This site presents the images from the ebook *High: Advanced Multipitch Climbing*, by David Coley and Andy Kirkpatrick. In order to keep the cost of the book to a minimum most of these were not included in the book. Although they work best when used in conjunction with the book, most are self-explanatory.

Please use the following links to buy the book: Amazon USA (kindle) / Amazon UK (kindle) / itunes / kobo

Back to Other Chapters

Contents

In general in the book we encourage a light-is-right approach. Most of the climbing equipment used on multi-pitch climbs is the same as that used on single pitch ones. The rock type and route will determine the range and quantity of protection you need, however, you do need to take enough to not only protect the leader but to also build the belays (assume on average 6 pieces will be in the belays). Big routes often meander about more, so longer draws might be a good idea. If you are using direct belays, cordelettes or belay rigs can be useful.

Common mistakes are to bring too many screwgates, not to leave the second with the basic equipment to mount a rescue, not to have joined in the colour-coding revolution so both climbers can read the rack at speed, to have forgotten the head torches and to rack the gear into a mess.

To ensure you are travelling as light as is sensible, buy light gear, consider if things can do more than one job, think about the right combination of ropes, ensure you have what you need, but only what you need (e.g. you don't need all 256 pages of the guidebook)

1. General Climbing Gear

Typical multi-pitch trad (left) and bolted (right) racks. If the crack systems are more continuous, for example on North American granite, it would be common to only take one set of wires and double the number of cams. In other locations a large selection of micro-wires will be needed. On desert sandstone with splitter cracks you might swap the wires for many cams of the same size. In all cases it really helps if the rack is easy to read: i.e. not a collection of random stuff from a large number of manufacturers with gaps between sizes: you might know your rack well, but your partner will stress out trying to find the right size on the crux. Many climbers would want to add a pair of cordelettes as well for trad climbs.

Only take a big rack if you really need one, as it will slow you down. (Yosemite; Photo Nick D.)

Anatomy of an autoblocking belay device (in this case a Reverso 4). Such devices offer far more flexibility than normal belay plates for multi-pitch routes.

What the second needs. At all times the second requires enough gear to do his normal jobs, escape the system and prusik up to and rescue an injured leader. This probably means he needs (clockwise from top): a short prusik (in this case the chalk bag cord), length of 1mm cord to use as a knife (shown wrapped around one of the attachment points on the chalk bag), nut tool (if it's a trad route), Reverso with 2 lockers, locker for tying into powerpoints etc., 3 magic carabiners for the belay (unless it's a fully bolted route), 60cm sling for cleaning (and used in self-rescue), 120cm sling used in self-rescue, 1 spare locker and 1 normal carabiner (the latter could be replaced by the carabiner on the nut tool). If you plan on using a cordelette or sling to belay off then you will need to add one. The leader will need much of this equipment too although hopefully much of it will already be part of her lead rack, unless of course she has placed it all on the pitch.

If you run out of locking carabiners, use a pair of snap gates doubled up—but make sure the gates are truly opposing. On many climbs you only need three locking carabiners each: two for the Reverso and one to tie into the belay with.

Old screwgates like this should be thrown away—the collar can stick closed, and the gate is probably not as strong as modern versions. If once the collar is screwed up the gate doesn't rattle, bin the screwgate.

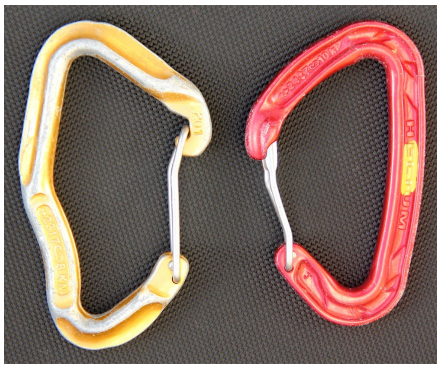
Use the correct sized carabiner for the job. Used like this, this one could easily fail.

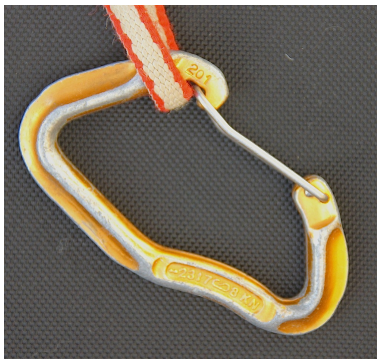
The three basic shapes of locking carabiners: Left, HMS, or pear-shaped; middle, standard D-shaped; right, oval. Large pear shaped carabiners are better if several ropes will be tied to the same carabiner, or when using a Munter hitch. A mini-, or micro-, traxion requires an oval carabiner.

Use triple action auto locking carabiners like the one on the right. Not ones that can be opened by just turning the sleeve.

For most jobs, snapgates without a tooth (keylock, left) are better than ones with a tooth (right) as they won't keep getting snagged in slings.

Assuming you are swinging leads, you both need to be happy using the rack and be able to select the correct piece as quickly as possible. This will be easier if the rack is uniform and easy to read. (If you are short of a birthday present, buy a set of coloured carabiners to make the cams even easier to identify.)

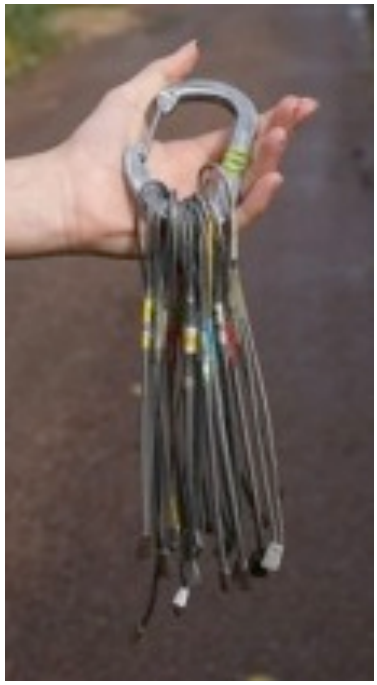




The yellow carabiner on the left has a ledge at the nose that can hook a bolt, wire or sling and lead to the carabiner failing; the red one on the right is a better design with no ledge. You can find an example of what happens when this occurs here: www. A hooked-up carabiner can fail at only 10% of its rated strength (http://blackdiamondequipment.com/en/qc-lab-weakness-of-nosehooked-carabiners.html).*

Although not needed on most routes, on long routes with several easy pitches with bolted belays a micro-traxion will make moving together less dangerous. It also makes a great ascender or rescue pulley.

A belay loop that is a different colour to the rest of the harness is a good safety feature; brightly coloured gear loops also help.



Bunches of wires are often best carried on larger, possibly oval, carabiners so they are easier to handle. Some people like to use a toothless (keylock) carabiner to make the wires snag less. I (DC) prefer using one with a tooth to reduce the chance of wires being dropped when the gate is opened. It is hard to get oval carabiners in different colours, so you may have to paint them so you can quickly pick the right one on your harness. A different colour for: micros, small, medium, and large.

Mark your wires to match the carabiner that carries them. This will greatly speed re-racking at belays particularly by someone not used to your rack. Bass micro-wires don't normally need to be marked, as it is obvious these all go on the one carabiner.

3 Sling Draws and Extenders

Using short extenders when the rope passes through an angle causes more drag, increases the effective FF and means pieces are more likely to unzip. Folding 60cm slings up to create "sling" or "alpine" draws will help greatly, as these can be rapidly deployed as long or short extenders as and when required.

Forming a sling draw from a 60cm sling. On trad routes consider carrying half your extenders in this form and leaving your 10cm sports draws at home.

The bottom sling has been sewn so as not to leave any ends that can catch; this is a better solution for sling draws and slings in general.

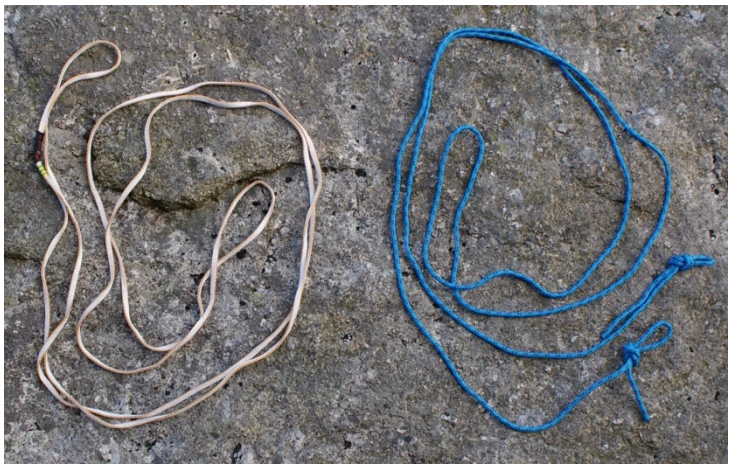
Sling draws are also useful for extending pieces when bring up two seconds. On trad gear or bolts, clipping with a sling draw also creates a foot hold for gorilla aid.

Be careful of retainers on sling draws or just don't use them. These can cause a fatal mis-clip if the sling draw isn't formed correctly. (This is not an issue in normal draws with retainers.)

Shock-absorbing extenders (commonly called screamers): top, stitching based and not reusable once deployed (made by Yates); bottom, friction based and reusable (made by e-climb).

The two basic types of extender. Top: closed (also termed a dog bone, or express, extender). Bottom: open. An alternative is a half bone, which has dog bone stitching along half its length: this possibly ensures the rope carabiner is well fixed, but the flexible upper half puts less leverage on any protection that might rotate out – and unlike a open extender gets less entangled with other gear on the harness.

3. Cordelettes



Cordelette. Left: sling-style (i.e. a circle made of cord or webbing). Right: snakeloop-style (i.e. a length of cord, or webbing, with knotted or sewn loops at the end).

Cord-based cordelettes can be finished and used sling-style (left) or snakeloop-style (right). Note a triple fisherman's has been used on this spectra cord.

4. Pre-tied Belay Rigs

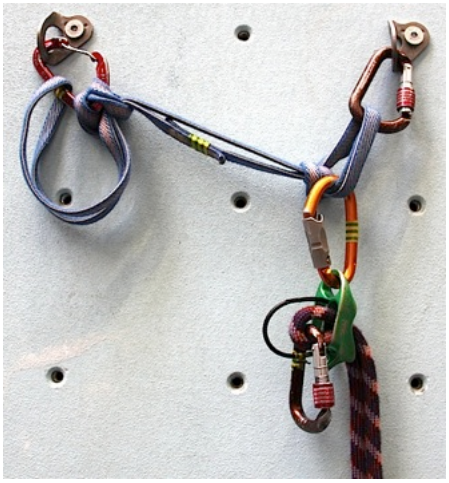
A belay rig is a sling or length or cord used to link anchor bolts together. It is much shorter than a cordelette and, unlike a cordellete, is carried with all its carabiners and the reverso attached. Commercial versions include a harness-style buckle to make adjustment even faster. There are to basic ways to set one up: so the bolts are connected in series, or so they are connected in parallel. The latter is termed *Banshee* style.



Belay rigs: left, 120 cm sling with a double overhand (this is the most flexible); middle, 120 cm sling with a clove hitch made using both strands of the sling (the easiest to untie). Never clip anyone into the shelf if using a clovehitch – if anyone removes the carabiner with the clovehitch the shelf could fatally collapse); right, 60 cm sling with an overhand in the middle and the locker clipped across the overhand (using a 60cm requires the bolts to be closely spaced). Other arrangements are possible, for example a sliding-X. With these rigs the bolts are connected in parallel.

60cm banshee belay rig—a 120cm sling is best unless the bolts are close together. The small loop containing the lockers is formed from a bowline on a bight.

A cheaper alternative a sling is to us 7mm to create the Banshee rig. With a banshee rig the bolts are linked in series.



A banshee belay rig in action: the bolts are linked in series.

Edelrid's Adjustable Belay Station. Can be used in powerpoint or Banshee mode. COPYRIGHTED IMAGE

Edelrid's Adjustable Belay Station in use. COPYRIGHTED IMAGE

Close up of Mammut's Belay Eight banshee belay rig. Although heavy, such rigs are very hardwearing and don't leave you with a difficult to untie knot at every stance.

5. Prusik Cords etc.

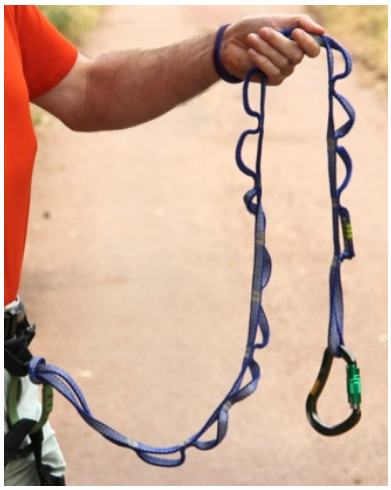
You will need one or more prusiks to climb the rope, use as a third hand when abseiling or to mount a rescue. 5.5mm seems a good diameter. Cord is much easier than webbing to thread through small holes in the rock when building your own rap stations.

Attaching a chalk bag (left), and three not so good ways to do it: you need to be able to easily rotate it to either side so you can access it even in a chimney. An advantage of attaching it with a piece of cord is that you will always have at least one prusik to get you out of trouble.

6. Daisies and Other Tails and Tethers

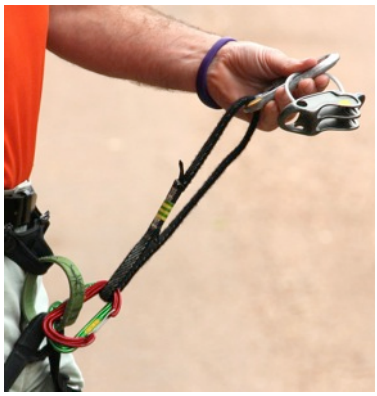
Having some way of attaching yourself without using the rope is often useful. As is being able to extend the abseil device away from your harness.

Cow's tail made from a 120cm sling. Girth hitching it to the belay loop rather than the tie-in points probably makes it more comfortable.

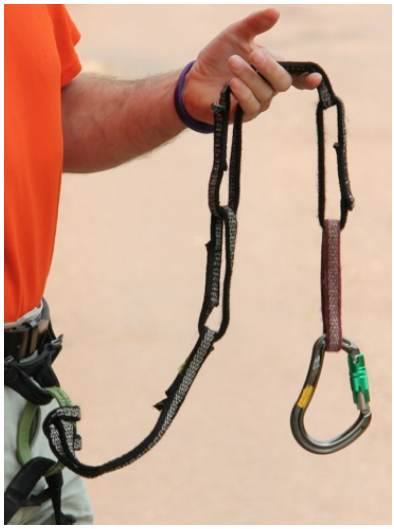


Standard daisy.

Lamb's tail (i.e. a open extender) girth hitched to belay loop.



Lamb's tail clipped to the belay loop using the two snap gates from the draw itself. This produces a slightly longer tail.



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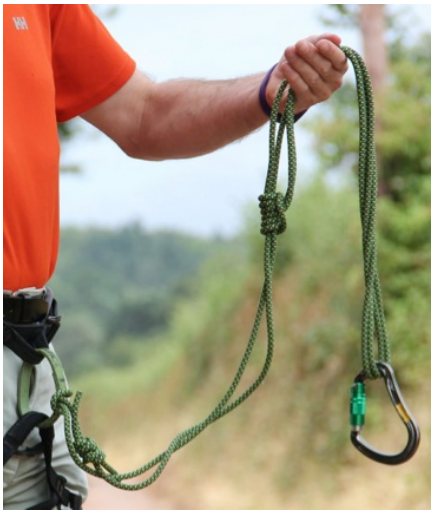
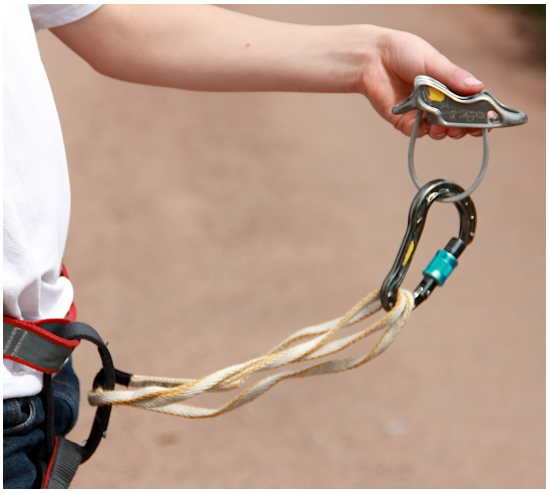


Purcell Prusik in 7mm nylon cord. This should provide greater dynamic properties than a cow's tail made from a dyneema sling.



Lamb's tail made from a doubled 60cm sling. This can be passed through the belay loop or the tie-in points.

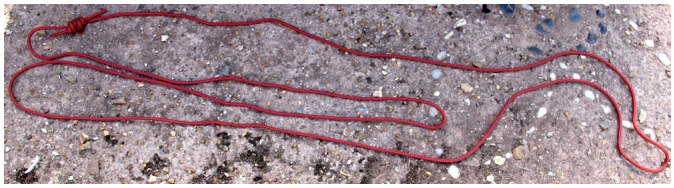
A cordelette can be used to make a very strong tether. Triple it up into a loop and put an overhand in the middle then girth hitch it to the harness. This should also be slightly dynamic. One nice thing about using the cordelette as a rap tether is that it is much easier to undo at the end of the day than knots in a 6mm dyneema sling!

Another cordelette tether: first double it up and girth hitch it to the belay loop.

Clip the far end to the belay loop with a locker.

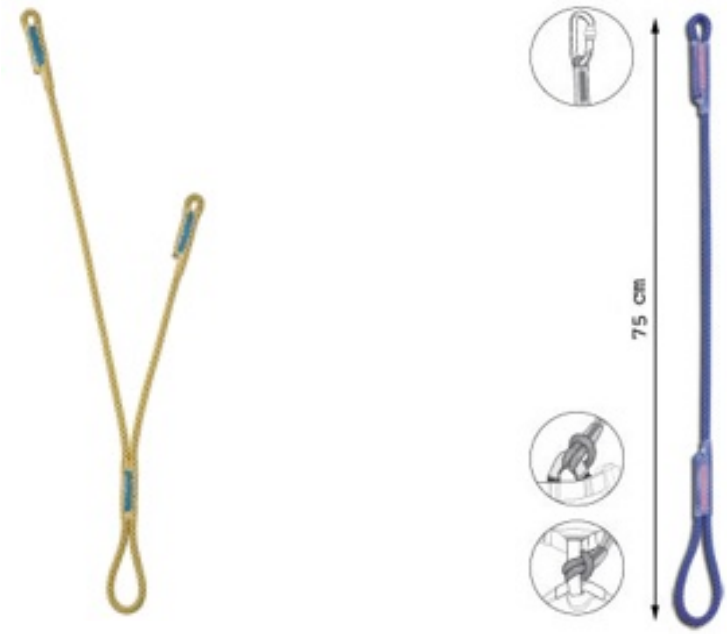
Then place the overhand.

For those concerned about shock loading a tether, or just wanting a very strong adjustable system, a 7mm nylon cordelette can be made into a Purcell prusik leash. Because the cord is so thick, the prusik will not grab well enough on new cord, so wear the cordelette in first. Note how when the cordelette is doubled up in the first stage the double fisherman's is offset slightly from one end to leave room for the girth hitch.



If you want to make maximum use of your cordelette as a tether, fold it with one loop twice the length, put an overhand at the midpoint of the four stands and a Purcell in the long strand. You now have one tether to clip into the anchors and one for your rap device. (Or you could forget the cordelette and just use a sling with a knot in it and stop making things so complex.)

Mammut's Belay Sling is strong, and unlike a traditional daisy cannot be mis-clipped).



Beal's Dynadoubleclip (left) and Dynaclip (right) lanyards. COPYRIGHTED IMAGES. Such rope-based lanyards greatly reduce the effective fall factor that might arise if the user falls off the stance (see data below).

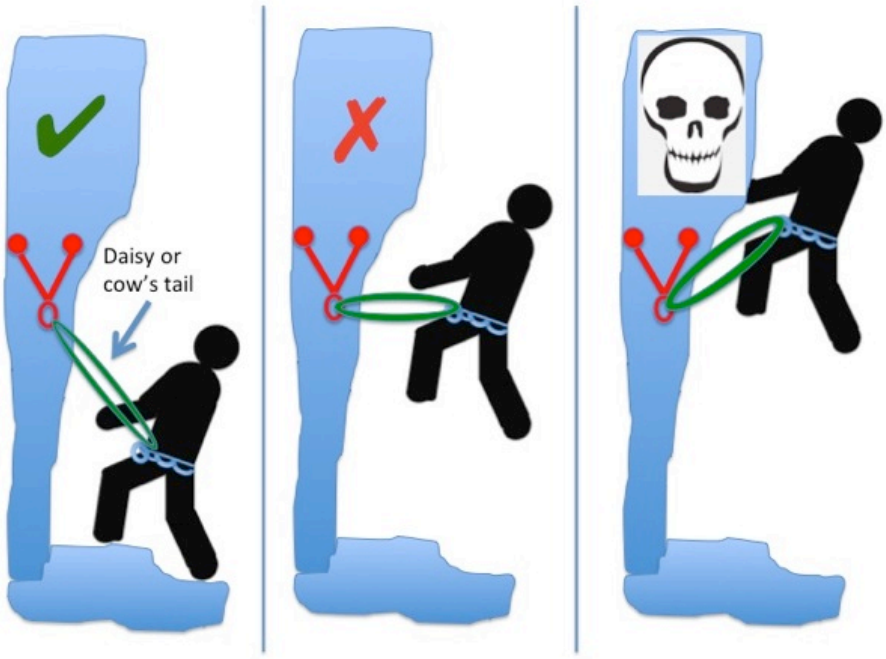
Fall factor (80kg)	***Measurement***	***Dynaclip***	***Nylon sling***	***Dyneema tape sling***

1	*Force*	*6.2 kN*	*11 kN*	*>15 kN*
1	*Number of falls before failure*	*>20*	*4-8*	*0-1*
2	*Force*	*9.5 kN*	*>15 kN*	*>15 kN*
2	*Number of falls before failure*	*8*	*0-2*	*0*

Data from Beal of forces produced by test falls on various lanyards (http://bealplanet.com/sport/anglais/longes-dynaclip.php). It is clear that a rope-based lanyard is less likely to fail, and produces a lower shock to the body.

Girth hitching a daisy or cow's tail to a harness. Either method is fine, but most people find the left-hand one more comfortable if it will be in place all day.

Making a lamb's tail from a standard open extender - nothing could be simpler. Note the two snap gates have been reversed so another locking carabiner is not needed.



Keep your weight on the daisy if possible at all times, and never put your waist above its attachment point. You should be just as worried if you partner does: it might be the whole belay that fails, not just her daisy.

How not to shorten a daisy. If the stitching between the pockets fails, you might find yourself unattached. Look very closely.

One way to shorten a daisy. As two carabiners are being clipped together, they should both be locking carabiners. It will be quicker if both are twist-locks.

Another way to shorten a daisy. The right hand carabiner probably only needs to be a snap gate, but some people will be happier with a twist lock, as if it became unclipped a high effective fall factor could result.

How not to clip a daisy. If the screwgate is subsequently clipped to the anchor the climber is only hanging from the stitching, which isn't designed to hold much more than body weight.

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7. Going Light

As always the key is to think creatively but to play safe. Think about whether some of the gear could be replaced by lighter alternatives or simply left at home. Finding a lightweight alternative might mean you can take some safety equipment that you were not going to because you had assumed it would be too heavy

If you are climbing many grades below your maximum, why cram your feet into rock shoes for eight hours when you could walk and climb in approach shoes?

If you use the right bindings, crampons can be fitted to approach shoes to get you up or down small patches of snow – don't try ice climbing in them.

Getting seriously traditional: Woollen socks grip a lot better than rock shoes on snow. (Rock shoes on snow are extremely dangerous.) The socks go over the shoes.

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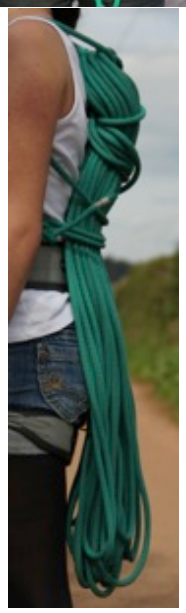
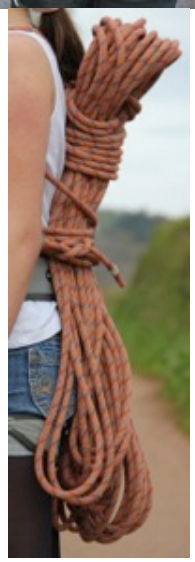
8. The Rope

Web forums are full of endless debates as to whether a single, double or twins are best. The important thing is to understand the advantages and disadvantages to each and to have fully experimented with each. This will allow you to choose the right rope for you and the route.





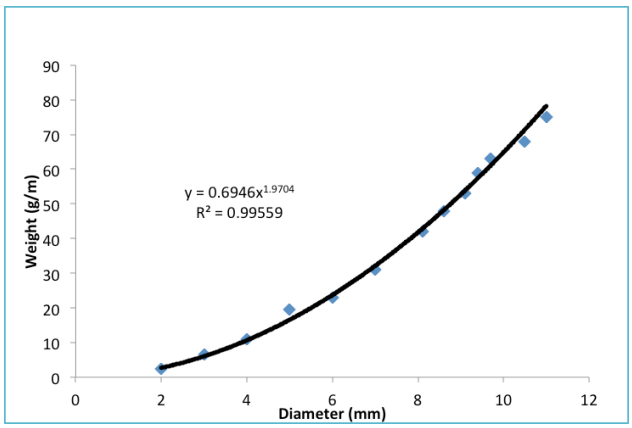





These photos show a pull line, a twin, a half and a single. When carried they might not look very different, but the weight difference is substantial, as is how small they can be compressed into a sack.

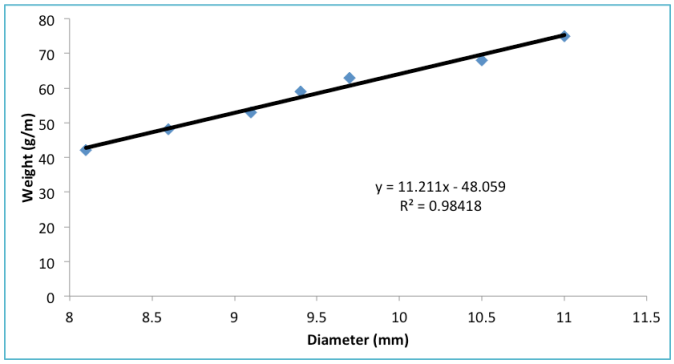
Different ropes feel very different when you start walking uphill whether they are in the sack or on your back. In this case: 0.9kg (5.5mm), 1.9kg (7.7mm), 2.3kg (8.5mm), 3.0kg (10.5mm); all 50m.

A 50m 5.5mm pull line will fit into a small fanny pack (bum bag) alongside the food, knife and head torch, but practice using one

before you head up a committing route: you may wish you had brought along a proper second rope.



Relationship between weight per metre and diameter for accessory cord to lead ropes.



Relationship between weight per metre and diameter just for lead ropes.

Centre Marks, Ends and Care

A rope needs a clear centre mark so you can find the middle quickly when setting abseils.

A good, easy to spot centre mark.

Ropes ends cut straight across (top) and wrapped in tape can catch when being pulled down from raps—consider smoothing the ends of the rope into a point with a hot knife, or a flame and your fingers (bottom). Removing the manufacturer's tape will remove any information about the date of manufacture, length and type of rope and therefore needs to be done with caution and not when others may use the rope.

An even better solution (Mammut 9.8mm Tusk rope). This approach also means you are less likely to untie your partner at a belay when trying to untie yourself, as you end of the rope looks different from her's.

Standard identifying marks found on climbing ropes. From left: twin, half, single.

What to do with the Second Rope

Most of the time it is best for one of the climbers to carry the spare rope on her back, or in a backpack, however an alternative is for the second to just tow the rap rope. (Tom Blight towing a rope. Riglos, Spain.) This approach is not popular outside of North America and I (DC) think it only sensible if the route includes a lot of chimneys (making carrying it on the back difficult), or if there is nothing much for the rope to catch on and no loose rock.

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9. Non-Climbing Gear

Even if you like to be comfortable, try not to take too much.

Modern windproofs are tiny and weigh about the same as a screwgate.

Shoes will fit comfortably on the back of your harness or fanny pack (bum bag).

The sack doesn't need to be big enough to take the climbing equipment and everything else unless the walk in is long; just strap half the load on the outside. Maybe you don't need a sack at all.

Even if you think you have the muscle, don't take a sack unless you really have to, especially on steep terrain. (Carl Hubbard fighting harder than needed because of a big sack, Tete D'Aval, French Alps.)

Tall man, small tent, tight shoes: Make sure your equipment is up to the job, you fit it and it fits you.

An example of two jobs done for the weight of one: If taking water, consider using sports additives as it won't add much weight but will add calories. (El Cap, Yosemite, USA.)

The amount of food required depends on the length of route: preparing for a multiday route at Camp 4, Yosemite, USA.

If you are climbing for many days in a row and returning to base between routes, try and eat well to perform well.

The weather can turn, even in summer in benign looking places like Yosemite. You

What you need will depend on the route, location and time of year, but on anything

Take enough to stay warm, but not enough to slow you down. (Jane drying out after a

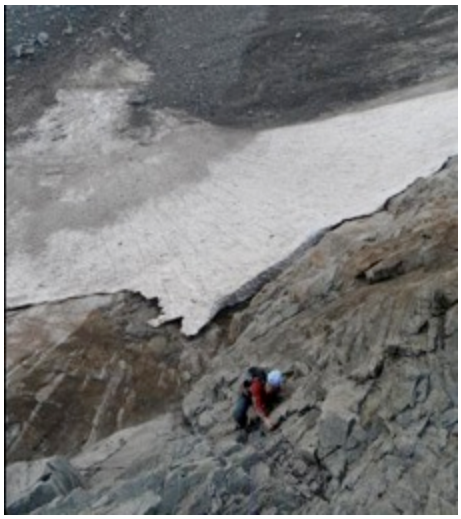
need to be prepared, but not too well prepared – your speed will suffer if you carry too much. Having an escape plan might be just as important as having storm gear, and a plan doesn't weigh anything.

except a short route it is likely to include: shoes (to get back down), phone (if there will be reception), water, windproof, knife and head torch; food and sunscreen are often useful as well.

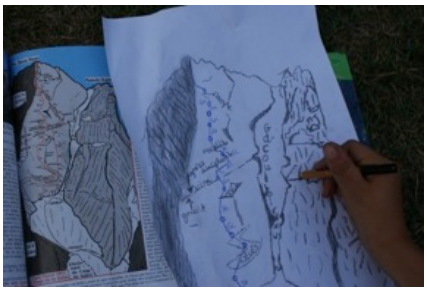
storm whilst soloing Lurking Fear, Yosemite, USA.)

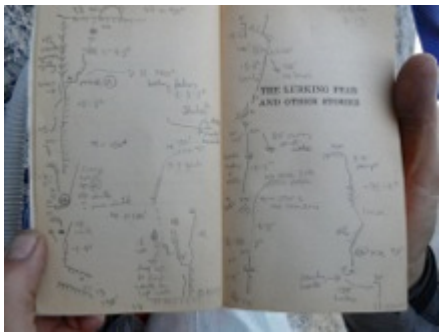
Often equipment can have more than one function: why take a duvet jacket just for the bivvy when an inverted sleeping bag will do almost as well—think creatively.

If you go somewhere cold and don't take a team of porters, a degree of suffering is inevitable. Some people seem to be better at suffering than others, but the idea is ***to try and not suffer*** *by using the right equipment.*



A classic alpine clothing dilemma. One moment you are playing around in the pre-dawn dark on cold snow, the next hot from pulling hard on rock and trying to move as fast as possible. (Ecrin, France.)





Try not to carry the whole guidebook around. Route descriptions can be copied in various ways (some of these probably breach copyright). Make sure you take the details of how to get to the route and off the top, and include details about alternative routes and rap descents nearby. You might like to take the details of adjacent routes in case yours already has climbers on it. On a multi-day route, or if the weather could turn bad, consider laminating the topo and/or carrying a spare. Carry the topo in a pocket, not in the sack so you can access it quickly.

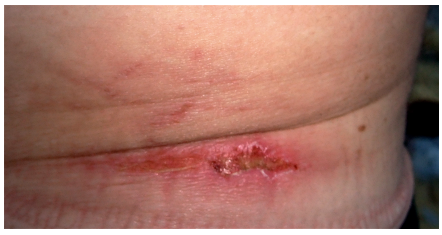
A water filter can save carrying a lot of water into the hills.

A length 1mm cord can be used instead of a knife to cut through ropes, cords and slings by using a sawing motion. Always keep a length wrapped around a tie-in point on your chalk bag.

Backup plastic buckles that are critical (i.e. a bum bag (fanny pack) containing your head torch, keys and passport) need to be backed up or replaced with ones that can't unclip mid move.

If you are going somewhere truly remote your cell phone won't work, so consider renting a satellite phone. COPYRIGHTED IMAGE

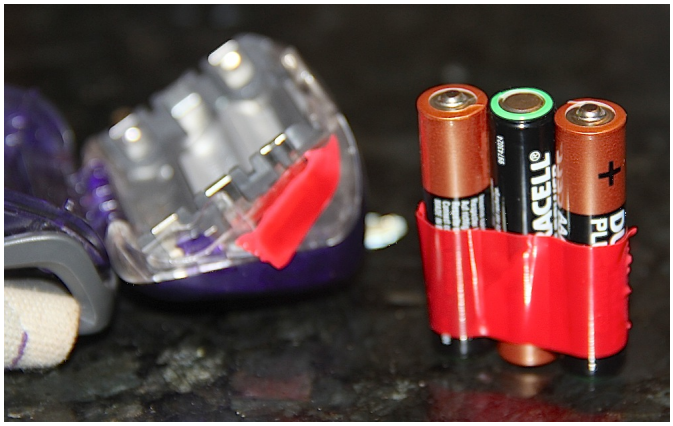
An alternative to a satellite phone is a GPS beacon that can send a message with your position to the rescue services. COPYRIGHTED IMAGE



What happens if your shirt doesn't cover your hips on a multiday route, and hence a reason to take along some finger tape.

*awaiting images

For photos that tell a story it is often worth trying to get the camera away from the climbers. Left, gorillapod self portrait; right, trekking pole shot.



A battery bundle. Think about how you plan to replace the batteries in your torch in the dark with no light to see what is going on. Note the tape on the bundle is offset from the centre and the matching tape on the headlamp indicating which way around the bundle should be inserted (you will be able to feel this in the dark). Only use a single wrap of tape, or the housing won't close.

On serious routes you can't afford to lose your head torch, so back the plastic clips up if you think you might be taking falls. A length of 1mm cord can be left permanently on your helmet for this.

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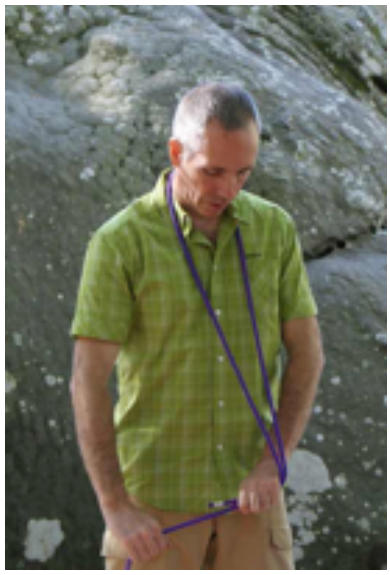
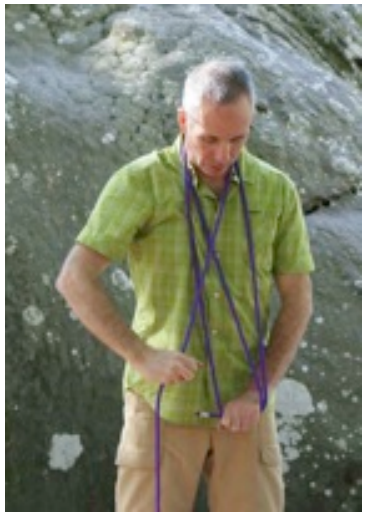
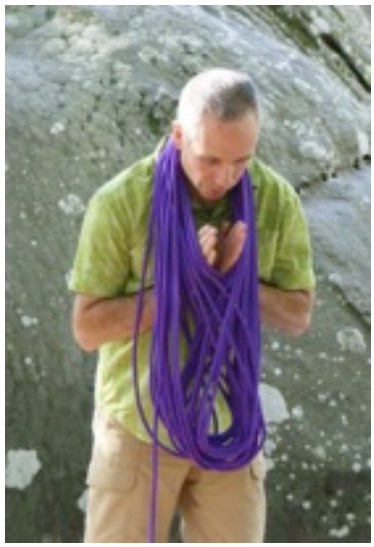
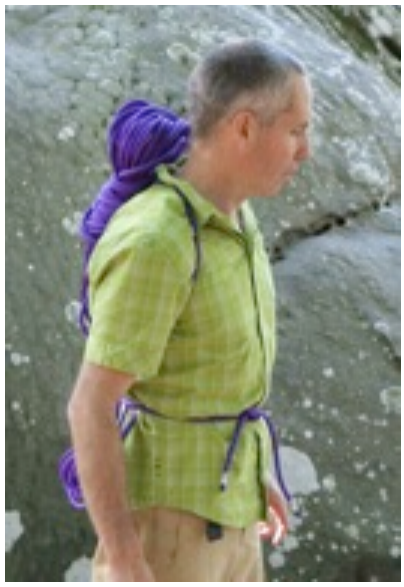
10. Coiling the Rope

The following photos show one (good) way of coiling the rope. We all have our favourite way, but this method: starts from one end (so you don't have to separate the two ropes), doesn't require you to keep lifting the coils to head height, produces a rucksack so you can carry it on your back and doesn't require you to pull the ropes through at the start of the climb (this can be important on unstable ledges or at the base of sea cliffs where there isn't much room, or if you are doing it repeatedly on multiple raps).

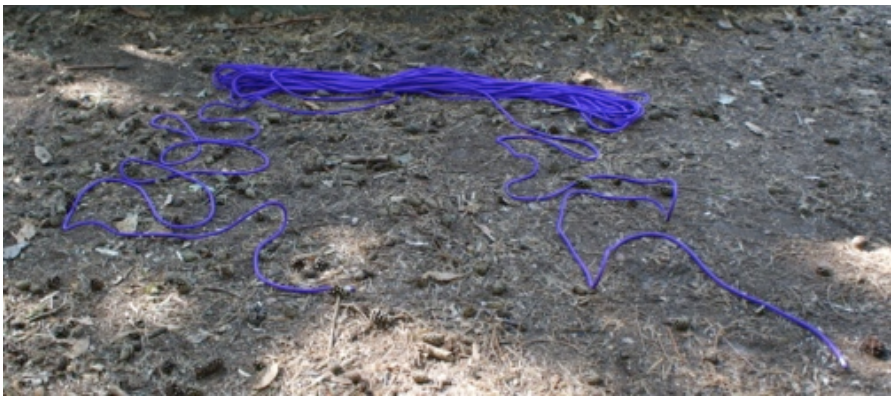


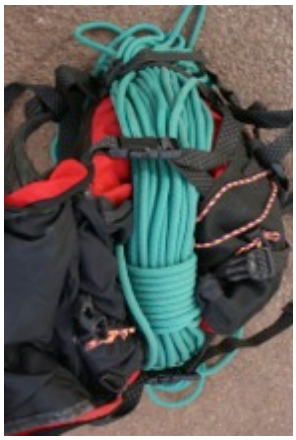






*Assuming you have coiled it in the way just described, you won't need to pull the rope through at the start of the route as long as you **very** carefully uncoil it. Unwrap the final turns, lay it down carefully and tease the two ends apart all the way to the main coils. The leader ties onto the end that looks like it is on top.*





An alternative to the normal rucksack coil—which you strap to your back—is a pack coil. (Start by coiling the rope as suggested above.) This is a way of finishing the coils so they fit nicely onto a small sack with compression straps. By undoing the finishing turns, you can quickly turn it into a rucksack coil for carrying on your back once you get to the face

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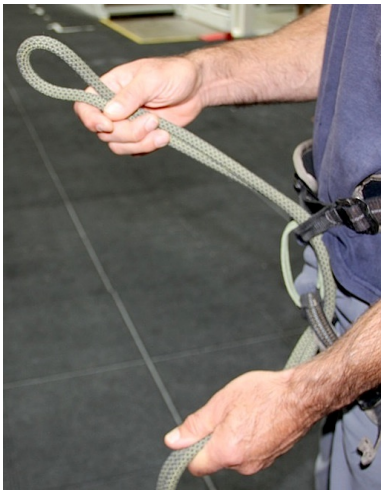
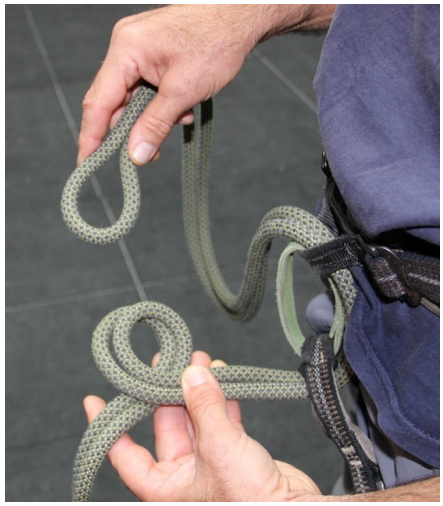
11. Tying into the Middle of the Rope

To tie into the middle of a 100m rope use a bowline on a bight with a step through. (The knots appendix shows a close-up of the knot.) This takes no longer than a normal bowline with a stopper. There is a video of this here:
https://www.youtube.com/watch?v=PzIP4IUnqvI&feature=player_embedded





Thread the bight through the tie-in points and form the hole of the bowline as normal. The rabbit goes up the hole, but instead of going around the tree and back down the hole, pass the loop over your head and then under your feet. Finally adjust the knot to bring it close to the harness. The knots appendix and Chapter 8 show other ways of tying into the middle of the rope.

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12. Coiling a 100m Rope

Coiling a 100m rope (coil it into two 50m bundles as normal but with a short length of rope between them, roll them toward each other and secure as normal but through both tunnels.

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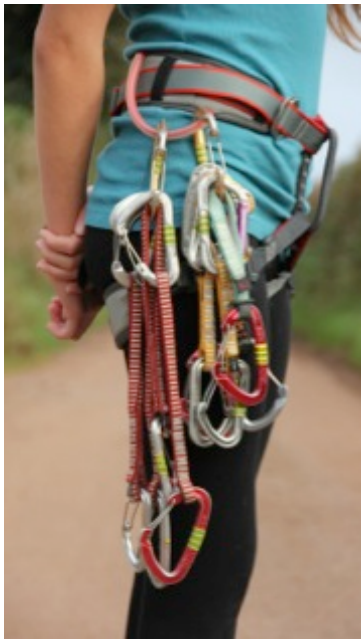
13. Racking the Gear

With small pieces such as wires and micro cams it is logical to keep them in bundles of similar items on a single carabiner. In part this is because there are simply so many of them that keeping them on separate carabiners would need a massive number of carabiners, but it is also because you often need to be much more precise in choosing the right piece with smaller pieces as the expansion range of a small cam or range in width along a stopper (nut) will only be a few millimetres, or less. This means you might need to try several pieces before you get the right one. However, keeping two or three medium or large cams on the same carabiner is a false economy, most of the time it should be obvious whether it is a 1 or 2 inch cam straight away, and if you do keep them on the same carabiner you won't be able to clip one as quickly when you need to.

Rack everything in a sensible, simple manner throughout the whole climb. Here the climber has cams on one side and wires on the other, but there are many alternatives. Most climbers keep the small pieces at the front, large pieces at the rear.

A mess will slow you down.

Racking cams in pairs if you have two sets saves harness real estate. Note the coloured carabiners and that each cam has its own carabiner unless you always extend your cams.



On easier pitches or easier bolted routes, try carrying the extenders in bunches; this makes it easier to pass them between you at each stance. It helps if each bunch only contains extenders of the same length. On bolted routes the second can clean onto bunches on his harness and simply clip them onto the leader's gear loops as he reaches the belay.

On items that are best clipped in a certain way or at a certain point, for example Dragon cams, mark the clip point with tape (here in red). The right-hand image shows the cam sling incorrectly clipped. (Plea to DMM: please mark the stitching area in bright tape to make it is easier to see where to clip and pull the webbing.)

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