



Catholic Bushwalking Club Inc.

AN INTRODUCTION TO ABSEILING FOR BUSHWALKERS

INTRODUCTION

These notes give an introduction to vertical descent using abseiling equipment and to the more common equipment and techniques for abseiling in canyons or when bushwalking. Special techniques and equipment are required for abseiling whilst caving and are not covered in these notes.

Abseiling is a potentially dangerous pursuit and anyone contemplating an abseiling trip is strongly advised to seek advice from an experienced abseiler and to ensure they have the proper equipment. Before attending an abseiling trip think not only of yourself but of your fellow party members – an inexperienced or ill-equipped party member will not only be a danger to themselves but also to the rest of the party.

The club does not put itself forward as an expert or adviser in abseiling and does not prescribe competence standards or equipment requirements for those attending club abseil functions, these matters are left to each individual. By attending a club abseiling trip you acknowledge that you are doing so at your own risk and agree that you will not make a claim on the club, the trip leader or other party members in the event of accident, misadventure or negligence.

ABSEIL PRACTICE DAY

To help members understand the techniques involved in, safety principles of and to gain some experience in abseiling the club usually offers an abseil practice day each year.

The following are generally covered at a club beginners' abseil practice day:-

- What is abseiling
- Safety
- Equipment (helmet, gloves, footwear, harness, carabiner, descender, rope, prusik loops, French prusik safety belay)
- Common types of descenders (Figure of 8, Rapel Rack, Gold Tail, Piton Brake Bar & others)
- Care of equipment
- Care and handling of ropes (protective outer, wear, pinch points, cleanliness, coiling, twist)
- Care of the environment
- Care of those below (falling rocks)
- Basic knots (tape knot, figure of 8, prusik knot, double fisherman's knot)
- Anchor point (stability, dual anchors, use of tape loops or bolts, protection of trees)
- Setting up an abseil (coiling and casting rope to avoid knots, checking rope length, safety end stopper, marking "puller" when using joined ropes, rope retrieval)
- Attaching to rope (safety anchor, check descent path, look for obstacles)
- A**(anchor), **B**(buckles), **C**(carabiners), **D**(descender), **E**(everything else) or
- A** (anchor), **R** (rope & reeving), **C** (carabiners), **H** (harness), **E** (equipment) and on **R** (rope)
- "Buddy" check
- Caution - loose clothing, dangling equipment, long hair
- Belay (self belay, bottom assisted belay, top assisted belay)
- Signals ("on rope", "on belay", "off rope", use of whistle in waterfalls – 1 "stop", 2 "go")
- Self arrest (leg wind, using a rack or other stopping device)
- Stance for descent (feet spacing, angle against rock face)
- Straight descent
- Overhang descent
- Difficult start
- Prusik ascent
- Notes for canyons (often cold &/or wet, swimming ability, hypothermia, storms/floods, currents, white water, hidden rocks, escape points, waterproofing of gear, strong & comfortable pack, dry/warm clothing, wetsuit, thermals, non-slip footwear, first aid kit, torch, whistle, fire lighting equipment, adequate food, energy food, hot drinks, toilet)

GETTING STARTED

Footwear

Footwear must be comfortable, not loose fitting, have a sole which gives good grip both wet and dry and should preferably be reasonably light so as to not impede swimming in wet canyons. "Dunlop Volley" sandals are ideal, some joggers lack grip when wet and are not recommended, heavy boots can be cumbersome with long swims.

Clothes

Requirement depends upon the weather (*remember even in summer sudden weather changes can bring extreme cold*), clothes should be close fitting around the chest and waist to avoid the possibility of becoming caught in your abseiling gear. Abseiling often involves standing around in the cold, therefore adequate warm clothing is recommended. In addition a wetsuit or "thermals" are a necessity for wet canyons where water temperatures can often be only a few degrees above freezing. Wool and synthetics can keep you warm even when wet, cotton will not.

Gloves

Leather gloves are recommended for the prevention of rope burn, especially on your "brake" hand.

Helmet

A safety helmet should always be worn as it will provide protection from falling rocks and also help avoid you being stunned if you slip and hit your head whilst descending.

Hair

Long hair should be worn under a cap or tied up to keep it well away from your abseiling gear. Loose hair can get tangled in abseiling gear with painful and potentially dangerous consequences.

Rope

Abseiling rope comes in a variety of diameters. Diameters from 9mm to 11mm are suitable but anything less than 9mm should not be used (*9mm is not suitable for single rope descent except when using a descender designed for the purpose*).

The rope used for abseiling is a "static" rope which means it will have minimal stretch under load (*rock climbers use "dynamic" ropes which have a much greater stretching ability – these are not suitable for abseiling*). Static abseiling ropes are generally constructed with an inner load bearing core surrounded by a protective braided outer sheath. Polyester and nylon are materials commonly used in the manufacture of abseiling ropes.

Abseiling ropes are susceptible to loss of strength from mechanical or other sources of damage and should be cut up and discarded if their strength is in any way suspect. Polyester and nylon are susceptible to damage from chemicals, strong detergents and from strong sunlight. Polyester and nylon are also flammable and will suffer severe strength loss or total failure through exposure to naked flame or point heat (*avoid exposing the rope to excessive friction heat caused by your descender by using sensible descent practices – in long or fast abseils it is possible for your descender to heat to 215°C, the melting point of polyester*). Ropes deteriorate with age and manufacturers recommend ropes be replaced after the earlier of 6 years of use, after use in a severe fall, where worn, where damaged or after contact with chemicals or excessive heat.

Your life quite literally hangs on the rope therefore it is essential you take good care of it:

- It is a mortal sin to step or walk on a rope as this can introduce grit between the fibres and exposes the rope to punctures and point loads and is a very fast way of damaging it.
- Protect the rope from falling stones, even a small stone striking a rope can cause a lot of damage.
- Make sure the rope doesn't pass over sharp edges or projections which could damage or cut it once you load it with your weight.
- **NEVER** use an abseiling rope to tow a vehicle. Once a tow rope - always a tow rope and never again for abseiling.

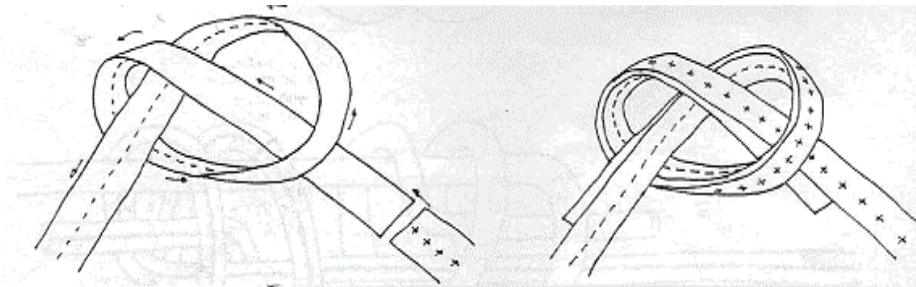
Knots

A few basic knots must be learnt by everyone who is going to abseil (*even if you don't intend to tie knots you need to be sure the person who is doing so knows what they are doing as your life depends on it!*).

Tape Knot

The tape knot is used to join all flat tapes, including the 5cm "seatbelt webbing" you use to make your harness and the tube tape you use to make belay points.

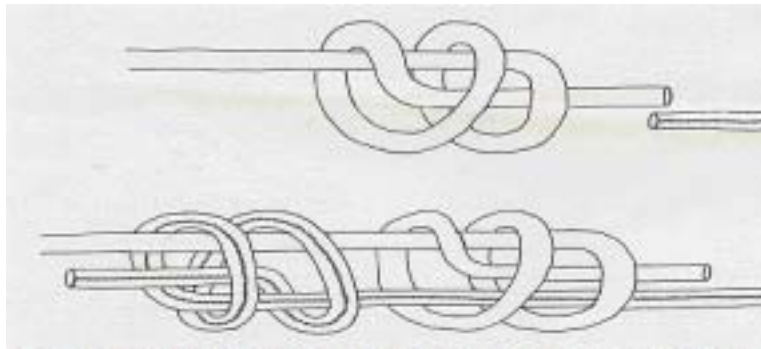
To tie this knot, first tie a simple over-hand knot near one end of the tape. Then bring the other end of the tape end-to-end with the first and keeping the tapes flat and back-to-back pass it right through the original knot. Then pull the knot tight.



You should have at least 5 cm of each end protruding beyond the knot. When using, check regularly to make sure that the knot is not working loose.

Double Fisherman's Knot

This knot is used to join two ropes and can be used to join ropes of different diameters. First tie a double over-hand knot near the end of the first rope, then pass the end of the second rope through the centre of this knot. With the second rope, tie a double over-hand knot around the first rope. Slide the two knots together and pull tight.



Prusik Knot

The prusik knot is a friction knot which will slide freely up or down the rope when unloaded but locks when under tension. The prusik knot is used both for safety in descent and for ascending a rope. Prusik slings must be carried by everyone who is abseiling. A prusik is tied by passing a sling through itself twice, around a thicker rope.

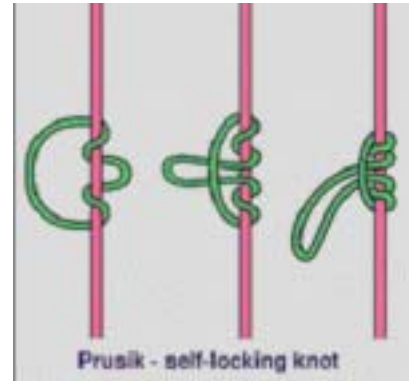
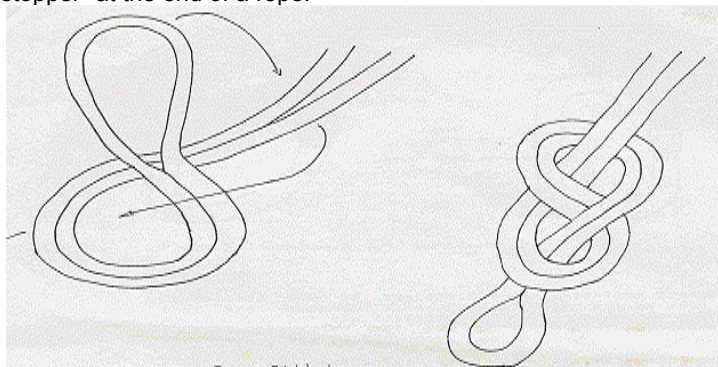


Figure of Eight Knot

This is a very useful knot and is strong, safe and easy to tie. It can be used to create an anchor, tie off a rope, shorten a rope and to place a "safety stopper" at the end of a rope.



Carabiners

Carabiners are essentially linking mechanisms with an opening and closing section or gate. They are made from either steel or aluminium alloy. The strength of each material is more than adequate for abseiling purposes. Steel carabiners are heavier than alloy, rust if left wet and the gate may stick if not lubricated with a non-stick lubricant.

Carabiners come in two basic shapes, "D" or "oval". A large "D" carabiner is used to complete your harness and the descender is attached to it. The large "D" carabiner has a locking screw gate.

Smaller oval carabiners may come with either a locking screw gate or a simple snap gate, however you must only use carabiners with locking screw gates for abseiling (*snap gate carabiners are used by rock climbers*). Also large "D" carabiners are preferred for abseiling as they offer slightly higher strength and their asymmetrical shape makes cross loading less likely than with oval carabiners.



IMPORTANT NOTES

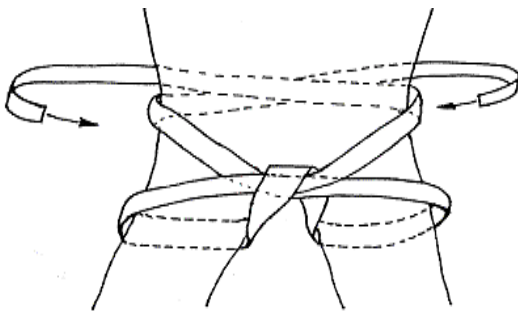
- **Carabiners are susceptible to hair-line fractures if they are dropped. These fractures cannot be seen by the naked eye, but can drastically weaken a carabiner. So NEVER DROP YOUR CARABINER. If you do, it is best to discard it immediately and replace it with a new one.**
- **Carabiners are designed to be loaded lengthways, never attach your carabiner so it will be loaded across the gate – the strength of a cross loaded carabiner is only about 25% to 30% of one correctly loaded.**

Harness

A variety of ready made harnesses are available for both rock climbing and abseiling, it is best to use a harness designed for abseiling. These are comfortable to wear, but can be expensive to buy. A simple, cheap and effective harness can be made from a single 5 metre length of 5cm flat, seatbelt webbing, tape. To make this harness, it is first of all necessary to learn how to tie a "Tape Knot".

To form a seatbelt webbing tape harness:-

- locate the mid-point of the tape and pass it between your legs so that a loop of about 5cm is out in front;
- take one of the tails, pass it round behind your right leg and through the loop in front;
- take the other tail, pass it round behind your left leg and through the loop in front. The two tails should be passing each other in opposite directions through the front loop. You should now have the basis of a seat for the harness;
- take each tail up across your stomach and over the opposite hip. Then wrap it around the waist until all of the tape is used;
- if you are right-handed, tie the ends of the tails together at your left hip with a tape knot;
- if you are left handed, tie the ends of the tails together at your right hip with a tape knot;
- the harness should now be a neat, but not tight fit. Don't worry about a little slackness, this will be taken up by the large "D" carabiner. If it is a sloppy fit after inserting the carabiner - start again;
- to complete the harness, use a large "D" carabiner to join ALL the loops of tape around the waist with EACH loop of tape at the crotch.



Tape Harness



Ready Made Harness

Descenders

There are many types of abseil descenders and as manufacturers are constantly developing new equipment it is impossible to describe all in these notes. The principles of descent are the same for all descenders with the difference generally being how you connect to and release yourself from the descender or how you control your descent.

A commonly used descender is the Figure of 8 (or Huit) which has the advantage of low cost and simplicity but the disadvantage that it tends to twist the ropes (especially when the ropes are wet) and can be dropped and lost whilst attaching to and detaching from the rope - a method of attaching a Figure of 8 so as to avoid this problem is shown below.

Other descenders include the Piton Brake Bar, the Rack and the Gold Tail. The Rack offers descent control features not available with some other systems although caution needs to be exercised as the rope can become disconnected if the Rack is "unloaded" during descent (*which can happen whilst wriggling through a difficult crack when descending in a canyon*). With the Gold Tail once properly locked in the rope can't accidentally come free, however the Gold Tail suffers the disadvantage of weight and high wear of the aluminium components.

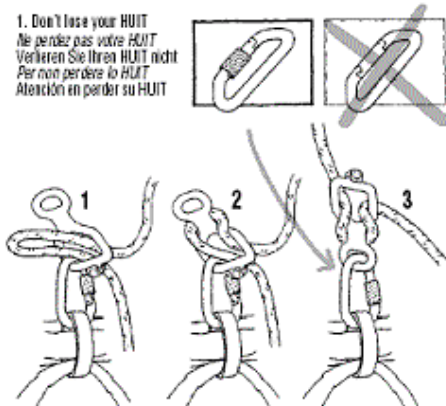


Figure of 8 (or Huit)



Rack



Gold Tail

ABSEILING

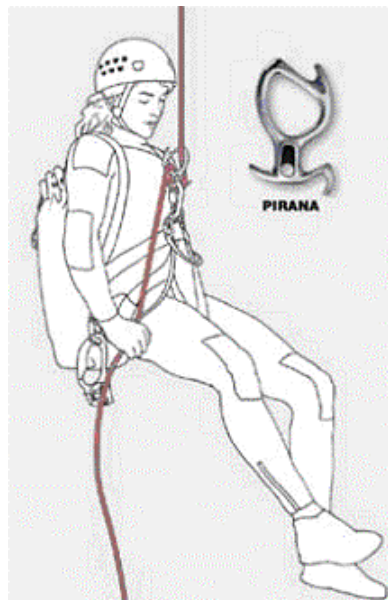
At last we can get into what it is all about – abseiling!

Put on your harness, attach a large "D" carabiner to the anchor point on the harness and attach your descender to the "D" carabiner. Make sure all buckles are securely tied, all gates securely locked and the descender securely and correctly fixed. Now pass the rope through the descender making sure that the tail falls to your natural side (*with a Figure of 8 the rope is placed through the descender before it is locked into the carabiner*). Stand facing the belay point with the tail rope falling to your natural side. Put on your gloves. Perform the A B C D E (or A R C H E R) check. Have another party member, who is safety belayed, perform a "buddy" check. Check to see that the abseil rope is not snagged or tangled and do a quick check to see where you are going and where to put your feet.

Grasp the rope with your natural hand (*your "brake" hand*) and hold it firmly behind your backside **DO NOT LET GO WITH THIS HAND AS IT FORMS YOUR BRAKE**, take your weight on the rope then lean back so that your body force is directed square to the rock face and place your feet comfortably apart. Call to the party below who will belay you "on rope" and wait for them to return "on belay".

Walk carefully backwards to the edge of the cliff. Continue to keep your feet comfortably apart to give good stability and balance and continue to lean out backwards so that your body force is directed square to the cliff face. Walk slowly down the cliff face, feeding the rope through your descender with your natural hand so as to keep pace with your descent. Keep your feet flat against the cliff face and have your body angled at about 45° to the cliff face. Proceed smoothly to the bottom of the cliff and when you reach the bottom and are safe, release the rope from the descender, call out "off rope" and move away from the descent path (*abseilers often accidentally dislodge rocks so it is important not to stand where you may be struck*).

The illustrations below show an abseiler descending using a Piton Brake Bar and in free fall descent using a Pirana (*the stance and rope position is similar for all types of descenders*).



Some Warnings

When abseiling on bushwalks you will generally be using a doubled rope, this enables you to retrieve the rope at the bottom of the abseil. When using a doubled rope you must have both strands of the rope passing through your descender (*never abseil on one strand of a double rope unless it has been properly tied off and never rely upon the weight of another abseiler on the second strand to counterbalance your weight*).

Always remember to double check everything, the rope, your harness, your carabiners, because if you make one mistake, it could well be your last (A B C D E).

Be aware that the most dangerous part of any abseil is before you have "hooked on" to the rope. At this stage you are at the top of the cliff and there is nothing to stop you falling should you slip or trip. Once you have "hooked on" the rope will hold you. A safety belay line should be used at all abseil starts and only released once the rope is properly connected through your descender, all safety checks completed and you are ready to descend.

Most serious canyoning accidents occur whilst not connected to the rope, either whilst setting up or hooking onto an abseil or whilst walking between abseil points.

Prusiking

This is a method of stopping yourself on the rope or going back up the rope. It is an extremely valuable safety skill and should be learnt by all abseilers.

It can happen that an abseiling device may become jammed, possibly by a piece of clothing becoming caught in the device, or you may be confronted by a tangle in the ropes or by an obstacle that requires some manoeuvring to get around or you may need to climb back up the rope. If this happens, you may need to be able to take your weight off the descender or be able to stop your descent and free both hands. You can do this by using prusik slings.

You need two slings made from 5mm or 6mm kernmantle cord. (Use a Double Fisherman's Knot to join ends when making the loops). One loop should be long enough to go from your feet to just above your waist. The other should be long enough to go from your waist to level with the top of your head.

Tie both slings to the rope using the prusik knot. The shorter sling must be tied above the longer sling. One foot is placed in the longer sling. The shorter sling is attached to the large "D" carabiner (carrying a spare carabiner makes this easier). Then by placing your weight alternately on one sling you can slide the other up (or down) the rope, then vice-a-versa.

You should practise tying a prusik knot with only one hand. You should always carry a pair of prusik slings when abseiling. Keep them handy in a pocket or tied to your harness but in a position where they cannot become caught while descending.

When transferring from an abseil to a prusik, the knot can be tied and the sling attached to the harness with one hand. This is not easy and there is the possibility of dropping the sling. Other approaches are to pull some rope up with the free hand and wrap two loops around one leg to "lock yourself off" or to use the locking device on your descender if it has one (such as the Rack).

While prusiking energy is wasted if you push out with one leg, it is easier to make a vertical push when the upper body is kept upright and close to the rope. It is also necessary to keep the prusiking action as smooth and even as possible to minimise rope abrasion.

To prusik over an overhang it is usually possible to push away from the edge with the free hand or leg and raise the sling past the lip. Climbing over the lip of a cliff is relatively simple where the belay point is well back from the edge, in other cases it may be advisable to connect to a second safety belay before attempting the final ascent.

Anchor Points

In canyoning natural anchor points are almost always used. The anchor must be at least as strong as the other parts of the abseiling system. The problem often lies with deciding what is strong enough. Wherever possible, and always when in doubt, 2 anchor points should be used.

Trees

A healthy tree, with a sound root system, growing in deep firm soil and that does not show signs of movement at the base should be selected. The tree should not move when given a hard shove at shoulder height. The rope should always be rigged as close to the base of the tree as possible so as to reduce leverage on the root system. The tree should be protected to prevent "rope burn" damage when retrieving the rope by using either a tree protector or by attaching a tape sling around the tree (the sling is usually left behind).

Boulders

A stable sound boulder resting flat and on a flat surface should be large enough if it cannot be moved by 2 people. If the surface is sloping or the boulder is not sitting flat, a larger boulder should be chosen. A sling should be placed around the base of the boulder to protect the rope from abrasion and to make rope retrieval easier (25mm tube tape is usually tied in place using a Tape Knot and of course has to be left behind in canyon situations). The rope should never be attached to the top or to a projection on a boulder as this could cause the boulder to roll or to tip and may release the rope.

Boulder Jam

There are frequently jams of small boulders at the top of waterfalls in canyons. These are generally very firmly jammed by floods and with a bit of ingenuity can make good anchors. Sometimes, removal of some sand will reveal a crack between the boulders through which a sling can be passed.

Driftwood

Driftwood is often jammed in boulders at the top of waterfalls and can frequently be used for an anchor. A thorough check should be made to ensure that the wood is not rotten, is sufficiently strong and firmly jammed in the boulders. There have been instances of driftwood pulling out of a boulder jam, especially when the driftwood is partly buried in sand.

In cases where no alternative anchor exists, it may be necessary to place driftwood as an anchor. This can be jammed behind boulders or between canyon walls. The driftwood should be sufficiently strong and the ends should be sound if it is to be used by jamming. At least two independent anchors should be used whenever driftwood is placed.

Natural Rock Features

Occasionally, features such as arches, projections or chockstones wedged in a crack are used. If the rock is sound these can provide excellent anchors, but if there is a hollow sound when tapped the rock is suspect and should not be used.

If a chockstone is used, care should be taken to ensure that there is sufficient taper in the crack to hold the chockstone. The rope should be rigged so that an outward force which could pull the chockstone out of the crack will not be applied.

Bolts

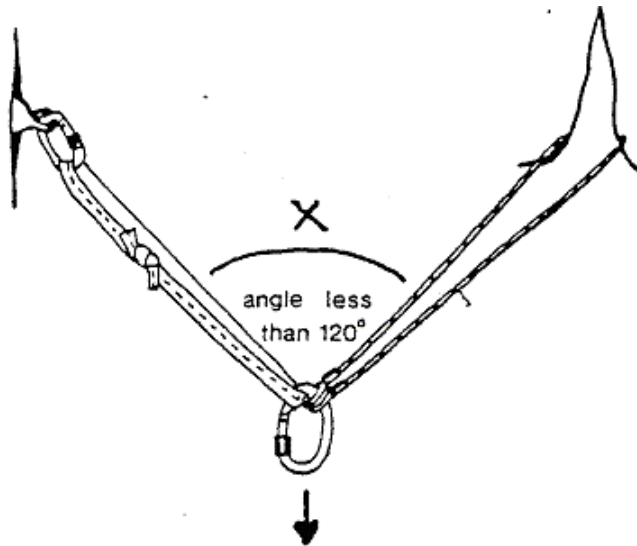
Bolts are sometimes placed on pitches where a natural anchor is not obvious. If using a pre-placed bolt, check it for rust or signs of fatigue. The surrounding rock should also be checked for failure. If a bolt is badly rusted or there are signs of fatigue or of failure in the rock then a different or second anchor should be used.

Rigging

Anchor points should be selected so that:

- There will be no rub points on the rope
- The rope will be easy to retrieve
- Areas of loose rock, which could be dislodged on people below, are avoided
- It is possible to safely, quickly and easily clip onto the rope
- The rope will naturally fall in the intended line of the abseil without tangling
- The drop is free of vegetation that might tangle the rope or make abseiling difficult

Where two anchors are used the angle marked X in the sketch below should be as narrow as possible, preferably less than 90° and never more than 120° (at 5° angle the load is 50% on both anchors, at 60° - 58%, at 90° - 71% and 120° - 100%). Both slings should be arranged so that neither will take a sudden force if one anchor fails.



A sling should be used where the anchor point is some distance from the edge so as to aid rope retrieval and in situations where it is needed to prevent the rope passing over sharp projections. Existing slings should be avoided as they may have suffered heat damage when the rope was pulled through by a previous party or may have deteriorated with age.

Abrasion can be a serious problem and may cause a rope to fail. The amount of abrasion increases as the length of the pitch increases, so more protection for the rope is required on pitches over 20m. Also if the rope is to be used for prusiking, it must be protected from major rub points as this technique can be quite jerky. Abrasion can be minimised when abseiling by adopting a smooth technique with no jumping.

The cliff edge is the most obvious rub point. The rope should be padded where the edge is sharp or irregular - close inspection is often necessary to reveal irregularities. Abrasion can be considerably worse if there is a long free drop below the abrasion point.

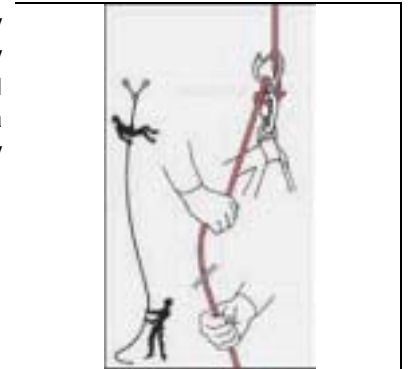
In canyons and other situations where you haul the rope down after the last abseiler - before the last person descends make sure the rope can be freely retrieved. Where ropes need to be joined make sure the last person down feeds the knot down past any likely choke points.

Belaying

Unless securely belayed you should avoid going closer to the cliff edge than your own height (stand further back on sloping, slippery or loose ground). A safety belay can easily be set up by attaching a sling to a suitable anchor and clipping this onto your harness with a spare carabiner.

All abseilers should ensure that they have 2 means of controlling their descent. If for some reason the rope comes out of your "brake" hand (your feet slip and you lose your grip, you receive a blow to the head from a falling object or during a slip) your descent control will be lost unless you have a second means of control. The usual means of providing a second descent control are top assisted belay, bottom assisted belay and self belay.

As most of the abseiling done by the club is in canyons, where carrying of unnecessary ropes is avoided due to weight considerations, use of a top belay is not usual. Normally in canyons the first person down will find a safe place to stand out of line from potential dislodged rocks and where they can observe the line of descent and they will provide a bottom belay for following party members. To arrest an abseiler with a bottom belay simply involves the belay person pulling the trailing end of the abseil rope tight.



The first person down the abseil will provide a self belay using a French prusik (alternatively they can be top belayed by another party member by means of a second rope). At the abseil practice day you will be shown how to tie and use a self belay.



French Prusik

To provide a top belay the belayer attaches their harness to an anchor point with a fixed belay line (the line should be reasonably tight so that the belayer will not be dragged forward if the person being belayed suddenly drops). The top belay rope (which is securely connected to the abseiler's harness) is passed through belayer's descender and the belayer controls the abseiler's descent using the normal descent control procedure. The belayer should protect their hands with gloves. There are a number of commercially available top belay devices which offer safety features including self locking should the belayer release the rope.

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