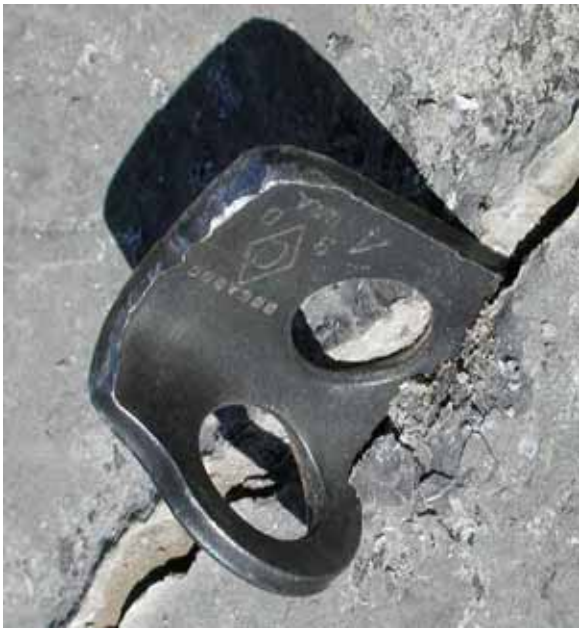
The Black Art of Piton Craft

Basic Considerations for Experienced Climbers or Rescue Personnel



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***WARNING**: Failure to use any or all of the techniques or systems explained or illustrated in this article in an appropriate manner could result in property damage, injury or death. Expert instruction and constant practice are mandatory. This is not a stand alone instructional article. It is designed to accompany professional instruction and practice under supervision.*

This article should not be taken alone out of the context of the greater body of knowledge regarding climbing and rescue technique. This article is written for the highly skilled intermediate, advanced or expert leader who is familiar with basic anchor construction and use of protection including natural anchors, nuts, cams, and bolts.

Introduction

As climbing and mountaineering continue to become increasingly popular there is a growing awareness of the inevitable damage we inflict upon our climbing environment. Rather than being simply users of mountains, cliffs and crags, many climbers have also taken up the cause of environmentalism and in addition to using wild places for recreation, have also chosen to become stewards and protectors of the lands that make for our recreational opportunities. This is admirable and even more importantly, necessary for the continued survival of our wild places.

Along these lines, in the 1970s many climbers in the US and Yosemite in particular began a movement away from destructive forms of protection in climbing. Pitons, being metal spikes driven into the rock, were deemed to be an insidious destruction of crack systems. Rock damage from piton use resulted in ugly and obvious piton scars. The movement toward what came to be known as “clean climbing” began. The new philosophy went so far as to totally eschew the use of pitons or other destructive gear in favour of non-destructive equipment such as passive nuts and eventually modern camming devices. “First clean ascents” began to be claimed where no pitons or bolts were used. Aid climbing similarly had a separate grade for aid climbs done clean.

In more recent times, bolts and sport climbing have taken hold of the crags, but unlike pitons, this destructive form of protection has been embraced by the new rock warriors. Sport climbers and now mixed climbers see bolts as a less obtrusive and necessary evil for their sport to continue as a safe activity pushing extreme physical limits without extreme physical risk.

These trends have resulted in the art of piton placement slowly disappearing from the repertoire of mainstream rock climbers. Many people who begin to climb at a climbing gym can move onto real rock without ever having even heard of pitons. Those who venture farther afield in their adventure climbing soon find that the swing of the pendulum has gone so far as to eliminate a legitimate and even necessary form of protection. The result is occasionally dangerous situations in which a climber or team without pitons must go unprotected or with poor or questionable anchors in remote alpine or mountain environments. This was not the intent of those advancing the cause of clean climbing. Above all, your environmental ethic should not cost you your life.

First ascents, serious alpine climbing, ice climbing, and similar adventure climbing in less populated or remote areas all may require a form of protection and anchor placement that provides strong and secure placements in thin cracks and other rock features that are not well protected by clean methods. This article is intended to re-educate modern climbers in the basics of the age old black art of Piton Craft.

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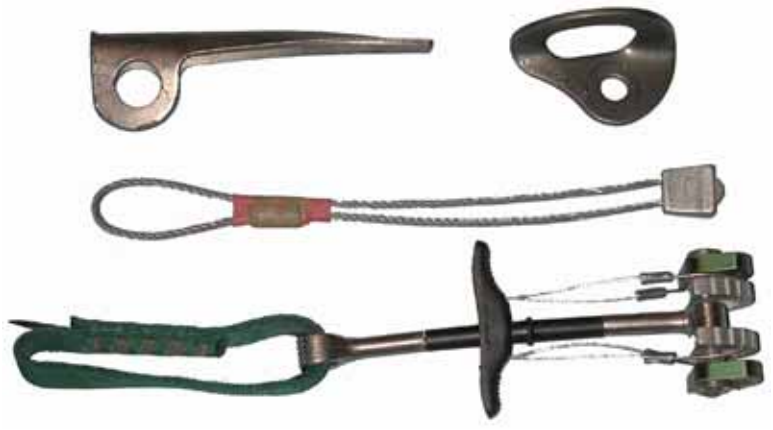
Pitons in the Continuum of Protection

As the introduction would suggest, pitons should not necessarily be considered the first or only method of protecting climbs or building anchors for climbing or rescue. Pitons may well be considered one of the last but necessary lines of defense in the arsenal of the climber or rescue specialist. **Natural anchors** such as trees, boulders, horns, natural chockstones or threads may provide safe and rapid protection or anchors for climbing or rescue. (See the article, "Anchors in Earnest" for further discussion on natural anchors.)

When natural anchors are inadequate for speedy creation of anchors, the **first artificial** anchors we often consider are **clean non-destructive protection** such as artificial chockstones (also known as nuts or chocks) passive camming devices, spring loaded camming devices and passive use of pitons (without hammering). They are often quick to place and remove, although they tend to be uni-directional.

Pitons fall into the category of **destructive / semi-permanent protection**. They are hammered into the rock. This may be done quickly by an experienced climber but the process is destructive. Removal is most destructive and occasionally time-consuming. Pitons tend to be multi-directional and can last for protracted periods of time before they become unsafe. They are particularly useful for belay and rappel anchors as well as for cracks too small or unusual to accept clean gear. They are often a third choice for protection and anchor placement.

Bolts are a form of **destructive / permanent protection** that tend to be a last choice due to the time and equipment required for placement and the permanent nature of the anchor created. A hole is drilled in the rock and a threaded rod or sleeve is either glued or wedged into the hole. The hole may be drilled into the rock with a portable hand driven rock drill and holder. In the case of routes in which numerous bolts are installed, a battery powered electric drill weighing as much as 7 kg (15 lbs) may be used. A metal "bolt hanger" is then attached and usually screwed or bolted into place. Bolting equipment tends to be either heavy or extremely heavy. They can create a very strong very secure anchor point with exceptional longevity if placed well with modern hardware in a conscientious manner by someone with a good background in bolt placement. These attributes tend to make them the first choice for sport climbing routes where strength and security are the primary issues along with the permanent creation of a sport route.



Photos - top to bottom: piton, bolt hanger, nut or chock, spring loaded camming device. There is tremendous variety in the design of each type of device.

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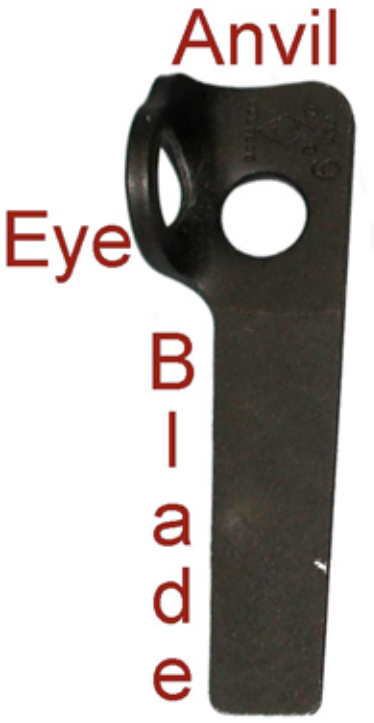
Parts of a Piton

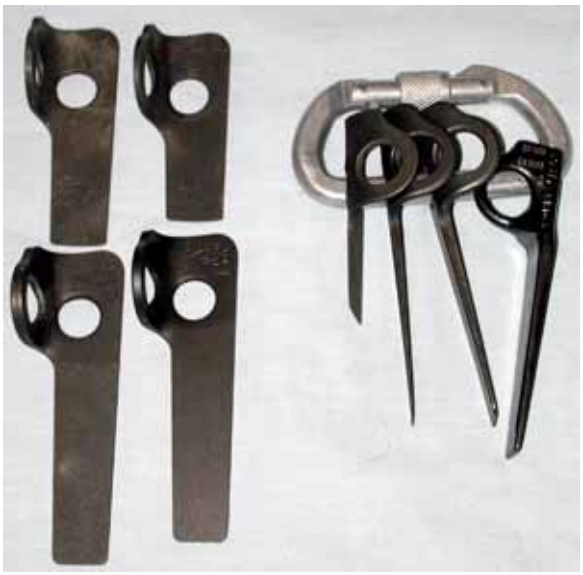


The portion of the piton that you hammer on is called the anvil. The part of the piton into which you clip the carabiner is called the eye. The portion of the piton that is driven into the rock is called the blade or shaft.

In the Bugaboo blade piton shown at right it is important to know that you should not clip into both holes at once.

Types of Pitons

Pitons have also been called “pins” or “pegs” as slang terms. Most pitons manufactured today are made of a hard chrome-molybdenum steel often called “chrome-moly”. Older styles and an extremely limited number of modern pitons are made of a soft malleable iron that allows them to mold to cracks. As a general rule chrome-moly pitons are stronger, more resilient and can be used more times than the older soft steel designs. In terms of general shape, pitons can be broken down into blade designs and angle designs.



Blade pitons vary in thickness from the thinnest designs which are barely as thick as a knife blade to the thicker end of the spectrum where pitons are perhaps one centimeter (just less than half an inch) thick.

The photo at left shows a selection of knifeblades (top left) and bugaboos blades (bottom left). The right side shows several blades racked on a carabiner for scale alongside a slightly thicker “Lost Arrow” piton.

Several of the more popular blade piton designs in North America include the “knifeblade”, “Bugaboo blade” and “Lost Arrow” designs all manufactured by Black Diamond™ in the US. Many other good quality pitons are made by SMC™, Grivel™, Interalp Camp™ and several other companies internationally. Look for a CE approval label as a mark of quality assurance. Short pitons for aid climbing will not bear the CE mark as they are not long enough to meet the CE standard.

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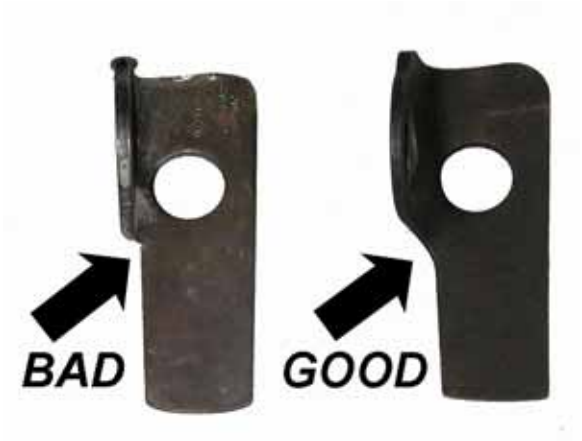
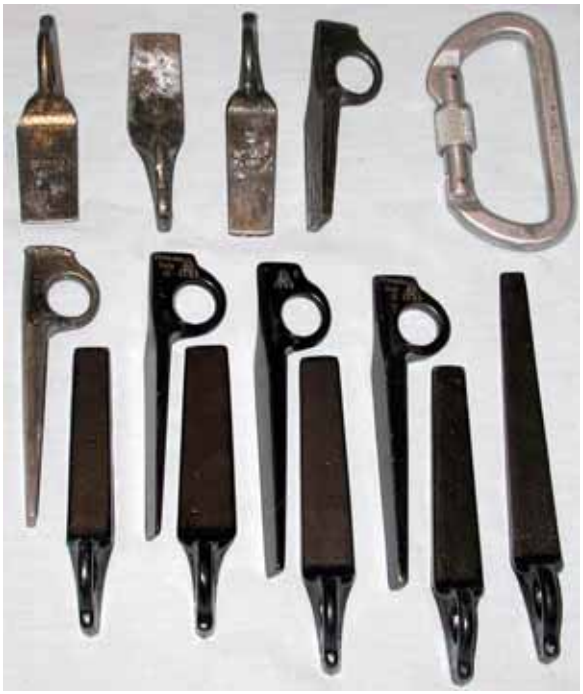


In recent years there have been some poorly manufactured knifeblade pitons on the market. In metal manufacturing any sharp or square inside corner can result in stress fractures or cracks and under load these cracks can propagate. The piton can then tear and fail.

A better design has a broader, rounder corner where stresses do not concentrate. The poor design has been known to have cracks initiated upon removal after only a single placement. Careful inspection of the area in question may show these small initial cracks.

If cracks are detected, no matter how tiny, the piton should be discarded immediately. (If visual inspection shows hairline cracks in ANY type of piton it should be discarded.) Better yet, do not purchase pitons of poor design and retire any that you may have.



The common "Lost Arrow™" design of piton is a type of horizontal blade piton. The thickness of these pitons varies from just slightly thicker than a knifeblade to almost 1cm thick near the eye.

The Black Diamond brand Lost Arrows™ come in eight sizes with the 3 shorter models designed for aid climbing. The five longer models are suitable for general purpose use as protection pieces and for belay and rappel anchors. One of the series is significantly longer than all the others.

The Lost Arrow™ design is particularly robust and careful use can allow you to reuse them anywhere from 25 to 100 or more times. A complete selection of Black Diamond brand Lost Arrows™ is shown in the photo at left.

Other manufacturers produce pitons similar in thickness and length to Lost Arrows™. In North America the term "Lost Arrow" piton has become the generic term for a medium thickness horizontal blade piton.

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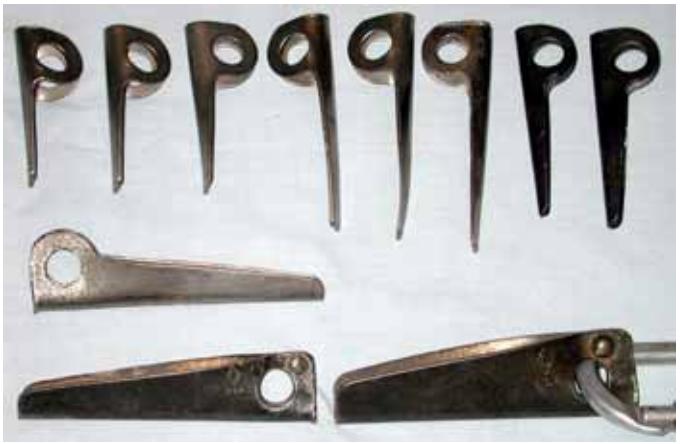

Angle pitons are made by folding a sheet of metal in a "U", "V" or "Z" shape. By using folded sheets of metal instead of a solid piece of metal the weight of a piton can be reduced in the larger size ranges.

The photo at left (upper row) shows three short shallow angle pitons used primarily for aid, three regular length shallow angles and two "baby" angles. The bottom three pitons are standard and large sizes which are becoming less common as other non-destructive protection often works well in the larger size ranges. The pitons shown are SMC™ (Seattle Manufacturing Corporation™) and Black Diamond™ brands.

As a historical footnote, prior to the invention of metal angle pitons wooden wedges were manufactured from hardwood with a hole drilled to accept a small rope sling. These are no longer manufactured (thankfully) and are essentially museum pieces. Wooden wedges found in place in a crack are likely no longer trustworthy.

A variation on the angle theme was invented by Ed Leeper and had a "Z" profile instead of the more common "U" or "V". This versatile design is useful in aid climbing where creative "stacking" techniques could extend their size range. A similar piton is now manufactured under another brand name. They come in shorter (aid) sizes and longer sizes for regular use.

The largest of pitons are now rarely seen and are called "bongs" due to the characteristic low tone they produced when hammered in. They have been produced in both aluminum and steel varieties. The aluminum bongs were subject to damage if driven too vigorously.

They are now rarely seen and have been supplanted by large cams and artificial chockstones (chocks / nuts).

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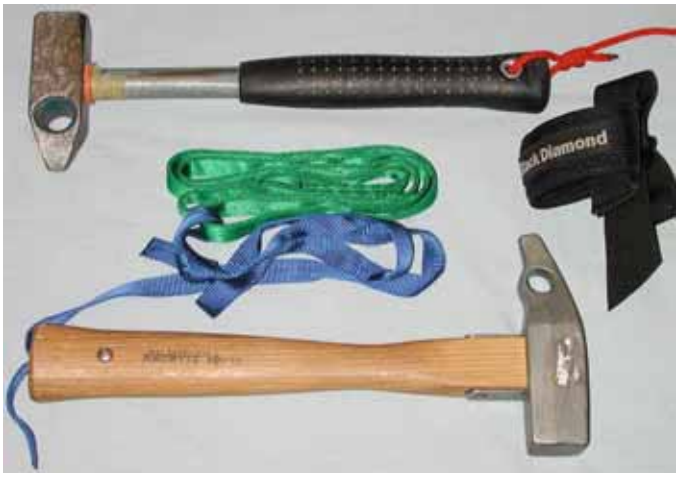
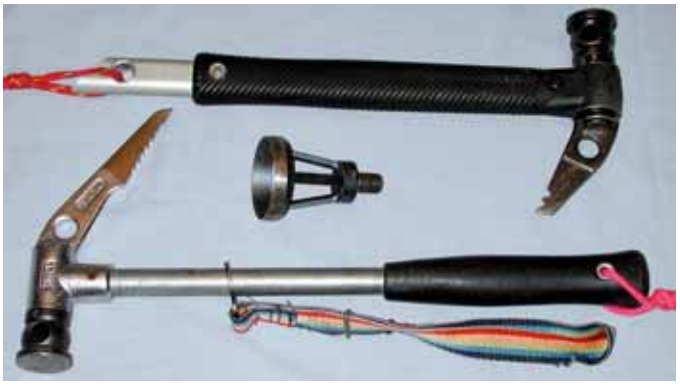
Hammers

Selection of an appropriate hammer for driving pitons is based on a number of interesting and sometimes conflicting criteria.



A heavier hammer with a hefty shaft is best for rapid driving of pitons with less hammer vibration and fatigue. If a lot pitons are going to be driven, the choice is for a beefy hammer typically with a wooden shaft or sometimes a metal shaft and rubber grip. Having a flat anvil on one end for driving the piton and a somewhat pointy nose on the other for aiding in piton removal are common useful design features. Some hammers have a hole in one end to attach an old retired carabiner to aid in pulling pitons. A hammer should have a keeper sling attached to keep it from being dropped. A holster will often be attached to the harness to hold the hammer when not in use.



When pitons are going to be used only occasionally and in climbing situations where weight is a consideration, climbers will often opt for a lighter hammer. Some modern lightweight hammers have a hollow plastic shaft for weight reduction. On alpine climbs some will use a multi-purpose tool that can be used as both an ice hammer and rock hammer. The hammers shown in the photo have interchangeable heads to facilitate use in varied environments.

Placement of Pitons

Before beginning the placement of pitons it is a good idea to think of eye protection such as glasses or sun glasses. Small metal and rock fragments can break off and could cause eye damage. Also removing large numbers of pitons, as in aid climbing, can result in abrasions especially to the knuckles. Some people choose to wear lightweight fingerless leather gloves when placing and removing large numbers of pitons particularly in big wall climbing. Now on to piton placement.

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When practicing piton placement be sure you are not practicing at someone's favorite rock climbing crag. A good place to practice is a roadside rock cut or defunct rock quarry. (Get permission if required and ensure no personal hazards exist first.)

Pound and remove as many pitons as you can then connect an old sling and carabiner and jump and bounce on every placement to give at least a rudimentary test of how solid your placements are. Pay attention to how easily each placement comes out when you eventually remove them. If a piton comes out surprisingly easy, ask yourself why that was so.

Conversely are there any placements you make that are incredibly difficult to remove? If so, why did that happen? Piton placement is as much feel and experience as it is technique. The following steps will assist you in obtaining better placements more often than not.

Begin by scanning the rock for suitable cracks. In the ideal world, a horizontal crack would be best. Horizontal placements have higher strengths in most cases. There tends to be less shifting or rotation in horizontal as opposed to vertical cracks. Once you find a crack that looks suitable, look for a locally wider portion of the crack that narrows down on either side. If the crack narrows on both sides the piton will wedge tighter if it begins to shift.

Visually inspect the surrounding rock to be sure it is not part of a loose block or flake. Sound the rock with your piton hammer by tapping on all sides both close to and farther away from the crack you propose to use. The sound should be uniform and solid throughout. There should be no local hollow sounds.

Select the appropriate size and type of piton for the crack. Orient the eye of the piton in the anticipated direction of pull (most often down). Ideally in a clean crack the piton should go in and be snug when it is about 1/2 to 2/3 of the way in. If the crack is filled with dirt or mud, attempt to clean it as well as practical in a timely manner.

In harder rock such as granite or quartzite you would typically want to have a piton that went in about 2/3 or perhaps even 3/4 of the way. In softer rock like limestone it may be beneficial to have it only go in only 1/2 way.

Experience is the best guide for how far to insert a piton in a given rock type and these guidelines are only broad generalizations and will vary slightly from location to location.

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Once you are satisfied that you have the right piton, begin to drive it home. Pay attention to a number of important indicators:

- Note how the piton feels as you drive it in. There should be constant resistance that gradually increases as the piton becomes tighter and tighter.
- In a clean crack the piton should begin to ring with a rising pitch. The sound should get higher and higher with each blow. Mud or dirt may dampen the sound. Angle pitons may ring even in poor placements but in general a good pinging sound is music to the ears.
- Observe the amount of movement with each blow. The piton should keep slowly going in at about the same rate with each blow. As the piton gets tighter your blows may have to become increasingly heavier.
- Continue hammering until the eye of the piton touches the rock.
- If a piton goes in more rapidly than average at the end you may have broken an edge of rock and the resulting placement may be poor.
- If the piton stops going in before the eye of the piton has touched the rock you may have chosen too thick a piton.
- If the pitons stops going in and the hammer blows sound odd or dull with the hammer bouncing back in an odd way you may have chosen a crack that was too shallow or “bottomed out”. Don’t pound any more!
- Observe if the crack widens as the piton is driven. If it does you may be pounding under a loose block, flake or detached section of rock.
- Avoid over-driving the piton. This may cause the rock to split or crack as shown in the photo at left. Even if the rock does not crack, over-driving may make the piton very difficult to remove.
- Under-driving a piton makes for a loose and weak piton. Only a lot of practice and experience can tell you just what the correct balance is going to be for any given rock type.

If possible, keep the ease of removal in mind when placing a piton and avoid placements that will be hard to get at for removal.

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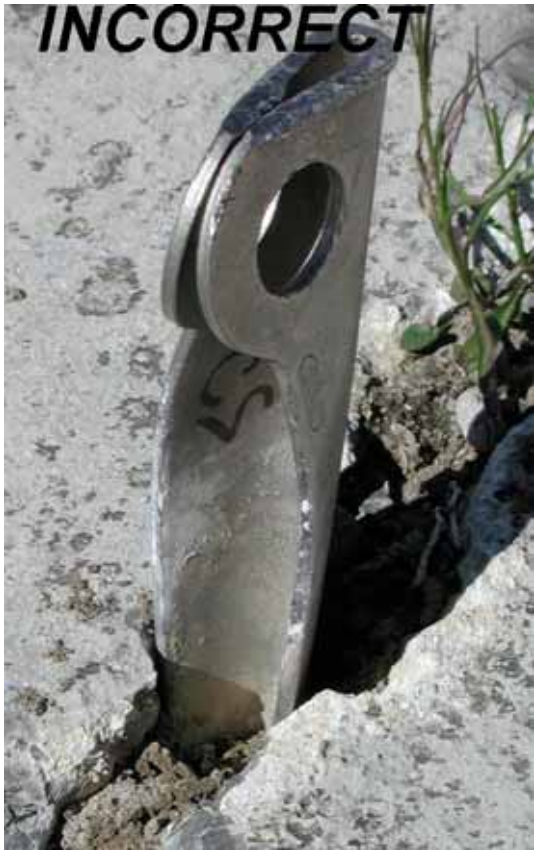
All of the previous illustrations have been using blade pitons. Much of the information for placing angle pitons is essentially identical. Angle pitons do have a correct and an incorrect orientation however. Angles should be placed such that the back of the spine and the two edges on the opposite side make contact with the rock. The sides of the angle should not be compressed when pounded into the rock. Refer to the photographs if uncertain.



Once you have driven the piton in until the eye touches the rock you should still do a final check of the placement. Visually inspect that no cracks developed, there was no shattering of the surrounding rock or widening of the crack in which the piton was placed.

Finish with a tap test that has also been called a “funkness test”. Hold your hammer lightly between your thumb and forefinger. Allow the hammer to swing gently like a pendulum and let it strike the piton along the axis of the crack. The piton should not shift or rotate at all with this amount of force. In addition, in most cases the hammer should bounce back like it hit a spring. A solid piton has a characteristic feel when tested in this way. It should not feel mushy or spongy.

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Once your piton has been tested, all that remains is to clip into the piece and appropriately attach the rope or build the rest of the anchor. For anchor building considerations see the article "Anchors in Earnest". Once a sling or rope is attached some people prefer to conduct a final test by tugging on the sling in all directions, including straight out, to be sure the placement is solid.

Once the carabiner has been attached be sure that the carabiner itself is not being levered over an edge or pried in an unusual manner.

If the carabiner is being levered or bent over an edge, there is the possibility that the piton may be levered out or perhaps more likely that the carabiner will simply break. Either situation is less than desirable.

One ingenious solution is to thread a wired nut through the eye of the piton so that the flexible wire is bent over the rock edge. Then clip a load attenuating runner such as a "Screamer™" on to the arrangement to reduce the impact force felt by the entire configuration. The end result is shown at right.

If the piton doesn't go in all the way to the eye, it is best to remove it and use a more appropriate sized piton or place the piton in a section of the crack where it fits better. If this is impossible (perhaps because you have a limited supply of pitons) it is possible to make the piton more functional by "tying the piton off". This amounts to tying a girth or a clove hitch low on the shaft of the piton to reduce leverage as shown at right.

The best way to complete this configuration is to clip a keeper carabiner into the eye and attach the piton to the rope using a load attenuating runner such as a "Screamer™".

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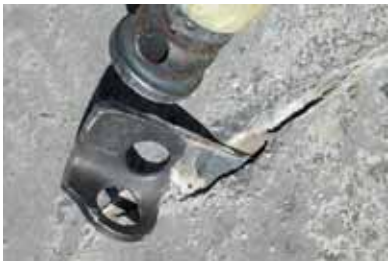
Removal of Pitons



Removing blade pitons is simply a matter of pounding the piton back and forth as far as it will go. Continue this action with repeated blows in each direction until the piton begins to loosen. Once it is loose, all that is often required is tapping it lightly into the center and removing it by hand.

In vertical cracks a slightly modified techniques is recommended. Pound the piton all the way up but only part way down until the blade is horizontal. Repeat this motion until the piton is loose enough to retrieve. This action may create a type of crack widening that can allow a wired nut to be used instead of a piton in future placements. In this way the damage done by the piton will at least serve a useful purpose.

Angle pitons require a modified technique as well. Instead of pounding all the way back and forth, only one or two blows are struck in each direction at a time. You are simply trying to locally widen the crack right around the piton rather than destroying a large section of crack. This saves time and reduces destruction.

Truly stubborn blade or angle pitons can be removed by prying on the eye if your hammer has a long thin nose which is designed for this purpose.

An alternate technique is to connect a retired carabiner to the piton and one to the hole in your hammer. The carabiners are connected with an old sling or a swaged wire cable sometimes called a “funkness device” designed especially for this purpose. The hammer is now swung straight outward to give a sudden shock load to the piton. This technique can ruin a good carabiner so some big wall climbers carry an old “cleaner ‘biner” for this technique. Wear your glasses and watch your eyes.

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Testing Pitons Found In Situ (Fixed Pitons)

Once pitons are in place can they be blindly trusted forever? Unfortunately, this is not the case. Rusting, chemical action, weathering and frost wedging all conspire to weaken fixed piton placements. An accident occurred in California in which a fixed anchor made of two pitons failed under only body weight. The climbers did not test the anchor before committing to it. I recently had a piton come out in my hand when I wiggled it with my fingers. The piton in this case was only in place for two years and had likely been wedged out by frost action. Pitons left in muddy cracks can often rust badly under the surface but look relatively fine on top.

The best way to test pitons is to repeat all the tests as if you were placing the piton for the first time. Visually inspect. Sound the rock. If you have no hammer, pound the rock with your fist to hear if it is hollow. Examine the crack and surrounding rock. Perform the funkness (tap) test if you have a hammer, but don't pound on the piton. If the piton moves, remove it, then replace it in a better location or with a new piton. Clip a sling and carabiner into the eye and tug it in all directions to see if it is loose. If anything is suspicious, feel free to back it up. These simple actions may save your life.

Ethical and Practical Issues

We began the discussion of pitons with an introduction to the reasons why pitons had fallen out of favour in popular climbing areas. We then justified them as a necessary evil in some situations. We discussed placement and removal and even talked about how to creatively remove pitons in such a manner that the damaged crack thus created may provide a future nut placement.

We can think even further regarding the ethic of piton placement. When practicing piton placement, do so out of the way of any climbing routes so that piton scars do not mar the landscape. Try an abandoned rock quarry or roadside rock cut. Be cognizant of the local custom regarding piton use in each area where you climb. If pitons are known not to be required in an established area or local custom dictates that they not be used, then best not to put them on your rack. If you are doing a new route or exploratory climb, pitons may be a welcome addition to your rack but they should not be a crutch. Use them as required but think of natural and clean options first. Natural and clean anchors and protection are often faster to place and remove and may enhance your speed and safety.

If you feel you must use a piton for running protection or as part of an anchor, consider leaving it in place so that others will not have to do likewise and continue scarring the rock. If you needed the pitons then perhaps others would as well. Let your conscience as well as your safety be your guides.

There is more to piton craft than what appears here! This is a basic introduction only. Read "*Freedom of the Hills*" or a similar suitable text. Get good instruction, preferably from an ACMG or IFMGA certified instructor or guide, then get out and practice in an unobtrusive location!

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