Flat Bottom Drill Guide

Flat Bottom Drills have a variety of applications ranging from drilling on inclined and rounded surfaces, drilling truly flat bottom holes, drilling intersecting holes, half holes, and shoulders, drilling through thin plates, and much more. While the flat bottom allows the drill to drill into an inclined or rounded surface it is important to take into account the angle of engagement and adjust the chipload accordingly to maximize the chance of a succesful drilling procedure.

TABLE 1

Angle Of Engagement	Chipload %
0° - 5°	100%
6° - 30°	70%
31° +	50%
Half Hole	50%

Speeds & Feeds calculations:

1. Determine the correct SFM and Chip Load (IPR) for the specific drill and material
2. Calculate the Speed (RPM) and Linear Feed (IPM)
3. If there is potential for chip packing for the specific operation use a peck cycle.
3. Determine angle on engagement on drill to the material surface.
4. Modify the chipload in accordance to Table 1 for the inital plunge only.
5. Be sure the initial plunge completely submerges the end of the drill.
6. Continue the drilling operation at the normal 100% chipload after inital plunge.

Example: Tool #FBD1250-C3 drilling into 4140 steel at 32 Rc on a 25° incline.

1. The Cutter Diameter is .125" and is used to find SFM and calculate Speed (RPM) and Chipload (IPR). Using the Speeds & Feeds chart (next page), SFM is 125 and the Chip Load (IPR) is .0030.

2. Calculate Speed (RPM) and Linear Feed (IPM)

RPM = (SFM x 3.82) / Cutter Diameter
= (125 x 3.82) / .125
= 3820

Linear Feed (IPM) = RPM x IPR
= 3820 x .0030
= 11.46

3. Will Chip-Packing be a concern?:

Chip packing occurs during standard drilling operations where the chips can only exit through the flutes valleys of the drill. The deeper the hole the longer the chips have to travel up the flutes and therefore a pecking cycle can be used to assit in chip removal and reduces the chances of chip packing.

Flat bottom drills can be used in unique drilling applications that may not require the use of a pecking cycle. Drilling a half hole, drilling into an existing hole, drilling a cross hole, and many other situations potentially allow for the chips to exit the cut in another fashion and therfore may not require the use of a peck cycle.

If chip packing is a concern follow the peck cycle guide lines on the next page. Always be sure the initial peck fully submerges the end of the drill into the material to avoid deflection or hole misalignment.

4. Use Table 1 to find the chipload modifier in relation to the drill angle of entry.

At a 25° incline the initial peck should have a chipload at 70% of the original value.

Modified Chipload = IPR * 0.7
= .0030 * 0.7
= .0021

5. Be sure the inital plung fully submerges the drill:

The drill point should only make contact with the angled surface during the initial peck. All subsequent pecks should be drilling into a flat surface at the proper feedrate.

Allowing the secondary peck to drill into the angled surface increases the chance of hole misalignment and deflection of the drill leading to poor results.

6. After the initial peck return the chipload to it's original calculated value for drilling of flat surfaces.

MATERIAL	Hardness: ≤ 28 Rc (≤ 271 HBn)									
	SFM	Chip Load (IPR - Inches Per Revolution) By Drill Diameter								
		0.015	0.031	0.047	0.062	0.078	0.093	0.125	0.187	0.250
ALUMINUM ALLOYS Casting (2xx, 5xx, 7xx, 8xx)	450	.00079	.00164	.00248	.00327	.00412	.00491	.00660	.00987	.01320
Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	600									
Casting - 3%-5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	450	.00071	.00147	.00223	.00295	.00371	.00442	.00594	.00889	.01188
Casting - 5%-8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	420									
Casting - 8%-12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	390									
Casting - 12%-16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	350									
Wrought - 5%-8% Si (4xxx)	600									
Wrought - 8%-12% Si (4xxx)	480									
MAGNESIUM ALLOYS	900	.00079	.00164	.00248	.00327	.00412	.00491	.00660	.00987	.01320
ZINC ALLOYS	480									
COPPER ALLOYS High Coppers - 90%+ (C1xxxx)	170	.00063	.00131	.00199	.00262	.00329	.00393	.00528	.00790	.01056
Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx, C66400-C69800)	375									
Phosphor Bronzes (Copper Tin alloys, C5xxxx)	170									
Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	375									
Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	375									
Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	170									
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	400									
PLASTICS Unfilled Plastics	500	.00079	.00164	.00248	.00327	.00412	.00491	.00660	.00987	.01320
Reinforced Plastics	350	.00063	.00131	.00199	.00329	.00393	.00528	.00790	.01056	.01584

HARVEY TOOL

Speeds & Feeds

Product Table: Miniature High Performance Drills - Flat Bottom Drill
Characteristics: For Aluminum and Non Ferrous Materials, 3x-5x Length of Flute
Series: FBDxxxx-C8

Product Notes:

Pecking cycles are recommended to avoid chip packing and breakage. Initial peck must fully submerge the drill point into the material. Do not use a pecking cycle for half-hole drilling or any situation where the drill is not fully enclosed in the material during the drilling operation. For Non-Ferrous materials, the initial peck depth should be 3-5x Diameter with each subsequent peck at 2-3x Diameter.

For entry on curved surfaces adjust feed rate according the angle of engagment in Table 1.

General Notes:

All posted speed and feed parameters are suggested starting values that may be increased given optimal setup conditions.

If you require additional information, Harvey Tool has a team of technical experts available to assist you through even the most challenging applications. Please contact us at **800-645-5609** or **Harveytech@harveyperformance.com.**

WARNING: Cutting tools may shatter under improper use. Government regulations require use of safety glasses and other appropriate safety equipment in the vicinity of use.