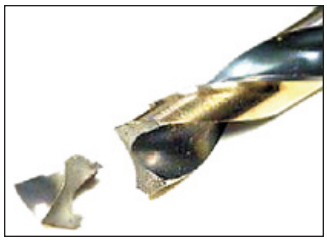
Product Information Report

Maximizing Drill Bit Performance



Overview

Drills perform three functions when making a hole:

- **Forming the chip** – The drill point digs into the material and pushes up a piece of it.
- **Cutting the chip** – The cutting lips take the formed chip away from the tip and cut the chip off the material.
- **Evacuating the chip** – The flutes guide the formed, cut chip out of the hole.

Proper Drill Use

The most important thing to remember is to let the drill do the work. Apply only enough pressure to guide the drill through the material.

Operating speed depends on:

- Composition and hardness of material to be drilled
- Depth of hole
- Type of drilling equipment
- Efficiency of the cutting fluid
- Quality of hole required

Getting the Most from Your Drill

- Use a drill motor with the proper speed and adequate power for the job, or set the drill to the proper speed.
- If the drill bit is flatted, align the flats with the jaws.
- Install the bit properly; tighten the chuck at all three chuck key points.
- Put the drill in contact with the workpiece and align squarely before starting the drill motor (hand drilling only).
- Position your body to give you maximum control of the drilling operation (hand drilling only).
- Start the drill at a reduced speed, exert steady, even pressure during drilling, and release pressure at breakthrough.
- Clamp a scrap metal backup to the workpiece where possible to allow the outer cutting edges of the drill point to cut completely through the workpiece.
- Do not force feed. Let the drill cut at its own pace. Keep a steady, medium pressure on the drill while observing the chips being produced.
- Once the bore is started, either keep the drill cutting or remove it. Idling the cutting edge will harden the steel and dull the bit.
- Avoid side pressure on the drill bit.
- Use a high-quality cutting fluid to cool and lubricate the workpiece and the drill bit.
- The harder the material or the larger the bit diameter, the slower the speed. A curly, smooth, stringy chip in steel means you're using the perfect speed and pressure.

Common Causes of Drill Failure

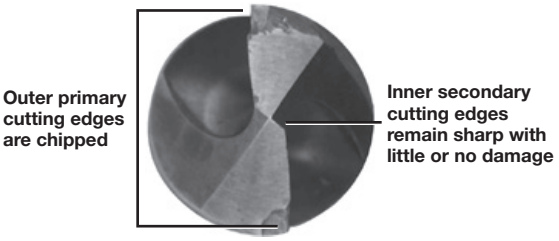
There are times when proper operating procedures are not followed and claims are made that the drills are defective. If a drill is returned to you as defective, it should be inspected to determine the cause of the failure. Here are some signs to look for, along with the probably cause of the failure and recommendations for fixing the problem.

- Using a two-flute drill to enlarge a hole
- Not using cutting fluid
- Improper speed/feed
- Improper hole enlargement
- Cutting with the flutes
- Failure to reduce speed/feed at breakthrough
- Improper chucking
- Improper length selection
- Use a drill as a reamer
- Using a drill as a drift punch
- Improper drill bit storage

Enlarging Existing Holes

Split point drill bit design requires that all four cutting edges be in contact with the workpiece before applying optimum feed pressure.

Opening up an existing hole utilizing only the outer portion of the cutting edge causing chipping.

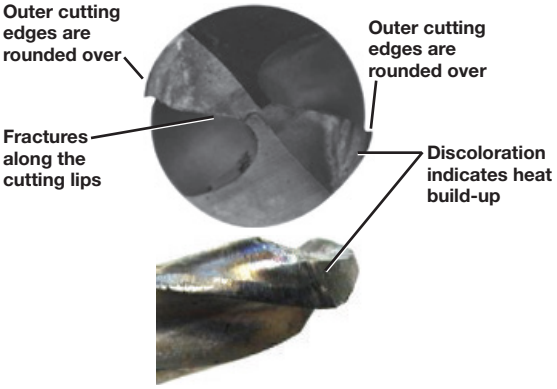


Excessive Speed

Use reduced speed and feed when starting to drill until the primary cutting edges have completely engaged the workpiece.

Rapid wear and rounding at the outer portion of the cutting edges indicates that the speed rate is too high.

Chipping at the outer cutting edges indicates excessive feed pressure.



Improper Chucking Procedures

Proper chucking procedures include tightening the drill chuck at all three holes.

Excessive Side Pressure

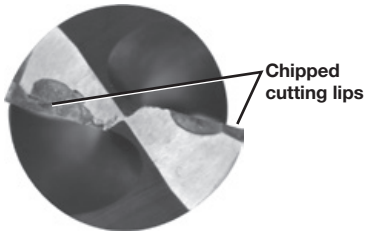
Maintain a straight in-line feed and avoid side pressure on the drill bit whenever possible.

Common Causes of Drill Failure (cont.)

Catching During Breakthrough

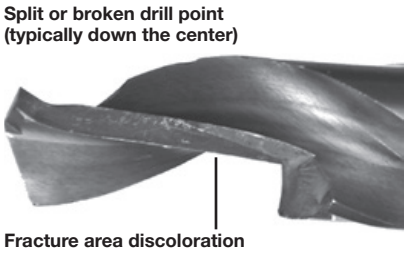
At the point when the drill begins to break through the material, backlash or flexing occurs resulting in an excessive feed rate.

To reduce grabbing and damage to the cutting lips, the feed pressure should be reduced as the drill begins to break through the back of the material.



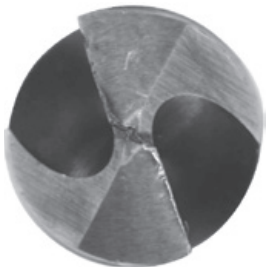
Stress Fracture

Stress fractures may occur during the grinding stages of the manufacturing process. Although this is extremely rare, familiarity with the fracture areas will help avoid incorrect failure analysis.



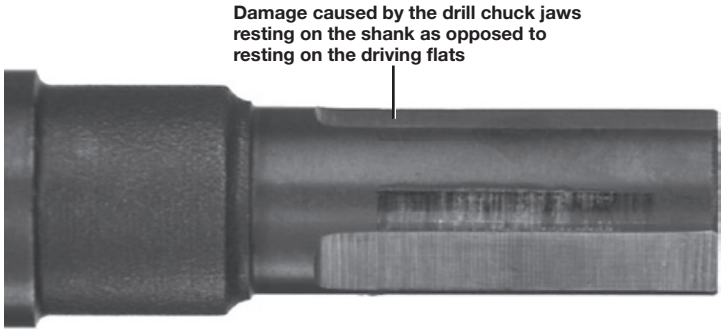
Crushed Drill Point

A crushed drill point, or a drill split up the web, indicates too much feed pressure or coming down with too much force on the workpiece.

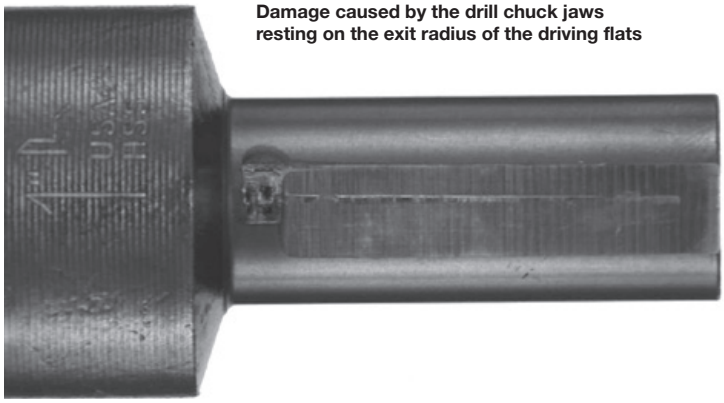


Common Causes of Drill Failure (cont.)

Improper Reduced Shank Drill Bits Chucking



Make sure the drill chuck jaws rest solely on the driving flats and the jaws are tightened at each of the three holes.

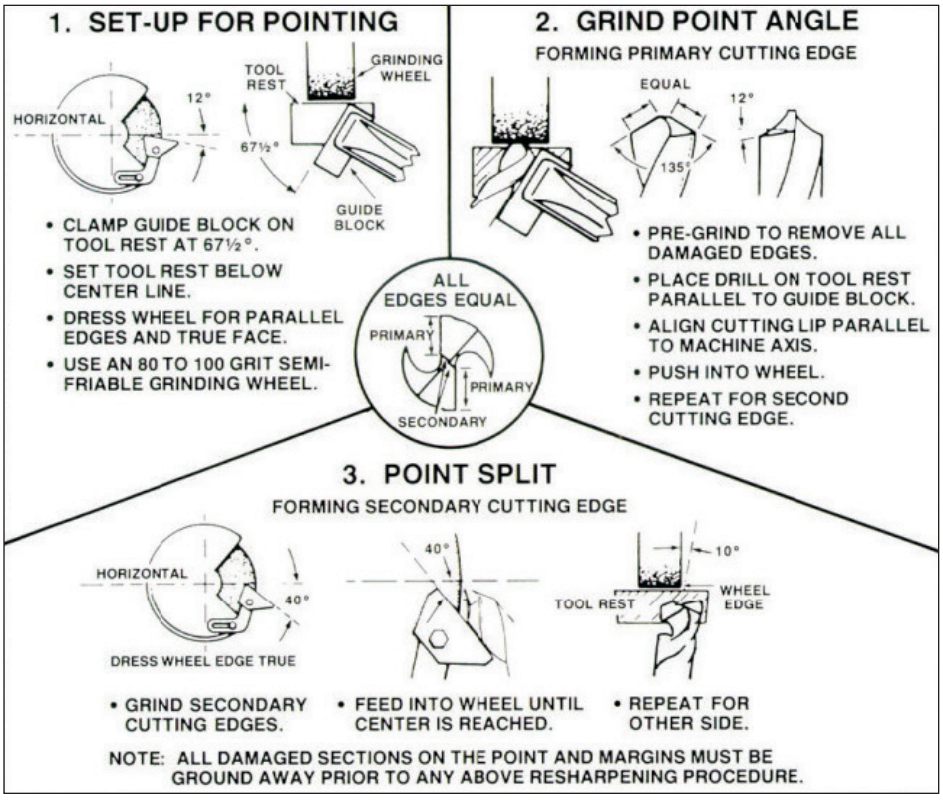


Do not set the drill too deep into the drill chuck or the jaws will not rest on the driving flats.

Fractional Drill Speed and Feed Table

Drill Dia. (Inches)	Decimal Equivalent (Inches)	Material													
		Aluminum		Mild Steel		Alloy Steel		Stainless Steel		Cast Steel		Cast Iron		Wood	
		RPM	SFM	RPM	SFM	RPM	SFM	RPM	SFM	RPM	SFM	RPM	SFM	RPM	SFM
1/16	.0625	12,000	200	4,900	80	3,000	50	1,800	30	2,400	40	3,700	60	15,000	300
3/32	.0937	8,000	200	3,300	80	2,000	50	1,200	30	1,600	40	2,500	60	12,000	300
1/8	.125	6,000	200	2,500	80	1,500	50	900	30	1,200	40	1,800	60	9,000	300
5/32	.1562	5,000	200	2,000	80	1,200	50	730	30	980	40	1,500	60	7,000	300
3/16	.1875	4,000	200	1,700	80	1,000	50	600	30	800	40	1,200	60	6,000	300
7/32	.2187	3,600	200	1,400	80	880	50	520	30	700	40	1,050	60	5,000	300
1/4	.250	3,000	200	1,300	80	770	50	460	30	610	40	920	60	4,500	300
9/32	.2812	2,700	200	1,100	80	680	50	400	30	540	40	800	60	4,000	300
5/16	.3125	2,500	200	1,000	80	600	50	370	30	490	40	750	60	3,600	300
11/32	.3437	2,200	200	900	80	550	50	330	30	445	40	670	60	3,000	300
3/8	.375	2,000	200	800	80	500	50	300	30	400	40	610	60	3,000	300
13/32	.4062	1,900	200	750	80	423	45	280	30	375	40	560	60	2,800	300
7/16	.4375	1,700	200	700	80	390	45	260	30	350	40	525	60	2,600	300
15/32	.4687	1,600	200	650	80	370	45	245	30	325	40	490	60	2,400	300
1/2	.500	1,500	200	600	80	345	45	230	30	300	40	460	60	2,300	300
17/32	.5312	1,400	200	570	80	330	45	200	25	290	35	430	60	1,900	250
9/16	.5625	1,300	200	550	80	306	45	170	25	240	35	400	60	1,700	250
19/32	.5938	1,250	200	520	80	290	45	160	25	230	35	385	60	1,600	250
5/8	.625	1,200	200	490	80	275	45	150	25	215	35	370	60	1,500	250
21/32	.6562	1,150	200	475	80	260	45	145	25	200	35	350	60	1,450	250
11/16	.6875	1,100	200	450	80	250	45	140	25	195	35	330	60	1,400	250
23/32	.7187	1,050	200	425	80	225	40	135	25	185	35	315	60	1,350	250
3/4	.7500	1,000	200	400	80	204	40	130	25	180	35	300	60	1,300	250
25/32	.7812	975	200	385	80	195	40	125	25	170	35	290	60	1,250	250
13/16	.8125	950	200	375	80	188	40	120	25	165	35	280	60	1,200	250
27/32	.8437	910	200	360	80	180	40	115	25	160	35	270	60	1,150	250
7/8	.875	870	200	350	80	175	40	110	25	155	35	260	60	1,100	250
29/32	.9062	840	200	330	80	170	40	105	25	150	35	250	60	1,050	250
15/16	.9375	800	200	325	80	163	40	100	25	145	35	240	60	1,000	250
31/32	.9687	780	200	315	80	155	40	95	25	140	35	235	60	950	250
1	1.0000	760	200	306	80	150	40	95	25	135	35	230	60	900	250

Resharpening Procedure

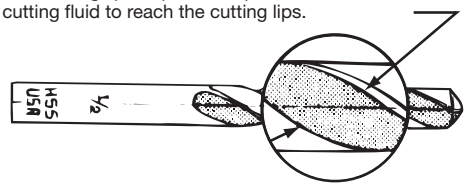


Twist Drill Nomenclature

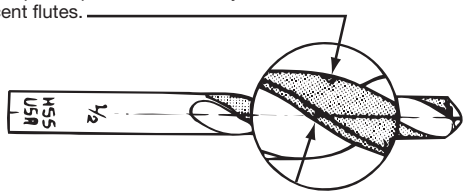
A twist drill is a rotary end cutting tool with one or more cutting lips, and one or more helical flutes for the chip passage and cutting fluid admission.

Shank
The part of the drill by which it is held and driven.

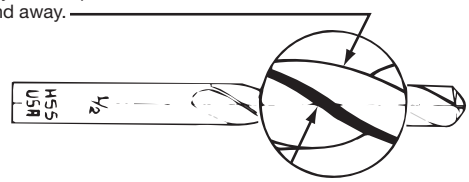
Flutes
Helical grooves cut or ground in the body of the drill to provide cutting lips to permit chip removal and allow cutting fluid to reach the cutting lips.



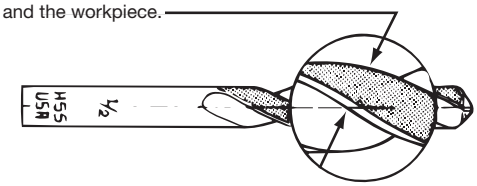
Land
The peripheral portion of the body between adjacent flutes.



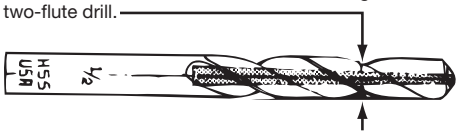
Margin
The cylindrical portion of the land which is not ground away.

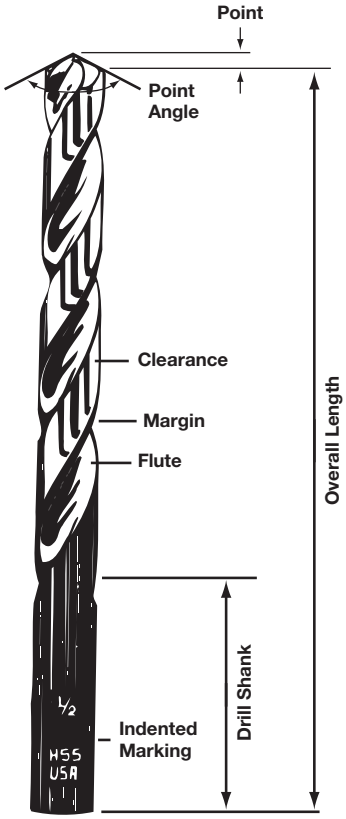


Clearance
The space provided behind the margin to eliminate undesirable contact between the drill and the workpiece.



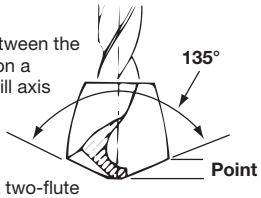
Web
The central portion of the body that joins the lands. The extreme end of the web forms the chisel edge on a two-flute drill.



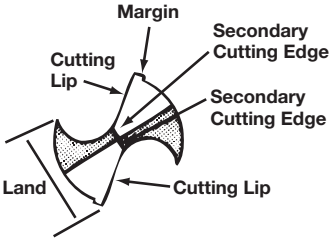


Point
The cutting end of a drill consisting of the ends of the lands and the web.

Point Angle
The angle included between the cutting lips projected on a plane parallel to the drill axis and parallel to the two cutting lips.



Lips
The cutting edges of a two-flute drill extending from the chisel edge to the periphery.



Split Point
Reduction of the web at the point by grinding away a portion of the chisel edge to create a secondary cutting edge.