

**TABLE 20-15** Spur gear definitions and formulas.

TERM AND SYMBOL	DEFINITION	FORMULA	
		METRIC GEARS	INCH GEARS
Pitch diameter—PD	The diameter of an imaginary circle on which the gear tooth is designed	$PD = MDL \times N$	$PD = N \div DP$
Number of teeth—N	The number of teeth on a gear	$N = PD \div MDL$	$N = PD \times DP$
Module—MDL	The length of pitch diameter per tooth	$MDL = PD \div N$	
Diametral pitch—DP	A ratio equal to the number of teeth on a gear for every inch of pitch diameter	—	$DP = N \div PD$
Addendum—ADD	The radial distance from the pitch circle to the top of the tooth	14.5° or 20° ADD = MDL 20° stub ADD = 0.8 × MDL	14.5° or 20° ADD = 1 ÷ DP 20° stub ADD = 0.8 ÷ DP
Dedendum—DED	The radial distance from the pitch circle to the bottom of the tooth	14.5° or 20° DED = 1.157 × MDL 20° stub DED = MDL	14.5° or 20° DED = 1.157 ÷ DP 20° stub DED = 1 ÷ DP
Whole depth—WD	The overall height of the tooth	14.5° or 20° WD = 2.157 × MDL 20° stub WD = 1.8 × MDL	14.5° or 20° WD = 2.157 ÷ DP 20° stub WD = 1.8 ÷ DP
Clearance—CL	The radial distance between the bottom of one tooth and the top of the mating tooth	14.5° or 20° CL = 0.157 × MDL 20° stub CL = 0.2 × MDL	14.5° or 20° CL = 0.157 ÷ DP 20° stub CL = 0.2 ÷ DP
Outside diameter—OD	The overall diameter of the gear	14.5° or 20° OD = PD + 2ADD = PD + 2 MDL 20° stub OD = PD + 2ADD = PD + 1.6 MDL	14.5° or 20° OD = PD + 2ADD = (N + 2) ÷ DP 20° stub OD = PD + 2ADD = (N + 1.6) ÷ DP
Root diameter—RD	The diameter at the bottom of the tooth	14.5° or 20° RD = PD - 2DED = PD - 2.314 MDL 20° stub RD = PD - 2DED = PD - 2MDL	14.5° or 20° RD = PD - 2DED = (N - 2.314) ÷ DP 20° stub RD = PD - 2DED = (N - 2) ÷ DP
Base circle—BC	The circle from which the involute curve of the tooth is formed	$BC = PD \cos PA$	$BC = PD \cos PA$
Pressure angle—PA	The angle between the direction of pressure between contacting teeth and a line tangent to the pitch circle	14.5° or 20°	14.5° or 20°
Backlash	The clearance between the teeth of two meshing gears	—	—
Circular pitch—CP	The distance measured from the point of one tooth to the corresponding point on the adjacent tooth on the circumference of the pitch diameter	$CP = 3.1416 PD \div N$ $= 3.1416 MDL$	$CP = 3.1416 PD \div N$ $= 3.1416 \div DP$
Circular thickness—T	The thickness of a tooth or space measured on the circumference of the pitch diameter	$T = 3.1416 PD \div 2N$ $= 1.5708 PD \div N$ $= 1.5708 MDL$	$T = 3.1416 PD \div 2N$ $= 1.5708 \div DP$
Chordal thickness—Tc	The thickness of a tooth or space measured along a chord on the circumference of the pitch diameter	$Tc = PD \sin (90^\circ \div N)$	$Tc = PD \sin (90^\circ \div N)$
Chordal addendum—ADDc	Chordal addendum, also known as Corrected addendum, is the perpendicular distance from chord to outside circumference of gear	$ADDc = ADD + (T^2 \div 4PD)$	$ADDc = ADD + (T^2 \div 4PD)$
Working depth—WKG DEPTH	The depth of engagement of two gears. The sum of two addendums	$WKG DP = 2ADD$	$WKG DP = 2ADD$