How NOT to Abseil

(almost) 1st Edition


Abseiling
(almost) 1st Edition
© Christopher Ward

This entire document is designed to be a supplement for structured instruction.
It is not to be used as the sole source of information for anyone entering the world of vertical rope activities.

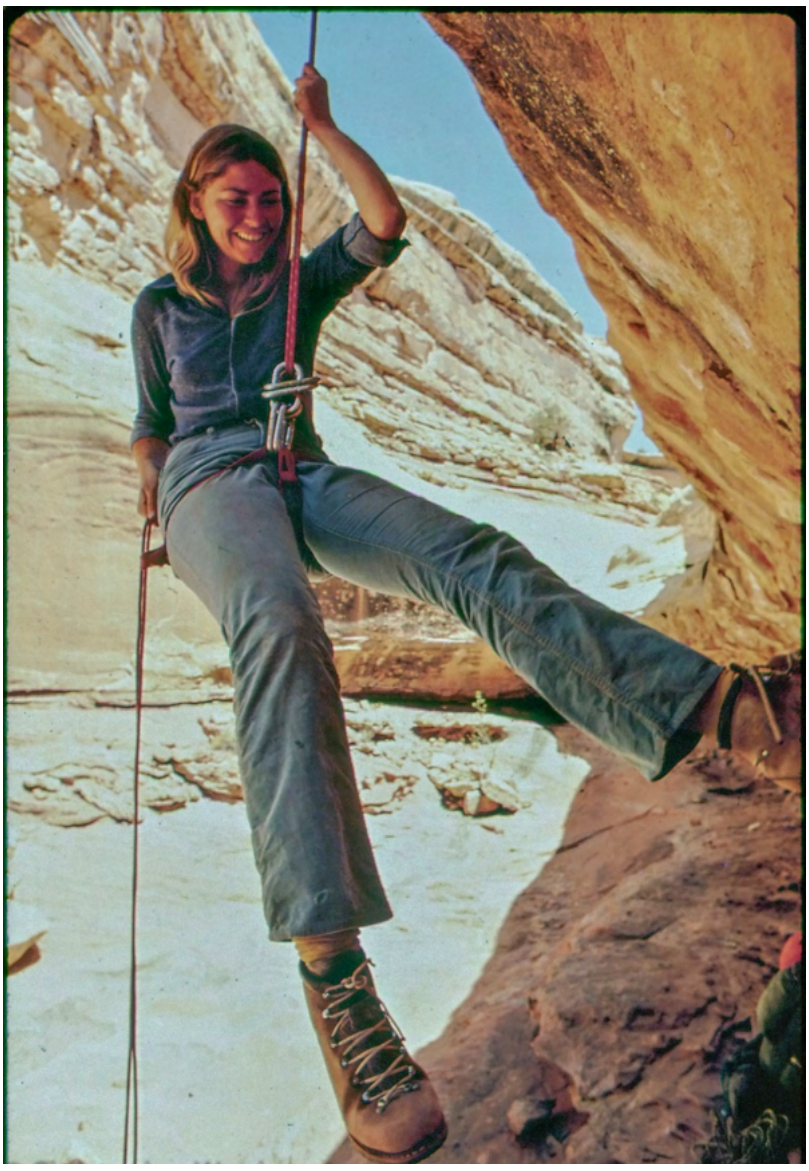
There is no substitute for qualified and competent instruction.

Read, get instruction, talk to others and build your own skill set.

But most importantly, have fun and enjoy the canyons , Caves and Mountains that this great world has to offer.

Contents

Basic Techniques



Standard Abseiling stance.
The Abseiler is using a Nappy sling harness and crossed carabiners as the descending device.

There are many variations to these basic methods.
For safety this document will only cover what is needed to efficiently and safely, descend a vertical face.

Abseiling is a fun sport. There is the fun and excitement of zipping down a line defying gravity. Abseiling can also be an extra facet to another sport. The Climber goes to the mountains to climb them. Abseiling is just the thing they do at the end of their climb. A caver uses abseiling to gain access to deep caves. All these activities use slightly different techniques and equipment but the basics are still the same.

A caver descending a wet pitch.

This rock climber is negotiating a difficult start to her abseil.

Two French canyoners doing a multi pitch descent. Have a close look at their anchor setup. Do you see any problems? Read up on SERENE anchors later in this booklet.

This mountaineer is abseiling in deteriorating conditions. Note the bad rub point on the rope in the foreground!

In order to reduce accidents multiple checks are performed at the beginning of each descent. Two people should always go through this check together. When you check your gear, your buddy should also check your gear at the same time.

The ABCDE check

Anchor
Check Knots, Carabiners, Slings and anchor point.

Buckles
Buckles doubled back, Harness fitting well, Loose straps and clothing away.

Carabiners
Gates done up, not cross loaded, all OK

Descender
Threaded OK, Nothing can get caught in device (hair, jackets, straps).

Elmet or **E**verything else
Helmet fitted correct, All loose kit secured, Comfy and good to go.

Stance and Technique

Feet and Legs
Feet at least shoulder width apart, Knees slightly bent, Feet flat on rock face. Legs perpendicular to the cliff face.

Hands and Arms
Brake hand-Thumb on Bum, Other hand sitting comfortably on rope.

Overall Stance
Relaxed, Not hunched over, Leaning back.

Smile
Beaming with exuberance.

The Script

In order to avoid confusion at an abseiling venue, a set script is used between the belayer and the abseiler. It may vary slightly among individuals but to the right is the basic set of calls.

Abseiler
On Rope!

Belayer
On Belay!
Abseil when Ready!

Abseiler
Abseiling!

Abseiler
Safe!
Off Rope!

Clothing

Comfortable
Dress for the day. But wear
Comfortable, stout shoes with good grip.
No loose clothing.
Gloves are advisable.

Equipment

The Mark of the
European Economic Area

The Mark of the
International Climbing and Mountaineering Federation, commonly known by its French name
Union Internationale des Associations d'Alpinisme (UIAA)

All equipment should carry either one or both of these Marks, signifying that it has been manufactured to an acceptable standard.
Be wary of purchasing equipment over the internet or any equipment that does not carry these marks.

Care inspection and maintenance of equipment

Harnesses

Hardware

Ropes

Records and Logs

Harnesses

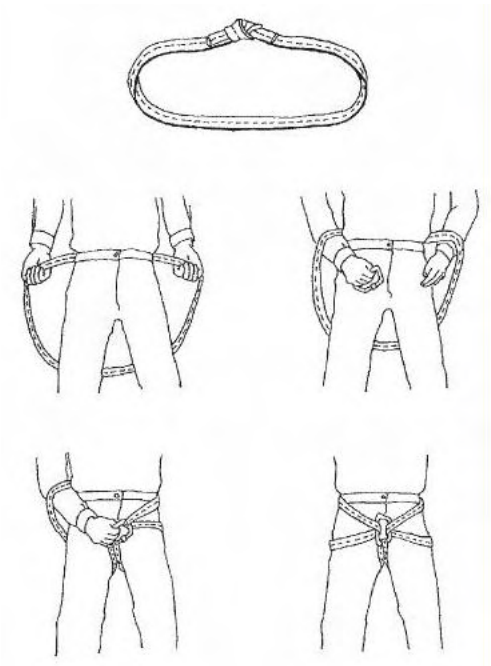
Harnesses come in all shapes and sizes and so do people. When shopping for a new harness it is best to try on as many as you can. An expensive harness does not mean it will be the most comfortable for you.
Waist belts should be adjusted to sit above your hip bones and around your waist (The Harry high pants look). If you fit the belt low around your pelvis to get the cool, low hipster look you could slip out of your harness if tipped upside down, but you would look cool
in the afterlife!

Canyoning specific Harness
This harness has a protective seat at the back. It also has a high tie in point as the harness will be used for abseiling with the wearer usually carrying a pack therefore a high centre of gravity is provided. Limited gear loops.

Caving Specific Harness.
This harness is very light weight. It has protective sleeves over the leg loops and has a very low tie in point. This is a benefit when prussiking with SRT (single rope technique) equipment. Limited gear loops.

Climbing Harness
Leg loops and waist belt are two individual assemblies connected with a belay loop. Waist belt fitted with gear loops to carry climbing kit. Very comfortable, lots of gear loops and easy to use.

Full body Harness.
Very safe, has a high tie in point. Mostly used for small children and industrial work.
This harness is difficult to abseil in due to the high centre of gravity. No gear loops.



Nappy Sling Harness.
There are a few different methods to make webbing and improvised harnesses. The easiest and cheapest is the nappy sling.
A loop of tubular tape is the best material to use but even the end of an abseiling rope will work all be it slightly uncomfortable.

Descenders

There are literally hundreds of different descenders and methods to use while abseiling.
This page contains a few of the more popular types and methods.
Various sports will need different requirements from descenders so the variety of descenders is large.
Cavers will want different kit to canyoners but all descenders still have the basic role. To get an abseiler safely to the ground.

(the pictures below are not to scale)

Rappel Rack.
An “in line” device.
Very good for long abseils and harsh environments. Can be easily locked off. Heavy and cumbersome

Figure eight
A circular device.
A very safe device. Simple, light and easy to use. Cannot be locked off easily. Can twist ropes.

Petzl Pirahna
A circular device
Designed for Canyoning
Varying friction settings.
Can be easily locked off.

Petzl Stop.
An “in line / bobbin” device.
Very good for long abseils and harsh environments. Designed for caving. Auto braking

Whale Tail or Gold Tail
An inline device. Good heat dissipation, robust, good for long abseils, designed for caving.

ATC/ Tubular belay device.
Not easily locked off.
Heats up quickly.
Can be very jerky.

Guide Plate
A belay device
Very light weight.
Heats up quickly.
Hard to lock off.

Crossed Carabiners.
Should only be used as an emergency descender method.
Difficult to set up, hard to lock off.

Wear and Tear

Left to right. A rappel rack, a Petzl Piranha, a Kong hydrobot.
All these descenders are showing signs of wear but are still serviceable.
As a general rule 10% wearing of the metal is the lifespan of any device. Having said that as little as 5% wear on some lightweight carabiners would put them below their design strength. Aluminium bared Rappel racks are made for harsh conditions and can operate quite safely with 20% wear on some bars.
It is best to retire any equipment you are questionable about. Either throw it in the bin or if you want to keep it for a memento , make it unusable .

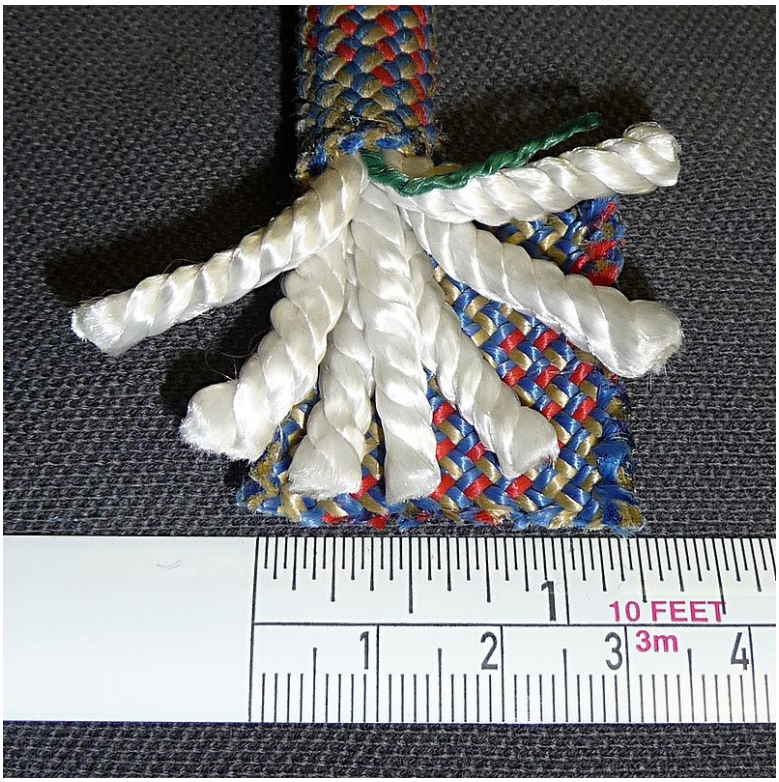
This rope has been abraded over a course edge. The core was not damaged but the sheath is damaged.
Time for retirement!

This figure eight descender is just waiting to retire the next person that abseils on it.
Muddy or sandy ropes will saw through aluminium descenders like a hack saw. Keep your ropes clean.

Ropes

Rope types

Five different ropes. Visibly they are of differing sheath weaves and colours. In regard to handling and characteristics they vary immensely. The white rope is a static rope. It has very little to no stretch. The other ropes are Dynamic ropes. They are used by climbers. A dynamic rope is very stretchy and will bounce an abseiler while on rappel. The elastic nature is designed to absorb shock loads encounter during a fall.



Care

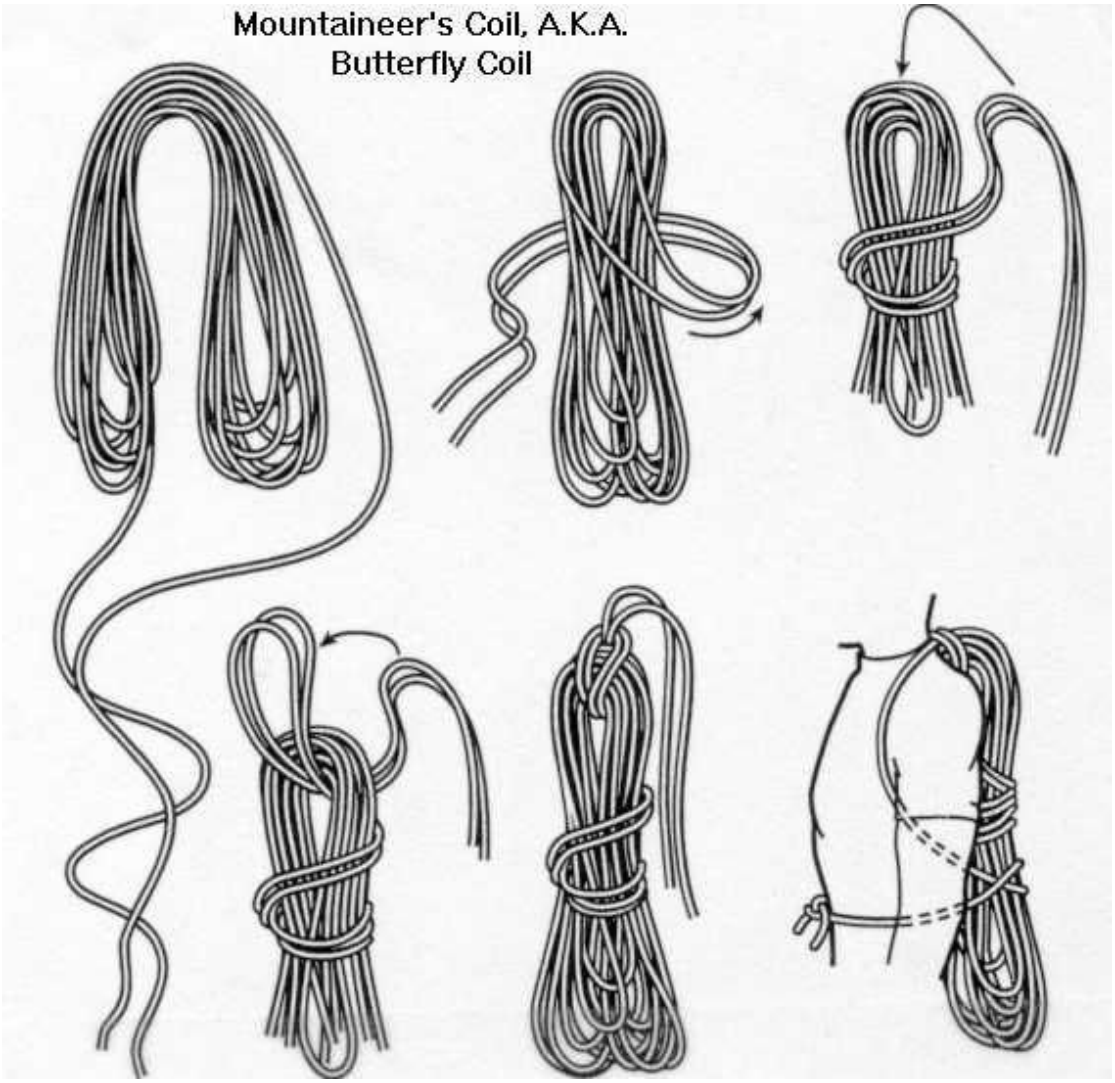
Kernmantle rope should be inspected before and after every use for any form of damage. "Boogers," which indicate internal damage to the kern, appear as tufts of white threads poking out from the mantle. Ropes that have been severely stressed have tapered sections which are visibly or palpably thinner. Rope that has been abraded or cut on sharp edges should be examined closely by an experienced user, who may choose to cut the rope at that point, rather than risk it parting at that location.

A rope can be cleaned by forming it into a chain sinnet to prevent excessive tangling and washing it in a front-loading clothes washing machine with soap flakes. Strong cleansers, including bleach and detergent should not be used on life-critical nylon components. Commercial rope cleaning devices are also available.

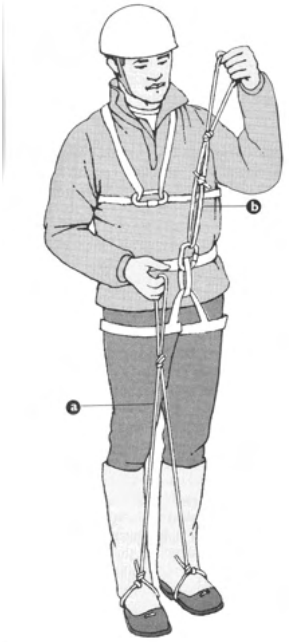
Coiling Ropes

Over the shoulder coiling method.
This can be done either with two strands or a single strand

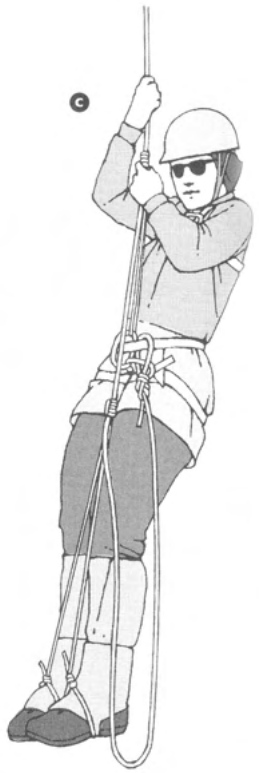
Coiling ropes needs to be done in a way that achieves two goals.
1 The rope is stored neatly and safely.
2 The rope can be easily and speedily deployed.



Prusiking



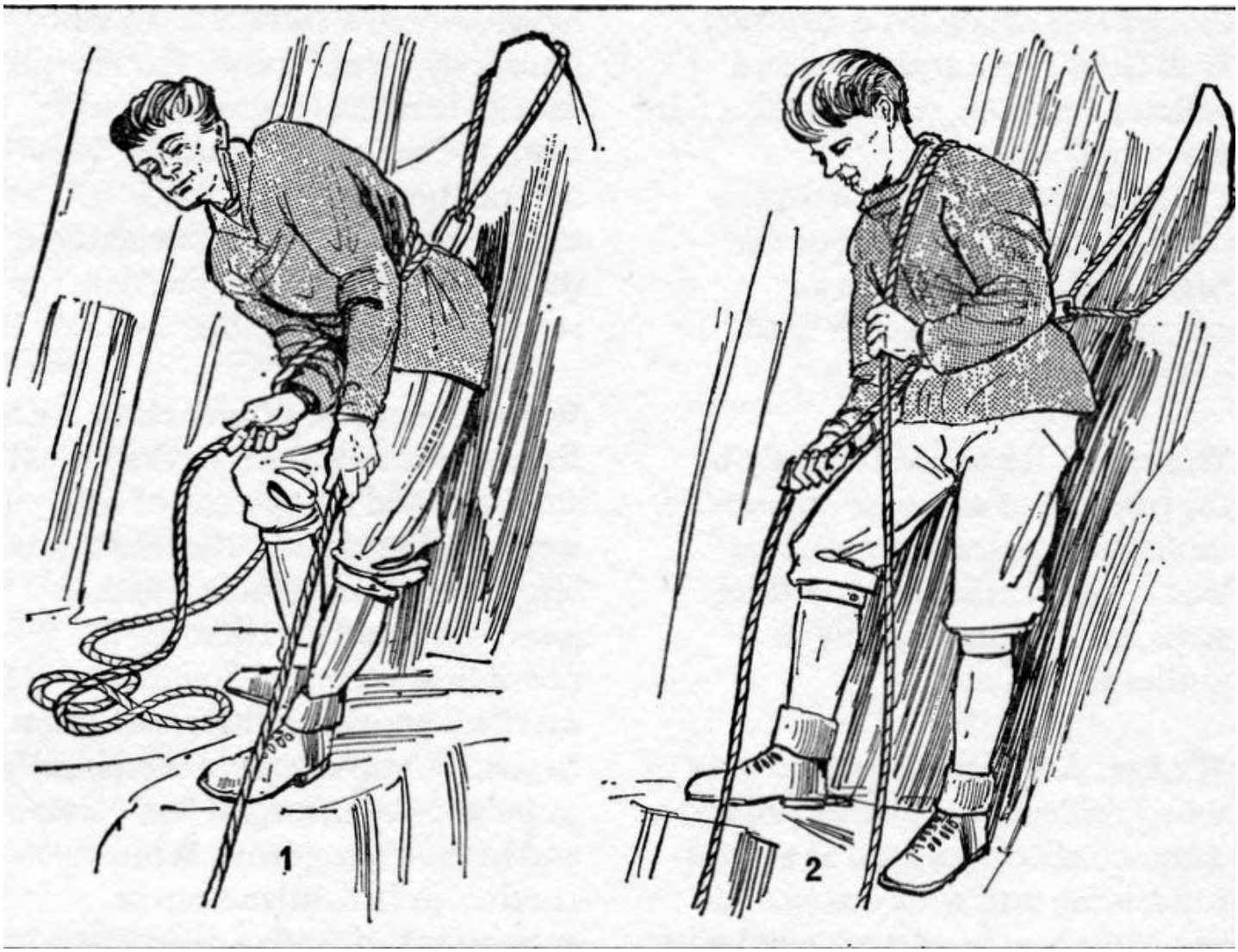
Ascending a rope using the Texas-prusik system (pack and ice ax omitted for clarity): a, sitting or resting and moving foot prusik sling up; b, sitting on heels, ready to stand; c, standing and moving seat-harness prusik sling up.



A handy trick if you have to prusik up a rope with your pack.
Tie into the end of the rope.
Clip the pack to the formed bight in the rope.
The pack will follow you on a 2:1 haul system. You will be able to prusik relatively unencumbered by you pack.

There are many different ways to prusik.
The styles shown on this page are what is popular with Mountaineers.

Belaying



100 years ago

This was how it was done.
Climbers were made of steel
Ropes were made of hemp and sisal.
NO ONE fell because, if you did, you had a memorial named after you !

We DO NOT belay like this anymore!
We are made of flesh.
Our ropes are now stronger than steel.
Our memories tell us “the older we get, the better we were”.

Belay Devices

The first of the belay devices. The Salewa Stitch Plate. It revolutionised climbing. It Is an *aperture* device.

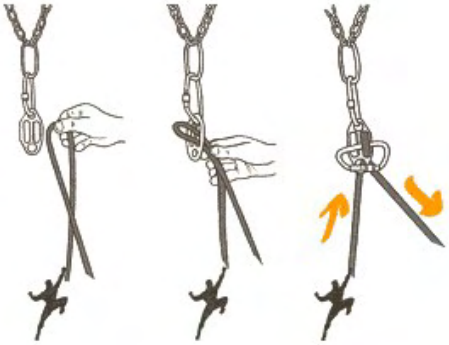
A Petzl Gri Gri. An Auto locking belay device.

A Black Diamond ATC. Pretty much the standard belay device used today. It is a *tubular* device

Below. The Guide Plate. An extremely universal device. It can be set to Auto lock (see below), standard belay, Abseiled on and can be used as an ascender.

A DMM Pivot
It can be used as a tubular device (right) and also as an auto locking guide plate (left)

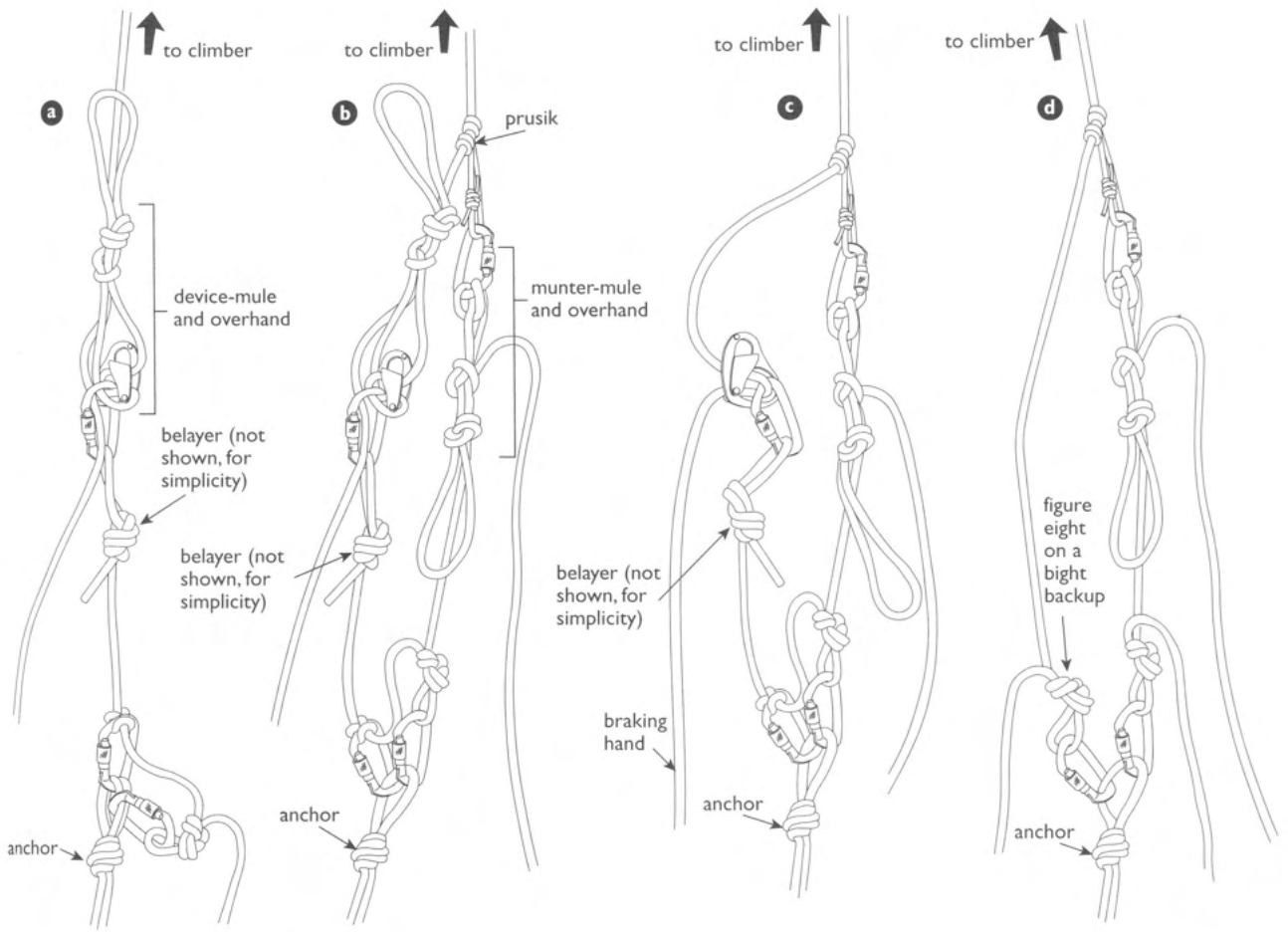
The Munter hitch.
An excellent knot for belaying. It can easily be locked off when tied as the Munter Mule. Unfortunatly this knot twists the rope quite a lot.



Escaping the Belay

A time may come when you need to escape the belay. This is when you have made yourself part of the belay system. In order to get help or build a hauling system to rescue your partner you need to "Escape the Belay".

https://www.youtube.com/watch?v=fDtOdyCOe4o



Escaping the belay: a, tie off belay device with mule knot (device-mule) backed up with an overhand knot; b, attach a tie-off loop to the rope with a prusik hitch and clip a locking carabiner to the loop, then attach the carabiner to the rope from the anchor with a munter-mule and overhand knot backup; c, untie the first overhand backup and device-mule, and slowly transfer load to the tie-off loop using the belay device; d, as a backup, connect the rope from the fallen climber to the anchor with a figure eight on a bight, and then remove the belay device.

Knots

Figure 8 Knot Instructions

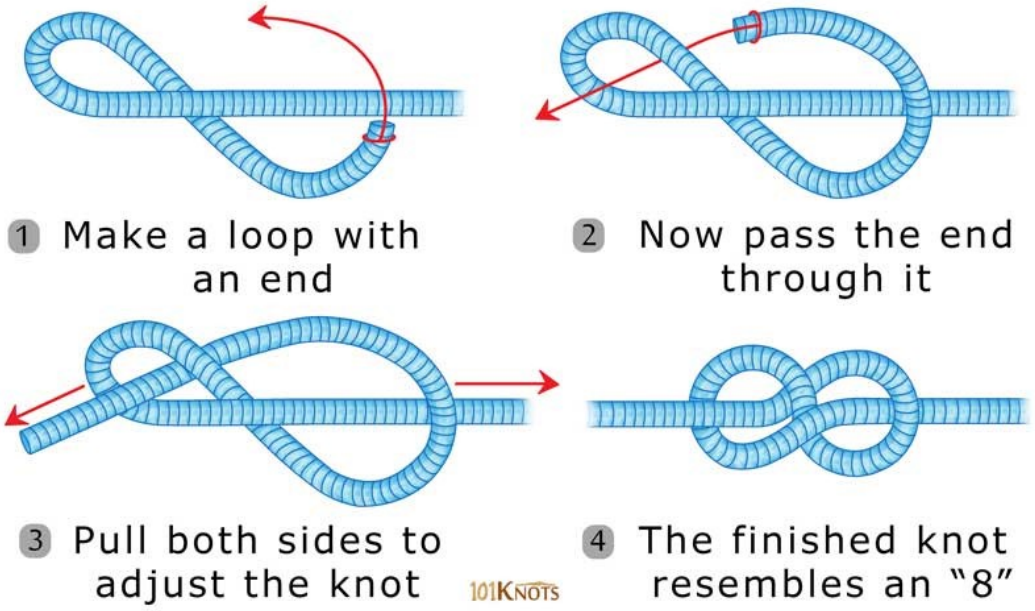


Figure 8 Follow Through Tying Steps

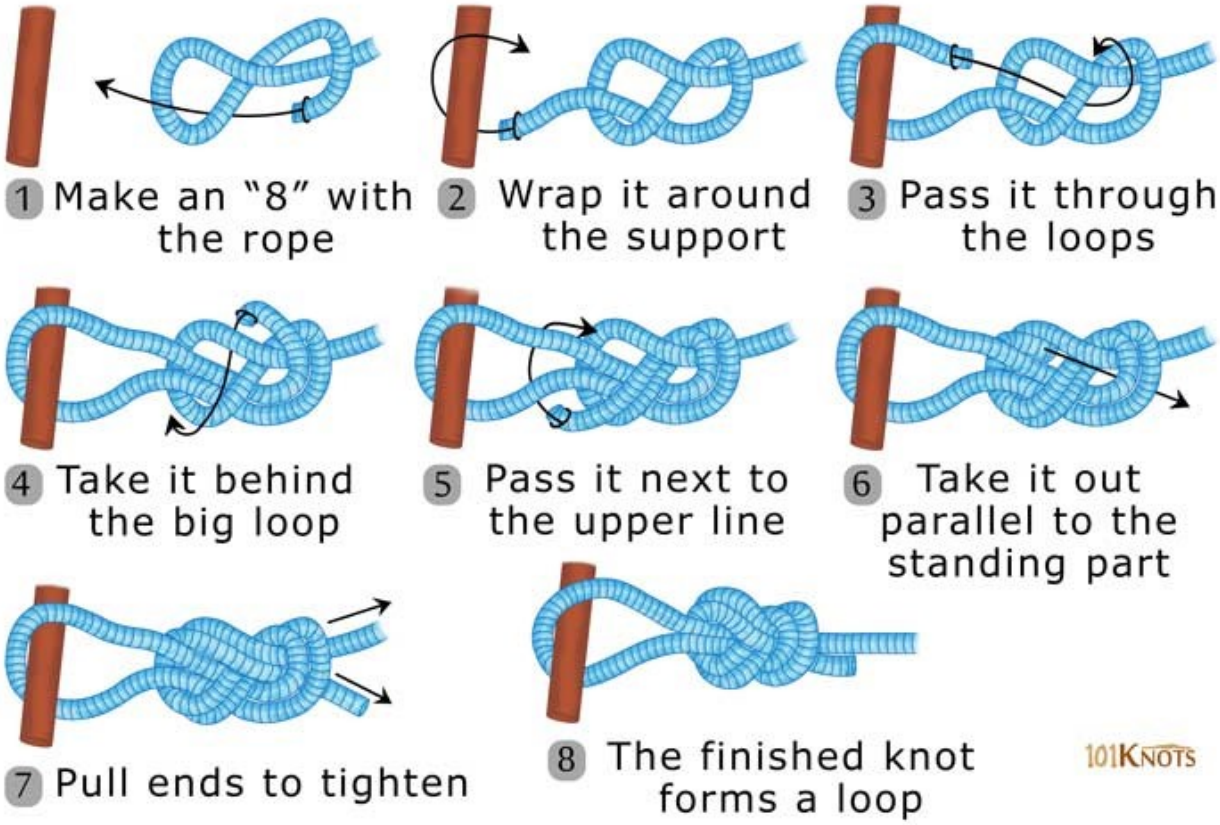
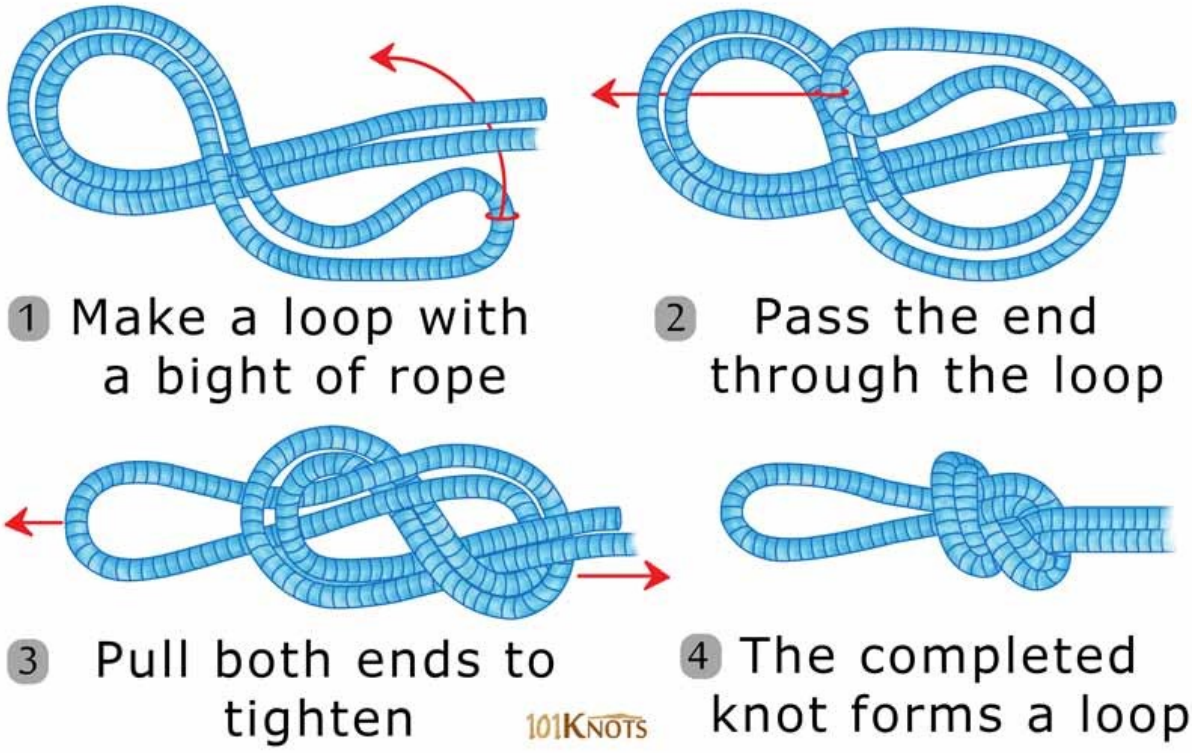
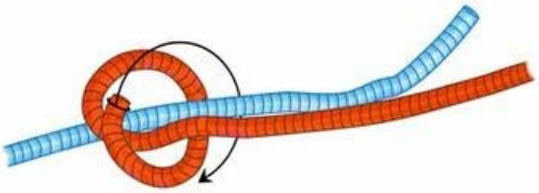


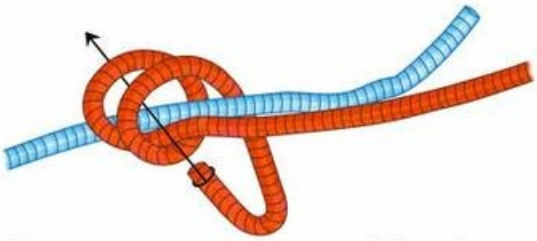
Figure 8 on a Bight Instructions



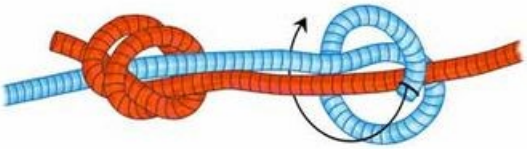
Double Fisherman's Knot Instructions



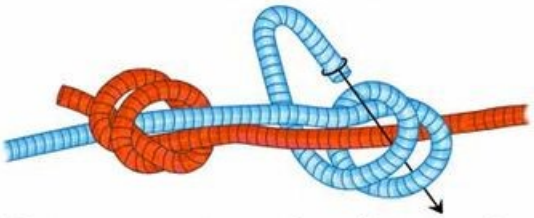
1 Make a loop with the red rope



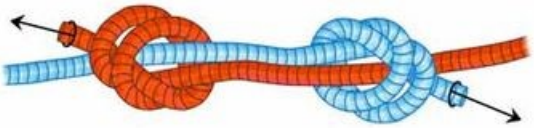
2 Loop once more and feed its end into it



3 Make a loop with the blue rope



4 Loop again and tuck its end into it



5 Tighten the two individual knots by their tag ends

6 Pull the standing parts to draw the knots close together

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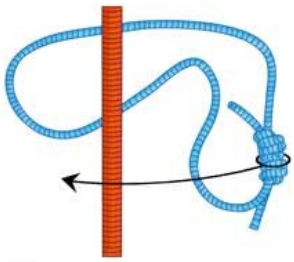
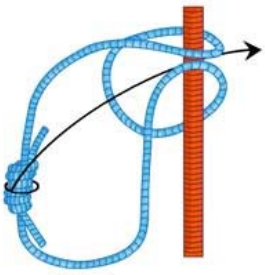
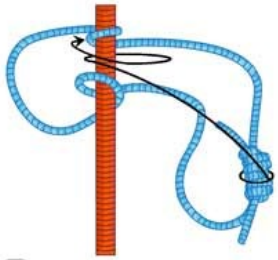
Prusik Knot Instructions



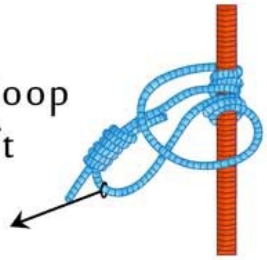
1 Make a loop and bring the junction point to the left of the thick central rope



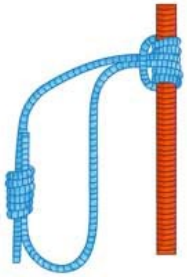
2 Now pass it to the right side through the loop just formed



3 Turn it round the central rope thrice



4 Finally, take it out of the last loop formed passing it to the left



5 Tighten the knot

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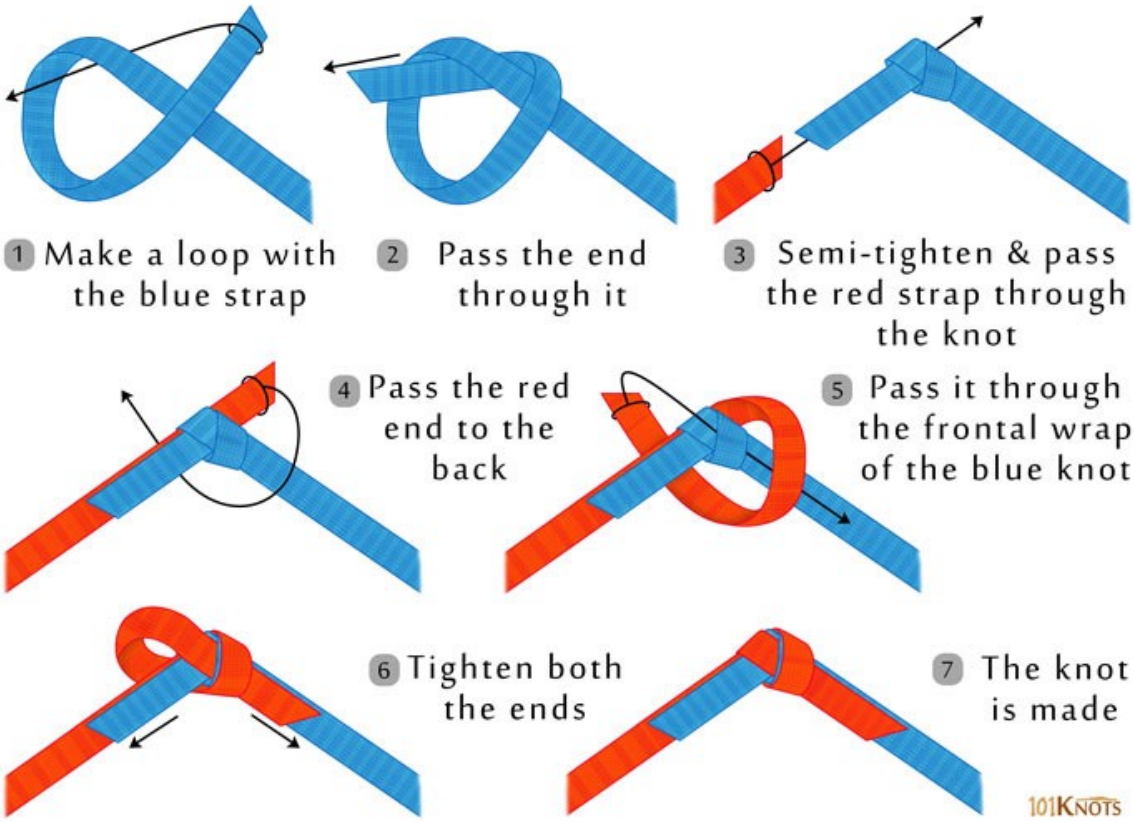
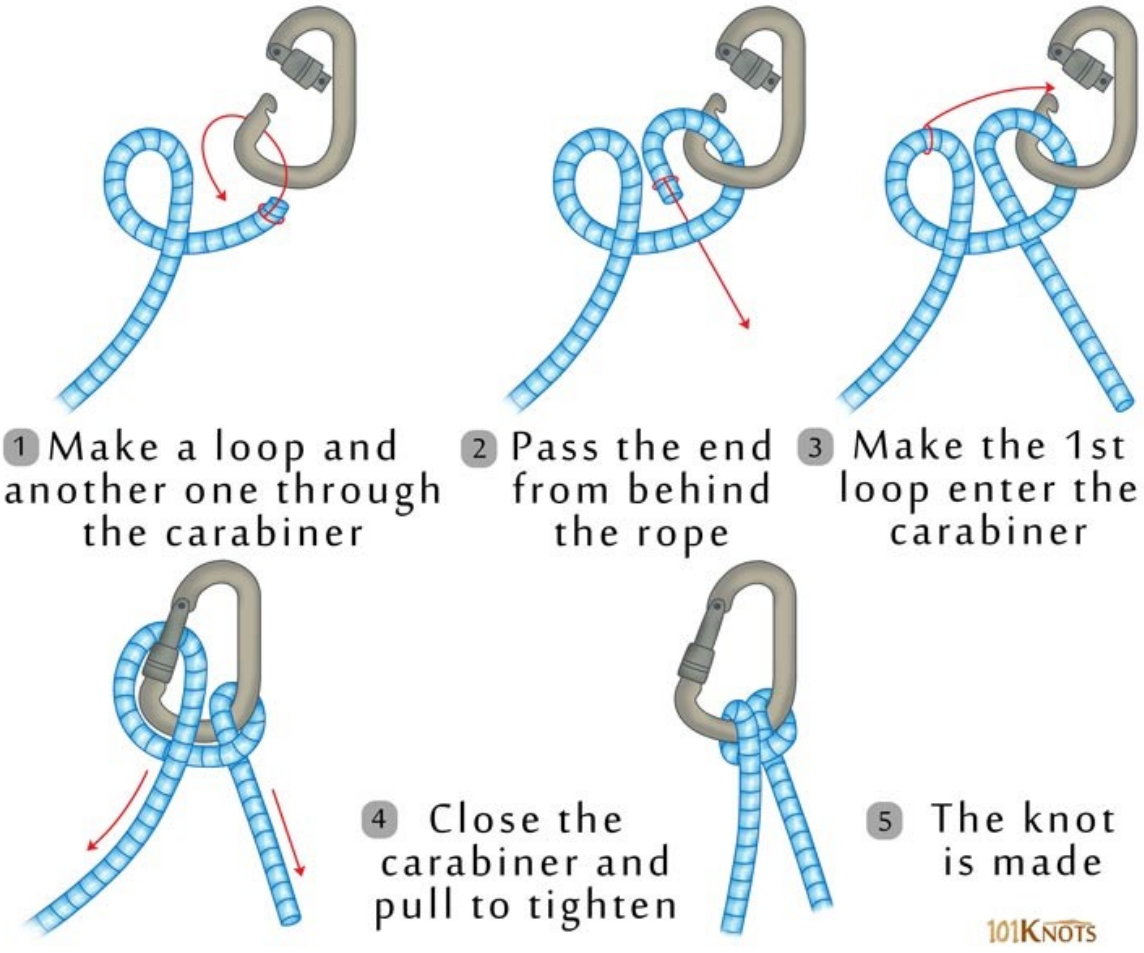
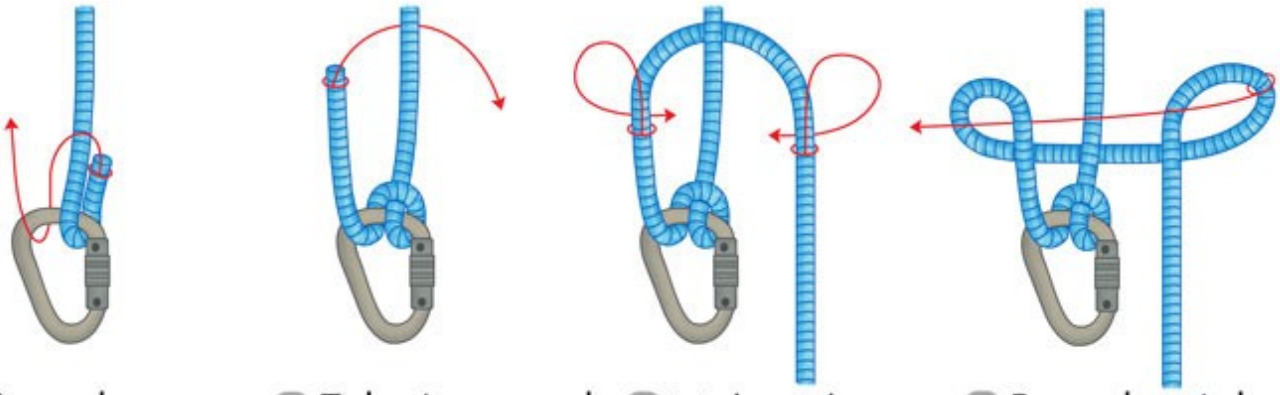
Water Knot Instructions



Tying a Munter Hitch



Munter Mule Instructions

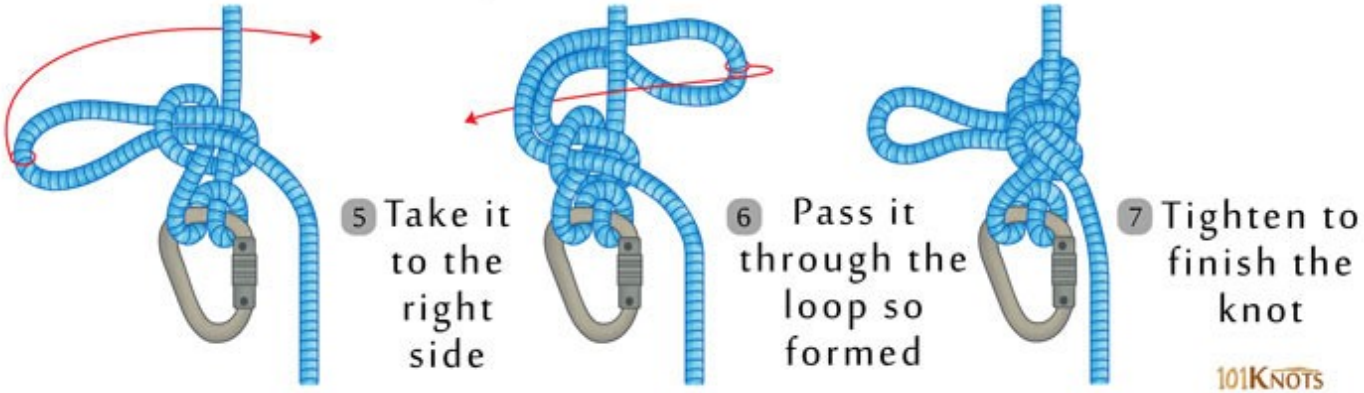


1 Wrap the rope end through the carabiner twice

2 Take it up and pass it to the right side

3 Make 2 loops with the rope

4 Pass the right loop through the left one



5 Take it to the right side

6 Pass it through the loop so formed

7 Tighten to finish the knot

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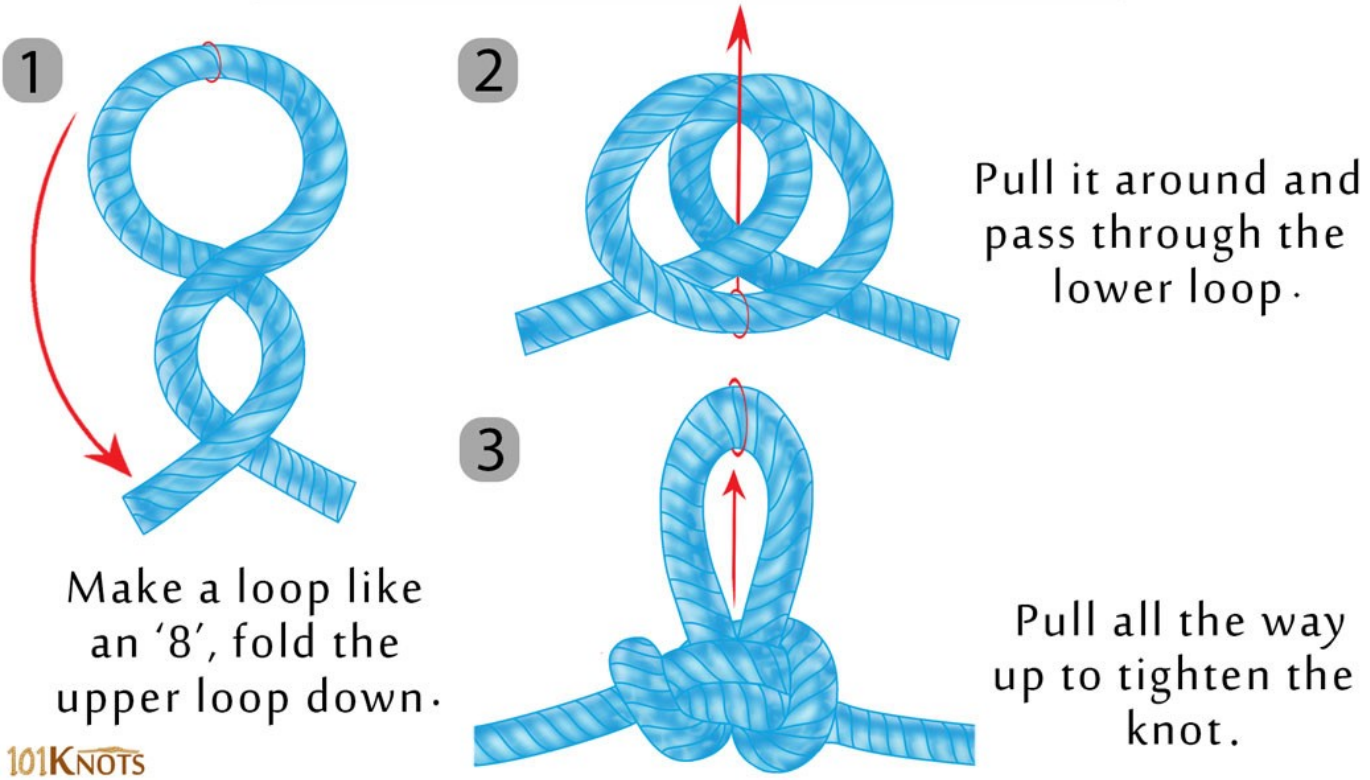
Butterfly Knot



1 Make a loop like an '8', fold the upper loop down.

2 Pull it around and pass through the lower loop.

3 Pull all the way up to tighten the knot.

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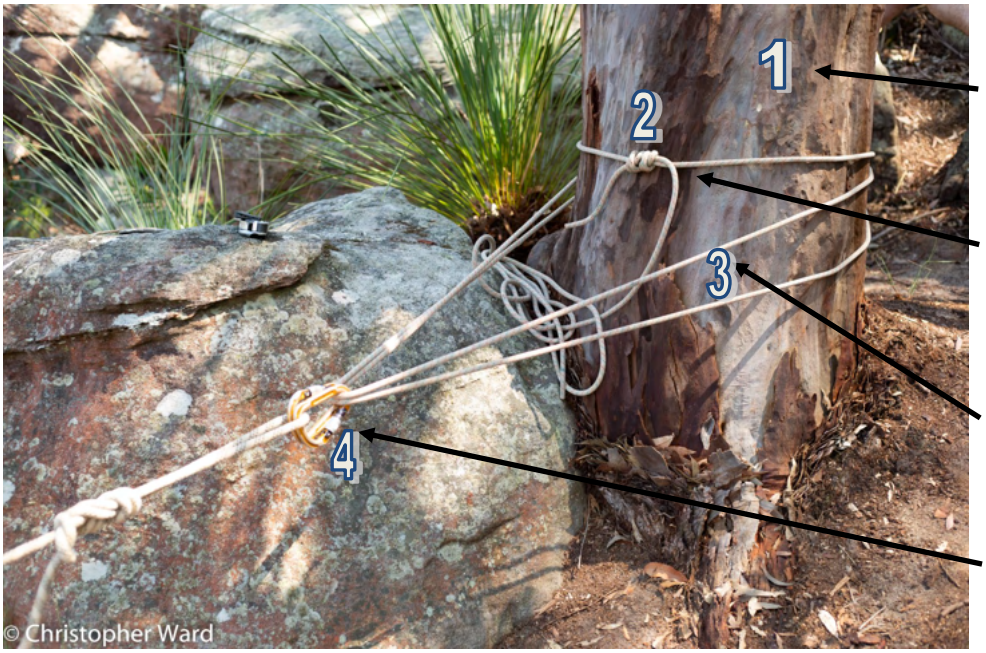
Anchors

Anchors are as varied as there are cliffs. A key feature of a good anchor is redundancy. That is the anchor is backed up with a second secure anchor. Having said that, an extremely solid single anchor can be OK, if it is perfect.
Below is an anchor that consists of a very healthy, large tree. The sling is an 11mm rope arranged in a wrap three pull two arrangement. The connecting carabiners and doubled and opposed.
The entire arrangement is very sound.



1 A healthy, well rooted Angophora tree approx. 60cm in diameter

2 A double fishermans knot positioned so it can readily seen by the abseiler for checking.

3 The rope is wrapped around the anchor 3 times and the last two wraps connected to the carabiners. 11mm UIAA Rope.

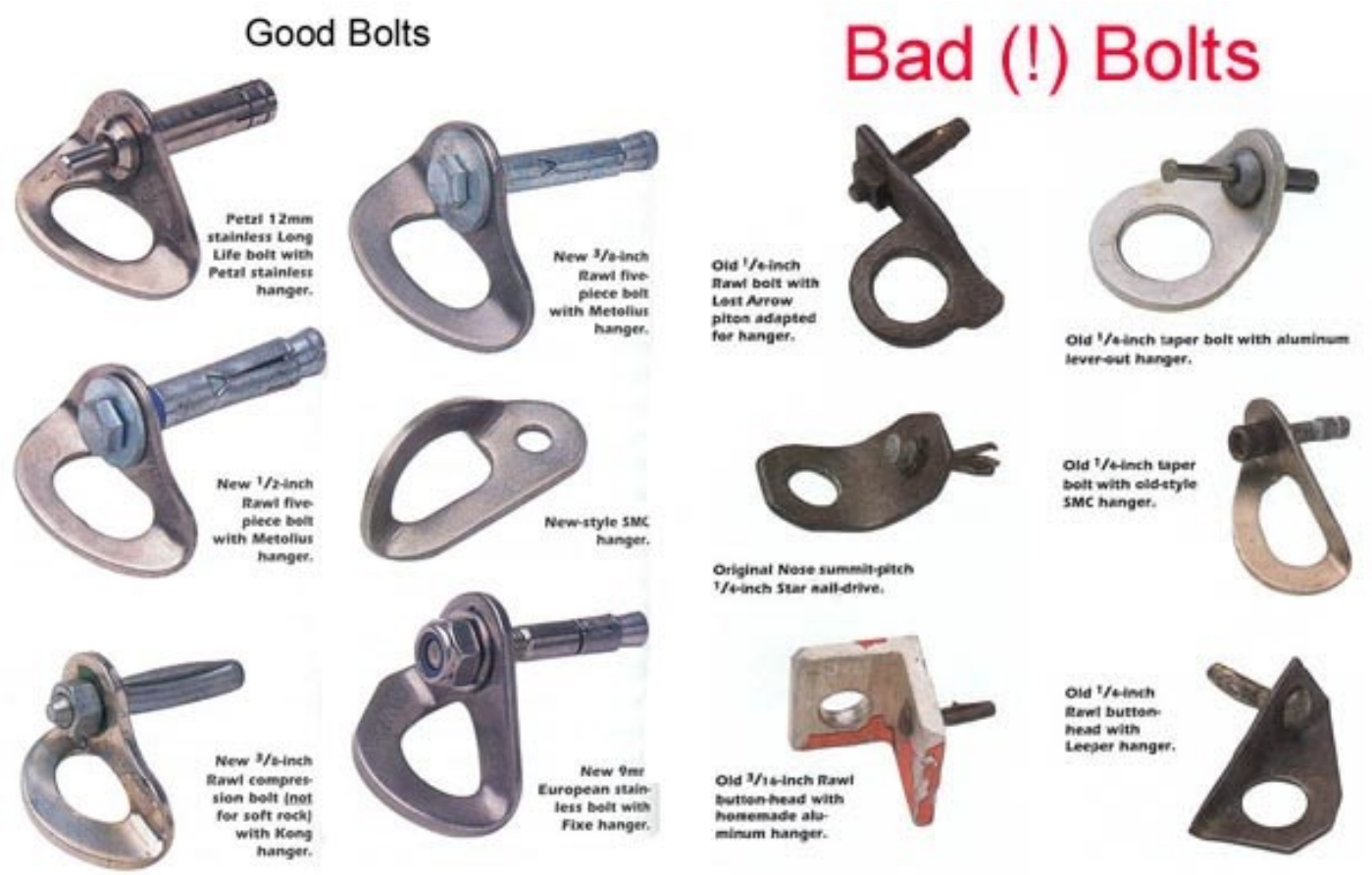
4 Double screw gate carabiners arranged with gates opposing.

Artificial Anchors

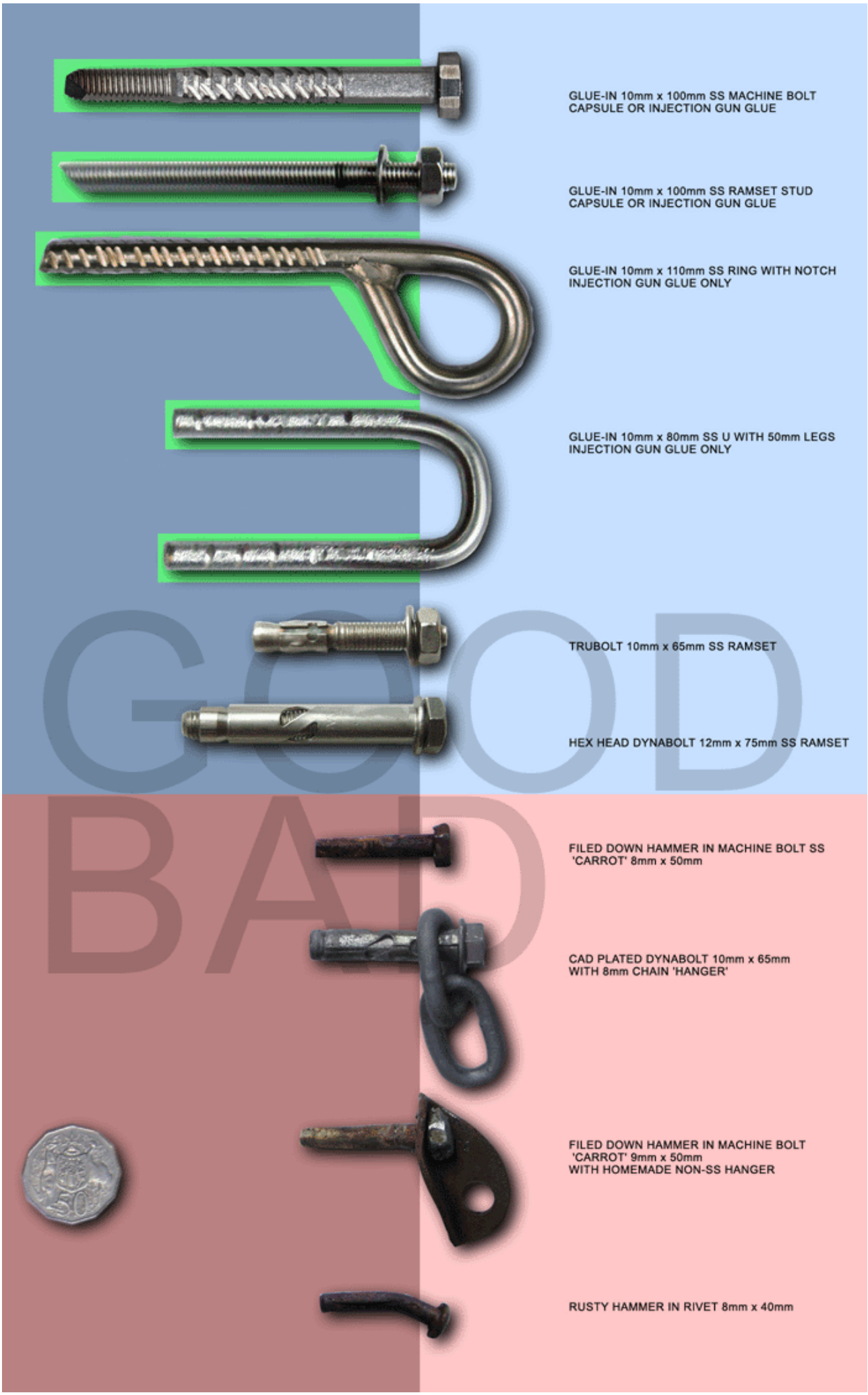
Bolts and artificial anchors.
Years ago placing bolts was seen as unethical. Now it is common place. Placing bolts needs experience and sound knowledge. Not all bolts are placed safely, so sound judgement is needed to decide if it's a "good bolt" or a "bad bolt".

You may come across an old Australian climbing anchor called the carrot bolt. This is an 8mm diameter bolt just hammered into an undersized hole! And it can be as risky as it sounds! Use with experience and sound judgement.

Modern glue in ring anchors are becoming more common at cliff tops and these should be what your looking for but nothing surpasses a good healthy big tree.



Left to Right
A well placed ring bolt with the ring embedded in epoxy resin to stop any spinning movement and on the right, a pair of old carrot bolts. These operate by having a “hanger” fitted over the bolt as shown in the pictures below.


GLUE-IN 10mm x 100mm SS MACHINE BOLT
CAPSULE OR INJECTION GUN GLUE
GLUE-IN 10mm x 100mm SS RAMSET STUD
CAPSULE OR INJECTION GUN GLUE
GLUE-IN 10mm x 110mm SS RING WITH NOTCH
INJECTION GUN GLUE ONLY
GLUE-IN 10mm x 80mm SS U WITH 50mm LEGS
INJECTION GUN GLUE ONLY
TRUBOLT 10mm x 65mm SS RAMSET
HEX HEAD DYNABOLT 12mm x 75mm SS RAMSET
GOOD
BAD
FILED DOWN HAMMER IN MACHINE BOLT SS
'CARROT' 8mm x 50mm
CAD PLATED DYNABOLT 10mm x 65mm
WITH 8mm CHAIN 'HANGER'
FILED DOWN HAMMER IN MACHINE BOLT
'CARROT' 9mm x 50mm
WITH HOMEMADE NON-SS HANGER
RUSTY HAMMER IN RIVET 8mm x 40mm

S.E.R.E.N.E

Solid
Equalised
Redundant
Efficient
No **E**xtension

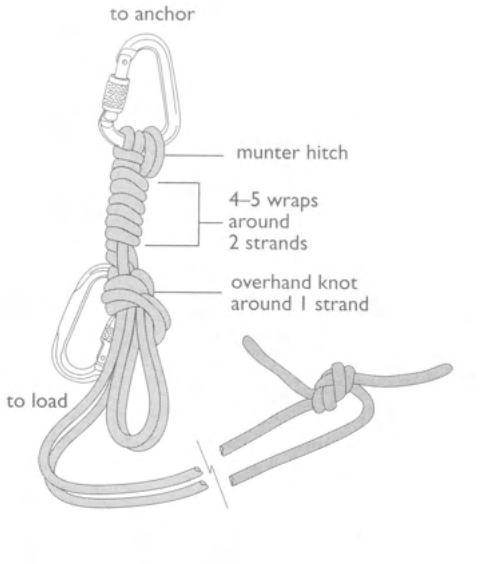
Wrap three Pull two

Rescue

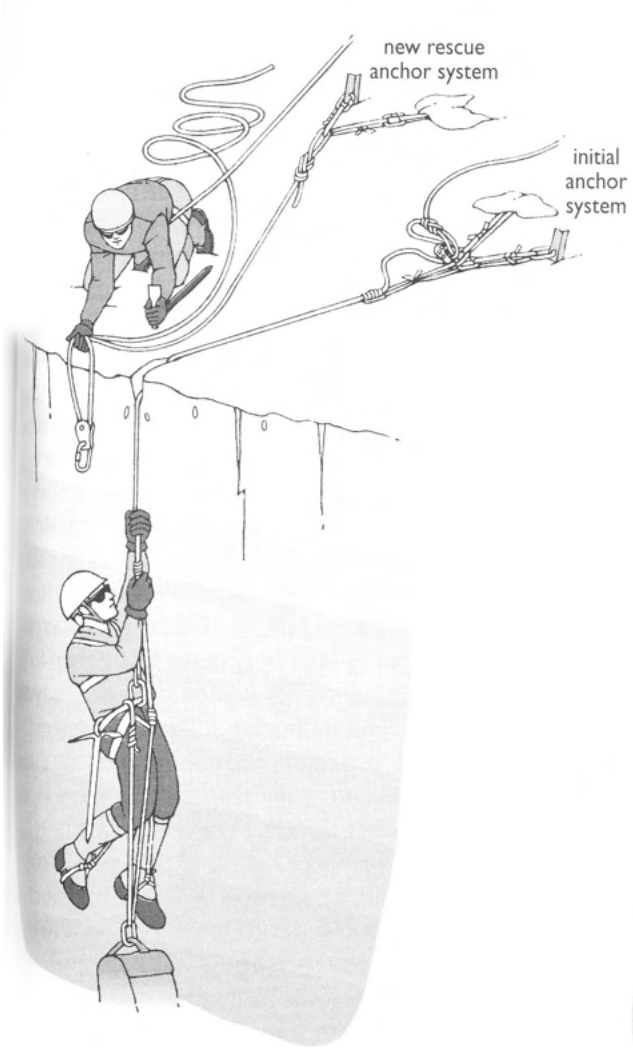
Suspension trauma also known as harness hang syndrome (HHS), , is an effect which occurs when the human body is held upright without any movement for a period of time. If the person is strapped into a harness or tied to an upright object they will eventually suffer the central ischaemic response (commonly known as fainting). Fainting while remaining vertical increases the risk of death from cerebral hypoxia. People at risk of suspension trauma include people using industrial harnesses (fall arrest systems, abseiling systems, confined space systems), people using harnesses for sporting purposes (caving, climbing, parachuting, etc.), stunt performers, circus performers, and occupations that require the use of harnesses and suspension systems in general. Suspension shock can also occur in medical environments, for similar reasons.[

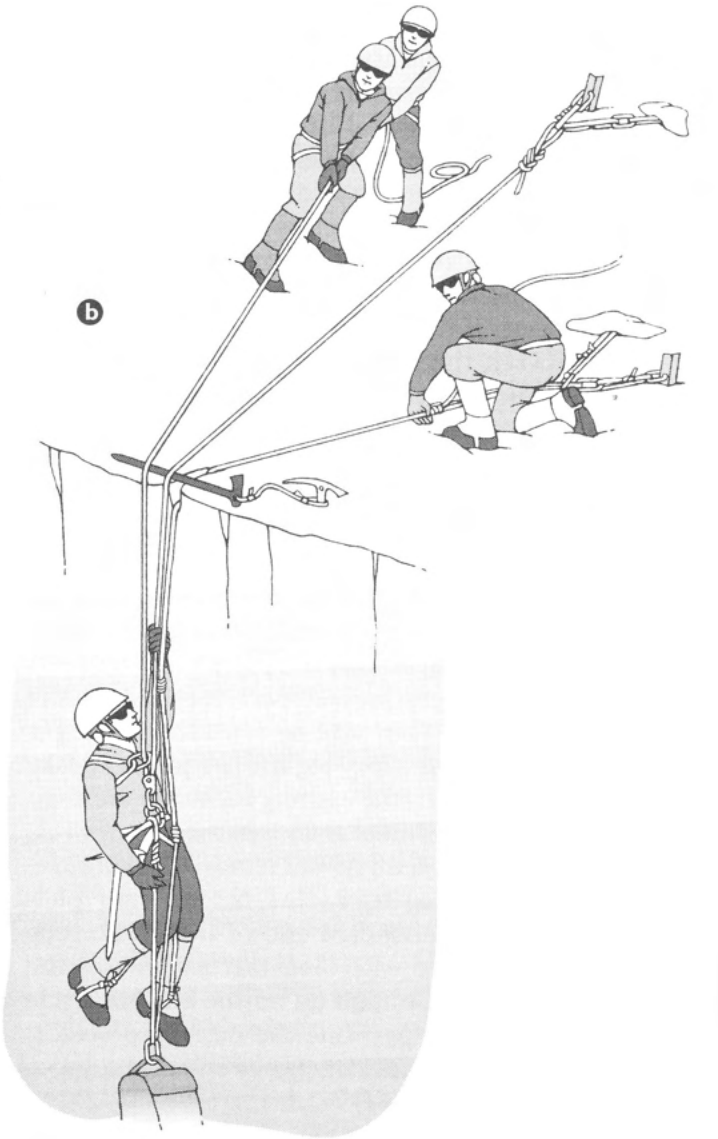
Symptoms

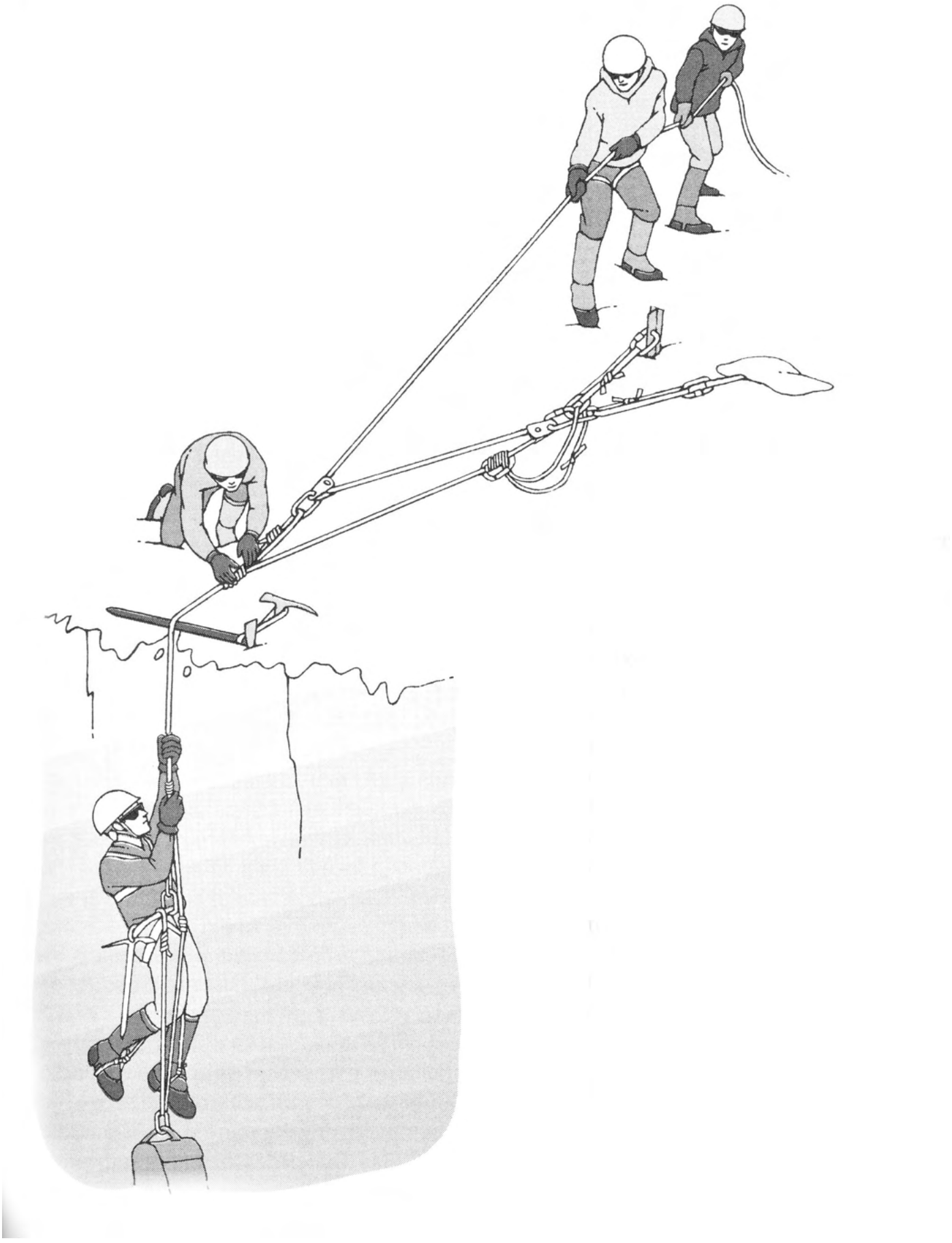
Onset of symptoms may be after just a few minutes, but usually occurs after at least 20 minutes of free hanging. Typical symptoms are pallor, sweating, shortness of breath, blurred vision, dizziness, nausea, hypotension and numbness of the legs. Eventually it leads to fainting, which may result in death due to oxygen deprivation of the brain.

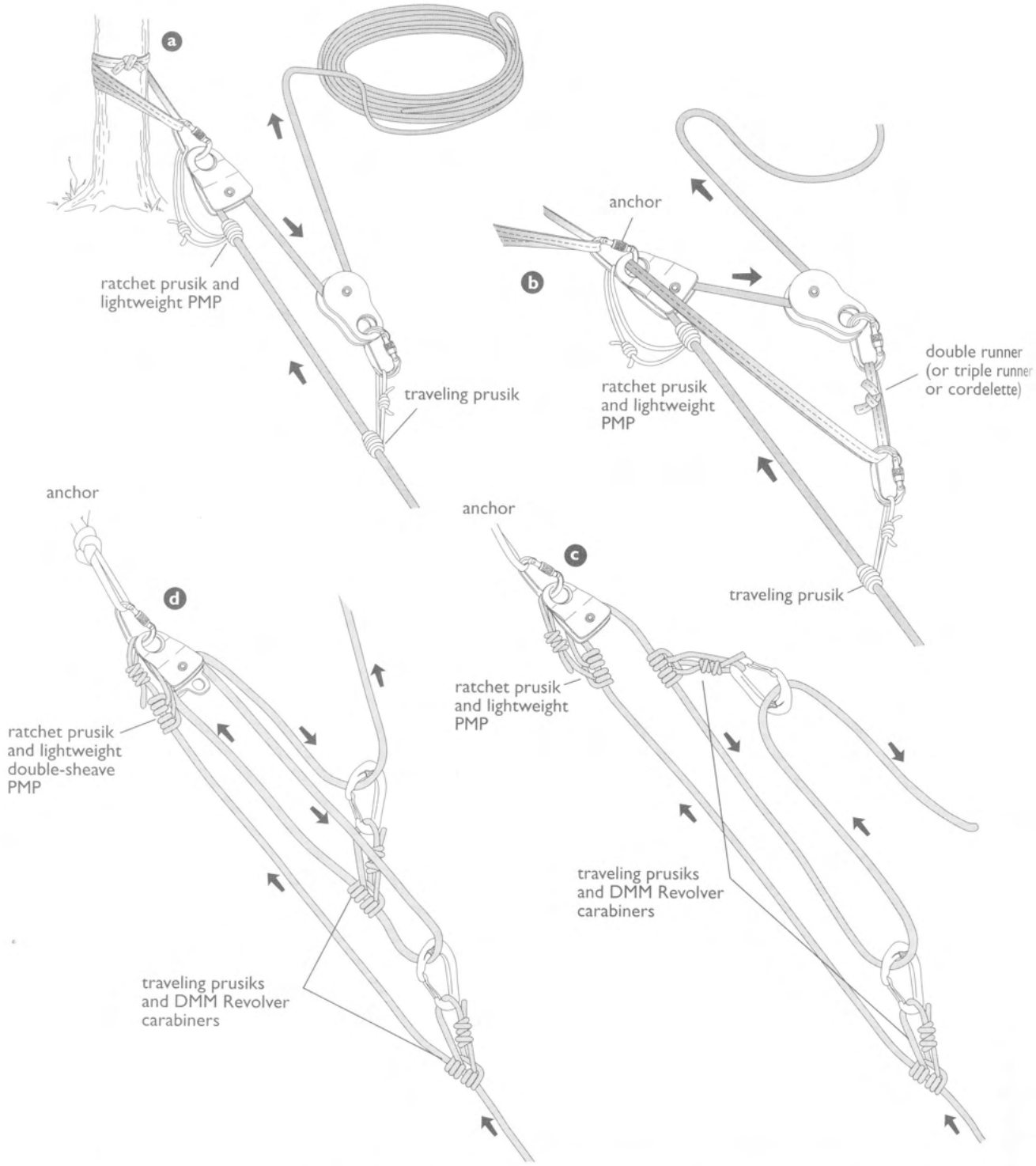


A Load Releasing Hitch or LRH


new rescue
anchor system
initial
anchor
system


b

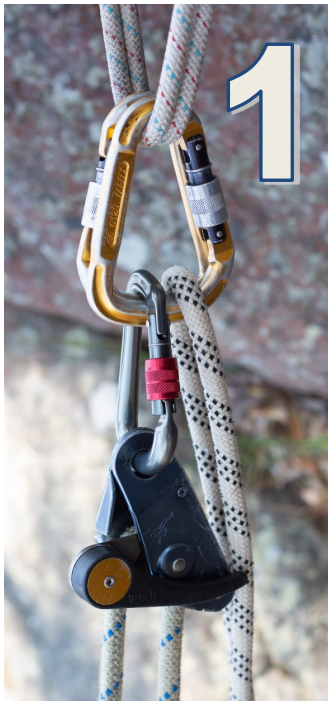


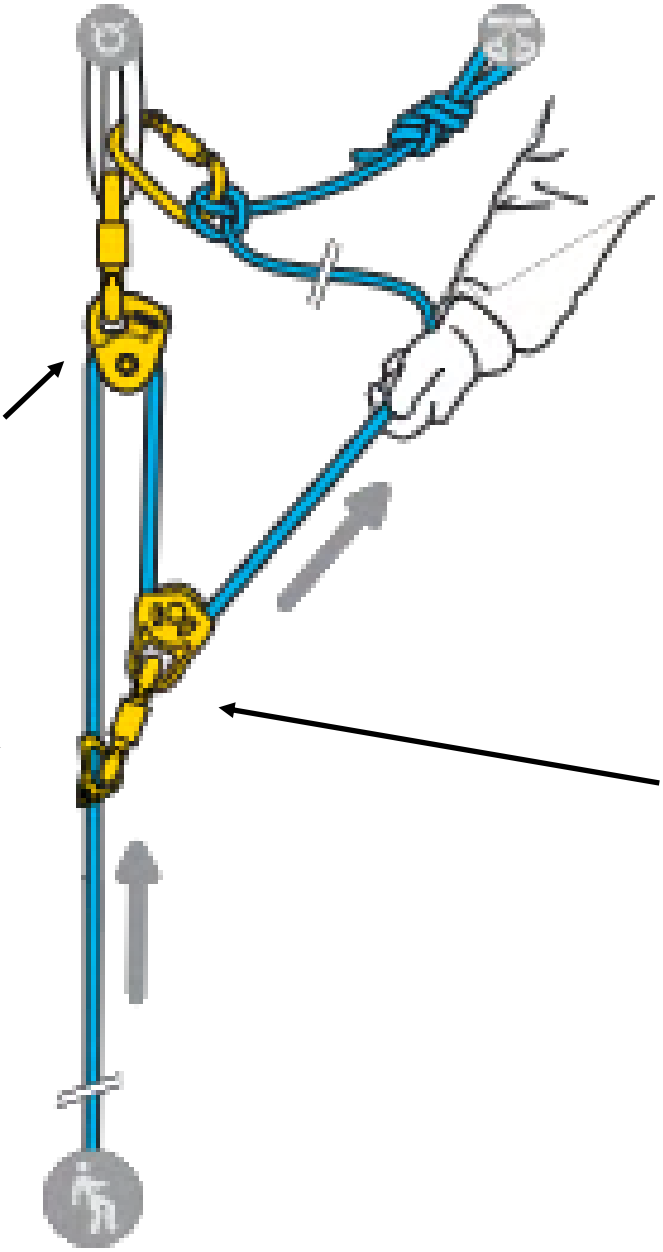


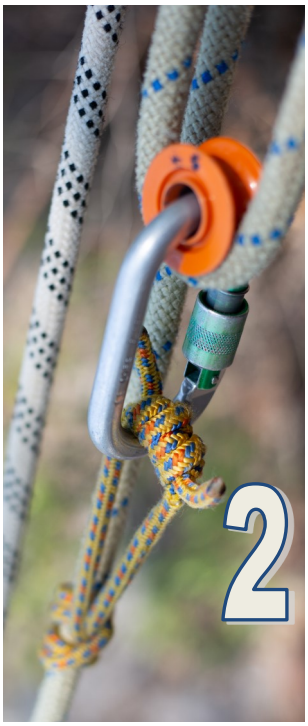
Raising systems: a, 3:1 (Z) pulley; b, 5:1 pulley with a second carabiner and long runner (or cord); c, 5:1 pulley with two traveling prusiks and one pulley; d, 9:1 pulley (Z-on-Z). Note that the pulley shown is a double-sheave PMP. Two single-sheave pulleys could be substituted; ideally the ratchet pulley would be a PMP.

A simple 3 to 1 or Zed pully system.

The most straight forward method for rigging a mechanical pull system. It is limited in that a 3 to 1 mechanical advantage is often not enough to raise the average person by another single rescuer.



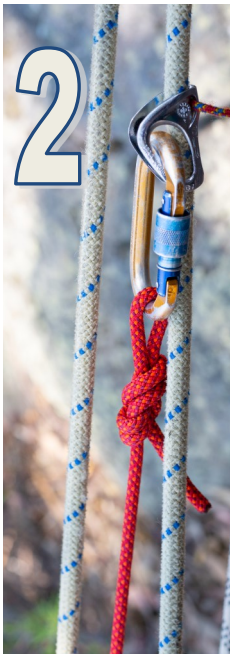


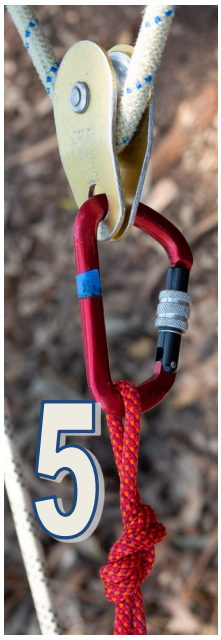


1. A Petzl GriGri has been used as the main amnchor pully. It is auto locking and can be easily released to lower the system.
2. Here a prusik loop is attached to the main line. The return lines travel through a light weight pully.

7 to 1 hauling system

Sometimes referred to as the Mariners hoist. It requires an additional floating cord shown in grey in the diagram to the left.. Slightly more complex but the mechanical advantage is noticeable over the 3 to 1 system.





1. A Petzl GriGri has been used as the main amnchor pully. It is auto locking and can be easily released to lower the system.
2. 2 A Petzl Tiblock is being used to attach the floating rope to the main line.
3. The entire system is being “bolted on” to an existing line attached to the load.
4. Here a prusik loop is attached to the main line and a light weight pully carries the floating line.
5. Here the floating line is being picked up by the main line through a heavy pully.

Handy Internet links.

Pully Systems

https://www.youtube.com/watch?v=M2w3NZzPwOM

Multi-Pitch Rappelling- Potentially Fatal Errors to Avoid


Have Fun
and stay safe.
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