl).

1 liter = 1 cubic decimeter = the volume of 1 kilogram of pure water at a temperature of 39.2 degrees F.

Measures of Weight

10 milligrams (mg) = 1 centigram (cg).
10 centigrams = 1 decigram (dg).
10 decigrams = 1 gram (g).
10 grams = 1 dekagram (dag).
10 dekagrams = 1 hectogram (hg).
10 hectograms = 1 kilogram (kg).
1000 kilograms = 1 (metric) ton (t).

Metric and English Conversion Table

Linear Measure

1 kilometer = 0.6214 mile.
1 meter = 39.37 inches; 3.2808 feet; 1.0936 yards.
1 centimeter = 0.3937 inch.
1 millimeter = 0.03937 inch.

1 mile = 1.609 kilometers.
1 yard = 0.9144 meter.
1 foot = 0.3048 meter.
1 foot = 304.8 millimeters.
1 inch = 2.54 centimeters.
1 inch = 25.4 millimeters.

Square Measure

1 square kilometer = 0.3861 square mile = 247.1 acres.
1 hectare = 2.471 acres = 107,639 square feet.
1 are = 0.0247 acre = 1076.4 square feet.
1 square meter = 10.764 square feet = 1.196 square yards.
1 square centimeter = 0.155 square inch.
1 square millimeter = 0.00155 square inch.

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1 square mile = 2.5899 square kilometers.
1 acre = 0.4047 hectare = 40.47 ares.
1 square yard = 0.836 square meter.
1 square foot = 0.0929 square meter = 929 square centimeters.
1 square inch = 6.452 square centimeters = 645.2 square millimeters.

Cubic Measure

1 cubic meter = 35.315 cubic feet = 1.308 cubic yards.
1 cubic meter = 264.2 U. S. gallons.
1 cubic centimeter = 0.061 cubic inch.
1 liter (cubic decimeter) = 0.0353 cubic foot = 61.023 cubic inches.
1 liter = 0.2642 U. S. gallon = 1.0567 U. S. quarts.

1 cubic yard = 0.7646 cubic meter.
1 cubic foot = 0.02832 cubic meter = 28.317 liters.
1 cubic inch = 16.38706 cubic centimeters.
1 U. S. gallon = 3.785 liters.
1 U. S. quart = 0.946 liter.

Weight

1 metric ton = 0.9842 ton (of 2240 pounds) = 2204.6 pounds.
1 kilogram = 2.2046 pounds = 35.274 ounces avoirdupois.
1 gram = 0.03215 ounce troy = 0.03527 ounce avoirdupois.
1 gram = 15.432 grains.

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1 ton (of 2240 pounds) = 1.016 metric ton = 1016 kilograms.
1 pound = 0.4536 kilogram = 453.6 grams.
1 ounce avoirdupois = 28.35 grams.
1 ounce troy = 31.103 grams.
1 grain = 0.0648 gram.

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1 kilogram per square millimeter = 1422.32 pounds per square inch
1 kilogram per square centimeter = 14.223 pounds per square inch.
1 kilogram-meter = 7.233 foot-pounds.
1 pound per square inch = 0.0703 kilogram per square centimeter.
1 calorie (kilogram calorie) = 3.968 B.T.U. (British thermal unit).

The C.G.S. System of Measurement

The C.G.S. (centimeter-gram-second) system, frequently known as the absolute system of measurement, is based upon the length and weight units of the metric system, and the second as the time unit. In this system, the unit of distance is one centimeter, the unit of mass (or weight) is one gram, and the unit of time, one second. From these fundamental units are derived:

Unit of velocity = 1 centimeter per second.
Acceleration due to gravity (at Paris) = 981 centimeters per sec. per sec.
Unit of force = 1 dyne = $\frac{1}{981}$ gram.
Unit of work = 1 erg = 1 dyne-centimeter.
Unit of power = 1 watt = 10,000,000 ergs per second.

The C.G.S. system of power measurements is becoming more and more used in the engineering field. It is used exclusively for electrical machines and apparatus on account of the simple relationship which exists between the various units. It is likely to be soon adopted in many other fields. The unit of work, erg, is so small that in practical work the joule is usually employed instead. One joule equals 10,000,000 ergs.

Standard of Length. — In 1866 the United States, by act of Congress, passed a law making legal the meter, the only measure of length that has been legalized by the United States Government. The United States yard is defined by the relation: 1 yard = $\frac{3600}{3937}$ meter. The legal equivalent of the meter for commercial purposes was fixed as 39.37 inches, by law, in July, 1866, and experience having shown that this value was exact within the error of observation, the United States

Office of Standard Weights and Measures was, in 1893, authorized to derive the yard from the meter by the use of this relation. The United States prototype meters Nos. 27 and 21 were received from the International Bureau of Weights and Measures in 1889. Meter No. 27, sealed in its metal case, is preserved in a fireproof vault at the Bureau of Standards.

Comparisons made prior to 1893 indicated that the relation of the yard to the meter, fixed by the act of 1866, was by chance the exact relation between the international meter and the British imperial yard, within the error of observation. A subsequent comparison made between the standards just mentioned indicates that the legal relation adopted by Congress is in error 0.0001 inch; but, in view of the fact that certain comparisons made by the English Standards Office between the imperial yard and its authentic copies show variations as great if not greater than this, it cannot be said with certainty that there is a difference between the imperial yard of Great Britain and the United States yard derived from the meter. The bronze yard No. 11, which was an exact copy of the British imperial yard both in form and material, had shown changes when compared with the imperial yard in 1876 and 1888, which could not reasonably be said to be entirely due to changes in Bronze No. 11. On the other hand, the new meters represented the most advanced ideas of standards, and it therefore seemed that greater stability as well as higher accuracy would be secured by accepting the international meter as a fundamental standard of length.

Application of the Metric System. — In the practical application of the metric system in machine shop and drafting-room work, the part of the system with which the draftsman and machinist come into direct contact is the length measurements. The length units of the metric system that are most generally used in connection with any work relating to mechanical engineering are the meter, the centimeter, and the millimeter. The decimeter is not commonly used as a length measurement. On mechanical drawings all dimensions are generally given in millimeters, no matter how large they may be. In fact, dimensions of such machines as locomotives and large electrical apparatus are given exclusively in millimeters. This practice is adopted to avoid mistakes due to misplacing decimal points, or misreading dimensions if other units are used as well. When dimensions are given in millimeters, the majority can be given without resorting to decimal points, as a millimeter is only a trifle more than 1/32 inch. Only dimensions of precision need be given in decimals of a millimeter; such dimensions are generally given in hundredths of a millimeter — for example, 0.02 millimeter. As 0.01 millimeter is equal to 0.0004 inch, it is seldom that dimensions would be given with greater accuracy than to hundredths of a millimeter.

Drawings made to the metric system are not made to scales of 1/2, 1/4, 1/8, etc., as in the case of drawings made to the English system. If the object cannot be drawn full size, it is generally drawn 1/2.5, size, and, if this is too large, it is drawn 1/5, 1/10, 1/20, 1/50, 1/100, 1/200, 1/500, or 1/1000 size.

Tables of Metric Equivalents. — The following tables for the conversion of millimeters into inches and feet into millimeters and vice versa are based on one inch equals 25.4 millimeters, exactly. This is American Standard practice for industrial use and has also been adopted by industry in Canada, Great Britain, Germany, Italy, Russia, Switzerland, Sweden, and other countries. The conversion tables for feet into meters, miles into kilometers, square inches into square centimeters, and square feet into square meters are based on one meter equals 39.37 inches. The use of 25.4 millimeters equals one inch, exactly, results in an inch that is shorter than the inch based on one meter equals 39.37 inches by approximately two parts in one million.

Use of Conversion Tables. — On this and following pages tables are given which permit conversion from English to metric units and vice versa over a wide range of values. Where the desired value cannot be obtained directly from these tables, a simple addition of two or more values taken directly from the table will suffice as shown in the following examples:

Example 1: Find the millimeter equivalent of 78 inches.

$$\begin{aligned} 70 \text{ in.} &= 1{,}778.000 \text{ mm} \\ \underline{8 \text{ in.}} &= \underline{203.200 \text{ mm}} \\ 78 \text{ in.} &= 1{,}981.200 \text{ mm} \end{aligned}$$

Example 2: Find the inch equivalent of 84.9 mm.

$$\begin{aligned} 80.\ \text{mm} &= 3.1496 \text{ in.} \\ 4.\ \text{mm} &= 0.1575 \text{ in.} \\ \underline{0.9 \text{ mm}} &= \underline{0.0354 \text{ in.}} \\ 84.9 \text{ mm} &= 3.3425 \text{ in.} \end{aligned}$$

Inch—Millimeter and Inch—Centimeter Conversion Table*
(Based on 1 inch = 25.4 millimeters, exactly)†

INCHES TO MILLIMETERS

In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.
10	254.000	1	25.400	0.1	2.540	0.01	0.254	0.001	0.025
20	508.000	2	50.800	0.2	5.080	0.02	0.508	0.002	0.051
30	762.000	3	76.200	0.3	7.620	0.03	0.762	0.003	0.076
40	1,016.000	4	101.600	0.4	10.160	0.04	1.016	0.004	0.102
50	1,270.000	5	127.000	0.5	12.700	0.05	1.270	0.005	0.127
60	1,524.000	6	152.400	0.6	15.240	0.06	1.524	0.006	0.152
70	1,778.000	7	177.800	0.7	17.780	0.07	1.778	0.007	0.178
80	2,032.000	8	203.200	0.8	20.320	0.08	2.032	0.008	0.203
90	2,286.000	9	228.600	0.9	22.860	0.09	2.286	0.009	0.229
100	2,540.000	10	254.000	1.0	25.400	0.10	2.540	0.010	0.254

MILLIMETERS TO INCHES

Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.
100	3.9370	10	0.3937	1	0.0394	0.1	0.0039	0.01	0.0004
200	7.8740	20	0.7874	2	0.0787	0.2	0.0079	0.02	0.0008
300	11.8110	30	1.1811	3	0.1181	0.3	0.0118	0.03	0.0012
400	15.7480	40	1.5748	4	0.1575	0.4	0.0157	0.04	0.0016
500	19.6850	50	1.9685	5	0.1968	0.5	0.0197	0.05	0.0020
600	23.6220	60	2.3622	6	0.2362	0.6	0.0236	0.06	0.0024
700	27.5591	70	2.7559	7	0.2756	0.7	0.0276	0.07	0.0028
800	31.4961	80	3.1496	8	0.3150	0.8	0.0315	0.08	0.0031
900	35.4331	90	3.5433	9	0.3543	0.9	0.0354	0.09	0.0035
1,000	39.3701	100	3.9370	10	0.3937	1.0	0.0394	0.10	0.0039

* For inches to centimeters, shift decimal point in mm column one place to left and read centimeters, thus:

40 in. = 1,016 mm = 101.6 cm

For centimeters to inches, shift decimal point of centimeter value one place to right and enter mm column, thus:

70 cm = 700 mm = 27.5591 inches

† American Standard Practice for Industrial Use (ASA B48.1)

Decimals of an Inch to Millimeters
(Based on 1 inch = 25.4 millimeters, exactly)

Inches	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	Millimeters									
0.000	...	0.0254	0.0508	0.0762	0.1016	0.1270	0.1524	0.1778	0.2032	0.2286
0.010	0.2540	0.2794	0.3048	0.3302	0.3556	0.3810	0.4064	0.4318	0.4572	0.4826
0.020	0.5080	0.5334	0.5588	0.5842	0.6096	0.6350	0.6604	0.6858	0.7112	0.7366
0.030	0.7620	0.7874	0.8128	0.8382	0.8636	0.8890	0.9144	0.9398	0.9652	0.9906
0.040	1.0160	1.0414	1.0668	1.0922	1.1176	1.1430	1.1684	1.1938	1.2192	1.2446
0.050	1.2700	1.2954	1.3208	1.3462	1.3716	1.3970	1.4224	1.4478	1.4732	1.4986
0.060	1.5240	1.5494	1.5748	1.6002	1.6256	1.6510	1.6764	1.7018	1.7272	1.7526
0.070	1.7780	1.8034	1.8288	1.8542	1.8796	1.9050	1.9304	1.9558	1.9812	2.0066
0.080	2.0320	2.0574	2.0828	2.1082	2.1336	2.1590	2.1844	2.2098	2.2352	2.2606
0.090	2.2860	2.3114	2.3368	2.3622	2.3876	2.4130	2.4384	2.4638	2.4892	2.5146
0.100	2.5400	2.5654	2.5908	2.6162	2.6416	2.6670	2.6924	2.7178	2.7432	2.7686
0.110	2.7940	2.8194	2.8448	2.8702	2.8956	2.9210	2.9464	2.9718	2.9972	3.0226
0.120	3.0480	3.0734	3.0988	3.1242	3.1496	3.1750	3.2004	3.2258	3.2512	3.2766
0.130	3.3020	3.3274	3.3528	3.3782	3.4036	3.4290	3.4544	3.4798	3.5052	3.5306
0.140	3.5560	3.5814	3.6068	3.6322	3.6576	3.6830	3.7084	3.7338	3.7592	3.7846
0.150	3.8100	3.8354	3.8608	3.8862	3.9116	3.9370	3.9624	3.9878	4.0132	4.0386
0.160	4.0640	4.0894	4.1148	4.1402	4.1656	4.1910	4.2164	4.2418	4.2672	4.2926
0.170	4.3180	4.3434	4.3688	4.3942	4.4196	4.4450	4.4704	4.4958	4.5212	4.5466
0.180	4.5720	4.5974	4.6228	4.6482	4.6736	4.6990	4.7244	4.7498	4.7752	4.8006
0.190	4.8260	4.8514	4.8768	4.9022	4.9276	4.9530	4.9784	5.0038	5.0292	5.0546
0.200	5.0800	5.1054	5.1308	5.1562	5.1816	5.2070	5.2324	5.2578	5.2832	5.3086
0.210	5.3340	5.3594	5.3848	5.4102	5.4356	5.4610	5.4864	5.5118	5.5372	5.5626
0.220	5.5880	5.6134	5.6388	5.6642	5.6896	5.7150	5.7404	5.7658	5.7912	5.8166
0.230	5.8420	5.8674	5.8928	5.9182	5.9436	5.9690	5.9944	6.0198	6.0452	6.0706
0.240	6.0960	6.1214	6.1468	6.1722	6.1976	6.2230	6.2484	6.2738	6.2992	6.3246
0.250	6.3500	6.3754	6.4008	6.4262	6.4516	6.4770	6.5024	6.5278	6.5532	6.5786
0.260	6.6040	6.6294	6.6548	6.6802	6.7056	6.7310	6.7564	6.7818	6.8072	6.8326
0.270	6.8580	6.8834	6.9088	6.9342	6.9596	6.9850	7.0104	7.0358	7.0612	7.0866
0.280	7.1120	7.1374	7.1628	7.1882	7.2136	7.2390	7.2644	7.2898	7.3152	7.3406
0.290	7.3660	7.3914	7.4168	7.4422	7.4676	7.4930	7.5184	7.5438	7.5692	7.5946
0.300	7.6200	7.6454	7.6708	7.6962	7.7216	7.7470	7.7724	7.7978	7.8232	7.8486
0.310	7.8740	7.8994	7.9248	7.9502	7.9756	8.0010	8.0264	8.0518	8.0772	8.1026
0.320	8.1280	8.1534	8.1788	8.2042	8.2296	8.2550	8.2804	8.3058	8.3312	8.3566
0.330	8.3820	8.4074	8.4328	8.4582	8.4836	8.5090	8.5344	8.5598	8.5852	8.6106
0.340	8.6360	8.6614	8.6868	8.7122	8.7376	8.7630	8.7884	8.8138	8.8392	8.8646
0.350	8.8900	8.9154	8.9408	8.9662	8.9916	9.0170	9.0424	9.0678	9.0932	9.1186
0.360	9.1440	9.1694	9.1948	9.2202	9.2456	9.2710	9.2964	9.3218	9.3472	9.3726
0.370	9.3980	9.4234	9.4488	9.4742	9.4996	9.5250	9.5504	9.5758	9.6012	9.6266
0.380	9.6520	9.6774	9.7028	9.7282	9.7536	9.7790	9.8044	9.8298	9.8552	9.8806
0.390	9.9060	9.9314	9.9568	9.9822	10.0076	10.0330	10.0584	10.0838	10.1092	10.1346
0.400	10.1600	10.1854	10.2108	10.2362	10.2616	10.2870	10.3124	10.3378	10.3632	10.3886
0.410	10.4140	10.4394	10.4648	10.4902	10.5156	10.5410	10.5664	10.5918	10.6172	10.6426
0.420	10.6680	10.6934	10.7188	10.7442	10.7696	10.7950	10.8204	10.8458	10.8712	10.8966
0.430	10.9220	10.9474	10.9728	10.9982	11.0236	11.0490	11.0744	11.0998	11.1252	11.1506
0.440	11.1760	11.2014	11.2268	11.2522	11.2776	11.3030	11.3284	11.3538	11.3792	11.4046
0.450	11.4300	11.4554	11.4808	11.5062	11.5316	11.5570	11.5824	11.6078	11.6332	11.6586
0.460	11.6840	11.7094	11.7348	11.7602	11.7856	11.8110	11.8364	11.8618	11.8872	11.9126
0.470	11.9380	11.9634	11.9888	12.0142	12.0396	12.0650	12.0904	12.1158	12.1412	12.1666
0.480	12.1920	12.2174	12.2428	12.2682	12.2936	12.3190	12.3444	12.3698	12.3952	12.4206
0.490	12.4460	12.4714	12.4968	12.5222	12.5476	12.5730	12.5984	12.6238	12.6492	12.6746

Use previous table to obtain whole inch equivalents to add to decimal equivalents above. All values given in this table are exact; figures to the right of the last place figures are all zeros.

Decimals of an Inch to Millimeters
(Based on 1 inch = 25.4 millimeters, exactly)

Inches	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	Millimeters									
0.500	12.7000	12.7254	12.7508	12.7762	12.8016	12.8270	12.8524	12.8778	12.9032	12.9286
0.510	12.9540	12.9794	13.0048	13.0302	13.0556	13.0810	13.1064	13.1318	13.1572	13.1826
0.520	13.2080	13.2334	13.2588	13.2842	13.3096	13.3350	13.3604	13.3858	13.4112	13.4366
0.530	13.4620	13.4874	13.5128	13.5382	13.5636	13.5890	13.6144	13.6398	13.6652	13.6906
0.540	13.7160	13.7414	13.7668	13.7922	13.8176	13.8430	13.8684	13.8938	13.9192	13.9446
0.550	13.9700	13.9954	14.0208	14.0462	14.0716	14.0970	14.1224	14.1478	14.1732	14.1986
0.560	14.2240	14.2494	14.2748	14.3002	14.3256	14.3510	14.3764	14.4018	14.4272	14.4526
0.570	14.4780	14.5034	14.5288	14.5542	14.5796	14.6050	14.6304	14.6558	14.6812	14.7066
0.580	14.7320	14.7574	14.7828	14.8082	14.8336	14.8590	14.8844	14.9098	14.9352	14.9606
0.590	14.9860	15.0114	15.0368	15.0622	15.0876	15.1130	15.1384	15.1638	15.1892	15.2146
0.600	15.2400	15.2654	15.2908	15.3162	15.3416	15.3670	15.3924	15.4178	15.4432	15.4686
0.610	15.4940	15.5194	15.5448	15.5702	15.5956	15.6210	15.6464	15.6718	15.6972	15.7226
0.620	15.7480	15.7734	15.7988	15.8242	15.8496	15.8750	15.9004	15.9258	15.9512	15.9766
0.630	16.0020	16.0274	16.0528	16.0782	16.1036	16.1290	16.1544	16.1798	16.2052	16.2306
0.640	16.2560	16.2814	16.3068	16.3322	16.3576	16.3830	16.4084	16.4338	16.4592	16.4846
0.650	16.5100	16.5354	16.5608	16.5862	16.6116	16.6370	16.6624	16.6878	16.7132	16.7386
0.660	16.7640	16.7894	16.8148	16.8402	16.8656	16.8910	16.9164	16.9418	16.9672	16.9926
0.670	17.0180	17.0434	17.0688	17.0942	17.1196	17.1450	17.1704	17.1958	17.2212	17.2466
0.680	17.2720	17.2974	17.3228	17.3482	17.3736	17.3990	17.4244	17.4498	17.4752	17.5006
0.690	17.5260	17.5514	17.5768	17.6022	17.6276	17.6530	17.6784	17.7038	17.7292	17.7546
0.700	17.7800	17.8054	17.8308	17.8562	17.8816	17.9070	17.9324	17.9578	17.9832	18.0086
0.710	18.0340	18.0594	18.0848	18.1102	18.1356	18.1610	18.1864	18.2118	18.2372	18.2626
0.720	18.2880	18.3134	18.3388	18.3642	18.3896	18.4150	18.4404	18.4658	18.4912	18.5166
0.730	18.5420	18.5674	18.5928	18.6182	18.6436	18.6690	18.6944	18.7198	18.7452	18.7706
0.740	18.7960	18.8214	18.8468	18.8722	18.8976	18.9230	18.9484	18.9738	18.9992	19.0246
0.750	19.0500	19.0754	19.1008	19.1262	19.1516	19.1770	19.2024	19.2278	19.2532	19.2786
0.760	19.3040	19.3294	19.3548	19.3802	19.4056	19.4310	19.4564	19.4818	19.5072	19.5326
0.770	19.5580	19.5834	19.6088	19.6342	19.6596	19.6850	19.7104	19.7358	19.7612	19.7866
0.780	19.8120	19.8374	19.8628	19.8882	19.9136	19.9390	19.9644	19.9898	20.0152	20.0406
0.790	20.0660	20.0014	20.1168	20.1422	20.1676	20.1930	20.2184	20.2438	20.2692	20.2946
0.800	20.3200	20.3454	20.3708	20.3962	20.4216	20.4470	20.4724	20.4978	20.5232	20.5486
0.810	20.5740	20.5994	20.6248	20.6502	20.6756	20.7010	20.7264	20.7518	20.7772	20.8026
0.820	20.8280	20.8534	20.8788	20.9042	20.9296	20.9550	20.9804	21.0058	21.0312	21.0566
0.830	21.0820	21.1074	21.1328	21.1582	21.1836	21.2090	21.2344	21.2598	21.2852	21.3106
0.840	21.3360	21.3614	21.3868	21.4122	21.4376	21.4630	21.4884	21.5138	21.5392	21.5646
0.850	21.5900	21.6154	21.6408	21.6662	21.6916	21.7170	21.7424	21.7678	21.7932	21.8186
0.860	21.8440	21.8694	21.8948	21.9202	21.9456	21.9710	21.9964	22.0218	22.0472	22.0726
0.870	22.0980	22.1234	22.1488	22.1742	22.1996	22.2250	22.2504	22.2758	22.3012	22.3266
0.880	22.3520	22.3774	22.4028	22.4282	22.4536	22.4790	22.5044	22.5298	22.5552	22.5806
0.890	22.6060	22.6314	22.6568	22.6822	22.7076	22.7330	22.7584	22.7838	22.8092	22.8346
0.900	22.8600	22.8854	22.9108	22.9362	22.9616	22.9870	23.0124	23.0378	23.0632	23.0886
0.910	23.1140	23.1394	23.1648	23.1902	23.2156	23.2410	23.2664	23.2918	23.3172	23.3426
0.920	23.3680	23.3934	23.4188	23.4442	23.4696	23.4950	23.5204	23.5458	23.5712	23.5966
0.930	23.6220	23.6474	23.6728	23.6982	23.7236	23.7490	23.7744	23.7998	23.8252	23.8506
0.940	23.8760	23.9014	23.9268	23.9522	23.9776	24.0030	24.0284	24.0538	24.0792	24.1046
0.950	24.1300	24.1554	24.1808	24.2062	24.2316	24.2570	24.2824	24.3078	24.3332	24.3586
0.960	24.3840	24.4094	24.4348	24.4602	24.4856	24.5110	24.5364	24.5618	24.5872	24.6126
0.970	24.6380	24.6634	24.6888	24.7142	24.7396	24.7650	24.7904	24.8158	24.8412	24.8666
0.980	24.8920	24.9174	24.9428	24.9682	24.9936	25.0190	25.0444	25.0698	25.0952	25.1206
0.990	25.1460	25.1714	25.1968	25.2222	25.2476	25.2730	25.2984	25.3238	25.3492	25.3746
1.000	25.4000	...	..	...	...	...	...	...	...	...

Use previous table to obtain whole inch equivalents to add to decimal equivalents above. All values given in this table are exact; figures to the right of the last place figures are all zeros.

Millimeters to Inches
(Based on 1 inch = 25.4 millimeters, exactly)

Milli-meters	0	1	2	3	4	5	6	7	8	9
	Inches									
0	...	0.03937	0.07874	0.11811	0.15748	0.19685	0.23622	0.27559	0.31496	0.35433
10	0.39370	0.43307	0.47244	0.51181	0.55118	0.59055	0.62992	0.66929	0.70866	0.74803
20	0.78740	0.82677	0.86614	0.90551	0.94488	0.98425	1.02362	1.06299	1.10236	1.14173
30	1.18110	1.22047	1.25984	1.29921	1.33858	1.37795	1.41732	1.45669	1.49606	1.53543
40	1.57480	1.61417	1.65354	1.69291	1.73228	1.77165	1.81102	1.85039	1.88976	1.92913
50	1.96850	2.00787	2.04724	2.08661	2.12598	2.16535	2.20472	2.24409	2.28346	2.32283
60	2.36220	2.40157	2.44094	2.48031	2.51969	2.55906	2.59843	2.63780	2.67717	2.71654
70	2.75591	2.79528	2.83465	2.87402	2.91339	2.95276	2.99213	3.03150	3.07087	3.11024
80	3.14961	3.18898	3.22835	3.26772	3.30709	3.34646	3.38583	3.42520	3.46457	3.50394
90	3.54331	3.58268	3.62205	3.66142	3.70079	3.74016	3.77953	3.81890	3.85827	3.89764
100	3.93701	3.97638	4.01575	4.05512	4.09449	4.13386	4.17323	4.21260	4.25197	4.29134
110	4.33071	4.37008	4.40945	4.44882	4.48819	4.52756	4.56693	4.60630	4.64567	4.68504
120	4.72441	4.76378	4.80315	4.84252	4.88189	4.92126	4.96063	5.00000	5.03937	5.07874
130	5.11811	5.15748	5.19685	5.23622	5.27559	5.31496	5.35433	5.39370	5.43307	5.47244
140	5.51181	5.55118	5.59055	5.62992	5.66929	5.70866	5.74803	5.78740	5.82677	5.86614
150	5.90551	5.94488	5.98425	6.02362	6.06299	6.10236	6.14173	6.18110	6.22047	6.25984
160	6.29921	6.33858	6.37795	6.41732	6.45669	6.49606	6.53543	6.57480	6.61417	6.65354
170	6.69291	6.73228	6.77165	6.81102	6.85039	6.88976	6.92913	6.96850	7.00787	7.04724
180	7.08661	7.12598	7.16535	7.20472	7.24409	7.28346	7.32283	7.36220	7.40157	7.44094
190	7.48031	7.51969	7.55906	7.59843	7.63780	7.67717	7.71654	7.75591	7.79528	7.83465
200	7.87402	7.91339	7.95276	7.99213	8.03150	8.07087	8.11024	8.14961	8.18898	8.22835
210	8.26772	8.30709	8.34646	8.38583	8.42520	8.46457	8.50394	8.54331	8.58268	8.62205
220	8.66142	8.70079	8.74016	8.77953	8.81890	8.85827	8.89764	8.93701	8.97638	9.01575
230	9.05512	9.09449	9.13386	9.17323	9.21260	9.25197	9.29134	9.33071	9.37008	9.40945
240	9.44882	9.48819	9.52756	9.56693	9.60630	9.64567	9.68504	9.72441	9.76378	9.80315
250	9.84252	9.88189	9.92126	9.96063	10.0000	10.0394	10.0787	10.1181	10.1575	10.1969
260	10.2362	10.2756	10.3150	10.3543	10.3937	10.4331	10.4724	10.5118	10.5512	10.5906
270	10.6299	10.6693	10.7087	10.7480	10.7874	10.8268	10.8661	10.9055	10.9449	10.9843
280	11.0236	11.0630	11.1024	11.1417	11.1811	11.2205	11.2598	11.2992	11.3386	11.3780
290	11.4173	11.4567	11.4961	11.5354	11.5748	11.6142	11.6535	11.6929	11.7323	11.7717
300	11.8110	11.8504	11.8898	11.9291	11.9685	12.0079	12.0472	12.0866	12.1260	12.1654
310	12.2047	12.2441	12.2835	12.3228	12.3622	12.4016	12.4409	12.4803	12.5197	12.5591
320	12.5984	12.6378	12.6772	12.7165	12.7559	12.7953	12.8346	12.8740	12.9134	12.9528
330	12.9921	13.0315	13.0709	13.1102	13.1496	13.1890	13.2283	13.2677	13.3071	13.3465
340	13.3858	13.4252	13.4646	13.5039	13.5433	13.5827	13.6220	13.6614	13.7008	13.7402
350	13.7795	13.8189	13.8583	13.8976	13.9370	13.9764	14.0157	14.0551	14.0945	14.1339
360	14.1732	14.2126	14.2520	14.2913	14.3307	14.3701	14.4094	14.4488	14.4882	14.5276
370	14.5669	14.6063	14.6457	14.6850	14.7244	14.7638	14.8031	14.8425	14.8819	14.9213
380	14.9606	15.0000	15.0394	15.0787	15.1181	15.1575	15.1969	15.2362	15.2756	15.3150
390	15.3543	15.3937	15.4331	15.4724	15.5118	15.5512	15.5906	15.6299	15.6693	15.7087
400	15.7480	15.7874	15.8268	15.8661	15.9055	15.9449	15.9843	16.0236	16.0630	16.1024
410	16.1417	16.1811	16.2205	16.2598	16.2992	16.3386	16.3780	16.4173	16.4567	16.4961
420	16.5354	16.5748	16.6142	16.6535	16.6929	16.7323	16.7717	16.8110	16.8504	16.8898
430	16.9291	16.9685	17.0079	17.0472	17.0866	17.1260	17.1654	17.2047	17.2441	17.2835
440	17.3228	17.3622	17.4016	17.4409	17.4803	17.5197	17.5591	17.5984	17.6378	17.6772
450	17.7165	17.7559	17.7953	17.8346	17.8740	17.9134	17.9528	17.9921	18.0315	18.0709
460	18.1102	18.1496	18.1890	18.2283	18.2677	18.3071	18.3465	18.3858	18.4252	18.4646
470	18.5039	18.5433	18.5827	18.6220	18.6614	18.7008	18.7402	18.7795	18.8189	18.8583
480	18.8976	18.9370	18.9764	19.0157	19.0551	19.0945	19.1339	19.1732	19.2126	19.2520
490	19.2913	19.3307	19.3701	19.4094	19.4488	19.4882	19.5276	19.5669	19.6063	19.6457

Millimeters to Inches
(Based on 1 inch = 25.4 millimeters, exactly)

Millimeters	0	1	2	3	4	5	6	7	8	9
	Inches									
500	19.6850	19.7244	19.7638	19.8031	19.8425	19.8819	19.9213	19.9606	20.0000	20.0394
510	20.0787	20.1181	20.1575	20.1969	20.2362	20.2756	20.3150	20.3543	20.3937	20.4331
520	20.4724	20.5118	20.5512	20.5906	20.6299	20.6693	20.7087	20.7480	20.7874	20.8268
530	20.8661	20.9055	20.9449	20.9843	21.0236	21.0630	21.1024	21.1417	21.1811	21.2205
540	21.2598	21.2992	21.3386	21.3780	21.4173	21.4567	21.4961	21.5354	21.5748	21.6142
550	21.6535	21.6929	21.7323	21.7717	21.8110	21.8504	21.8898	21.9291	21.9685	22.0079
560	22.0472	22.0866	22.1260	22.1654	22.2047	22.2441	22.2835	22.3228	22.3622	22.4016
570	22.4409	22.4803	22.5197	22.5591	22.5984	22.6378	22.6772	22.7165	22.7559	22.7953
580	22.8346	22.8740	22.9134	22.9528	22.9921	23.0315	23.0709	23.1102	23.1496	23.1890
590	23.2283	23.2677	23.3071	23.3465	23.3858	23.4252	23.4646	23.5039	23.5433	23.5827
600	23.6220	23.6614	23.7008	23.7402	23.7795	23.8189	23.8583	23.8976	23.9370	23.9764
610	24.0157	24.0551	24.0945	24.1339	24.1732	24.2126	24.2520	24.2913	24.3307	24.3701
620	24.4094	24.4488	24.4882	24.5276	24.5669	24.6063	24.6457	24.6850	24.7244	24.7638
630	24.8031	24.8425	24.8819	24.9213	24.9606	25.0000	25.0394	25.0787	25.1181	25.1575
640	25.1969	25.2362	25.2756	25.3150	25.3543	25.3937	25.4331	25.4724	25.5118	25.5512
650	25.5906	25.6299	25.6693	25.7087	25.7480	25.7874	25.8268	25.8661	25.9055	25.9449
660	25.9843	26.0236	26.0630	26.1024	26.1417	26.1811	26.2205	26.2598	26.2992	26.3386
670	26.3780	26.4173	26.4567	26.4961	26.5354	26.5748	26.6142	26.6535	26.6929	26.7323
680	26.7717	26.8110	26.8504	26.8898	26.9291	26.9685	27.0079	27.0472	27.0866	27.1260
690	27.1654	27.2047	27.2441	27.2835	27.3228	27.3622	27.4016	27.4409	27.4803	27.5197
700	27.5591	27.5984	27.6378	27.6772	27.7165	27.7559	27.7953	27.8346	27.8740	27.9134
710	27.9528	27.9921	28.0315	28.0709	28.1102	28.1496	28.1890	28.2283	28.2677	28.3071
720	28.3465	28.3858	28.4252	28.4646	28.5039	28.5433	28.5827	28.6220	28.6614	28.7008
730	28.7402	28.7795	28.8189	28.8583	28.8976	28.9370	28.9764	29.0157	29.0551	29.0945
740	29.1339	29.1732	29.2126	29.2520	29.2913	29.3307	29.3701	29.4094	29.4488	29.4882
750	29.5276	29.5669	29.6063	29.6457	29.6850	29.7244	29.7638	29.8031	29.8425	29.8819
760	29.9213	29.9606	30.0000	30.0394	30.0787	30.1181	30.1575	30.1969	30.2362	30.2756
770	30.3150	30.3543	30.3937	30.4331	30.4724	30.5118	30.5512	30.5906	30.6299	30.6693
780	30.7087	30.7480	30.7874	30.8268	30.8661	30.9055	30.9449	30.9843	31.0236	31.0630
790	31.1024	31.1417	31.1811	31.2205	31.2598	31.2992	31.3386	31.3780	31.4173	31.4567
800	31.4961	31.5354	31.5748	31.6142	31.6535	31.6929	31.7323	31.7717	31.8110	31.8504
810	31.8898	31.9291	31.9685	32.0079	32.0472	32.0866	32.1260	32.1654	32.2047	32.2441
820	32.2835	32.3228	32.3622	32.4016	32.4409	32.4803	32.5197	32.5591	32.5984	32.6378
830	32.6772	32.7165	32.7559	32.7953	32.8346	32.8740	32.9134	32.9528	32.9921	33.0315
840	33.0709	33.1102	33.1496	33.1890	33.2283	33.2677	33.3071	33.3465	33.3858	33.4252
850	33.4646	33.5039	33.5433	33.5827	33.6220	33.6614	33.7008	33.7402	33.7795	33.8189
860	33.8583	33.8976	33.9370	33.9764	34.0157	34.0551	34.0945	34.1339	34.1732	34.2126
870	34.2520	34.2913	34.3307	34.3701	34.4094	34.4488	34.4882	34.5276	34.5669	34.6063
880	34.6457	34.6850	34.7244	34.7638	34.8031	34.8425	34.8819	34.9213	34.9606	35.0000
890	35.0394	35.0787	35.1181	35.1575	35.1969	35.2362	35.2756	35.3150	35.3543	35.3937
900	35.4331	35.4724	35.5118	35.5512	35.5906	35.6299	35.6693	35.7087	35.7480	35.7874
910	35.8268	35.8661	35.9055	35.9449	35.9843	36.0236	36.0630	36.1024	36.1417	36.1811
920	36.2205	36.2598	36.2992	36.3386	36.3780	36.4173	36.4567	36.4961	36.5354	36.5748
930	36.6142	36.6535	36.6929	36.7323	36.7717	36.8110	36.8504	36.8898	36.9291	36.9685
940	37.0079	37.0472	37.0866	37.1260	37.1654	37.2047	37.2441	37.2835	37.3228	37.3622
950	37.4016	37.4409	37.4803	37.5197	37.5591	37.5984	37.6378	37.6772	37.7165	37.7559
960	37.7953	37.8346	37.8740	37.9134	37.9528	37.9921	38.0315	38.0709	38.1102	38.1496
970	38.1890	38.2283	38.2677	38.3071	38.3465	38.3858	38.4252	38.4646	38.5039	38.5433
980	38.5827	38.6220	38.6614	38.7008	38.7402	38.7795	38.8189	38.8583	38.8976	38.9370
990	38.9764	39.0157	39.0551	39.0945	39.1339	39.1732	39.2126	39.2520	39.2913	39.3307
1000	39.3701	...	...	...	...	...	...	...	...	...

WEIGHTS AND MEASURES

Fractional Inch—Millimeter and Foot—Millimeter Conversion Tables

(Based on 1 inch = 25.4 millimeters, exactly)*

FRACTIONAL INCH TO MILLIMETERS

In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.
1/64	0.397	17/64	6.747	33/64	13.097	49/64	19.447
1/32	0.794	9/32	7.144	17/32	13.494	25/32	19.844
3/64	1.191	19/64	7.541	35/64	13.891	51/64	20.241
1/16	1.588	5/16	7.938	9/16	14.288	13/16	20.638
5/64	1.984	21/64	8.334	37/64	14.684	53/64	21.034
3/32	2.381	11/32	8.731	19/32	15.081	27/32	21.431
7/64	2.778	23/64	9.128	39/64	15.478	55/64	21.828
1/8	3.175	3/8	9.525	5/8	15.875	7/8	22.225
9/64	3.572	25/64	9.922	41/64	16.272	57/64	22.622
5/32	3.969	13/32	10.319	21/32	16.669	29/32	23.019
11/64	4.366	27/64	10.716	43/64	17.066	59/64	23.416
3/16	4.762	7/16	11.112	11/16	17.462	15/16	23.812
13/64	5.159	29/64	11.509	45/64	17.859	61/64	24.209
7/32	5.556	15/32	11.906	23/32	18.256	31/32	24.606
15/64	5.953	31/64	12.303	47/64	18.653	63/64	25.003
1/4	6.350	1/2	12.700	3/4	19.050	1	25.400

INCHES TO MILLIMETERS

In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.
1	25.4	3	76.2	5	127.0	7	177.8	9	228.6	11	279.4
2	50.8	4	101.6	6	152.4	8	203.2	10	254.0	12	304.8

FEET TO MILLIMETERS

Ft.	Mm.	Ft.	Mm.	Ft.	Mm.	Ft.	Mm.	Ft.	Mm.
100	30,480	10	3,048	1	304.8	0.1	30.48	0.01	3.048
200	60,960	20	6,096	2	609.6	0.2	60.96	0.02	6.096
300	91,440	30	9,144	3	914.4	0.3	91.44	0.03	9.144
400	121,920	40	12,192	4	1,219.2	0.4	121.92	0.04	12.192
500	152,400	50	15,240	5	1,524.0	0.5	152.40	0.05	15.240
600	182,880	60	18,288	6	1,828.8	0.6	182.88	0.06	18.288
700	213,360	70	21,336	7	2,133.6	0.7	213.36	0.07	21.336
800	243,840	80	24,384	8	2,438.4	0.8	243.84	0.08	24.384
900	274,320	90	27,432	9	2,743.2	0.9	274.32	0.09	27.432
1,000	304,800	100	30,480	10	3,048.0	1.0	304.80	0.10	30.480

* American Standard Practice for Industrial Use (ASA B48.1)

Example 1: Find millimeter equivalent of 293 feet, 5 47/64 inches.

200 ft	=	60,960.	mm
90 ft	=	27,432.	mm
3 ft	=	914.4	mm
5 in.	=	127.0	mm
47/64 in.	=	18.653	mm
293 ft. 5 47/64 in.	=	89,452.053	mm

Example 2: Find millimeter equivalent of 71.86 feet.

70. ft	=	21,336.	mm
1. ft	=	304.8	mm
.80 ft	=	243.84	mm
.06 ft	=	18.288	mm
71.86 ft	=	21,902.928	mm

Foot—Meter and Mile—Kilometer Conversion Tables

(Based on 1 meter = 39.37 inches)*

FEET TO METERS
(1 ft. = 0.304801 m.)

Feet	Meters	Feet	Meters	Feet	Meters	Feet	Meters	Feet	Meters
100	30.480	10	3.048	1	0.305	0.1	0.030	0.01	0.003
200	60.960	20	6.096	2	0.610	0.2	0.061	0.02	0.006
300	91.440	30	9.144	3	0.914	0.3	0.091	0.03	0.009
400	121.920	40	12.192	4	1.219	0.4	0.122	0.04	0.012
500	152.400	50	15.240	5	1.524	0.5	0.152	0.05	0.015
600	182.881	60	18.288	6	1.829	0.6	0.183	0.06	0.018
700	213.361	70	21.336	7	2.134	0.7	0.213	0.07	0.021
800	243.841	80	24.384	8	2.438	0.8	0.244	0.08	0.024
900	274.321	90	27.432	9	2.743	0.9	0.274	0.09	0.027
1,000	304.801	100	30.480	10	3.048	1.0	0.305	0.10	0.030

METERS TO FEET
(1 m. = 3.280833 ft.)

Meters	Feet	Meters	Feet	Meters	Feet	Meters	Feet	Meters	Feet
100	328.083	10	32.808	1	3.281	0.1	0.328	0.01	0.033
200	656.167	20	65.617	2	6.562	0.2	0.656	0.02	0.066
300	984.250	30	98.425	3	9.842	0.3	0.984	0.03	0.098
400	1,312.333	40	131.233	4	13.123	0.4	1.312	0.04	0.131
500	1,640.416	50	164.042	5	16.404	0.5	1.640	0.05	0.164
600	1,968.500	60	196.850	6	19.685	0.6	1.968	0.06	0.197
700	2,296.583	70	229.658	7	22.966	0.7	2.297	0.07	0.230
800	2,624.667	80	262.467	8	26.247	0.8	2.625	0.08	0.262
900	2,952.750	90	295.275	9	29.528	0.9	2.953	0.09	0.295
1,000	3,280.833	100	328.083	10	32.808	1.0	3.281	0.10	0.328

MILES TO KILOMETERS
(1 mile = 1.609347 km.)

Miles	Km.	Miles	Km.	Miles	Km.	Miles	Km.	Miles	Km.
1,000	1,609.35	100	160.93	10	16.09	1	1.61	0.1	0.16
2,000	3,218.69	200	321.87	20	32.19	2	3.22	0.2	0.32
3,000	4,828.04	300	482.80	30	48.28	3	4.83	0.3	0.48
4,000	6,437.39	400	643.74	40	64.37	4	6.44	0.4	0.64
5,000	8,046.74	500	804.67	50	80.47	5	8.05	0.5	0.80
6,000	9,656.08	600	965.61	60	96.56	6	9.66	0.6	0.97
7,000	11,265.43	700	1,126.54	70	112.65	7	11.27	0.7	1.13
8,000	12,874.78	800	1,287.48	80	128.75	8	12.87	0.8	1.29
9,000	14,484.12	900	1,448.41	90	144.84	9	14.48	0.9	1.45
10,000	16,093.47	1,000	1,609.35	100	160.93	10	16.09	1.0	1.61

KILOMETERS TO MILES
(1 km. = 0.621370 mile)

Km.	Miles	Km.	Miles	Km.	Miles	Km.	Miles	Km.	Miles
1,000	621.37	100	62.14	10	6.21	1	0.62	0.1	0.06
2,000	1,242.74	200	124.27	20	12.43	2	1.24	0.2	0.12
3,000	1,864.11	300	186.41	30	18.64	3	1.86	0.3	0.19
4,000	2,485.48	400	248.55	40	24.86	4	2.49	0.4	0.25
5,000	3,106.85	500	310.68	50	31.07	5	3.11	0.5	0.31
6,000	3,728.22	600	372.82	60	37.28	6	3.73	0.6	0.37
7,000	4,349.59	700	434.96	70	43.50	7	4.35	0.7	0.43
8,000	4,970.96	800	497.10	80	49.71	8	4.97	0.8	0.50
9,000	5,592.33	900	559.23	90	55.92	9	5.59	0.9	0.56
10,000	6,213.70	1,000	621.37	100	62.14	10	6.21	1.0	0.62

* Act of U. S. Congress, 1866. On this basis 1 inch = 25.40005 mm, approximately.

Square Inch—Square Centimeter and Square Foot—Square Meter Conversion Tables

(Based on 1 meter = 39.37 inches)*

SQUARE INCHES TO SQUARE CENTIMETERS
(1 sq. in. = 6.45163 sq. cm.)

Sq. In.	Sq. Cm.	Sq. In.	Sq. Cm.	Sq. In.	Sq. Cm.	Sq. In.	Sq. Cm.	Sq. In.	Sq. Cm.
100	645.16	10	64.52	1	6.45	0.1	0.65	0.01	0.06
200	1,290.33	20	129.03	2	12.90	0.2	1.29	0.02	0.13
300	1,935.49	30	193.55	3	19.35	0.3	1.94	0.03	0.19
400	2,580.65	40	258.07	4	25.81	0.4	2.58	0.04	0.26
500	3,225.82	50	322.58	5	32.26	0.5	3.23	0.05	0.32
600	3,870.98	60	387.10	6	38.71	0.6	3.87	0.06	0.39
700	4,516.14	70	451.61	7	45.16	0.7	4.52	0.07	0.45
800	5,161.30	80	516.13	8	51.61	0.8	5.16	0.08	0.52
900	5,806.47	90	580.65	9	58.06	0.9	5.81	0.09	0.58
1,000	6,451.63	100	645.16	10	64.52	1.0	6.45	0.10	0.65

SQUARE CENTIMETERS TO SQUARE INCHES
(1 sq. cm. = 0.155000 sq. in.)

Sq. Cm.	Sq. In.	Sq. Cm.	Sq. In.	Sq. Cm.	Sq. In.	Sq. Cm.	Sq. In.	Sq. Cm.	Sq. In.
100	15.500	10	1.550	1	0.155	0.1	0.015	0.01	0.002
200	31.000	20	3.100	2	0.310	0.2	0.031	0.02	0.003
300	46.500	30	4.650	3	0.465	0.3	0.046	0.03	0.005
400	62.000	40	6.200	4	0.620	0.4	0.062	0.04	0.006
500	77.500	50	7.750	5	0.775	0.5	0.078	0.05	0.008
600	93.000	60	9.300	6	0.930	0.6	0.093	0.06	0.009
700	108.500	70	10.850	7	1.085	0.7	0.108	0.07	0.011
800	124.000	80	12.400	8	1.240	0.8	0.124	0.08	0.012
900	139.500	90	13.950	9	1.395	0.9	0.140	0.09	0.014
1,000	155.000	100	15.500	10	1.550	1.0	0.155	0.10	0.016

SQUARE FEET TO SQUARE METERS
(1 sq. ft. = 0.0929034 sq. m.)

Sq. Ft.	Sq. M.	Sq. Ft.	Sq. M.	Sq. Ft.	Sq. M.	Sq. Ft.	Sq. M.	Sq. Ft.	Sq. M.
1,000	92.903	100	9.290	10	0.929	1	0.093	0.1	0.009
2,000	185.807	200	18.581	20	1.858	2	0.186	0.2	0.019
3,000	278.710	300	27.871	30	2.787	3	0.279	0.3	0.028
4,000	371.614	400	37.161	40	3.716	4	0.372	0.4	0.037
5,000	464.517	500	46.452	50	4.645	5	0.465	0.5	0.046
6,000	557.420	600	55.742	60	5.574	6	0.557	0.6	0.056
7,000	650.324	700	65.032	70	6.503	7	0.650	0.7	0.065
8,000	743.227	800	74.323	80	7.432	8	0.743	0.8	0.074
9,000	836.131	900	83.613	90	8.361	9	0.836	0.9	0.084
10,000	929.034	1,000	92.903	100	9.290	10	0.929	1.0	0.093

SQUARE METERS TO SQUARE FEET
(1 sq. m. = 10.76387 sq. ft.)

Sq. M.	Sq. Ft.	Sq. M.	Sq. Ft.	Sq. M.	Sq. Ft.	Sq. M.	Sq. Ft.	Sq. M.	Sq. Ft.
100	1,076.39	10	107.64	1	10.76	0.1	1.08	0.01	0.11
200	2,152.77	20	215.28	2	21.53	0.2	2.15	0.02	0.22
300	3,229.16	30	322.92	3	32.29	0.3	3.23	0.03	0.32
400	4,305.55	40	430.56	4	43.06	0.4	4.31	0.04	0.43
500	5,381.94	50	538.19	5	53.82	0.5	5.38	0.05	0.54
600	6,458.32	60	645.83	6	64.58	0.6	6.46	0.06	0.65
700	7,534.71	70	753.47	7	75.35	0.7	7.53	0.07	0.75
800	8,611.10	80	861.11	8	86.11	0.8	8.61	0.08	0.86
900	9,687.48	90	968.75	9	96.87	0.9	9.69	0.09	0.97
1,000	10,763.87	100	1,076.39	10	107.64	1.0	10.76	0.10	1.08

* Act of U. S. Congress, 1866. On this basis 1 inch = 25.40005 mm, approximately.

Cubic Inch—Cubic Centimeter and Cubic Foot—Cubic Meter Conversion Tables

(Based on 1 meter = 39.37 inches)*

CUBIC INCHES TO CUBIC CENTIMETERS
(1 cu. in. = 16.38716 cu. cm.)

Cu. In.	Cu. Cm.	Cu. In.	Cu. Cm.	Cu. In.	Cu. Cm.	Cu. In.	Cu. Cm.	Cu. In.	Cu. Cm.
100	1,638.72	10	163.87	1	16.39	0.1	1.64	0.01	0.16
200	3,277.43	20	327.74	2	32.77	0.2	3.28	0.02	0.33
300	4,916.15	30	491.62	3	49.16	0.3	4.92	0.03	0.49
400	6,554.86	40	655.49	4	65.55	0.4	6.56	0.04	0.66
500	8,193.58	50	819.36	5	81.94	0.5	8.19	0.05	0.82
600	9,832.30	60	983.23	6	98.32	0.6	9.83	0.06	0.98
700	11,471.01	70	1,147.10	7	114.71	0.7	11.47	0.07	1.15
800	13,109.73	80	1,310.97	8	131.10	0.8	13.11	0.08	1.31
900	14,748.44	90	1,474.84	9	147.48	0.9	14.75	0.09	1.47
1,000	16,387.16	100	1,638.72	10	163.87	1.0	16.39	0.10	1.64

CUBIC CENTIMETERS TO CUBIC INCHES
(1 cu. cm. = 0.0610234 cu. in.)

Cu. Cm.	Cu. In.	Cu. Cm.	Cu. In.	Cu. Cm.	Cu. In.	Cu. Cm.	Cu. In.	Cu. Cm.	Cu. In.
1,000	61.023	100	6.102	10	0.610	1	0.061	0.1	0.006
2,000	122.047	200	12.205	20	1.220	2	0.122	0.2	0.012
3,000	183.070	300	18.307	30	1.831	3	0.183	0.3	0.018
4,000	244.094	400	24.409	40	2.441	4	0.244	0.4	0.024
5,000	305.117	500	30.512	50	3.051	5	0.305	0.5	0.031
6,000	366.140	600	36.614	60	3.661	6	0.366	0.6	0.037
7,000	427.164	700	42.716	70	4.272	7	0.427	0.7	0.043
8,000	488.187	800	48.819	80	4.882	8	0.488	0.8	0.049
9,000	549.211	900	54.921	90	5.492	9	0.549	0.9	0.055
10,000	610.234	1,000	61.023	100	6.102	10	0.610	1.0	0.061

CUBIC FEET TO CUBIC METERS
(1 cu. ft. = 0.0283170 cu. m.)

Cu. Ft.	Cu. M.	Cu. Ft.	Cu. M.	Cu. Ft.	Cu. M.	Cu. Ft.	Cu. M.	Cu. Ft.	Cu. M.
1,000	28.317	100	2.832	10	0.283	1	0.028	0.1	0.003
2,000	56.634	200	5.663	20	0.566	2	0.057	0.2	0.006
3,000	84.951	300	8.495	30	0.850	3	0.085	0.3	0.008
4,000	113.268	400	11.327	40	1.133	4	0.113	0.4	0.011
5,000	141.585	500	14.158	50	1.416	5	0.142	0.5	0.014
6,000	169.902	600	16.990	60	1.699	6	0.170	0.6	0.017
7,000	198.219	700	19.822	70	1.982	7	0.198	0.7	0.020
8,000	226.536	800	22.654	80	2.265	8	0.227	0.8	0.023
9,000	254.853	900	25.485	90	2.549	9	0.255	0.9	0.025
10,000	283.170	1,000	28.317	100	2.832	10	0.283	1.0	0.028

CUBIC METERS TO CUBIC FEET
(1 cu. m. = 35.31445 cu. ft.)

Cu. M.	Cu. Ft.	Cu. M.	Cu. Ft.	Cu. M.	Cu. Ft.	Cu. M.	Cu. Ft.	Cu. M.	Cu. Ft.
100	3,531.44	10	353.14	1	35.31	0.1	3.53	0.01	0.35
200	7,062.89	20	706.29	2	70.63	0.2	7.06	0.02	0.71
300	10,594.34	30	1,059.43	3	105.94	0.3	10.59	0.03	1.06
400	14,125.78	40	1,412.58	4	141.26	0.4	14.13	0.04	1.41
500	17,657.22	50	1,765.72	5	176.57	0.5	17.66	0.05	1.77
600	21,188.67	60	2,118.87	6	211.89	0.6	21.19	0.06	2.12
700	24,720.12	70	2,472.01	7	247.20	0.7	24.72	0.07	2.47
800	28,251.56	80	2,825.16	8	282.52	0.8	28.25	0.08	2.83
900	31,783.00	90	3,178.30	9	317.83	0.9	31.78	0.09	3.18
1,000	35,314.45	100	3,531.44	10	353.14	1.0	35.31	0.10	3.53

* Act of U. S. Congress, 1866. On this basis 1 inch = 25.40005 mm. approximately.

Cubic Foot—Liter and Gallon—Liter Conversion Tables

(Based on 1 liter = 1000.028 cubic centimeters)*

CUBIC FEET TO LITERS
(1 cu. ft. = 28.31622 liters)

Cu. Ft.	Liters	Cu. Ft.	Liters	Cu. Ft.	Liters	Cu. Ft.	Liters	Cu. Ft.	Liters
100	2,831.62	10	283.16	1	28.32	0.1	2.83	0.01	0.28
200	5,663.24	20	566.32	2	56.63	0.2	5.66	0.02	0.57
300	8,494.87	30	849.49	3	84.95	0.3	8.49	0.03	0.85
400	11,326.49	40	1,132.65	4	113.26	0.4	11.33	0.04	1.13
500	14,158.11	50	1,415.81	5	141.58	0.5	14.16	0.05	1.42
600	16,989.73	60	1,698.97	6	169.90	0.6	16.99	0.06	1.70
700	19,821.35	70	1,982.14	7	198.21	0.7	19.82	0.07	1.98
800	22,652.98	80	2,265.30	8	226.53	0.8	22.65	0.08	2.27
900	25,484.60	90	2,548.46	9	254.85	0.9	25.48	0.09	2.55
1,000	28,316.22	100	2,831.62	10	283.16	1.0	28.32	0.10	2.83

LITERS TO CUBIC FEET
(1 liter = 0.0353154 cu. ft.)

Liters	Cu. Ft.	Liters	Cu. Ft.	Liters	Cu. Ft.	Liters	Cu. Ft.	Liters	Cu. Ft.
1,000	35.315	100	3.532	10	0.353	1	0.035	0.1	0.004
2,000	70.631	200	7.063	20	0.706	2	0.071	0.2	0.007
3,000	105.946	300	10.595	30	1.059	3	0.106	0.3	0.011
4,000	141.262	400	14.126	40	1.413	4	0.141	0.4	0.014
5,000	176.577	500	17.658	50	1.766	5	0.177	0.5	0.018
6,000	211.892	600	21.189	60	2.119	6	0.212	0.6	0.021
7,000	247.208	700	24.721	70	2.472	7	0.247	0.7	0.025
8,000	282.523	800	28.252	80	2.825	8	0.283	0.8	0.028
9,000	317.839	900	31.784	90	3.178	9	0.318	0.9	0.032
10,000	353.154	1,000	35.315	100	3.532	10	0.353	1.0	0.035

U. S. GALLONS TO LITERS
(1 U. S. gallon = 3.785329 liters)

Gals.	Liters	Gals.	Liters	Gals.	Liters	Gals.	Liters	Gals.	Liters
1,000	3,785.33	100	378.53	10	37.85	1	3.79	0.1	0.38
2,000	7,570.66	200	757.07	20	75.71	2	7.57	0.2	0.76
3,000	11,355.99	300	1,135.60	30	113.56	3	11.36	0.3	1.14
4,000	15,141.32	400	1,514.13	40	151.41	4	15.14	0.4	1.51
5,000	18,926.64	500	1,892.66	50	189.27	5	18.93	0.5	1.89
6,000	22,711.97	600	2,271.20	60	227.12	6	22.71	0.6	2.27
7,000	26,497.30	700	2,649.73	70	264.97	7	26.50	0.7	2.65
8,000	30,282.63	800	3,028.26	80	302.83	8	30.28	0.8	3.03
9,000	34,067.96	900	3,406.80	90	340.68	9	34.07	0.9	3.41
10,000	37,853.29	1,000	3,785.33	100	378.53	10	37.85	1.0	3.79

LITERS TO U. S. GALLONS
(1 liter = 0.264178 U. S. gallon)

Liters	Gals.	Liters	Gals.	Liters	Gals.	Liters	Gals.	Liters	Gals.
1,000	264.18	100	26.42	10	2.64	1	0.26	0.1	0.03
2,000	528.36	200	52.84	20	5.28	2	0.53	0.2	0.05
3,000	792.53	300	79.25	30	7.93	3	0.79	0.3	0.08
4,000	1,056.71	400	105.67	40	10.57	4	1.06	0.4	0.11
5,000	1,320.89	500	132.09	50	13.21	5	1.32	0.5	0.13
6,000	1,585.07	600	158.51	60	15.85	6	1.59	0.6	0.16
7,000	1,849.25	700	184.92	70	18.49	7	1.85	0.7	0.18
8,000	2,113.42	800	211.34	80	21.13	8	2.11	0.8	0.21
9,000	2,377.60	900	237.76	90	23.78	9	2.38	0.9	0.24
10,000	2,641.78	1,000	264.18	100	26.42	10	2.64	1.0	0.26

*For practical purposes in some applications 1 liter is taken as being equal to 1,000 cubic centimeters, exactly.

Pound—Kilogram and Ounce—Gram Conversion Tables

POUNDS TO KILOGRAMS (1 pound = 0.453592 kilogram)

Lb.	Kg.	Lb.	Kg.	Lb.	Kg.	Lb.	Kg.	Lb.	Kg.
1,000	453.59	100	45.36	10	4.54	1	0.45	0.1	0.05
2,000	907.18	200	90.72	20	9.07	2	0.91	0.2	0.09
3,000	1,360.78	300	136.08	30	13.61	3	1.36	0.3	0.14
4,000	1,814.37	400	181.44	40	18.14	4	1.81	0.4	0.18
5,000	2,267.96	500	226.80	50	22.68	5	2.27	0.5	0.23
6,000	2,721.55	600	272.16	60	27.22	6	2.72	0.6	0.27
7,000	3,175.14	700	317.51	70	31.75	7	3.18	0.7	0.32
8,000	3,628.74	800	362.87	80	36.29	8	3.63	0.8	0.36
9,000	4,082.33	900	408.23	90	40.82	9	4.08	0.9	0.41
10,000	4,535.92	1,000	453.59	100	45.36	10	4.54	1.0	0.45

KILOGRAMS TO POUNDS (1 kilogram = 2.204622 pounds)

Kg.	Lb.	Kg.	Lb.	Kg.	Lb.	Kg.	Lb.	Kg.	Lb.
1,000	2,204.62	100	220.46	10	22.05	1	2.20	0.1	0.22
2,000	4,409.24	200	440.92	20	44.09	2	4.41	0.2	0.44
3,000	6,613.87	300	661.39	30	66.14	3	6.61	0.3	0.66
4,000	8,818.49	400	881.85	40	88.18	4	8.82	0.4	0.88
5,000	11,023.11	500	1,102.31	50	110.23	5	11.02	0.5	1.10
6,000	13,227.73	600	1,322.77	60	132.28	6	13.23	0.6	1.32
7,000	15,432.35	700	1,543.24	70	154.32	7	15.43	0.7	1.54
8,000	17,636.98	800	1,763.70	80	176.37	8	17.64	0.8	1.76
9,000	19,841.60	900	1,984.16	90	198.42	9	19.84	0.9	1.98
10,000	22,046.22	1,000	2,204.62	100	220.46	10	22.05	1.0	2.20

OUNCES TO GRAMS (1 ounce = 28.3495 grams)

Oz.	G.	Oz.	G.	Oz.	G.	Oz.	G.	Oz.	G.
10	283.50	1	28.35	0.1	2.84	0.01	0.28	0.001	0.03
20	566.99	2	56.70	0.2	5.67	0.02	0.57	0.002	0.06
30	850.48	3	85.05	0.3	8.50	0.03	0.85	0.003	0.09
40	1,133.98	4	113.40	0.4	11.34	0.04	1.13	0.004	0.11
50	1,417.48	5	141.75	0.5	14.17	0.05	1.42	0.005	0.14
60	1,700.97	6	170.10	0.6	17.01	0.06	1.70	0.006	0.17
70	1,984.46	7	198.45	0.7	19.84	0.07	1.98	0.007	0.20
80	2,267.96	8	226.80	0.8	22.68	0.08	2.27	0.008	0.23
90	2,551.46	9	255.15	0.9	25.51	0.09	2.55	0.009	0.26
100	2,834.95	10	283.50	1.0	28.35	0.10	2.83	0.010	0.28

GRAMS TO OUNCES (1 gram = 0.035274 ounce)

G.	Oz.	G.	Oz.	G.	Oz.	G.	Oz.	G.	Oz.
100	3.527	10	0.353	1	0.035	0.1	0.004	0.01	0.000
200	7.055	20	0.706	2	0.071	0.2	0.007	0.02	0.001
300	10.582	30	1.058	3	0.106	0.3	0.011	0.03	0.001
400	14.110	40	1.411	4	0.141	0.4	0.014	0.04	0.001
500	17.637	50	1.764	5	0.176	0.5	0.018	0.05	0.002
600	21.164	60	2.116	6	0.212	0.6	0.021	0.06	0.002
700	24.692	70	2.469	7	0.247	0.7	0.025	0.07	0.002
800	28.219	80	2.822	8	0.282	0.8	0.028	0.08	0.003
900	31.747	90	3.175	9	0.317	0.9	0.032	0.09	0.003
1,000	35.274	100	3.527	10	0.353	1.0	0.035	0.10	0.004

Pounds per Square Inch—Kilograms per Square Centimeter and Pounds per Square Foot—Kilograms per Square Meter Conversion Tables

POUNDS PER SQUARE INCH TO KILOGRAMS PER SQUARE CENTIMETER
(1 lb. per sq. in. = 0.0703066 kg. per sq. cm.)

Lb/in.²	Kg/cm²	Lb/in.²	Kg/cm²	Lb/in.²	Kg/cm²	Lb/in.²	Kg/cm²	Lb/in.²	Kg/cm²
1,000	70.307	100	7.031	10	0.703	1	0.070	0.1	0.007
2,000	140.613	200	14.061	20	1.406	2	0.141	0.2	0.014
3,000	210.920	300	21.092	30	2.109	3	0.211	0.3	0.021
4,000	281.226	400	28.123	40	2.812	4	0.281	0.4	0.028
5,000	351.533	500	35.153	50	3.515	5	0.352	0.5	0.035
6,000	421.840	600	42.184	60	4.218	6	0.422	0.6	0.042
7,000	492.146	700	49.215	70	4.921	7	0.492	0.7	0.049
8,000	562.453	800	56.245	80	5.625	8	0.562	0.8	0.056
9,000	632.759	900	63.276	90	6.328	9	0.633	0.9	0.063
10,000	703.066	1,000	70.307	100	7.031	10	0.703	1.0	0.070

KILOGRAMS PER SQUARE CENTIMETER TO POUNDS PER SQUARE INCH
(1 kg. per sq. cm. = 14.22340 lb. per sq. in.)

Kg/cm²	Lb/in.²	Kg/cm²	Lb/in.²	Kg/cm²	Lb/in.²	Kg/cm²	Lb/in.²	Kg/cm²	Lb/in.²
100	1,422.34	10	142.23	1	14.22	0.1	1.42	0.01	0.14
200	2,844.68	20	284.47	2	28.45	0.2	2.84	0.02	0.28
300	4,267.02	30	426.70	3	42.67	0.3	4.27	0.03	0.43
400	5,689.36	40	568.94	4	56.89	0.4	5.69	0.04	0.57
500	7,111.70	50	711.17	5	71.12	0.5	7.11	0.05	0.71
600	8,534.04	60	853.40	6	85.34	0.6	8.53	0.06	0.85
700	9,956.38	70	995.64	7	99.56	0.7	9.96	0.07	1.00
800	11,378.72	80	1,137.87	8	113.79	0.8	11.38	0.08	1.14
900	12,801.06	90	1,280.11	9	128.01	0.9	12.80	0.09	1.28
1,000	14,223.40	100	1,422.34	10	142.23	1.0	14.22	0.10	1.42

POUNDS PER SQUARE FOOT TO KILOGRAMS PER SQUARE METER
(1 lb. per sq. ft. = 4.882409 kg. per sq. m.)

Lb/ft²	Kg/m²	Lb/ft²	Kg/m²	Lb/ft²	Kg/m²	Lb/ft²	Kg/m²	Lb/ft²	Kg/m²
1,000	4,882.41	100	488.24	10	48.82	1	4.88	0.1	0.49
2,000	9,764.82	200	976.48	20	97.65	2	9.76	0.2	0.98
3,000	14,647.23	300	1,464.72	30	146.47	3	14.65	0.3	1.46
4,000	19,529.64	400	1,952.96	40	195.30	4	19.53	0.4	1.95
5,000	24,412.04	500	2,441.20	50	244.12	5	24.41	0.5	2.44
6,000	29,294.45	600	2,929.44	60	292.94	6	29.29	0.6	2.93
7,000	34,176.86	700	3,417.69	70	341.77	7	34.18	0.7	3.42
8,000	39,059.27	800	3,905.93	80	390.59	8	39.06	0.8	3.91
9,000	43,941.68	900	4,394.17	90	439.42	9	43.94	0.9	4.39
10,000	48,824.09	1,000	4,882.41	100	488.24	10	48.82	1.0	4.88

KILOGRAMS PER SQUARE METER TO POUNDS PER SQUARE FOOT
(1 kg. per sq. m. = 0.204817 lb. per sq. ft.)

Kg/m²	Lb/ft²	Kg/m²	Lb/ft²	Kg/m²	Lb/ft²	Kg/m²	Lb/ft²	Kg/m²	Lb/ft²
1,000	204.82	100	20.48	10	2.05	1	0.20	0.1	0.02
2,000	409.63	200	40.96	20	4.10	2	0.41	0.2	0.04
3,000	614.45	300	61.44	30	6.14	3	0.61	0.3	0.06
4,000	819.27	400	81.93	40	8.19	4	0.82	0.4	0.08
5,000	1,024.08	500	102.41	50	10.24	5	1.02	0.5	0.10
6,000	1,228.90	600	122.89	60	12.29	6	1.23	0.6	0.12
7,000	1,433.72	700	143.37	70	14.34	7	1.43	0.7	0.14
8,000	1,638.54	800	163.85	80	16.39	8	1.64	0.8	0.16
9,000	1,843.35	900	184.34	90	18.43	9	1.84	0.9	0.18
10,000	2,048.17	1,000	204.82	100	20.48	10	2.05	1.0	0.20

Pounds per Cubic Inch—Grams per Cubic Centimeter and Pounds per Cubic Foot—Kilograms per Cubic Meter Conversion Tables

POUNDS PER CUBIC INCH TO GRAMS PER CUBIC CENTIMETER
(1 lb. per cu. in. = 27.67974 g. per cu. cm.)

Lb./in.^{3}	G./cm.^{3}	Lb./in.^{3}	G./cm.^{3}	Lb./in.^{3}	G./cm.^{3}	Lb./in.^{3}	G./cm.^{3}	Lb./in.^{3}	G./cm.^{3}
100	2,767.97	10	276.80	1	27.68	0.1	2.77	0.01	0.28
200	5,535.95	20	553.60	2	55.36	0.2	5.54	0.02	0.55
300	8,303.92	30	830.39	3	83.04	0.3	8.30	0.03	0.83
400	11,071.90	40	1,107.19	4	110.72	0.4	11.07	0.04	1.11
500	13,839.87	50	1,383.99	5	138.40	0.5	13.84	0.05	1.38
600	16,607.84	60	1,660.78	6	166.08	0.6	16.61	0.06	1.66
700	19,375.82	70	1,937.58	7	193.76	0.7	19.38	0.07	1.94
800	22,143.79	80	2,214.38	8	221.44	0.8	22.14	0.08	2.21
900	24,911.77	90	2,491.18	9	249.12	0.9	24.91	0.09	2.49
1,000	27,679.74	100	2,767.97	10	276.80	1.0	27.68	0.10	2.77

GRAMS PER CUBIC CENTIMETER TO POUNDS PER CUBIC INCH
(1 g. per cu. cm. = 0.0361275 lb. per cu. in.)

G./cm.^{3}	Lb./in.^{3}	G./cm.^{3}	Lb./in.^{3}	G./cm.^{3}	Lb./in.^{3}	G./cm.^{3}	Lb./in.^{3}	G./cm.^{3}	Lb./in.^{3}
1,000	36.128	100	3.613	10	0.361	1	0.036	0.1	0.004
2,000	72.255	200	7.226	20	0.723	2	0.072	0.2	0.007
3,000	108.382	300	10.838	30	1.084	3	0.108	0.3	0.011
4,000	144.510	400	14.451	40	1.445	4	0.145	0.4	0.014
5,000	180.638	500	18.064	50	1.806	5	0.181	0.5	0.018
6,000	216.765	600	21.676	60	2.168	6	0.217	0.6	0.022
7,000	252.892	700	25.289	70	2.529	7	0.253	0.7	0.025
8,000	289.020	800	28.902	80	2.890	8	0.289	0.8	0.029
9,000	325.148	900	32.515	90	3.251	9	0.325	0.9	0.033
10,000	361.275	1,000	36.128	100	3.613	10	0.361	1.0	0.036

POUNDS PER CUBIC FOOT TO KILOGRAMS PER CUBIC METER
(1 lb. per cu. ft. = 16.01837 kg. per cu. m.)

Lb./ft.^{3}	Kg./m.^{3}	Lb./ft.^{3}	Kg./m.^{3}	Lb./ft.^{3}	Kg./m.^{3}	Lb./ft.^{3}	Kg./m.^{3}	Lb./ft.^{3}	Kg./m.^{3}
100	1,601.84	10	160.18	1	16.02	0.1	1.60	0.01	0.16
200	3,203.67	20	320.37	2	32.04	0.2	3.20	0.02	0.32
300	4,805.51	30	480.55	3	48.06	0.3	4.81	0.03	0.48
400	6,407.35	40	640.73	4	64.07	0.4	6.41	0.04	0.64
500	8,009.18	50	800.92	5	80.09	0.5	8.01	0.05	0.80
600	9,611.02	60	961.10	6	96.11	0.6	9.61	0.06	0.96
700	11,212.86	70	1,121.29	7	112.13	0.7	11.21	0.07	1.12
800	12,814.70	80	1,281.47	8	128.15	0.8	12.81	0.08	1.28
900	14,416.53	90	1,441.65	9	144.17	0.9	14.42	0.09	1.44
1,000	16,018.37	100	1,601.84	10	160.18	1.0	16.02	0.10	1.60

KILOGRAMS PER CUBIC METER TO POUNDS PER CUBIC FOOT
(1 kg. per cu. m. = 0.0624283 lb. per cu. ft.)

Kg./m.^{3}	Lb./ft.^{3}	Kg./m.^{3}	Lb./ft.^{3}	Kg./m.^{3}	Lb./ft.^{3}	Kg./m.^{3}	Lb./ft.^{3}	Kg./m.^{3}	Lb./ft.^{3}
1,000	62.428	100	6.243	10	0.624	1	0.062	0.1	0.006
2,000	124.857	200	12.486	20	1.249	2	0.125	0.2	0.012
3,000	187.285	300	18.728	30	1.873	3	0.187	0.3	0.019
4,000	249.713	400	24.971	40	2.497	4	0.250	0.4	0.025
5,000	312.142	500	31.214	50	3.121	5	0.312	0.5	0.031
6,000	374.570	600	37.457	60	3.746	6	0.375	0.6	0.037
7,000	436.998	700	43.700	70	4.370	7	0.437	0.7	0.044
8,000	499.426	800	49.943	80	4.994	8	0.499	0.8	0.050
9,000	561.855	900	56.186	90	5.619	9	0.562	0.9	0.056
10,000	624.283	1,000	62.428	100	6.243	10	0.624	1.0	0.062

British Thermal Unit—Foot Pound and Horsepower—Kilowatt Conversion Tables

BRITISH THERMAL UNITS TO FOOT-POUNDS
(1 Btu = 778.26 ft.-lbs.)*

Btu	Ft.-lb.	Btu	Ft.-lb.	Btu	Ft.-lb.	Btu	Ft.-lb.	Btu	Ft.-lb.
100	77,826	10	7,783	1	778	0.1	78	0.01	8
200	155,652	20	15,565	2	1,557	0.2	156	0.02	16
300	233,478	30	23,348	3	2,335	0.3	233	0.03	23
400	311,304	40	31,130	4	3,113	0.4	311	0.04	31
500	389,130	50	38,913	5	3,891	0.5	389	0.05	39
600	466,956	60	46,696	6	4,670	0.6	467	0.06	47
700	544,782	70	54,478	7	5,448	0.7	545	0.07	54
800	622,608	80	62,261	8	6,226	0.8	623	0.08	62
900	700,434	90	70,043	9	7,004	0.9	700	0.09	70
1,000	778,260	100	77,826	10	7,783	1.0	778	0.10	78

FOOT-POUNDS TO BRITISH THERMAL UNITS
(1 ft.-lb. = 0.00128492 Btu)*

Ft.-lb.	Btu	Ft.-lb.	Btu	Ft.-lb.	Btu	Ft.-lb.	Btu	Ft.-lb.	Btu
10,000	12.849	1,000	1.285	100	0.128	10	0.013	1	0.001
20,000	25.698	2,000	2.570	200	0.257	20	0.026	2	0.003
30,000	38.548	3,000	3.855	300	0.385	30	0.039	3	0.004
40,000	51.397	4,000	5.140	400	0.514	40	0.051	4	0.005
50,000	64.246	5,000	6.425	500	0.642	50	0.064	5	0.006
60,000	77.095	6,000	7.710	600	0.771	60	0.077	6	0.008
70,000	89.944	7,000	8.994	700	0.899	70	0.090	7	0.009
80,000	102.794	8,000	10.279	800	1.028	80	0.103	8	0.010
90,000	115.643	9,000	11.564	900	1.156	90	0.116	9	0.012
100,000	128.492	10,000	12.849	1,000	1.285	100	0.128	10	0.013

HORSEPOWER TO KILOWATTS
(1 hp. = 0.74570 kw.)†

Hp.	Kw.	Hp.	Kw.	Hp.	Kw.	Hp.	Kw.	Hp.	Kw.
1,000	745.7	100	74.6	10	7.5	1	0.7	0.1	0.1
2,000	1,491.4	200	149.1	20	14.9	2	1.5	0.2	0.1
3,000	2,237.1	300	223.7	30	22.4	3	2.2	0.3	0.2
4,000	2,982.8	400	298.3	40	29.8	4	3.0	0.4	0.3
5,000	3,728.5	500	372.8	50	37.3	5	3.7	0.5	0.4
6,000	4,474.2	600	447.4	60	44.7	6	4.5	0.6	0.4
7,000	5,219.9	700	522.0	70	52.2	7	5.2	0.7	0.5
8,000	5,965.6	800	596.6	80	59.7	8	6.0	0.8	0.6
9,000	6,711.3	900	671.1	90	67.1	9	6.7	0.9	0.7
10,000	7,457.0	1,000	745.7	100	74.6	10	7.5	1.0	0.7

KILOWATTS TO HORSEPOWER
(1 kw. = 1.34102 hp.)†

Kw.	Hp.	Kw.	Hp.	Kw.	Hp.	Kw.	Hp.	Kw.	Hp.
1,000	1,341.0	100	134.1	10	13.4	1	1.3	0.1	0.1
2,000	2,682.0	200	268.2	20	26.8	2	2.7	0.2	0.3
3,000	4,023.1	300	402.3	30	40.2	3	4.0	0.3	0.4
4,000	5,364.1	400	536.4	40	53.6	4	5.4	0.4	0.5
5,000	6,705.1	500	670.5	50	67.1	5	6.7	0.5	0.7
6,000	8,046.1	600	804.6	60	80.5	6	8.0	0.6	0.8
7,000	9,387.1	700	938.7	70	93.9	7	9.4	0.7	0.9
8,000	10,728.2	800	1,072.8	80	107.3	8	10.7	0.8	1.1
9,000	12,069.2	900	1,206.9	90	120.7	9	12.1	0.9	1.2
10,000	13,410.2	1,000	1,341.0	100	134.1	10	13.4	1.0	1.3

* Conversion factor defined by International Steam Table Conference, 1929.
† Based on 1 horsepower = 550 foot-pounds per second.

Fundamental Electrical Units. -- The fundamental electrical units of the *International System* were, by international agreement, superseded by those of the *Absolute System* derived from the fundamental mechanical units of length, mass, and time by use of accepted principles of electromagnetism with the value of the permeability of space taken as 0.0000001 in the meter-kilogram-second system.

The relations between the mean international units and the absolute units are: one mean international ohm equals 1.00049 absolute ohm; one mean international volt equals 1.00034 absolute volt. This change became effective on January 1, 1948.

The *Ampere* (unit of electric current). — The absolute ampere is the constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular sections, and placed 1 meter apart in a vacuum, will produce between these conductors a force equal to 0.0000002 meter-kilogram-second unit (newton) of force per meter of length.

The *Volt* (unit of difference of potential and of electromotive force). — The volt is the difference of electric potential between two points of a conducting wire carrying a constant current of 1 ampere, when the power dissipated between these points is equal to 1 watt.

The *Ohm* (unit of electric resistance). — The ohm is the electric resistance between two points of a conductor when a constant difference of potential of 1 volt, applied between these two points, produces in this conductor a current of 1 ampere, this conductor not being the seat of any electromotive force.

The *Coulomb* (unit of quantity of electricity). — The coulomb is the quantity of electricity transported in 1 second by a current of 1 ampere.

The *Farad* (unit of electric capacitance). — The farad is the capacitance of a capacitor between the plates of which there appears a difference of potential of 1 volt when it is charged by a quantity of electricity equal to 1 coulomb.

The *Henry* (unit of electric inductance). — The henry is the inductance of a closed circuit in which an electromotive force of 1 volt is produced when the electric current in the circuit varies uniformly at a rate of 1 ampere per second.

Power and Heat Equivalents

1 horsepower-hour = 0.746 kilowatt-hour = 1,980,000 foot-pounds = 2545 Btu (British thermal units) = 2.64 pounds of water evaporated at 212° F. = 17 pounds of water raised from 62° to 212° F.

1 kilowatt-hour = 1000 watt-hours = 1.34 horsepower-hour = 2,655,200 foot-pounds = 3,600,000 joules = 3415 Btu = 3.54 pounds of water evaporated at 212° F. = 22.8 pounds of water raised from 62° to 212° F.

1 horsepower = 746 watts = 0.746 kilowatt = 33,000 foot-pounds per minute = 550 foot-pounds per second = 2545 Btu per hour = 42.4 Btu per minute = 0.71 Btu per second = 2.64 lbs. of water evaporated per hour at 212° F.

1 kilowatt = 1000 watts = 1.34 horsepower = 2,655,200 foot-pounds per hour = 44,200 foot-pounds per minute = 737 foot-pounds per second = 3415 Btu per hour = 57 Btu per minute = 0.95 Btu per second = 3.54 pounds of water evaporated per hour at 212° F.

1 watt = 1 joule per second = 0.00134 horsepower = 0.001 kilowatt = 3.42 Btu per hour = 44.22 foot-pounds per minute = 0.74 foot-pounds per second = 0.0035 pound of water evaporated per hour at 212° F.

1 Btu (British thermal unit) = 1052 watt-seconds = 778 foot-pounds = 0.252 kilogram-calorie = 0.000292 kilowatt-hour = 0.000393 horsepower-hour = 0.00104 pound of water evaporated at 212° F.

1 foot-pound = 1.36 joule = 0.000000377 kilowatt-hour = 0.00129 Btu = 0.0000005 horsepower-hour.

1 joule = 1 watt-second = 0.000000278 kilowatt-hour = 0.00095 Btu = 0.74 foot-pound.

ANH NGỮ THỰC HÀNH

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ABS Acrylonttrine-Butadiene-Styrene

LCD Liquid Crystal Display

PCM Pulse Code Modulation