

<i>To Find</i>	<i>Given</i>	<i>Formula</i>	
1. Basic Geometry			
Circumference of a circle	Diameter	Circumference =	3.1416 x diameter
Diameter of a circle	Circumference	Diameter =	Circumference / 3.1416
2. Motion			
Ratio	High Speed & Low Speed	Ratio =	$\frac{\text{RPM High}}{\text{RPM Low}}$
RPM	Feet per Minute of Belt and Pulley Diameter	RPM =	$\frac{\text{FPM}}{.262 \times \text{diameter in inches}}$
Belt Speed Feet per Minute	RPM & Pulley Diameter	FPM =	.262 x RPM x diameter in inches
Ratio	Teeth of Pinion & Teeth of Gear	Ratio =	$\frac{\text{Teeth of Gear}}{\text{Teeth of Pinion}}$
Ratio	Two Sprockets or Pulley Diameters	Ratio =	$\frac{\text{Diameter Driven}}{\text{Diameter Driver}}$
3. Force - Work - Torque			
Force (F)	Torque & Diameter	F =	$\frac{\text{Torque} \times 2}{\text{Diameter}}$
Torque (T)	Force & Diameter	T =	(F x Diameter) / 2
Diameter (Dia.)	Torque & Force	Diameter =	(2 x T) / F
Work	Force & Distance	Work =	Force x Distance
Chain Pull	Torque & Diameter	Pull =	(T x 2) / Diameter
4. Power			
Chain Pull	Horsepower & Speed (FPM)	Pull =	(33,000 x HP) / Speed
Horsepower	Force & Speed (FPM)	HP =	(Force x Speed) / 33,000
Horsepower	RPM & Torque (#in.)	HP =	(Torque x RPM) / 63025
Horsepower	RPM & Torque (#ft.)	HP =	(Torque x RPM) / 5250
Torque	HP & RPM	T #in. =	(63025 x HP) / RPM
Torque	HP & RPM	T #ft. =	(5250 x HP) / RPM
5. Inertia			
Accelerating Torque (#ft.)	WK ² , RMP, Time	T =	$\frac{\text{WK}^2 \times \text{RPM}}{308 \times \text{Time}}$
Accelerating Time (Sec.)	Torque, WK ² , RPM	t =	$\frac{\text{WK}^2 \times \text{RPM}}{308 \times \text{Torque}}$
WK ² at motor	WK ² at Load, Ratio	WK ² Motor =	$\frac{\text{WK}^2}{\text{Ratio}^2}$
6. Gearing			
Gearset Centers	Pd Gear & Pd Pinion	Centers =	(Pd _G + Pd _p) / 2
Pitch Diameter	No. of Teeth & Diametral Pitch	Pd =	Teeth / DP
Pitch Diameter	No. of Teeth & Module	Pd =	(Teeth x Module) / 25.4
Diametral Pitch	Pd & No. of Teeth	DP =	Teeth / Pd
Module	Pd & No. of Teeth	Module =	(Pd x 25.4) / Teeth
Circular Pitch	Pd & No. of Teeth	CP =	(3.1416 x Pd) / Teeth
Circular Pitch	Diametral Pitch	CP =	3.1416 / DP
Number of Teeth	Pd & DP	Teeth =	Pd x DP
Number of Teeth	Pd & Module	Teeth =	(Pd x 25.4) / Module
Tooth Depth	Diametral Pitch	TD =	2.35 / DP
Tooth Depth	Module	TD =	(2.35 x Module) / 25.4

<i>To Find</i>	<i>Given</i>	<i>Formula</i>
7. Belting		
Effective Tension	T_1 and T_2	$T_e = T_1 - T_2$
Effective Tension	HP, RPM, Pulley Radius	$T_e = \frac{63025 \times \text{HP}}{\text{RPM} \times R}$
Effective Tension	Torque, Pulley Radius	$T_e = \text{Torque} / R$
Effective Tension	Horsepower, Belt Velocity (FPM)	$T_e = (\text{HP} \times 33000) / \text{FPM}$
Total Load	T_1 & T_2	$TL = T_1 + T_2$
8. Overhung Load		
Overhung Load	Torque, Diameter	$OHL = (T \times 2) / \text{Diameter}$
Overhung Load	Effective Tension, Belt Factor $f = 1.50$ V-Belts $f = 2.50$ flat belts	$OHL = T_e \times f$
Overhung Load	Horsepower, Speed (RPM) Diameter, factor $f = 1.0$ chain $f = 1.25$ gear drives $f = 1.50$ V-belts $f = 2.50$ flat belts	$OHL = \frac{126000 \times f \times \text{HP}}{\text{Diameter} \times \text{RPM}}$
Overhung Load	Weight	$OHL = \text{Weight}$
9. Electricity		
Motor Speed (RPM)	Number of Poles	$\text{RPM} = \frac{120 \times \text{HZ}}{\text{No. of Poles}}$
Horsepower Single Phase or Direct Current Motor	Volts, Amps, Power factor Efficiency	$\text{HP} = \frac{\text{Volts} \times \text{Amps} \times \text{Pf} \times \text{Eff.}}{746}$
Horsepower 3 Phase Motor	Volts, Amps, Power factor Efficiency	$\text{HP} = \frac{\text{Volts} \times \text{Amps} \times 1.73 \times \text{Pf} \times \text{Eff.}}{746}$
Horsepower	Watts	$\text{HP} = \text{Watts} / 746$
Horsepower	Kilowatts	$\text{HP} = \text{KW} / .746$
Motor Power (Watts), Single Phase	Volts, Amps, Pf, Eff.	$\text{Watts} = \text{V} \times \text{Amps} \times \text{Pf} \times \text{Eff.}$
Motor Power (Watts), 3 Phase	Volts, Amps, Pf, Eff.	$\text{Watts} = 1.73 \times \text{V} \times \text{Amps} \times \text{Pf} \times \text{Eff.}$
10. Temperature		
Degrees Fahrenheit	Degrees Centigrade	$^{\circ}\text{F} = (1.8 \times ^{\circ}\text{C}) + 32$
Degrees Centigrade	Degrees Fahrenheit	$^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$
11. Metric Conversions		
Inches x 25.4 = Millimeters		Millimeter x .0394 = inches
Pounds x .455 = Kilograms		Kilogram x 2.2 = pounds
U.S. Gallons x 3.785 = Liters		Liter x .264 = U.S. Gallon
Pounds (Force) x 4.448 = Newtons		Newtons x .2246 = Pounds (Force)
Pounds inches x .113 = Newton Meters		Newton Meters x 8.85 = Pound-ins.
Horsepower x .746 = Kilowatts		Kilowatts x 1.34 = Horsepower
Pounds/in ² (psi) x .0069 = Newtons/mm ²		Newton /mm ² x 145 = Pounds/in ²
BTU x .00029 = Kilowatt Hours		Kilowatt Hours x 3415 = BTU's

Engineering Calculations Quick Reference Guide

Torque

$$\text{Horsepower} = \frac{\text{Torque, Pound-inches (RPM)}}{63,025}$$

$$\text{Horsepower} = \frac{\text{Torque, Pound-feet (RPM)}}{5,252}$$

Flywheel Effect, WR²

$$WR^2 = \frac{0.17773F (D_o^4 - D_i^4)}{1000} - \frac{NY (D_o - Z)^3}{1000} \text{ lb.-ft}^2$$

for gray iron. Multiply by 1.08 for steel.

Where: D_o = Outside diameter of rim, inches.
 D_i = Inside diameter of rim, inches.
 F = Face width of rim, inches
 N = Number of grooves
 Y = Groove constant from table
 Z = Groove constant from table

**Torque Required to Accelerate
or Decelerate a Flywheel**

The torque required to uniformly accelerate or decelerate a sheave, pulley or flywheel can be calculated as follows:

$$\text{Torque (in. lbs.)} = \frac{.03908 \times N \times W \times R^2}{t}$$

$$\text{Torque (ft. lbs.)} = \frac{.003257 \times N \times W \times R^2}{t}$$

N = Difference between initial and final RPM.

W = Weight of rim in pounds.

R = Mean Radius of Sheave Rim, Pulley or Flywheel in feet.

t = Time required to effect speed change, in seconds.

Data for WR² Calculations

Groove	Pitch Diameter	Add to PD to find D _o	Outside Diameter (in)	Outside Diameter (D _o) Minus Inside Diameter (D _i) for Standard Sheaves	Y	Z
3V	-	-	up to 10.6	1.2	.113	.30
	-	-	10.7 to 25.0	1.3	.113	.30
	-	-	25.1 to 35.5	1.5	.113	.30
5V	-	-	up to 21.2	1.9	.320	.50
	-	-	21.2 to 31.5	2.0	.320	.50
	-	-	37.5 to 50.00	2.2	.320	.50
8V	-	-	up to 22.4	2.7	.885	.80
	-	-	22.5 to 53.0	2.9	.885	.80
	-	-	53.1 & up	3.0	.885	.80
A Multi-Duty	All	.75	-	1.6	.377	.50
B Multi-Duty	All	.35	-	1.6	.377	.50
A	All	.25	-	1.5	.238	.40
B	All	.35	-	1.7	.384	.50
C	Up to 18.0	.40	-	2.1	.696	.65
C	20.1 to 50.0	.40	-	2.2	.696	.68
D	Up to 20.0	.60	-	2.9	1.280	.90
D	20.0 to 58.0	.60	-	3.0	1.280	.90
E (Special)		.80	-		2.050	1.14

V-Belt Drive Factors

Arc of Contact Correction Factors G and R

$\frac{D-d}{C}$	Small Sheave Arc of Contact	Factor G	Factor R	$\frac{D-d}{C}$	Small Sheave Arc of Contact	Factor G	Factor R
.00	180°	1.00	1.000	.80	133°	.87	.917
.10	174°	.99	.999	.90	127°	.85	.893
.20	169°	.97	.995	1.00	120°	.82	.866
.30	163°	.96	.989	1.10	113°	.80	.835
.40	157°	.94	.980	1.20	106°	.77	.800
.50	151°	.93	.968	1.30	99°	.73	.760
.60	145°	.91	.954	1.40	91°	.70	.714
.70	139°	.89	.937	1.50	83°	.65	.661

D = Diam. of large sheave
 C = Center distance
 d = Diam. of small sheave

Allowable Sheave Rim Speed

Sheave Material	Rim Speed in Feet per Minute
Cast Iron.....	6,500
Ductile Iron.....	8,000
Steel.....	10,000

NOTE: Above rim speed values are maximum for normal considerations. In some cases, these values may be exceeded. Consult factory and include complete details of proposed application.

Bearing Load Calculations

To find actual loads, it is necessary to know machine component weights and values of all other forces contributing to the load. Sometimes it becomes desirable to know the bearing load imposed by the V-belt drive alone. This can be done if you know bearing spacing with respect to the sheave center and shaft load and apply it to the formula:

Overhung Sheave

$$\text{Load at B, lbs} = \frac{\text{Shaft Load} \times (a+b)}{a}$$

$$\text{Load at A, lbs} = \frac{\text{Shaft load} \times b}{a}$$

Where: a and b = spacing, inches

Short Cut Ways to Figure Pump Drives

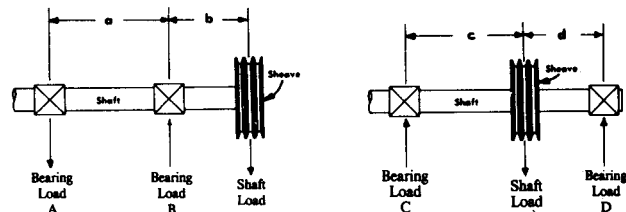
- *D = Diameter of pump sheave
- *d = Diameter of engine sheave
- SPM = Strokes Per Minute
- RPM = Engine Speed in Revolutions Per Minute
- R = Gear box ratio
- *C = Shaft center distance
- *Required values to determine belt length

$$\text{Belt length} = \frac{2C + 1.57(D+d) + \frac{(D-d)^2}{4C}}$$

$$D = \frac{\text{RPM} \times d}{\text{SPM} \times R} \qquad \text{RPM} = \frac{\text{SPM} \times R \times D}{d}$$

$$d = \frac{\text{SPM} \times R \times D}{\text{RPM}} \qquad R = \frac{\text{RPM} \times d}{\text{SPM} \times D}$$

$$\text{SPM} = \frac{\text{RPM} \times d}{R \times D}$$



Sheave Between Bearings

$$\text{Load at D, lbs} = \frac{\text{Shaft Load} \times c}{c + d}$$

$$\text{Load at C, lbs} = \frac{\text{Shaft Load} \times d}{c + d}$$

Where: spacing, inches

V-Belt Tension

Belt Effective Pull

$$T_1 - T_2 = 33,000 \left(\frac{HP}{V} \right)$$

Where: T_1 = Tight Side Tension, pounds
 T_2 = Slack Side Tension, pounds
 HP = Design Horsepower
 V = Belt Speed, feet per minute

Total Belt Pull

$$T_1 + T_2 = 33,000 (2.5 - G) \left(\frac{HP}{GV} \right)$$

Where: T_1 = Tight Side Tension, pounds
 T_2 = Slack Side Tension, pounds
 HP = Design Horsepower
 V = Belt Speed, feet per minute
 G = Arc of Contact Correction Factor

Arc Correction Factor

$$G = 1.25 \left(1 - \frac{1}{e^{5123\theta}} \right)$$

Where: θ = arc of contact in radians

Belt Length

$$\text{Belt Length} = 2C + 1.57 (D+d) + \frac{(D-d)^2}{4C}$$

Belt Length = Belt outside diameter
 D = O.D. of large sheave
 d = O.D. of small sheave
 C = center distance between shafts

Belt Speed

$$V = \frac{(PD) (RPM)}{3.82} = (PD) (RPM) (.262)$$

Where: V = Belt Speed, feet per minute
 PD = Pitch Diameter of sheave or pulley
 RPM = Revolutions Per Minute of the same sheave or pulley

Tight Side Tension

$$T_1 = 41,250 \left(\frac{HP}{GV} \right)$$

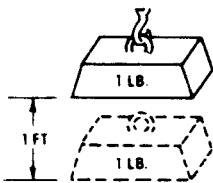
Where: T_1 = Tight Side Tension, pounds
 HP = Design Horsepower
 V = Belt Speed, feet per minute
 G = Arc of Contact Correction Factor

Slack Side Tension

$$T_2 = 33,000 (1.25 - G) \left(\frac{HP}{GV} \right)$$

Where: T_2 = Slack Side Tension, pounds
 HP = Design Horsepower
 V = Belt Speed, feet per minute
 G = Arc of Contact Correction Factor

ENGINEERING INFORMATION—Torque and Horsepower Equivalents



A foot-pound is the amount of energy expended in lifting a one-pound mass a distance of one foot against the pull of gravity.

FOOT-POUNDS INDICATE ENERGY

$$\text{Torque (in Pound-inches)} = \frac{63,025 \times \text{HP}}{\text{RPM}}$$

$$= \text{Force} \times \text{Lever Arm (in Inches)}$$

$$\text{Torque (in Pound-Feet)} = \frac{5,252 \times \text{HP}}{\text{RPM}}$$

$$= \text{Force} \times \text{Lever Arm (in Feet)}$$

Force = Working Load in Pounds.

FPM = Feet Per Minute.

RPM = Revolutions Per Minute.

Lever Arm = Distance from the Force to the center of rotation in Inches or Feet.

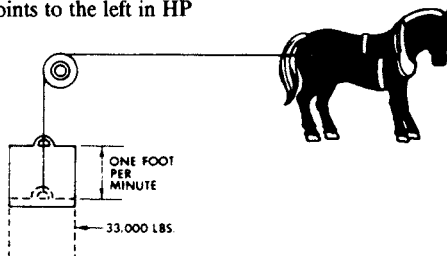
How to Read Torque Tables

The tables on the following pages give the Torque in Pound-Inches for ranges of HP and RPM values.

For fractional HP values move the decimal points to the left in HP and Torque values.

HORSEPOWER

Common Unit of Mechanical power. (HP) One HP is the rate of work required to raise 33,000 pounds one foot in one minute.



$$\text{HP} = \frac{\text{Force} \times \text{FPM}}{33,000}$$

$$\text{HP} = \frac{\text{Torque (in Pound-Inches)} \times \text{RPM}}{63,025}$$

$$\text{HP} = \frac{\text{Torque (in Pound-Feet)} \times \text{RPM}}{5,252}$$

Overhung Loads

An overhung load is a bending force imposed on a shaft due to the torque transmitted by V-drives, chain drives and other power transmission devices, other than flexible couplings.

Most motor and reducer manufacturers list the maximum values allowable for overhung loads. It is desirable that these figures be compared with the load actually imposed by the connected drive.

Overhung loads may be calculated as follows:

$$\text{O.H.L.} = \frac{63,000 \times \text{hp} \times F}{N \times R}$$

Where HP = Transmitted hp \times service factor.

N = RPM of shaft.

R = Radius of sprocket, pulley, etc.

F = Factor.

Weights of the drive components are usually negligible. The formula is based on the assumption that the load is applied at a point equal to one shaft diameter from the bearing face. Factor F depends on the type of drive used:

$$F = \begin{cases} 1.00 & \text{for single chain drives.} \\ 1.10 & \text{for TIMING belt drives.} \\ 1.25 & \text{for spur or helical gear or double-chain drives.} \\ 1.50 & \text{for V-belt drives.} \\ 2.50 & \text{for flat belt drives.} \end{cases}$$

Example: Find the overhung load imposed on a reducer by a double chain drive transmitting 7 hp @ 30 RPM. The pitch diameter of the sprocket is 10"; service factor is 1.3.

Solution:

$$\text{O.H.L.} = \frac{(63,000)(7 \times 1.3)(1.25)}{(30)(5)} = 4,780 \text{ lbs.}$$

Mathematical Equations

To find circumference of a circle, multiply diameter by 3.1416.

To find diameter of a circle multiply circumference by .31831.

To find area of a circle, multiply square of diameter by .7854.

To find area of a rectangle, multiply length by breadth.

To find area of a triangle, multiply base by $\frac{1}{2}$ perpendicular height.

To find area of ellipse, multiply product of both diameters by .7854.

To find area of parallelogram, multiply base by altitude.

To find side of an inscribed square, multiply diameter by 0.7071 or multiply circumference by 0.2251 or divide circumference by 4.4428.

To find side of inscribed cube, multiply radius of sphere by 1.1547.

To find side of an equal square, multiply diameter by .8862.

To find the surface of a sphere, square the diameter and multiply by 3.1416.

To find the volume of a sphere, cube the diameter and multiply by .5236.

A side of a square multiplied by 1.4142 equals diameter of its circumscribing circle.

A side of a square multiplied by 4.443 equals circumference of its circumscribing circle.

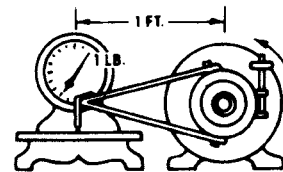
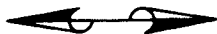
A side of a square multiplied by 1.128 equals diameter of an equal circle.

A side of a square multiplied by 3.547 equals circumference of equal circle.

To find gallon capacity of tanks (given dimensions of a cylinder in inches), square the diameter of the cylinder, multiply by the length and by .0034.

TORQUE

It is: a turning moment or twisting effort. Is it expressed in foot-pounds? or pound-feet?



A pound-foot is the moment created by a force of one pound applied to the end of a lever arm one foot long.

POUND-FEET INDICATE TORQUE

Example:

25 HP at 150 RPM = 10504 Pound-Inches Torque

2.5 HP at 150 RPM = 1050.4 Pound-Inches Torque

For other values of RPM move decimal point in RPM values to the left or right as desired, and in Torque values move to the right or left (opposite way) the same number of places.

Example:

25 HP at 150 RPM = 10504 Pound-Inches Torque

25 HP at 1.50 RPM = 1050400 Pound-Inches Torque

2.5 HP at 1.50 RPM = 105040 Pound-Inches Torque

Torque in Pound-inches for Horsepower at Different Revolutions Per Minute

Torque for 1-50 hp @ 100-260 RPM

HP	Revolutions per Minute																
	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260
1	630	572	525	484	450	420	393	370	350	331	315	300	286	274	262	252	242
2	1260	1145	1050	969	900	840	787	741	700	663	630	600	572	548	525	504	484
3	1890	1718	1575	1454	1350	1260	1181	1112	1050	995	945	900	859	822	787	756	727
4	2521	2291	2100	1939	1800	1680	1575	1482	1400	1326	1260	1200	1145	1096	1050	1008	969
5	3151	2864	2626	2424	2250	2100	1969	1853	1750	1658	1575	1500	1432	1370	1313	1260	1212
6	3781	3437	3151	2908	2701	2521	2363	2224	2100	1990	1890	1800	1718	1644	1575	1512	1454
7	4411	4010	3676	3393	3151	2941	2757	2595	2450	2321	2205	2100	2005	1918	1838	1764	1696
8	5042	4583	4201	3878	3601	3361	3151	2965	2801	2653	2521	2400	2291	2192	2100	2016	1939
9	5672	5156	4726	4363	4051	3781	3545	3336	3151	2985	2836	2701	2578	2466	2363	2268	2181
10	6302	5729	5252	4848	4501	4201	3939	3707	3501	3317	3151	3001	2864	2740	2626	2521	2424
11	6932	6302	5777	5332	4951	4621	4332	4078	3851	3648	3466	3301	3151	3014	2888	2773	2666
12	7563	6875	6302	5817	5402	5042	4726	4448	4201	3980	3781	3601	3437	3288	3151	3025	2908
13	8193	7448	6827	6302	5852	5462	5120	4819	4551	4312	4096	3901	3724	3562	3413	3277	3151
14	8823	8021	7352	6787	6302	5882	5514	5190	4901	4643	4411	4201	4010	3836	3676	3529	3393
15	9453	8594	7878	7272	6752	6302	5908	5561	5252	4975	4726	4501	4297	4110	3939	3781	3636
16	10084	9167	8403	7756	7202	6722	6302	5931	5602	5307	5042	4801	4583	4384	4201	4033	3878
17	10714	9740	8928	8241	7653	7142	6696	6302	5952	5639	5357	5102	4870	4658	4464	4285	4120
18	11344	10313	9453	8726	8103	7563	7090	6673	6302	5970	5672	5402	5156	4932	4726	4537	4363
19	11974	10886	9979	9211	8553	7983	7484	7044	6652	6302	5987	5702	5443	5206	4989	4789	4605
20	12605	11459	10504	9696	9003	8403	7878	7414	7002	6634	6302	6002	5729	5480	5252	5042	4848
21	13235	12032	11029	10181	9453	8823	8272	7785	7352	6965	6617	6302	6016	5754	5514	5294	5090
22	13865	12605	11554	10665	9903	9243	8665	8156	7703	7297	6932	6602	6302	6028	5777	5546	5332
23	14495	13178	12079	11150	10354	9663	9059	8526	8053	7629	7247	6902	6588	6302	6039	5798	5575
24	15126	13750	12605	11635	10804	10084	9453	8897	8403	7961	7563	7202	6875	6576	6302	6050	5817
25	15756	14323	13130	12120	11254	10504	9847	9268	8753	8292	7878	7503	7161	6850	6565	6302	6060
26	16386	14896	13655	12605	11704	10924	10241	9639	9103	8624	8193	7803	7448	7124	6827	6554	6302
27	17016	15469	14180	13089	12154	11344	10635	10009	9453	8956	8508	8103	7734	7398	7090	6806	6544
28	17647	16042	14705	13574	12605	11764	11029	10380	9803	9287	8823	8403	8021	7672	7352	7058	6787
29	18277	16615	15231	14059	13055	12184	11423	10751	10154	9619	9138	8703	8307	7946	7615	7310	7029
30	18907	17188	15756	14544	13505	12605	11817	11122	10504	9951	9453	9003	8594	8220	7878	7563	7272
31	19537	17761	16281	15029	13955	13025	12211	11492	10854	10283	9768	9303	8880	8494	8140	7815	7514
32	20168	18334	16806	15513	14405	13445	12605	11863	11204	10614	10084	9603	9167	8768	8403	8067	7756
33	20798	18907	17331	15998	14855	13865	12998	12234	11554	10946	10399	9903	9453	9042	8665	8319	7999
34	21428	19480	17857	16483	15306	14285	13392	12605	11904	11278	10714	10204	9740	9316	8928	8571	8241
35	22058	20053	18382	16968	15756	14705	13786	12975	12254	11609	11029	10504	10026	9590	9191	8823	8484
36	22689	20626	18907	17453	16206	15126	14180	13346	12605	11941	11344	10804	10313	9864	9453	9075	8726
37	23319	21199	19432	17937	16656	15546	14574	13717	12955	12273	11659	11104	10599	10138	9716	9327	8968
38	23949	21772	19958	18422	17106	15966	14968	14088	13305	12605	11974	11404	10886	10412	9978	9579	9211
39	24579	22345	20483	18907	17557	16386	15362	14458	13655	12936	12289	11704	11172	10686	10241	9831	9453
40	25210	22918	21008	19392	18007	16806	15756	14829	14005	13268	12605	12004	11459	10960	10504	10084	9696
41	25840	23491	21533	19877	18457	17226	16150	15200	14355	13600	12920	12304	11745	11234	10766	10336	9938
42	26470	24064	22058	20362	18907	17647	16544	15570	14705	13931	13235	12605	12032	11508	11029	10588	10181
43	27100	24637	22584	20846	19357	18067	16938	15941	15056	14263	13550	12905	12318	11782	11292	10840	10423
44	27731	25210	23109	21331	19807	18487	17331	16312	15406	14595	13865	13205	12605	12057	11554	11092	10665
45	28361	25783	23634	21816	20258	18907	17725	16683	15756	14927	14180	13505	12891	12331	11817	11344	10908
46	28991	26356	24159	22301	20708	19327	18119	17053	16106	15258	14495	13805	13177	12605	12079	11596	11150
47	29621	26928	24684	22786	21158	19747	18513	17424	16456	15590	14810	14105	13464	12879	12342	11848	11393
48	30252	27501	25210	23270	21608	20168	18907	17795	16806	15922	15126	14405	13750	13153	12605	12100	11635
49	30882	28074	25735	23755	22058	20588	19301	18166	17156	16253	15441	14705	14037	13427	12867	12352	11877
50	31512	28647	26260	24240	22509	21008	19695	18536	17507	16585	15756	15006	14323	13701	13130	12605	12120

Torque in Pound-inches for Horsepower at Different Revolutions Per Minute (Cont.)

Torque for 1-50 hp @ 270-1000 RPM

HP	Revolutions per Minute																	
	270	280	290	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
1	233	225	217	210	180	157	140	126	114	105	96	90	84	78	74	70	66	63
2	466	450	434	420	360	315	280	252	229	210	193	180	168	157	148	140	132	126
3	700	675	651	630	540	472	420	378	343	315	290	270	252	236	222	210	199	189
4	933	900	869	840	720	630	560	504	458	420	387	360	336	315	296	280	265	252
5	1167	1125	1086	1050	900	787	700	630	572	525	484	450	420	393	370	350	331	315
6	1400	1350	1303	1260	1080	945	840	756	687	630	581	540	504	472	444	420	398	378
7	1633	1575	1521	1470	1260	1102	980	882	802	735	678	630	588	551	519	490	464	441
8	1867	1800	1738	1680	1440	1260	1120	1008	916	840	775	720	672	630	593	560	530	504
9	2100	2025	1955	1890	1620	1418	1260	1134	1031	945	872	810	756	709	667	630	597	567
10	2334	2250	2173	2100	1800	1575	1400	1260	1145	1050	969	900	840	787	741	700	663	630
11	2567	2475	2390	2310	1980	1733	1540	1386	1260	1155	1066	990	924	866	815	770	729	693
12	2801	2701	2607	2521	2160	1890	1680	1512	1375	1260	1163	1080	1008	945	889	840	796	756
13	3034	2926	2825	2731	2340	2048	1820	1638	1489	1365	1260	1170	1092	1024	963	910	862	819
14	3267	3151	3042	2941	2521	2205	1960	1764	1604	1470	1357	1260	1176	1102	1038	980	928	882
15	3501	3376	3259	3151	2701	2363	2100	1890	1718	1575	1454	1350	1260	1181	1112	1050	995	945
16	3734	3601	3477	3361	2881	2521	2240	2016	1833	1680	1551	1440	1344	1260	1186	1120	1061	1008
17	3968	3826	3694	3571	3061	2678	2380	2142	1948	1785	1648	1530	1428	1339	1260	1190	1127	1071
18	4201	4051	3911	3781	3241	2836	2521	2268	2062	1890	1745	1620	1512	1418	1334	1260	1194	1134
19	4435	4276	4129	3991	3421	2993	2661	2394	2177	1995	1842	1710	1596	1496	1408	1330	1260	1197
20	4668	4501	4346	4201	3601	3151	2801	2521	2291	2100	1939	1800	1680	1575	1482	1400	1326	1260
21	4901	4726	4563	4411	3781	3308	2941	2647	2406	2205	2036	1890	1764	1654	1557	1470	1393	1323
22	5135	4951	4781	4621	3961	3466	3081	2773	2521	2310	2133	1980	1848	1733	1631	1540	1459	1386
23	5368	5177	4998	4831	4141	3623	3221	2899	2635	2415	2230	2070	1932	1811	1705	1610	1525	1449
24	5602	5402	5215	5042	4321	3781	3361	3025	2750	2521	2327	2160	2016	1890	1779	1680	1592	1512
25	5835	5627	5433	5252	4501	3939	3501	3151	2864	2626	2424	2250	2100	1969	1853	1750	1658	1575
26	6069	5852	5650	5462	4681	4096	3641	3277	2979	2731	2521	2340	2184	2048	1927	1820	1724	1638
27	6302	6077	5867	5672	4861	4254	3781	3403	3093	2836	2617	2430	2268	2127	2001	1890	1791	1701
28	6535	6302	6085	5882	5042	4411	3921	3529	3208	2941	2714	2521	2352	2205	2076	1960	1857	1764
29	6769	6527	6302	6092	5222	4569	4061	3655	3323	3046	2811	2611	2436	2284	2150	2030	1923	1827
30	7002	6752	6519	6302	5402	4726	4201	3781	3437	3151	2908	2701	2520	2363	2224	2100	1990	1890
31	7236	6977	6737	6512	5582	4884	4341	3907	3552	3256	3005	2791	2605	2442	2298	2170	2056	1953
32	7469	7202	6954	6722	5762	5042	4481	4033	3666	3361	3102	2881	2689	2520	2372	2240	2122	2016
33	7703	7427	7171	6932	5942	5199	4621	4159	3781	3466	3199	2971	2773	2599	2446	2310	2189	2079
34	7936	7653	7389	7142	6122	5357	4761	4285	3896	3571	3296	3061	2857	2678	2520	2380	2255	2142
35	8169	7878	7606	7352	6302	5514	4901	4411	4010	3676	3393	3151	2941	2757	2595	2450	2321	2205
36	8403	8103	7823	7563	6482	5672	5042	4537	4125	3781	3490	3241	3025	2836	2669	2521	2388	2268
37	8636	8328	8041	7773	6662	5829	5182	4663	4239	3886	3587	3331	3109	2913	2743	2591	2454	2331
38	8870	8553	8258	7983	6842	5987	5322	4789	4354	3991	3684	3421	3193	2993	2817	2661	2520	2394
39	9103	8778	8475	8193	7022	6144	5462	4915	4469	4096	3781	3511	3277	3072	2891	2731	2587	2457
40	9337	9003	8693	8403	7202	6302	5602	5042	4583	4201	3878	3601	3361	3151	2965	2801	2653	2521
41	9570	9228	8910	8613	7382	6460	5742	5168	4698	4306	3975	3691	3445	3230	3040	2871	2720	2584
42	9803	9453	9127	8823	7563	6617	5882	5294	4812	4411	4072	3781	3529	3308	3114	2941	2786	2647
43	10037	9678	9345	9033	7743	6775	6022	5420	4927	4516	4169	3871	3613	3387	3188	3011	2852	2710
44	10270	9903	9562	9243	7923	6932	6162	5546	5042	4621	4266	3961	3697	3466	3262	3081	2919	2773
45	10504	10129	9779	9453	8103	7090	6302	5672	5156	4726	4363	4051	3781	3545	3336	3151	2985	2836
46	10737	10354	9997	9663	8283	7247	6442	5798	5271	4831	4460	4141	3865	3623	3410	3221	3051	2899
47	10971	10579	10214	9873	8463	7405	6582	5924	5385	4936	4557	4231	3949	3702	3484	3291	3118	2962
48	11204	10804	10431	10084	8643	7563	6722	6050	5500	5042	4654	4321	4033	3781	3559	3361	3184	3025
49	11437	11029	10649	10294	8823	7720	6862	6176	5614	5147	4751	4411	4117	3860	3633	3431	3250	3088
50	11671	11254	10866	10504	9003	7878	7002	6302	5729	5252	4848	4501	4201	3939	3707	3501	3317	3151

Torque in Pound-inches for Horsepower at Different Revolutions Per Minute (Cont.)

Torque for 51-100 hp @ 100-260 RPM

HP	Revolutions per Minute																
	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260
51	32142	29220	26785	24725	22959	21428	20089	18907	17857	16917	16071	15306	14610	13975	13392	12857	12362
52	32773	29793	27310	25210	23409	21848	20483	19278	18207	17249	16386	15606	14896	14249	13655	13109	12605
53	33403	30366	27836	25694	23859	22268	20877	19649	18557	17580	16701	15906	15183	14523	13918	13361	12847
54	34033	30939	28361	26179	24309	22689	21271	20019	18907	17912	17016	16206	15469	14797	14180	13613	13089
55	34663	31512	28886	26664	24759	23109	21664	20390	19257	18244	17331	16506	15756	15071	14443	13865	13332
56	35294	32085	29411	27149	25210	23529	22058	20761	19607	18575	17647	16806	16042	15345	14705	14117	13574
57	35924	32658	29937	27634	25660	23949	22452	21132	19957	18907	17962	17106	16329	15619	14968	14369	13817
58	36554	33231	30462	28118	26110	24369	22846	21502	20308	19239	18277	17406	16615	15893	15231	14621	14059
59	37184	33804	30987	28603	26560	24789	23240	21873	20658	19571	18592	17707	16902	16167	15493	14873	14301
60	37815	34377	31512	29088	27010	25210	23634	22244	21008	19902	18907	18007	17188	16441	15756	15126	14544
61	38445	34950	32037	29573	27461	25630	24028	22614	21358	20234	19222	18307	17475	16715	16018	15378	14786
62	39075	35523	32563	30058	27911	26050	24422	22985	21708	20566	19537	18607	17761	16989	16281	15630	15029
63	39705	36096	33088	30543	28361	26470	24816	23356	22058	20897	19852	18907	18048	17263	16544	15882	15271
64	48336	36669	33613	31027	28811	26890	25210	23727	22408	21229	20168	19207	18334	17537	16806	16134	15513
65	40966	37242	34138	31512	29261	27310	25604	24097	22759	21561	20483	19507	18621	17811	17069	16386	15756
66	41596	37815	34663	31997	29711	27731	25997	24468	23109	21892	20798	19807	18907	18085	17331	16638	15998
67	42226	38388	35189	32482	30162	28151	26391	24839	23459	22224	21113	20108	19194	18359	17594	16890	16241
68	42857	38961	35714	32967	30612	28571	26785	25210	23809	22556	21428	20408	19480	18633	17857	17142	16483
69	43487	39534	36239	33451	31062	28991	27179	25580	24159	22888	21743	20708	19766	18907	18119	17394	16725
70	44117	40106	36764	33936	31512	29411	27573	25951	24509	23219	22058	21008	20053	19181	18382	17647	16968
71	44747	40679	37289	34421	31962	29831	27967	26322	24859	23551	22373	21308	20339	19455	18644	17899	17210
72	45378	41252	37815	34906	32413	30252	28361	26693	25210	23883	22689	21608	20626	19729	18907	18151	17453
73	46008	41825	38340	35391	32863	30672	28755	27063	25560	24214	23004	21908	20912	20003	19170	18403	17695
74	46638	42398	38865	35875	33313	31092	29149	27434	25910	24546	23319	22208	21199	20277	19432	18655	17937
75	47268	42971	39390	36360	33763	31512	29543	27805	26260	24878	23634	22509	21485	20551	19695	18907	18180
76	47899	43544	39916	36845	34213	31932	29937	28176	26610	25210	23949	22809	21772	20825	19957	19159	18422
77	48529	44117	40441	37330	34663	32353	30330	28546	26960	25541	24264	23109	22058	21099	20220	19411	18665
78	49159	44690	40966	37815	35114	32773	30724	28917	27310	25873	24579	23409	22345	21373	20483	19663	18907
79	49789	45263	41491	38299	35564	33193	31118	29288	27661	26205	24894	23709	22631	21647	20745	19915	19149
80	50420	45836	42016	38784	36014	33613	31512	29658	28011	26536	25210	24009	22918	21921	21008	20168	19392
81	51050	46409	42542	39269	36464	34033	31906	30029	28361	26868	25525	24309	23204	22195	21271	20420	19634
82	51680	46982	43067	39754	36914	34453	32300	30400	28711	27200	25840	24609	23491	22469	21533	20672	19877
83	52310	47555	43592	40239	37365	34874	32694	30771	29061	27532	26155	24909	23777	22743	21796	20924	20119
84	52941	48128	44117	40724	37815	35294	33088	31141	29411	27863	26470	25210	24064	23017	22058	21176	20362
85	53571	48701	44642	41208	38265	35714	33482	31512	29761	28195	26785	25510	24350	23291	22321	21428	20604
86	54201	49274	45168	41693	38715	36134	33876	31883	30112	28527	27100	25810	24637	23565	22584	21680	20846
87	54831	49847	45693	42178	39165	36554	34269	32254	30462	28858	27415	26110	24923	23840	22846	21932	21089
88	55462	50420	46218	42663	39615	36974	34663	32624	30812	29190	27731	26410	25210	24114	23109	22184	21331
89	56092	50993	46743	43148	40066	37395	35057	32995	31162	29522	28046	26710	25496	24388	23371	22436	21574
90	56722	51566	47268	43632	40516	37815	35451	33366	31512	29854	28361	27010	25783	24662	23634	22689	21816
91	57352	52139	47794	44117	40966	38235	35845	33737	31862	30185	28676	27310	26069	24936	23897	22941	22058
92	57983	52712	48319	44602	41416	38655	36239	34107	32212	30517	28991	27611	26355	25210	24159	23193	22301
93	58613	53285	48844	45087	41866	39075	36633	34478	32563	30849	29306	27911	26642	25484	24422	23445	22543
94	59243	53857	49369	45572	42317	39495	37027	34849	32913	31180	29621	28211	26928	25758	24684	23697	22786
95	59873	54430	49895	46056	42767	39916	37421	35220	33263	31512	29936	28511	27215	26032	24947	23949	23028
96	60504	55003	50420	46541	43217	40336	37815	35590	33613	31844	30252	28811	27501	26306	25210	24201	23270
97	61134	55576	50945	47026	43667	40756	38209	35961	33963	32176	30567	29111	27788	26580	25472	24453	23513
98	61764	56149	51470	47511	44117	41176	38602	36332	34313	32507	30882	29411	28074	26854	25735	24705	23755
99	62394	56722	51995	47996	44567	41596	38996	36702	34663	32839	31197	29711	28361	27128	25997	24957	23998
100	63025	57295	52521	48481	45018	42016	39390	37073	35014	33171	31512	30012	28647	27402	26260	25210	24240

**Torque in Pound-inches for Horsepower at Different Revolutions Per Minute
(Cont.)**

Torque for 51-100 hp @ 270-1000 RPM

HP	Revolutions per Minute																	
	270	280	290	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
51	11904	11479	11083	10714	9183	8035	7141	6428	5844	5357	4945	4591	4285	4017	3781	3571	3383	3214
52	12138	11701	11301	10924	9363	8193	7282	6554	5958	5462	5042	4681	4369	4096	3855	3641	3449	3277
53	12371	11929	11518	11134	9543	8350	7422	6680	6073	5567	5138	4771	4453	4175	3929	3711	3516	3340
54	12605	12154	11735	11344	9723	8508	7563	6806	6187	5672	5235	4861	4537	4254	4003	3781	3582	3403
55	12838	12379	11953	11554	9903	8665	7703	6932	6302	5777	5332	4951	4621	4332	4078	3851	3648	3466
56	13071	12605	12170	11764	10084	8823	7843	7058	6417	5882	5429	5042	4705	4411	4152	3921	3715	3529
57	13305	12830	12387	11974	10264	8981	7983	7184	6531	5987	5526	5132	4789	4490	4226	3991	3781	3592
58	13538	13055	12605	12184	10444	9138	8123	7310	6646	6092	5623	5222	4873	4569	4300	4061	3847	3655
59	13772	13280	12822	12394	10624	9296	8263	7436	6760	6197	5720	5312	4957	4648	4374	4131	3914	3718
60	14005	13505	13039	12605	10804	9453	8403	7563	6875	6302	5817	5402	5041	4726	4448	4201	3980	3781
61	14239	13730	13257	12815	10984	9611	8543	7689	6990	6407	5914	5492	5126	4805	4522	4271	4046	3844
62	14472	13955	13474	13025	11164	9768	8683	7815	7104	6512	6011	5582	5210	4884	4597	4341	4113	3907
63	14705	14180	13691	13235	11344	9926	8823	7941	7219	6617	6108	5672	5294	4963	4671	4411	4179	3970
64	14939	14405	13908	13445	11524	10084	8963	8067	7333	6722	6205	5762	5378	5041	4745	4481	4245	4033
65	15172	14630	14126	13655	11704	10241	9103	8193	7448	6827	6302	5852	5462	5120	4819	4551	4312	4096
66	15406	14855	14343	13865	11884	10399	9243	8319	7563	6932	6399	5942	5546	5199	4893	4621	4378	4159
67	15639	15081	14560	14075	12064	10556	9383	8445	7677	7037	6496	6032	5630	5278	4967	4691	4444	4222
68	15873	15306	14778	14285	12244	10714	9523	8571	7792	7142	6593	6122	5714	5357	5041	4761	4511	4285
69	16106	15531	14995	14495	12424	10871	9663	8697	7906	7247	6690	6212	5798	5435	5116	4831	4577	4348
70	16339	15756	15212	14705	12605	11029	9803	8823	8021	7352	6787	6302	5882	5514	5190	4901	4643	4411
71	16573	15981	15430	14915	12785	11186	9943	8949	8135	7457	6884	6392	5966	5593	5264	4971	4710	4474
72	16806	16206	15647	15126	12965	11344	10084	9075	8250	7563	6981	6482	6050	5672	5338	5042	4776	4537
73	17040	16431	15864	15336	13145	11502	10224	9201	8365	7668	7078	6572	6134	5751	5412	5112	4842	4600
74	17273	16656	16082	15546	13325	11659	10364	9327	8479	7773	7175	6662	6218	5829	5486	5182	4909	4663
75	17507	16881	16299	15756	13505	11817	10504	9453	8594	7878	7272	6752	6302	5908	5561	5252	4975	4726
76	17740	17106	16516	15966	13685	11974	10644	9579	8708	7983	7369	6842	6386	5987	5635	5322	5041	4789
77	17973	17331	16734	16176	13865	12132	10784	9705	8823	8088	7466	6932	6470	6066	5709	5392	5108	4852
78	18207	17557	16951	16386	14045	12289	10924	9831	8938	8193	7563	7022	6554	6144	5783	5462	5174	4915
79	18440	17782	17168	16596	14225	12447	11064	9957	9052	8298	7659	7112	6638	6223	5857	5532	5241	4978
80	18674	18007	17386	16806	14405	12605	11204	10084	9167	8403	7756	7202	6722	6302	5931	5602	5307	5042
81	18907	18232	17603	17016	14585	12762	11344	10210	9281	8508	7853	7292	6806	6381	6005	5672	5373	5105
82	19141	18457	17820	17226	14765	12920	11484	10336	9396	8613	7950	7382	6890	6460	6080	5742	5440	5168
83	19374	18682	18038	17436	14945	13077	11624	10462	9511	8718	8047	7472	6974	6538	6154	5812	5506	5231
84	19607	18907	18255	17647	15126	13235	11764	10588	9625	8823	8144	7563	7058	6617	6228	5882	5572	5294
85	19841	19132	18472	17857	15306	13392	11904	10714	9740	8928	8241	7653	7142	6696	6302	5952	5639	5357
86	20074	19357	18690	18067	15486	13550	12044	10840	9854	9033	8338	7743	7226	6775	6376	6022	5705	5420
87	20308	19582	18907	18277	15666	13707	12184	10966	9969	9138	8435	7833	7310	6853	6450	6092	5771	5483
88	20541	19807	19124	18487	15846	13865	12324	11092	10084	9243	8532	7923	7394	6932	6524	6162	5838	5546
89	20775	20033	19342	18697	16026	14023	12464	11218	10198	9348	8629	8013	7478	7011	6599	6232	5904	5609
90	21008	20258	19559	18907	16206	14180	12605	11344	10313	9453	8726	8103	7562	7090	6673	6302	5970	5672
91	21241	20483	19776	19117	16386	14338	12745	11470	10427	9558	8823	8193	7647	7169	6747	6372	6037	5735
92	21475	20708	19994	19327	16566	14495	12885	11596	10542	9663	8920	8283	7731	7247	6821	6442	6103	5798
93	21708	20933	20211	19537	16746	14653	13025	11722	10656	9768	9017	8373	7815	7326	6895	6512	6169	5861
94	21942	21158	20428	19747	16926	14810	13165	11848	10771	9873	9114	8463	7899	7405	6969	6582	6236	5924
95	22175	21383	20646	19957	17106	14968	13305	11974	10886	9978	9211	8553	7983	7484	7043	6652	6302	5987
96	22408	21608	20863	20168	17286	15126	13445	12100	11000	10084	9308	8643	8067	7562	7118	6722	6368	6050
97	22642	21833	21080	20378	17466	15283	13585	12226	11115	10189	9405	8733	8151	7641	7192	6792	6435	6113
98	22875	22058	21298	20588	17647	15441	13725	12352	11229	10294	9502	8823	8235	7720	7266	6862	6501	6176
99	23109	22283	21515	20798	17827	15598	13865	12478	11344	10399	9599	8913	8319	7799	7340	6932	6567	6239
100	23342	22509	21732	21008	18007	15756	14005	12605	11459	10504	9696	9003	8403	7878	7414	7002	6634	6302