PRO-LOK® *Why Use Anything Else?*

655 North Hariton Street • Orange, CA 92868-1311 • (714) 633-0681 • *fax* (714) 633-0470

The Art of Drilling Hardplate

Featuring

BUTTER BITS

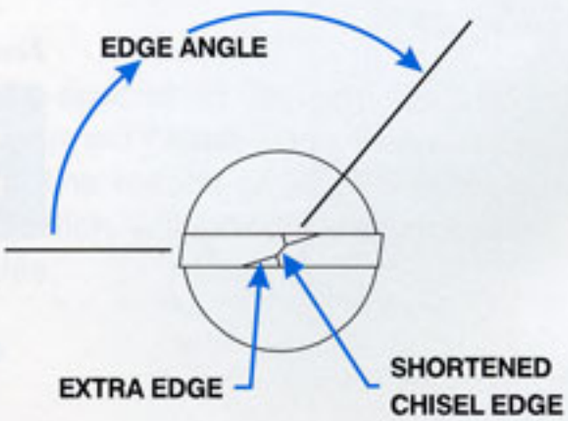
"Drills Hardplate Just Like it's Butter"

BUTTER BITS

"Drills Hardplate Just Like It's Butter"

SB01	3/16" x 3 1/2"
SB02	3/16" x 6"
SB05	1/4" x 4"
SB06	1/4" x 6"
SB11	5/16" x 5"
SB12	5/16" x 8"
SB15	3/8" x 5"
SB16	3/8" x 8"
SB17	3/8" x 12"
SB20	1/2" x 6"
SB21	1/2" x 12"

Featuring Our Special Negative Rake Angle Tip Design



The question is often asked: "What is the best way to drill Hardplate?"

Drilling safes is as much an art as it is a skill. Safe manufacturers have continued to use harder and more sophisticated materials, which has made it even more important than ever to refine your technique and to use the proper tools. Drill Speed, Drill Pressure and Drill Bits - Three important factors in the success of drilling.

DRILL SPEED

Aspects such as drill speed and drill pressure are probably the ones that are hardest to get right. There is a different 'ideal' speed for each application. One of the problems with determining the 'ideal' speed is that with a drill bit, the diameter of the cutting surface varies from zero at the tip to say - 3/16" at the edge. Choosing the most suitable speed based on the full diameter of the bit, leaves the center of the bit turning at a much reduced speed. The normal chisel edge at the tip of the bit is having to extrude metal out of it's way rather than cut in the way the lip does at the outside edges of the bit. Butter Bits feature a unique 'Negative Rake Angle' tip design, which helps overcome the problem by reducing the chisel edge almost to a point and producing an extra edge between the point and the normal cutting lip.

There have been studies published which have recommended cutting speeds of 3500 - 7000 rpm! Drilling at these speeds is not only impractical, but would produce so much heat that the tip would quickly burn-up and disintegrate. Speeds at 350 - 700 rpm were used for testing and were found to be quite effective.

DRILL PRESSURE

As far as pressure is concerned, studies were found that recommended .08mm per revolution. This was also found to produce excessive heat and premature tip failure. Through testing we determined that the proper pressure would vary from one material to the next. The best pressure to use is the pressure at which the hardplate begins to drill. This pressure should be maintained evenly during the entire drilling process.

It should be noted that stopping halfway through the hole runs the risk of the bottom of the hole becoming glazed in the few revs prior to stopping. Restarting could then cause problems.

DRILL BITS

Many drill bits that were once effective, are no longer adequate and locksmiths are forced to use special bits and methods to gain entry. The solution to drilling these new materials is to use bits which feature tips made of Tungsten Carbide or other sintered metals and to properly apply those bits to the hardplate application.

The majority of Tungsten Carbide tipped bits have been designed and manufactured for drilling masonry and are not suitable for the job of penetrating safe materials. There are hundreds of grades of metal carbide available for bit tips and various grades of steel which can be used for the body of the bit. Some metal carbides are more resistant to shock loading than others. It is these bits, which are generally used in masonry drills. Bits used for hardplate drilling require a carbide with a better resistance to failure from heat generated while drilling.

A few manufacturers of tipped bits make bits suitable for conversion to working on hard metals, but most of those are prohibitively expensive, especially when the body material is made of high speed steel. Also, subtle variations in design and materials have a remarkable effect on performance. In particular, the fluting and the method of fixing the tip determines whether the bit can be sharpened to produce a workable tool and whether it will stand the rigors and temperatures encountered when drilling hardplate.

10 Simple Steps to Successful Hardplate Drilling

After you have chosen a quality drill motor and Tungsten Carbide tipped bit, use these 10 simple steps to facilitate successful hardplate drilling:

1. *Always wear safety glasses and take care when drilling.*
2. *Do not drill soft materials (i.e., mild steel or brass) with a Tungsten Carbide bit. (Use a high speed steel bit.)*
3. *Use a center punch before starting to drill.*
4. *Use a drill rig if possible.*
5. *Use a cutting oil or lubricant as you drill.*
6. *Always hold the drill square to the work surface.*
7. *Apply even pressure on the bit.*
8. *Slow down on penetration of the hardplate.*
9. *When drilling hardplate with soft material behind, change the drill bit to a high speed steel bit on penetration of the hardplate. (Use a slot drill or an end mill to prevent burrs.)*
10. *Always look and listen when drilling. The tone and chips will tell you if your bit is dull.*

LEARN TO 'READ' THE CHIPS

Tip #10 is especially critical to drilling success. When you are drilling, watch the chippings and listen to the cutting tone. A change in tone will indicate that the sharp edge has gone or has stopped cutting. If in doubt, inspect the bit more often rather than trying to push it through. You should always stop drilling when the sharp edge has gone. (If you continue the tip could deteriorate and re-sharpening may not be possible. (If a bit has lost its sharp edge, you can resharpen it using a green grit wheel.)

The efficiency of a drill bit on any particular hardplate can often be judged by the size, shape and color of the chippings coming from the hole. Some materials give a needle like or flaky chippings while others can give continuous spirals--it all depends on the ductility of the metal being drilled and the sharpness of the drill bit, as well as the speed and pressure applied. It is quite common to get chipping coming out which are blue in color while drilling some hard steels in the most efficient manner, but a change to a hotter gray-blue color could indicate that too much heat is being generated at the cutting face. The increase of temperature in the cutting region may then cause the drill bit to become easily damaged and the bit will have to be scrapped. The speed and pressure should be reduced to lessen the overheating. Be careful, if you stop drilling halfway through, you can sometimes leave a surface which is actually harder to cut than the original material.

Common Faults & Symptoms and Their Remedies

There are several small factors that can make it much easier or much harder to penetrate hardplate. Here are a few common problems, their symptoms and their remedies.

DRILLING AT THE WRONG SPEED

Using the drill bit at too high a speed is usually evident when the bit will not bite and the tip quickly becomes burnt or dulled. You can use higher than normal speeds if you use a cutting fluid to draw excessive heat away from the cutting region. Using the drill bit at too low a speed will still cut, but you will find that your progress will probably be slow and exhausting. The best plan is to start with a slow speed and increase it slightly until you find the most efficient speed.

DRILLING WITH THE WRONG PRESSURE

Too much pressure results in the tip overheating and quickly loosing its edge. Insufficient pressure will give little or no progress or it will cause the material being cut to burnish and glaze.

POOR SHARPENING TECHNIQUE

Usually when a bit has irregular or incorrect angles, the problem is due to using a wrong type of sharpening stone or an improperly set jig. The result is usually little or no cutting ability and rapid overheating. If an inspection of the tip prior to drilling failed to highlight this fault, lack of chippings should make the user aware that something is wrong. The remedy is to have the bit sharpened on the correct "green grit" or diamond wheel using a properly set jig to ensure correct and uniform angles. (Sometimes it is cheaper to buy a new bit.)

DRILLING AT AN ANGLE TO THE WORK SURFACE

Drilling without a drill rig is often the prime cause of the fault. In this situation the tip will tend to skate around the surface. In addition to damage to the cutting edges, the drill flutes can become damaged above the tip and can add to the risk of breakage.

SAFETY PRECAUTIONS

The need for safety should also be highlighted at this juncture. The use of good quality safety goggles is important and leather safety gloves can often prevent the operator's hands getting burned by very hot swarf or drill bits. When drilling smaller items, it is always a wise policy to ensure that the work is held securely while drilling, particularly when the work is thin or has sharp edges.

COOLANT/CUTTING FLUID

There may be instances where drilling is enhanced by the introduction of a suitable coolant/cutting fluid, while other materials such as Nimonic and Manganese Alloys should be cut dry. In order to use a drill bit with maximum pressure, a large supply of fluid is needed to keep the tip temperature to an acceptable level. Usually the resultant spillage and splashing is not tolerable in anything but a workshop environment, so you must drill dry. There are a few gel and spray fluids available and users may find some improvement by using one of these. The danger here is that the use of small quantities can sometimes cause rapid variations of temperature as the tip heats, and localized partial quenching occurs. This can result in thermal stress cracks developing in the tip and rapid deterioration of the drill bit. Also, some gels or sprays are prone to make unpleasant smoke.

WHAT IS SO SPECIAL ABOUT PRO-LOK®'s "BUTTER BITS"?

Would you imagine you could drill a 3/8" hole in a piece of hardplate from a Mosler TRTL30 in 38 seconds? Would you like to be able to use one bit and be able to drill 25 holes in a piece of GSA hardplate in only 7 minutes? You can now do this and more with the incredible Butter Bits from PRO-LOK®.

You know that drilling hardplate is difficult and if you don't have the proper tools it may be impossible. It used to be that even if you had the right tools, to penetrate a safe effectively it required a level of skill and patience that very few locksmiths could develop. Now Butter Bits are changing safe work forever.

WHERE BUTTER BITS COME FROM

Pro-Lok has been working with an English manufacturer of safe bits to develop this unique bit which is both fast and durable. When Pro-Lok set out to develop a better bit, it was apparent that the best bits would come from an improvement of development of the practices of web thinning, worm pattern point, crankshaft drill point or split point grinding. All of these techniques have been used in general bit engineering for decades. In the past, however, these techniques have been used primarily on larger drills which were manufactured entirely from carbon or high speed steels. The application of these techniques to bits with Tungsten Carbide tips has been rare.

THE KEY TO THE DESIGN

Initial testing was performed using hard sandwich metals such as Maxalloy, solid High Speed Steel, and Hard Chrome Steel with a hardness of Rockwell 66C. After this testing, a particular tip style was chosen. We then explored various drill angles and sharpening methods. Further tests were done to determine which of the drill bit tip configurations was most effective over the widest range of applications.

The key to this bits success is the special tip design. This tip uses a unique negative rake angle and a shortened chisel edge that increases it's effectiveness and reduces tip failure. The results of all of this testing and design are PRO-LOK®'s Butter Bits, which will benefit the locksmith who encounters hardplate while drilling safes.