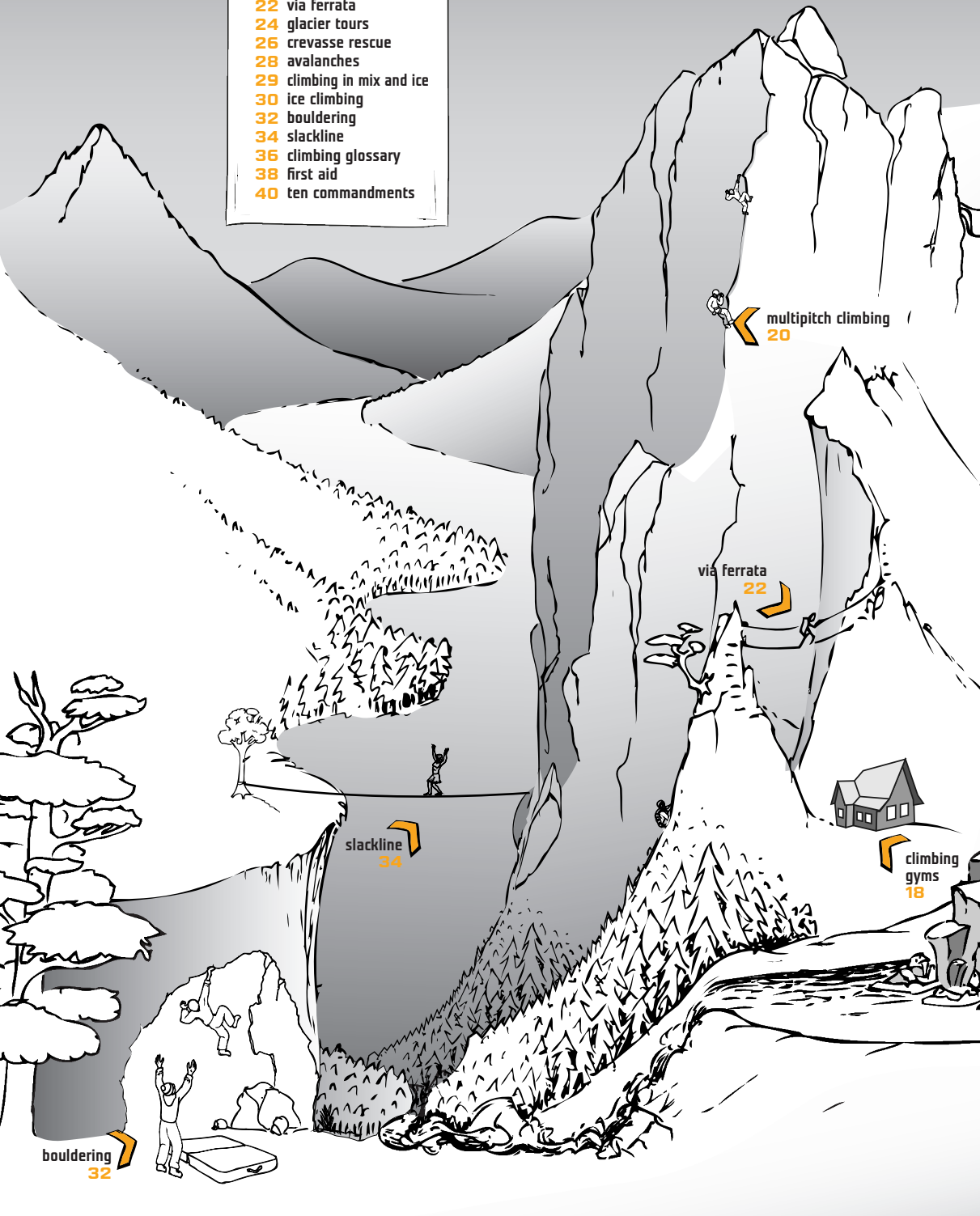
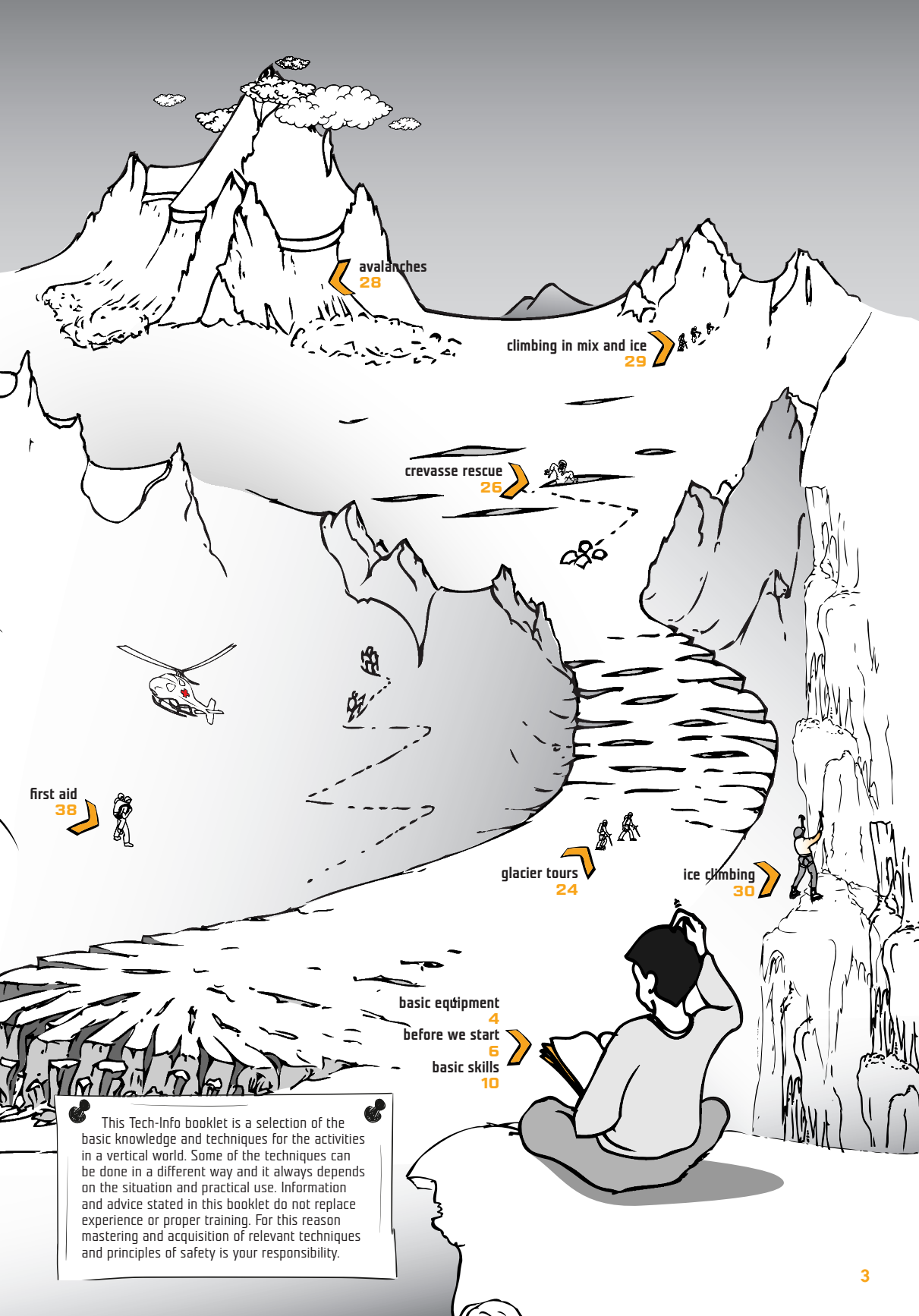
singing rock®

TECH INFO

EN

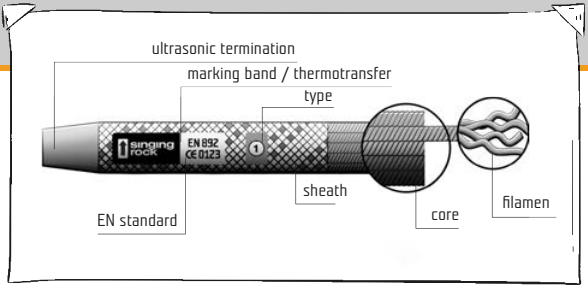
CONTENT





This Tech-Info booklet is a selection of the basic knowledge and techniques for the activities in a vertical world. Some of the techniques can be done in a different way and it always depends on the situation and practical use. Information and advice stated in this booklet do not replace experience or proper training. For this reason mastering and acquisition of relevant techniques and principles of safety is your responsibility.

ROPES



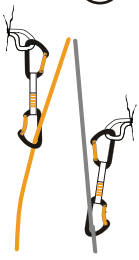
Dynamic (climbing) ropes
Dynamic ropes are designed with some elasticity to absorb fall impact energy.
One of the biggest difference from semi-static ropes is the elongation (elasticity) that is much bigger on dynamic ropes (standard fall test requires maximum 12 kN impact force for dynamic ropes). Only ropes marked EN 892 can be used for climbing!
There are 3 types of climbing ropes according to use:

1

Single rope
Used in the belay chain in a single line (sport routes, climbing gyms).

1/2

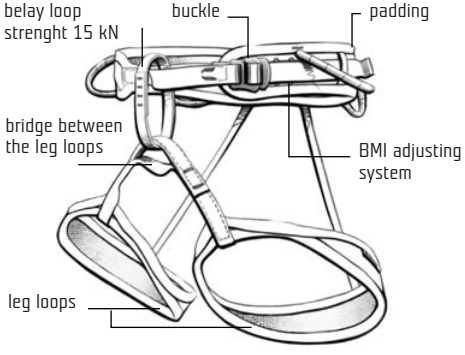
Half rope
Used in pair, in two independent belay lines (right and left).
Suitable for mountaineering, ice climbing or multi-pitch climbing.



Twin rope
Used in pair led parallel in one line. Usually used when a risk of rock or ice fall occurs (big wall, mountaineering, multi-pitch climbing).

How to take care of rope?
A rope will last the longest in a dry and dark place. Never store the rope near chemicals. If the rope gets wet, it is necessary to always let it dry. However, do not expose the rope to direct sunlight or heat sources. Sunlight is also harmful, therefore never leave the rope in the sun longer than necessary. Its biggest enemy is dust elements or dirt. By using a rope bag/rope sheet you avoid unnecessary wear and tear of the rope as well as of carabiners, which are also worn out quickly by dust particles.

SIT HARNESSES

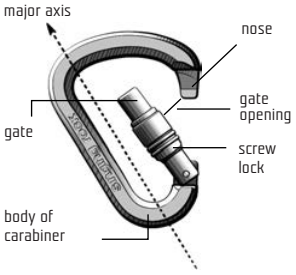


Basic classification of climbing harnesses
By the number of buckles, padding and purpose we distinguish the following categories:
sport – 1 buckle, simple and light for your maximum performance
universal – 3–4 buckles, allows variable adjustment according to the use
bigwall – 3–4 buckles, very comfortable with a lot of gear loops
skitouring – 1–3 buckles, light, could be put on even with the skis or crampons on
canyoning – 3 buckles, with special sit protector

How to take care of harness?
Same as rope, protect your harness against long-lasting direct sunlight, direct heat sources and acids, lixiviants, lyes and bleaches that damage synthetic fibres. If your harness is dirty, wash it by hand with cold water and soap solution. Dry in the dark at a temperature approx. 22°C. Check your harness regularly to make sure the seams are unbroken and that the steel parts and buckles are not damaged and fully functional.

How to take care of hardware and other metal climbing equipment?
Always keep in mind that metal parts of the equipment are subject to corrosion, therefore allow them to dry thoroughly after use. Fabric parts are damaged by moist, in which mould can appear.

CARABINERS



Basic classification of the carabiners according to EN12275:98 is by its construction and strength requirements in different way of use. In real conditions we choose a carabiner according to the purpose of use, material and type of locking mechanism:

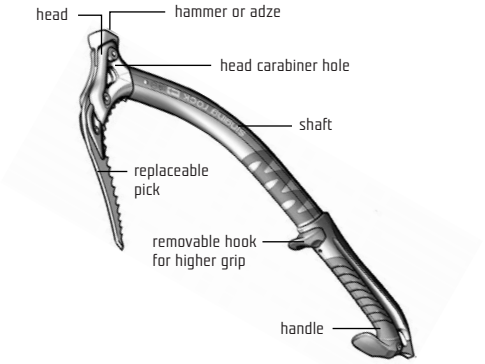
screw lock

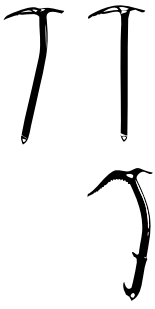
twist lock

triple lock

TYPE "B" – BASIC
Universal carabiner in various shapes and sizes for use in the belay system.
Type "H" – HMS
Pear-shaped carabiner primarily used for dynamic belaying by munter hitch. For added security it is fitted with a screw- or automatic locking mechanism.
Type "K" – (Klettersteig) for secured routes
Carabiner with an automatic locking mechanism primarily used for self-belay on secured routes (via ferrata).
Type "D" – (Directional) WITH LOCKED POSITION OF THE ROPE
The shape of the carabiner prevents dangerous side loading of the carabiner. Designed exclusively for connection to an EN566 loop express.
Type "X" OVAL
Designed for the connection with the ascenders, descenders, pulleys and for rescue techniques. It is not designed for belaying by munter hitch.
Type "Q" (Quick link) CARABINER WITH SCREW LOCK
Carabiner closed by screwing the nut, which is the bearing part of the carabiner. Carabiner designed for permanent connections, e.g. connecting a chain at a belay station, quickdraw for the climbing gyms etc.

ICE AXES



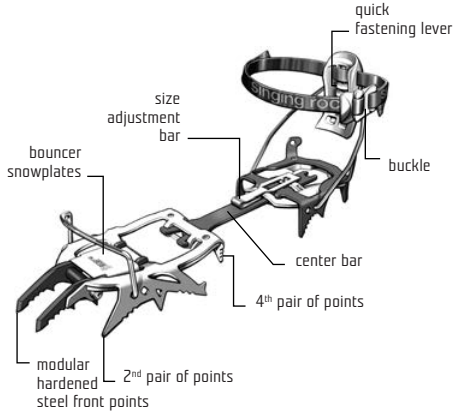


Ice axes are classified according to EN 13089.

Ⓑ **Type 1: Ice axe for the snow and ice**
Previously class B. Nowadays it does not have to be marked. This includes most of classical "tourist" ice axes.

Ⓣ **Type 2: Ice axe for the snow, ice and dry-tooling.**
Ice axe, or its replaceable parts (spikes) are marked by the letter T in a circle. This includes most technical ice axes with replaceable spikes, regardless of whether they are suitable only for ice or are specials for dry-tooling.

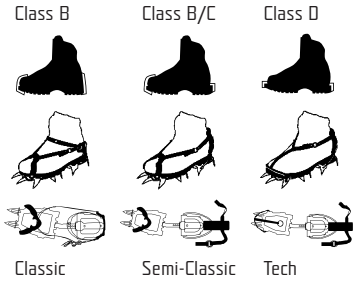
CRAMPONS



Crampons are usually classified according to the number of points and the type of binding as:

Tourist
10–12 points, flat horizontal points, used usually for mountaineering, i.e. walking on glaciers, firn fields and less steep slopes.

Binding systems and booth class:



Technical
12 points, vertical (mainly replaceable) front points, for classical and demanding mountaineering, for climbing on hard ice, steep slopes, icy gullies, highest-difficulty mixes and climbing of frozen waterfalls, where front points are extensively used.

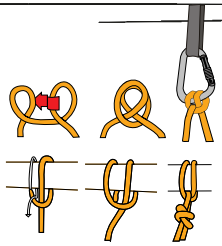
KNOTS

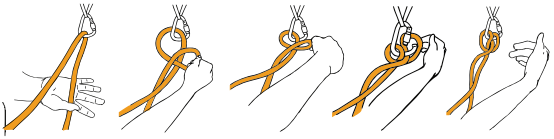
When making any knots, keep in mind that any knot reduces the strength of the rope depending on his kind and perfected on it construction.

ANCHORING KNOTS

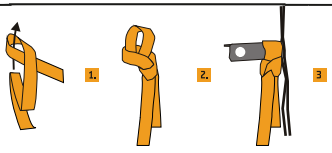
Clove hitch:
It is possible to tie it with one hand only.

it is easy to untie after loading. Due to the character of this knot it is essential to tie a backup knot, see the double fisherman's knot





Overhand slip knot
Used to fix webbing or accessory cord on partially driven pitons. It can be tied closer to the rock than clove hitch.



Girth hitch
Simple knot suitable to attach the sling around piton, ice screws, ice axe etc. Easier to tie than overhand slip knot.

Double Bowline
Used for creating two fixed loops at the rope end or for making provisory rope harness.

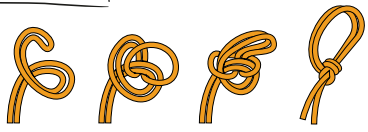
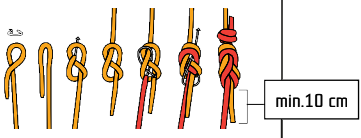
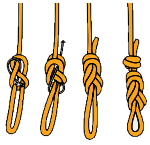


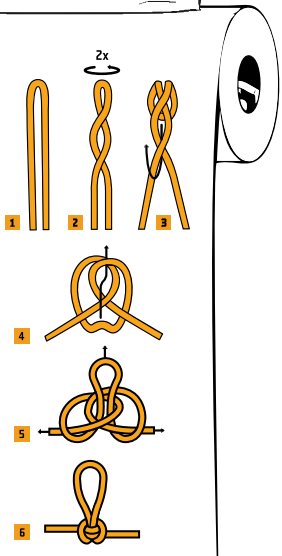
Figure-eight knot
To connect two ropes of the same type and same diameter;



Connection of ends of a rope loop

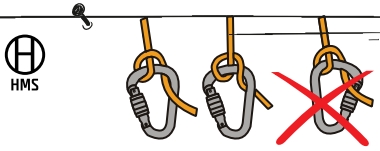


Due to the character of this knot is necessary to leave at least 10 cm long tail of the rope or is essential to tie a backup knot, double fisherman´s knot



Alpine butterfly
Used for anchoring from separate points, inter-anchoring, tying-in on the glacier. Never tie at the end of a rope.

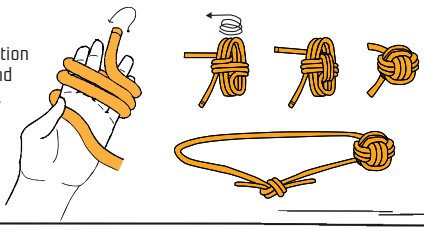
BELAY KNOT



Munter hitch
Knot used for belaying with HMS carabiner. The knot does not fix the rope, the friction only brakes sliding of the rope. It is easy to tie even with one hand or with the gloves on the hands. The part of the rope going to belayer must not go through the gate of the carabiner!

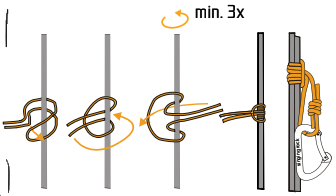
KNOT FOR SANDSTONE CLIMBING

Monkey´s Fist (Kinderkopf)
Suitable for protection points on Czech and Saxon sandstones.

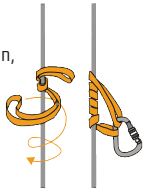


PRUSIK KNOTS

Klemheist (Machard) knot
Works very well, suitable also for flat slings, it is possible to make it also from thicker diameter slings (up to 9 mm).



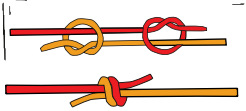
Prusik knot
Simple and the easiest friction knot. It works in both directions. Normally made from accessory cords 5-6 mm diameter. It is possible to make it with one hand only.



French prusik
Easy manipulation, it is possible to make it with one hand only, suitable also for flat slings.

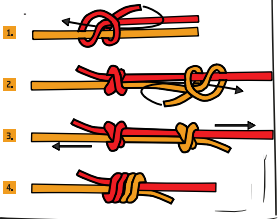
When climbing, it is advisable to carry a set of accessory cords for Prusik´s knots with a diameter of 5–6 mm in the following lengths: 1.5 m, 3 m and 5 m.

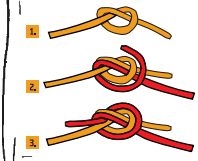
CONNECTING KNOTS



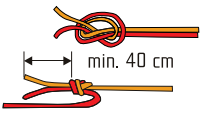
Fisherman knot
Connects two ropes well. Easy to tie and untie.

Double fisherman knot
Connection of two ropes using a double fisherman knot. Ideal for connection of two ropes or slings of a different type or diameter.





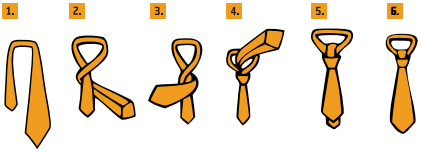
Overhand follow through
Used to join two ropes or slings together. Easy to tie. When loaded it is hard to untie.



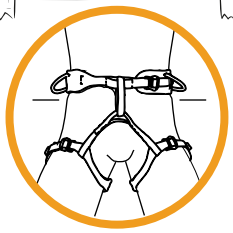
Overhand knot
It is simple knot and can be done with one hand only even with the gloves on. The best knot to join two ropes for rappelling. In pulling the ropes, the flat side of the knot slides on the surface and significantly lowers the possibility of jamming.

Do not use this knot with ropes of varying diameters!

Without proper understanding of knotting techniques and their practical mastery, use of knots is dangerous and may lead to serious accidents or death!

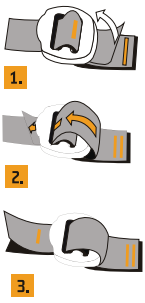


Tie knot
Not used during climbing but every climber should know it...



How to put on the harness
Waist belt should be above the hips and comfortably tightened.

Buckle locking
It´s necessary to put the webbing through the buckle behind the mark on the webbing

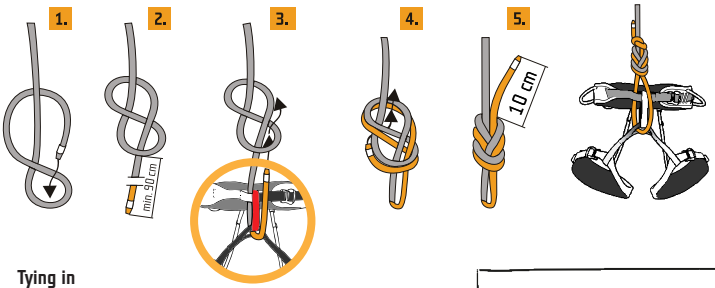


Rock&Lock buckle locking

1. Make the loop and put it through the buckle frame.

2. Hook the loop on cross bar.

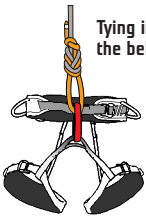
3. Tighten.



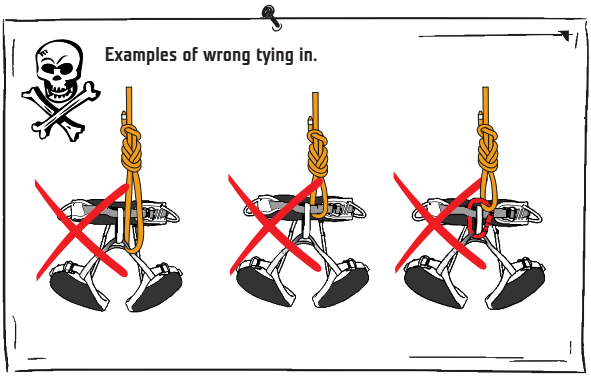
Tying in
Recommended tying in to a sit harness with figure-eight knot. Figure-eight knot is easily recognizable and can be easily checked visually.

Tying-in on belay loop.
Belay loop has enough strength to tie-in but tying-in is only allowed if it is recommended by the producer. This we can easily find in the instructions of use.

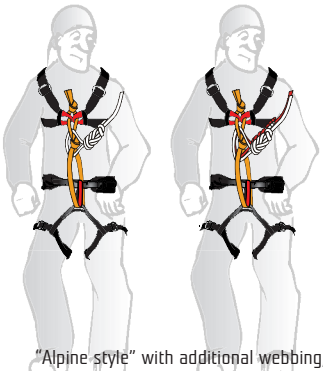
Tying in on the belay loop



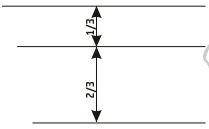
Examples of wrong tying in.

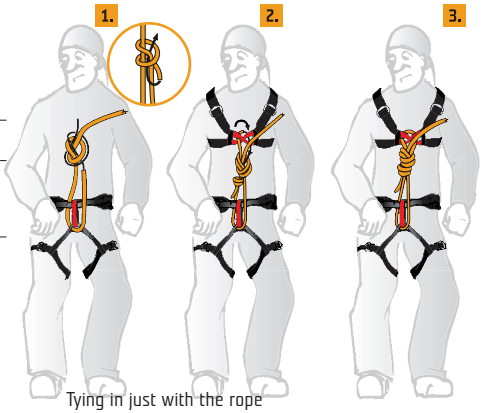


Recommended tying in to a combination of sit and chest harness



"Alpine style" with additional webbing, webbing strength must be min. 15 kN!





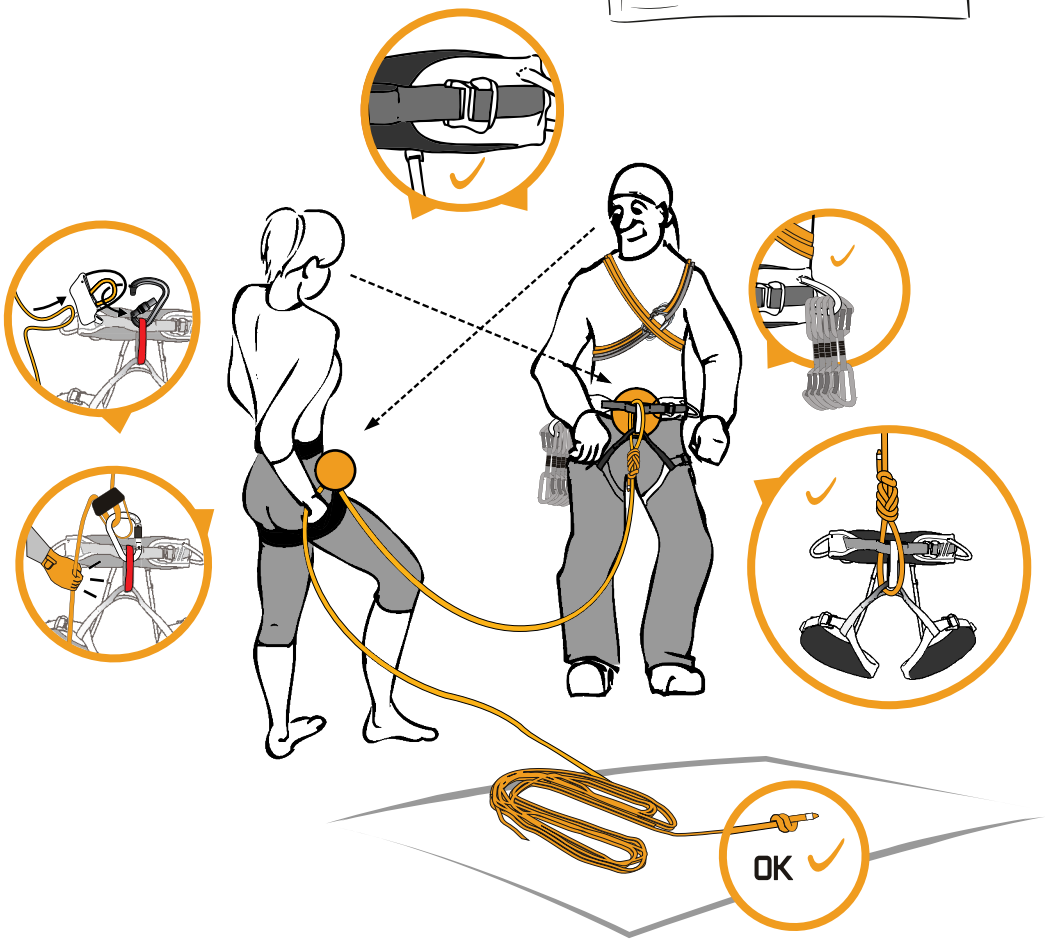
Tying in just with the rope

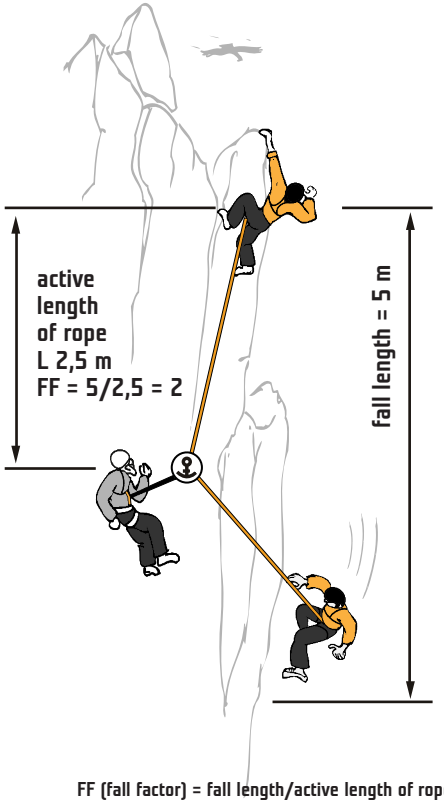
PARTNER CHECK

Partner check eliminates possible errors before you start climbing. Learn to perform partner check before every climb and you will prevent accidental injury..

Climbers will check on each other:

- Locked sit harness
- Correct tying-in (knot)
- Belay device (placing the rope in the belay device)
- Placing the carabiner into the belay loop and screwing of the carabiner locking mechanism
- Stop Knot at the end of rope against slip or to tie the climbing partner
- Sufficient amount and division of material





FF (fall factor) = fall length/active length of rope

IMPACT FORCE

In fall arrest, the falling climber is subjected to a breaking action thanks to his belay system (belayer, rope, protection points), which peaks at the moment of fall arrest = **impact force**.
The human body can survive the load 15x higher than its weight. Practically it means a value of approximately 12 kN. The value of impact force of all dynamic ropes therefore has to be lower than 12 kN.

FALL FACTOR

Fall factor is a number describing **the relation between the length of fall** and the **working ("active") length of rope**. Active length of rope means the length of rope between the belayer and the climber. Using standard belaying methods and standard climbing belay system (belayer, rope, protection...) the fall factor can get the values from 0 to 2.

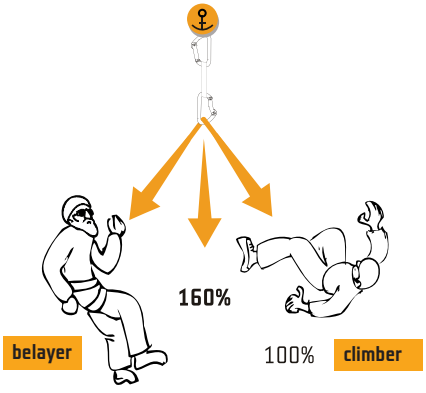
FF (fall factor) = fall length/active length of rope

The higher the fall factor the higher impact force generated while arresting a fall.
Every climber needs to have fall factor on his mind when climbing and do everything to lower the fall factor and the potential impact force to minimum:

- use proper rope and equipment (a quality dynamic rope and a safe harness)
- place the first protection as soon as possible
- place protection in short distances (even in easy terrain)
- keep your rope running fluently through runners (use quickdraws and slings)
- use fall absorbers for weak protection points (especially when the strength of protection is not secure enough – ice climbing, poor rock)
- use dynamic belaying technique (demanding skilled belayer with gloves)

Sheave effect

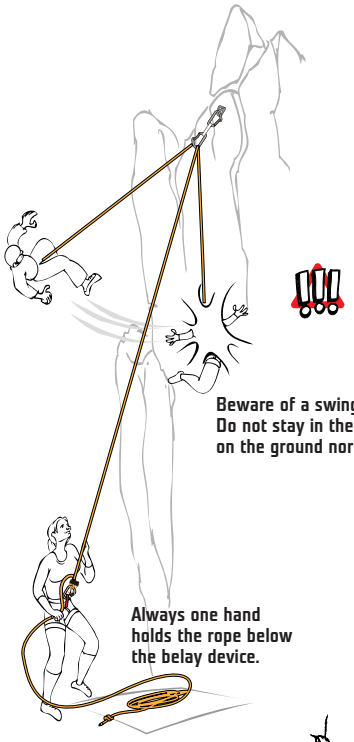
The last protection point is loaded with force resulting from the fall of climber and breaking force evolved by the belayer (friction on carabiner of last protection reduces the breaking force, which is about 40% lower than force induced by climber). The described two forces are acting on the last protection point at the moment of breaking the fall, which means the last protection point takes effect of 1,6x higher force comparing to force acting to fallen climber



BELAYING

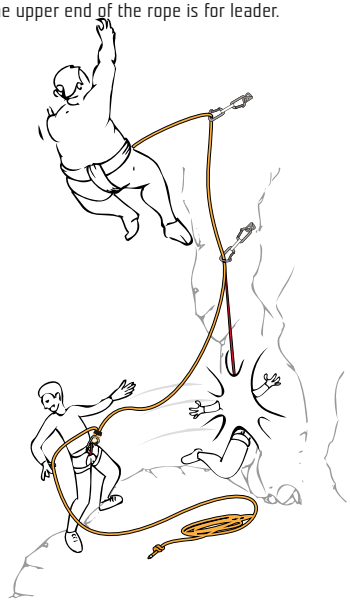
- only with certified equipment
- one hand grips the rope under the belay device
- catch the leader's back until the first protection point
- keep proper distance from the rock
- take in the rope in time
- do not leave slack
- at all times watch the climber
- maintain absolute attention, fall may occur any time, holds/footholds can break
- communicate with the belayer after finishing the route
- lower the climbing partner slowly and smoothly
- check where you are lowering your partner
- use the gloves for belaying

Before you start to climb, coil the rope to avoid the knots and twisting of the rope. The upper end of the rope is for leader.

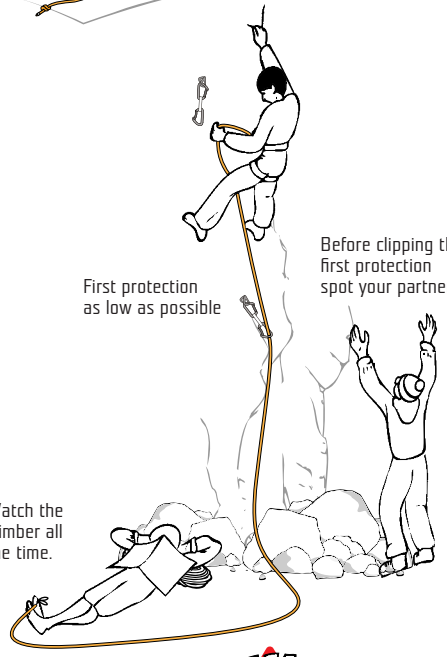


Beware of a swing.
Do not stay in the fall area, neither on the ground nor on the rock.

Always one hand holds the rope below the belay device.



Take into account the weight difference; if the belayer is 20% lighter or if the terrain so requires, the belayer must be secured as well.



First protection as low as possible

Before clipping the first protection spot your partner.

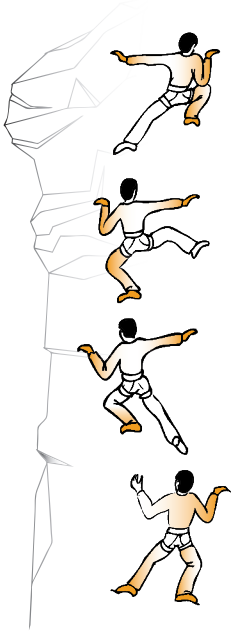
Watch the climber all the time.

Keep your attention all the time, the fall may happened any time, the hold/foothold can brake

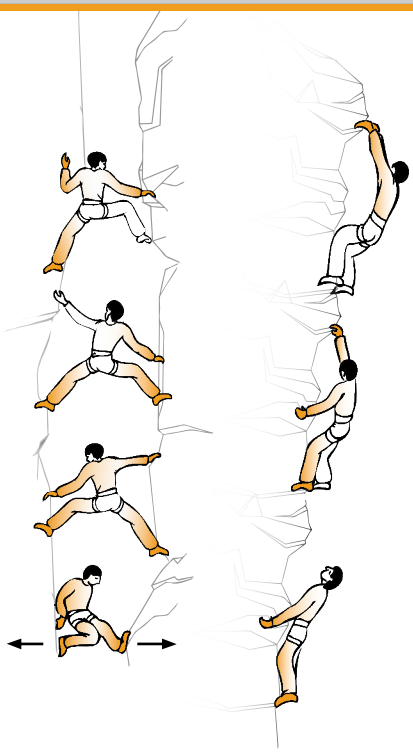
Keep the safe distance from the wall.

Methodology of climbing

The climber uses his legs to the maximum extent possible to lift the weight of the body. It is known that legs can develop 4x greater strength than arms (maximum). Upward movement should be smooth and natural. Climbers-beginners should avoid extreme positions of joints and always choose a natural variant of advancing.

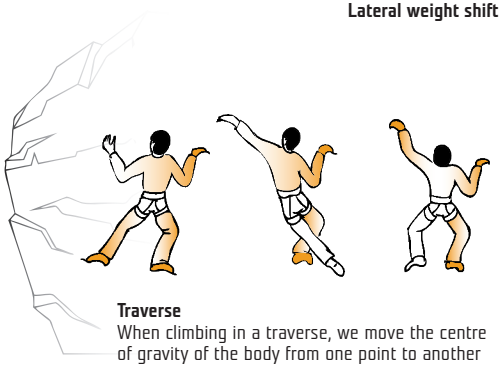


Lateral weight shift

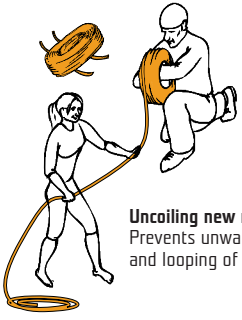


Chimney climbing
Chimney climbing can be used in narrow chimneys where the back forms one support part and the other one is provided by the back pressure of one of both legs. Upward movement is based on arms in combination with a leg leaned against the wall and a simultaneous push upwards.

Climbing technique in overhang
In overhang sections, the climber pushes his hips to the rock as hard as possible, which at least partially relieves the overloaded upper limbs.

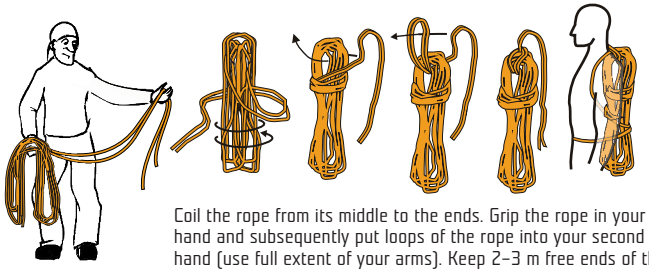


Traverse
When climbing in a traverse, we move the centre of gravity of the body from one point to another in horizontal position.



Uncoiling new rope
Prevents unwanted twisting and looping of the rope.

Coiling a rope – butterfly coil

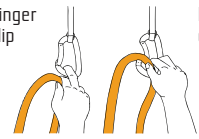


Coil the rope from its middle to the ends. Grip the rope in your hand and subsequently put loops of the rope into your second hand (use full extent of your arms). Keep 2–3 m free ends of the rope, make several twists of the ends around the bunch and tie.

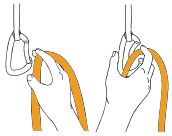
Quickdraw clipping

The basic skill for climbers who climb "on the sharp end of the rope", i.e. leader. Clip the rope from the most stable position and if possible at the height of the sit harness.

Finger clip

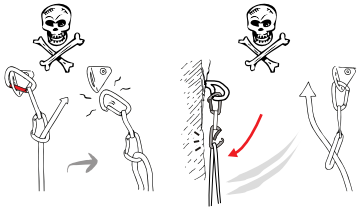


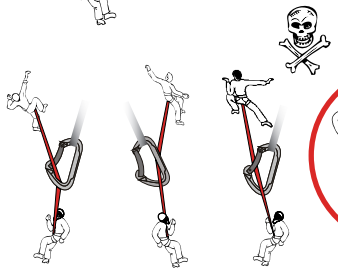
Pinch clip



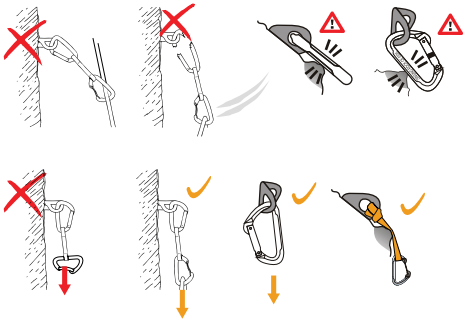
Correct leading of the rope

Wrong leading of the rope in the quickdraw

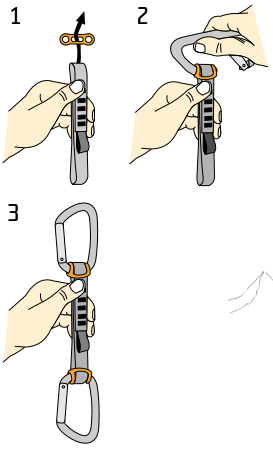




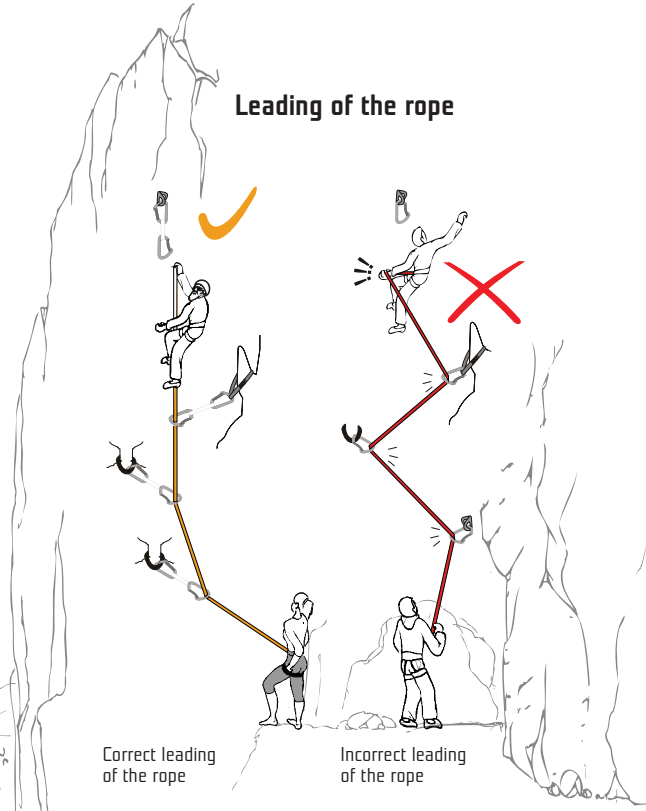
Incorrect leading of the rope



Fixing the carabiner in the quickdraw set
Prevents the carabiner from rotation across.



Leading of the rope

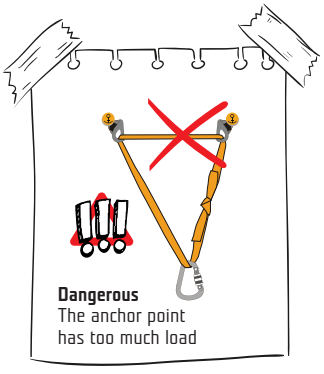


Correct leading of the rope

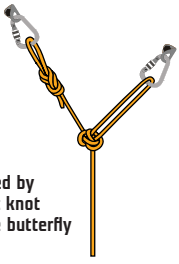
Incorrect leading of the rope

Belay station

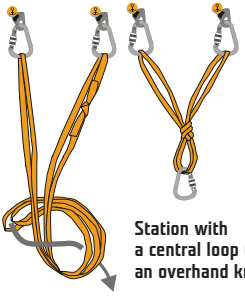
It must be established with 100% certainty and must mean security for belaying and rappelling. Usually made of several protection points (at least two). Protection point can be a rock piton, ice screw, friend, nut, sling in a thread, bolt expansion or glue-in anchor.



Dangerous
The anchor point has too much load

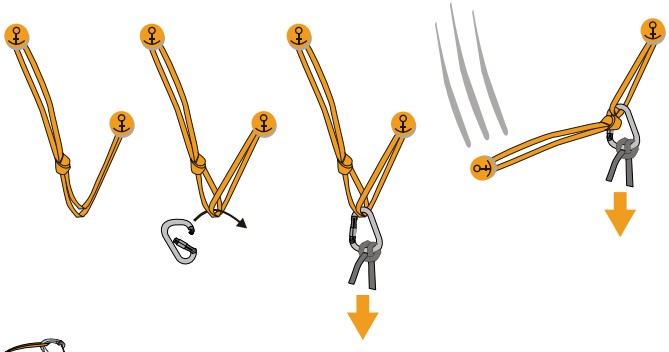


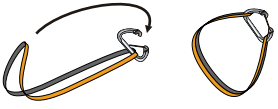
Station formed by a figure-eight knot and an Alpine butterfly



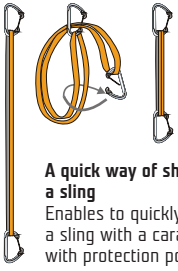
Station with a central loop using an overhand knot

In the event of tearing out an anchor point, the impact force is decreased by the overhand knot and twist of the sling.

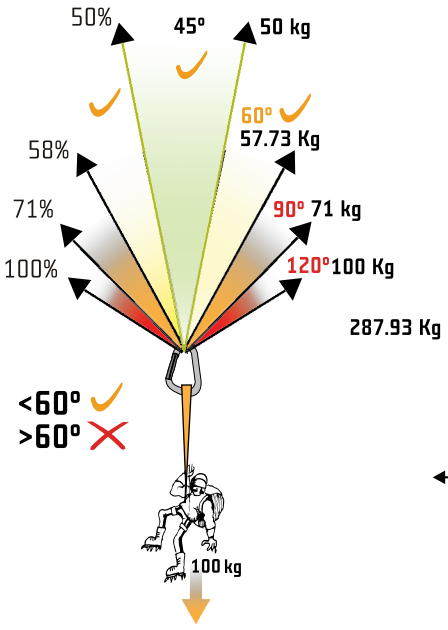




How to carry a 120-cm sling over the shoulder
This method enables to incorporate the sling immediately into the belay system because it contains a carabiner. It allows to have this sling under other slings. You simply unclip it from one end and take it out.



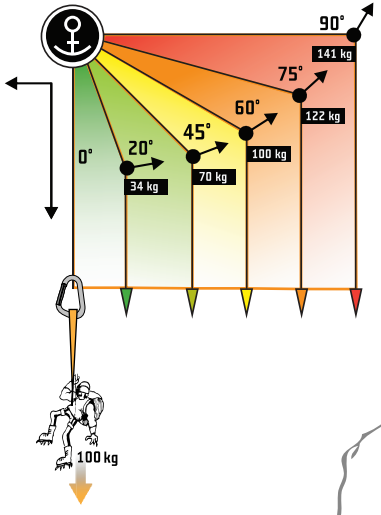
A quick way of shortening/extending a sling
Enables to quickly shorten/extend a sling with a carabiner in climbing with protection points.



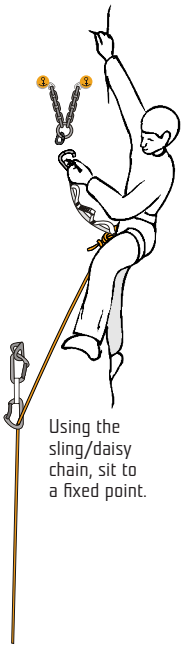
Distribution of forces at the belay station

With increasing angle the balance of forces acting on the belay station anchor points changes. By correctly connecting the individual protection points we ensure distribution of load and weight which impact the belay station – at the same time we ensure functionality of the belay station in case of failure of one of the protection points.

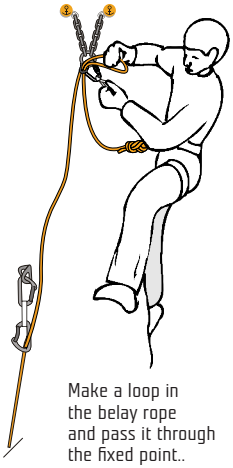
Use sufficiently long loops to decrease the angle.



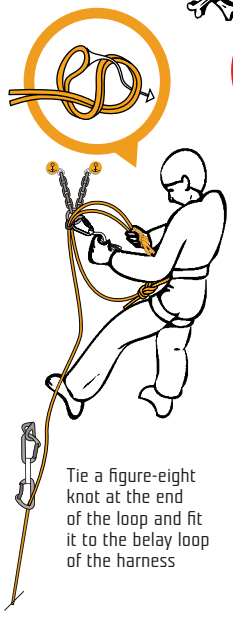
SAFE LOWERING



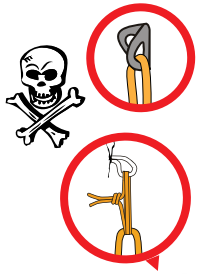
Using the sling/daisy chain, sit to a fixed point.



Make a loop in the belay rope and pass it through the fixed point..



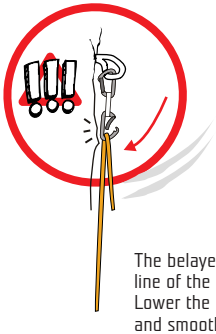
Tie a figure-eight knot at the end of the loop and fit it to the belay loop of the harness



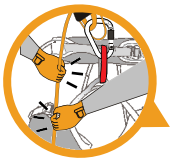
Never lower if the rope only runs through a bolt

Never lower if the rope only runs through a fabric sling.
Due to friction, slings can burn within seconds!

When lowering from the quickdraws from the anchor point (belay station) always have the rope clipped through two quickdraws with the gates facing each other.



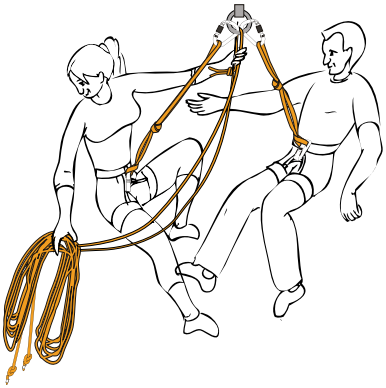
The belayer always holds the braking line of the rope with both hands.
Lower the climbing partner slowly and smoothly.
Check where you are lowering your partner.

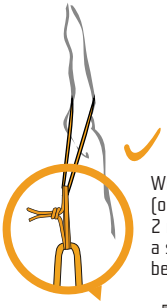


Untie the original figure-eight knot and pass the end of the rope through the fixed point.
Off belay through the sling/daisy chain

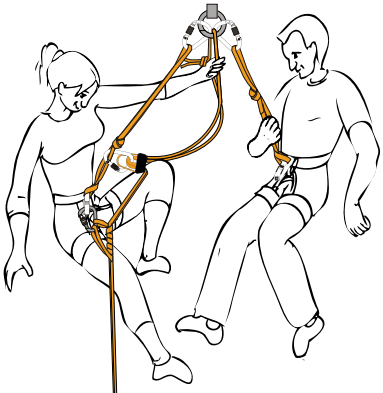
Always have a knot (double fisherman´s knot recommended) at the end of the rope which prevents the rope from slipping out of the belay device

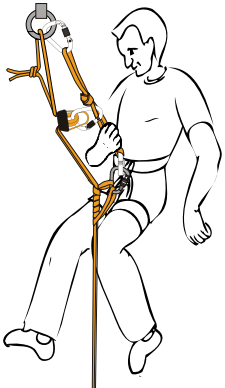
SAFE RAPPELLING



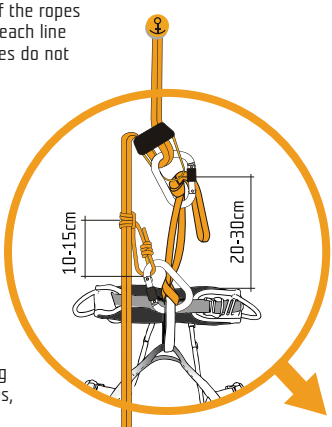


When rappelling you can rappel (on the half of the rope, using 2 ropes in the belay device) from a sling (e.g. behind a rock tip) because there is no friction heat.

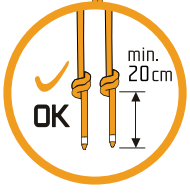




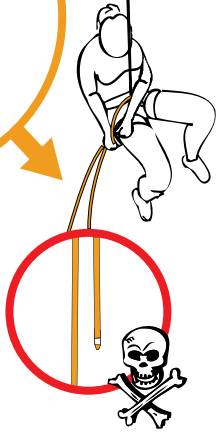
Rappelling with a Prusik knot to a daisy chain
Use a Prusik knot for self-belay. Rappel on equally long rope ends. Make a knot and the ends of the ropes (separately on each line so that the ropes do not twist.)

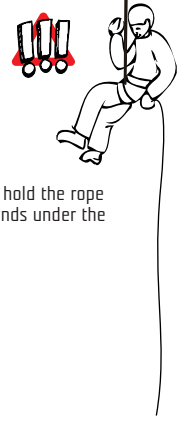


When rappelling on thinner ropes, use Klemheist (Machard) knot, French prusik or 3 laps on Prusik knot.



Have sufficiently long ropes.

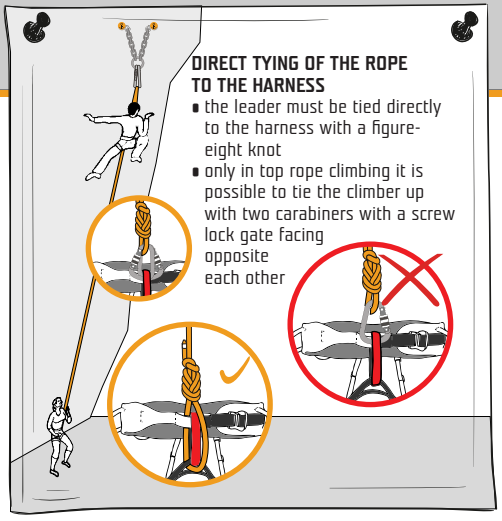




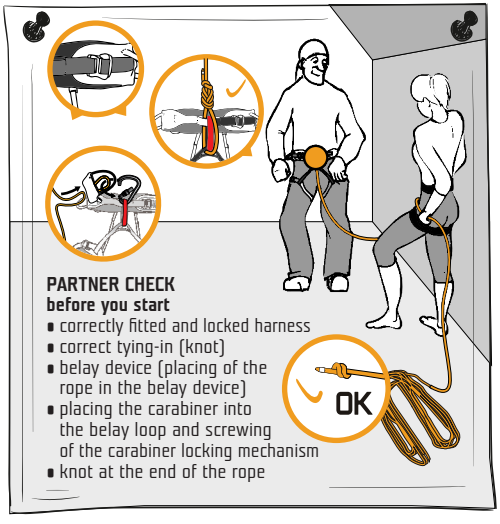
During rappelling, hold the rope lines with both hands under the rappelling device.

Climbing is a risky sport. In order to eliminate the risk, it is necessary to master the techniques of climbing, belaying and knotting. These skills can be acquired in climbing courses.

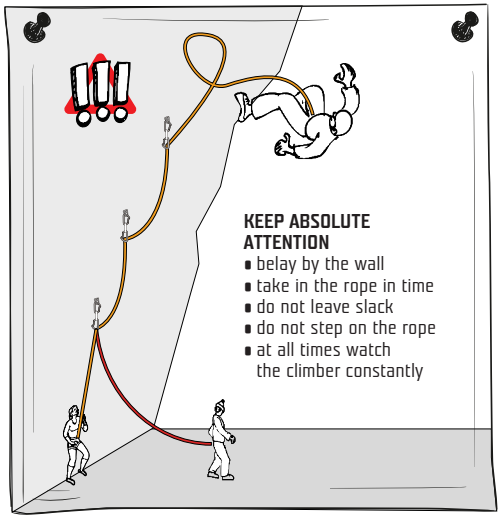
Climbing gym equipment:
- harness
- belay device
- HMS carabiner
- chalk bag
- chalk
- climbing shoes
- single dynamic rope



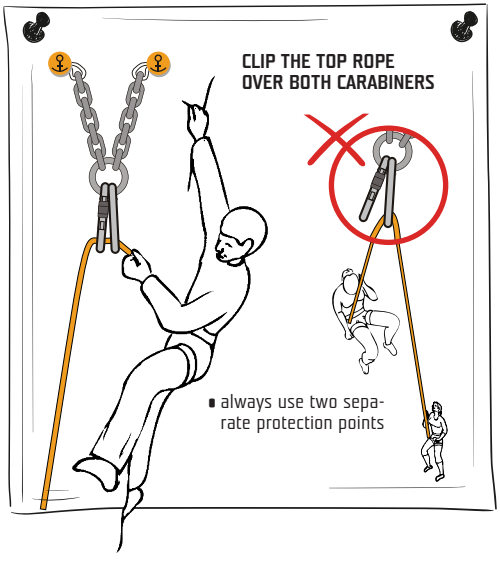
DIRECT TYING OF THE ROPE TO THE HARNESS
- the leader must be tied directly to the harness with a figure-eight knot
- only in top rope climbing it is possible to tie the climber up with two carabiners with a screw lock gate facing opposite each other



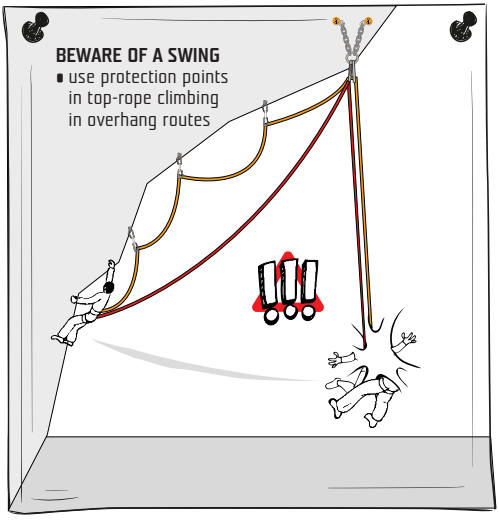
PARTNER CHECK
before you start
- correctly fitted and locked harness
- correct tying-in (knot)
- belay device (placing of the rope in the belay device)
- placing the carabiner into the belay loop and screwing of the carabiner locking mechanism
- knot at the end of the rope



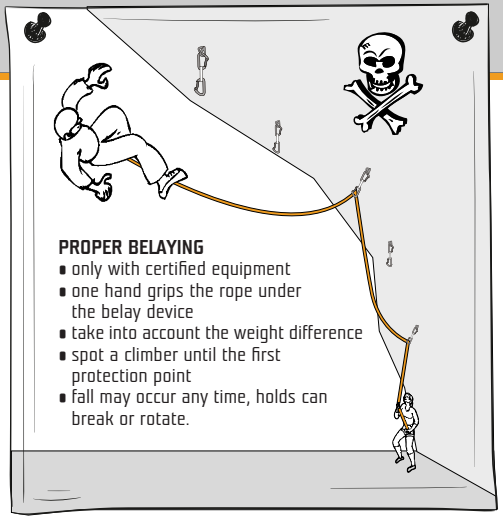
KEEP ABSOLUTE ATTENTION
- belay by the wall
- take in the rope in time
- do not leave slack
- do not step on the rope
- at all times watch the climber constantly



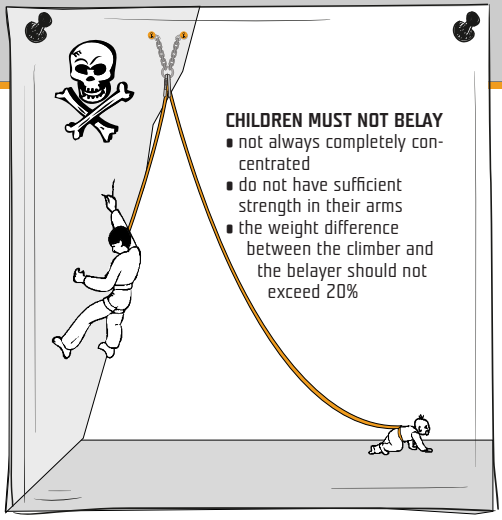
CLIP THE TOP ROPE OVER BOTH CARABINERS
- always use two separate protection points



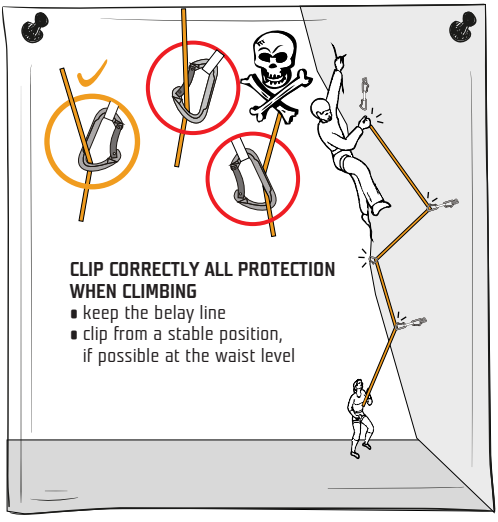
BEWARE OF A SWING
- use protection points in top-rope climbing in overhang routes



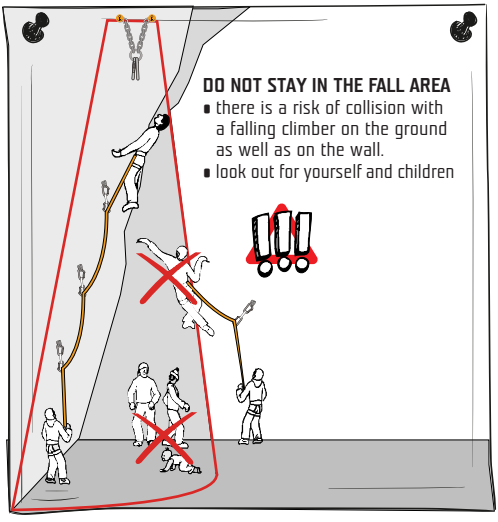
PROPER BELAYING
- only with certified equipment
- one hand grips the rope under the belay device
- take into account the weight difference
- spot a climber until the first protection point
- fall may occur any time, holds can break or rotate.



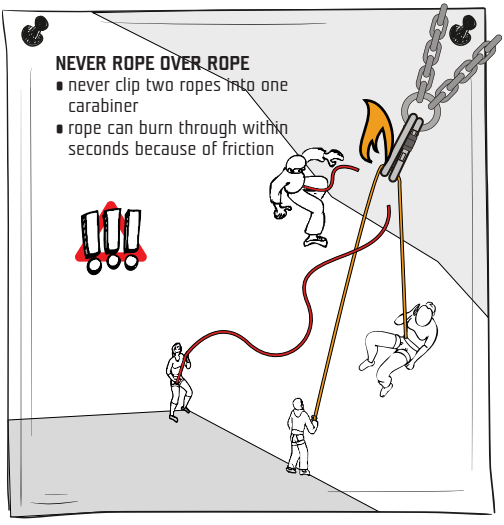
CHILDREN MUST NOT BELAY
- not always completely concentrated
- do not have sufficient strength in their arms
- the weight difference between the climber and the belayer should not exceed 20%



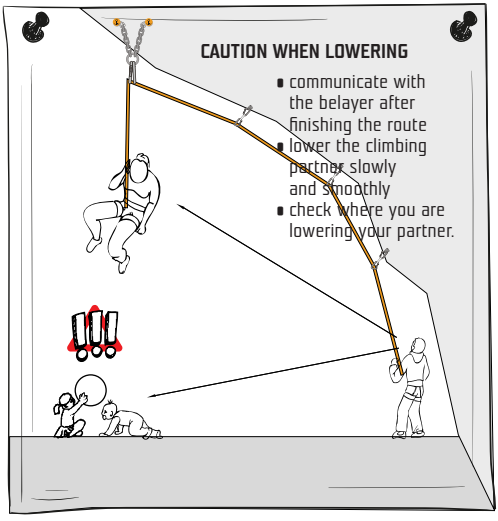
CLIP CORRECTLY ALL PROTECTION WHEN CLIMBING
- keep the belay line
- clip from a stable position, if possible at the waist level



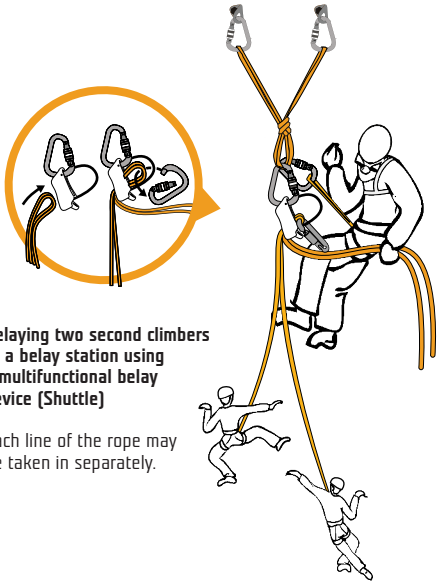
DO NOT STAY IN THE FALL AREA
- there is a risk of collision with a falling climber on the ground as well as on the wall.
- look out for yourself and children



NEVER ROPE OVER ROPE
- never clip two ropes into one carabiner
- rope can burn through within seconds because of friction

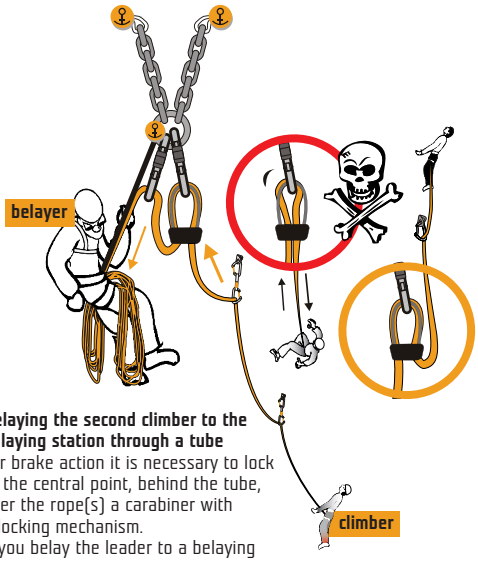


CAUTION WHEN LOWERING
- communicate with the belayer after finishing the route
- lower the climbing partner slowly and smoothly
- check where you are lowering your partner.



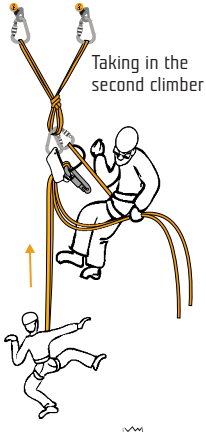
Belaying two second climbers at a belay station using a multifunctional belay device (Shuttle)

Each line of the rope may be taken in separately.

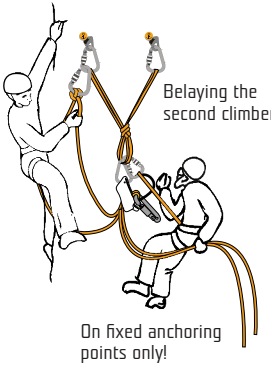


Belaying the second climber to the belaying station through a tube
For brake action it is necessary to lock to the central point, behind the tube, over the rope(s) a carabiner with a locking mechanism.
If you belay the leader to a belaying station, not body, with a tube it´s also necessary to create this reduction of impact force. After clipping the first protection point you can discharge this reduction of impact force.

Change at the station

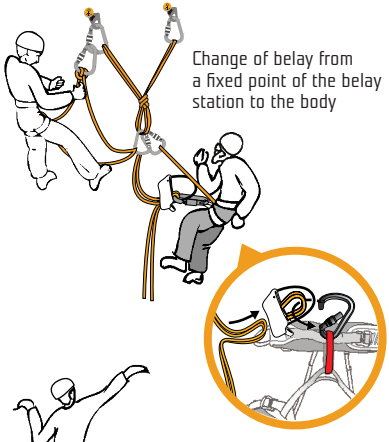


Taking in the second climber

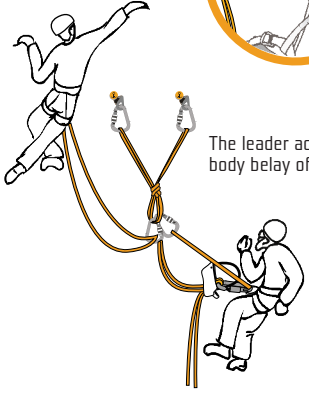


Belaying the second climber

On fixed anchoring points only!



Change of belay from a fixed point of the belay station to the body

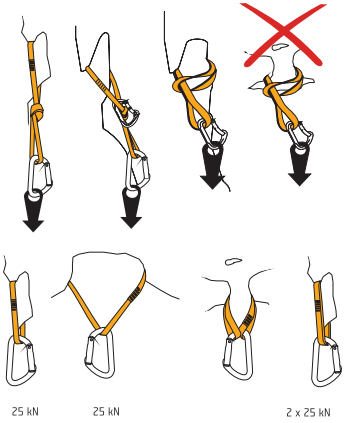


The leader advances, body belay of the leader

Advantages of body belay:
- softer impact of the falling leader on the wall
- shorter slack of the rope
- easier handling of the rope

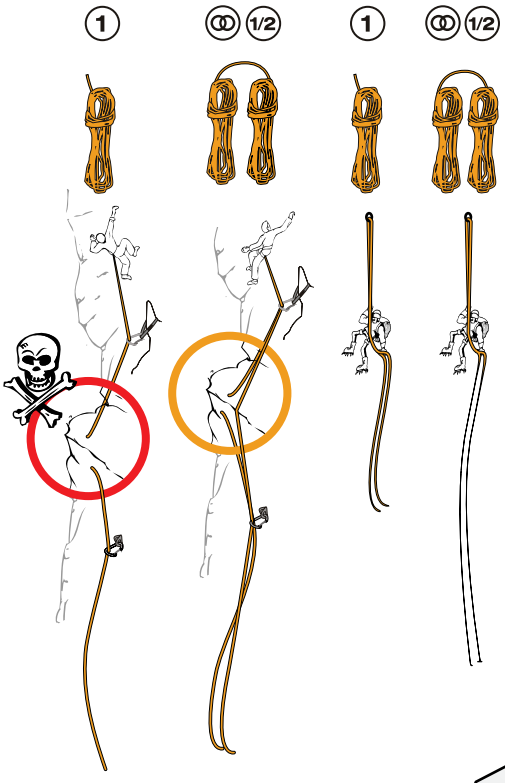
Disadvantages of body belay:
- the belayer becomes part of the belay system
- longer braking distance and therefore greater length of fall
- the belayer is at risk of hitting the wall and loosing control over belay
- more complicated manipulation during a rescue of the leader after the fall.

Protection points

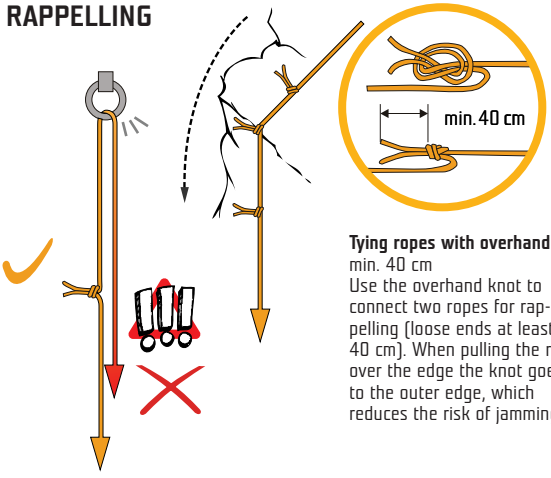


Possibilities of use of rock tips and threads as protection points

Advantages of half/twin ropes use during multipitch climbing

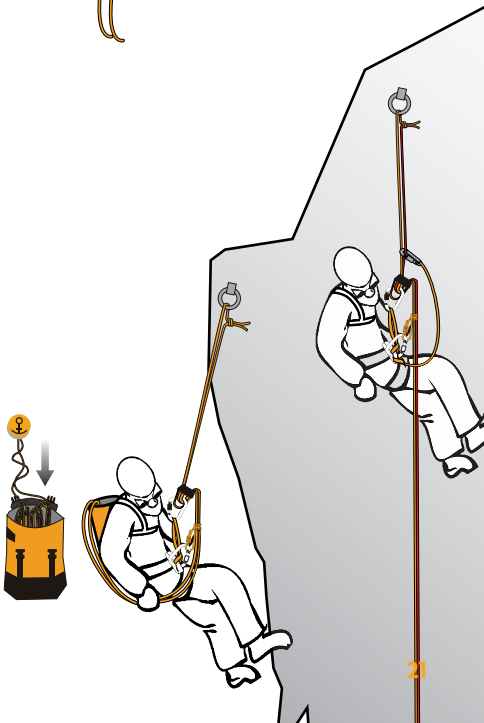


RAPPELLING

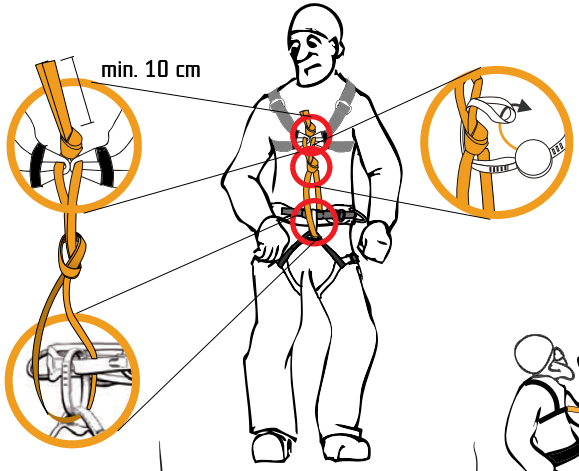


Tying ropes with overhand knot
min. 40 cm
Use the overhand knot to connect two ropes for rappelling (loose ends at least 40 cm). When pulling the rope over the edge the knot goes to the outer edge, which reduces the risk of jamming..

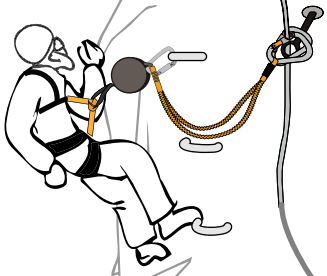
When rappelling from the sandstone ring, always pull the rope closer to the rock.



If the wind is strong and you are going to rappel, roll the rope up to the bag (start with those ends of the rope that will be the last to go out from the bag).

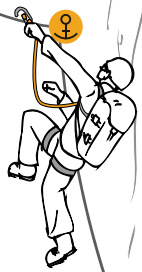


Recommended way of tying "Alpine style"with additional sling. ***The sling strength must be min. 15 kN!***



Emergency rest on a via ferrata
The rest using a carabiner added to the eye of the braking sling. In all variants of emergency sit out it is necessary to have clipped at least one loop of the ferrata set to the anchor rope as belay!

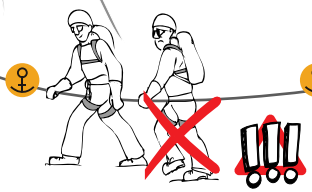
Never clip the via ferrata set into the belay loop! By clipping the via ferrata set in the belay you deactivate the fall absorber.



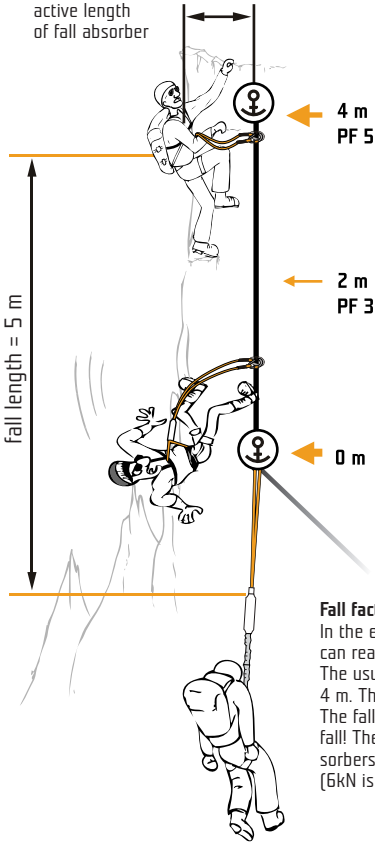
Keep the distance between the anchoring points of via ferrata, min. 1 section free.

Equipment for via ferrata

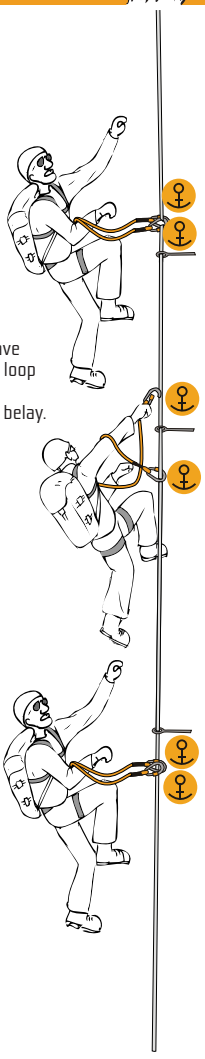
- via ferrata set with tearing webbing fall absorber
- sit (or fullbody) harness
- chest harness
- helmet
- sling for the connection of sit and chest harness
- gloves
- first aid kit
- short rope for additional belay
- HMS carabiner, slings, accessory cords



Maximum 1 climber in the section

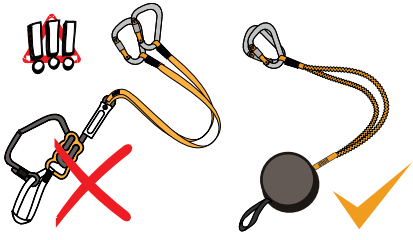


Fall factor
In the event of fall in via ferrata, the fall factor can reach unacceptably high levels.
The usual distance of anchor points is approx. 4 m. The length of the security loop is 1 m.
The fall factor would be 4 for maximum possible fall! Therefore it is necessary to use fall absorbers, that achieve maximum impact force 6 kN (6kN is defined by the standard of ferrata sets).



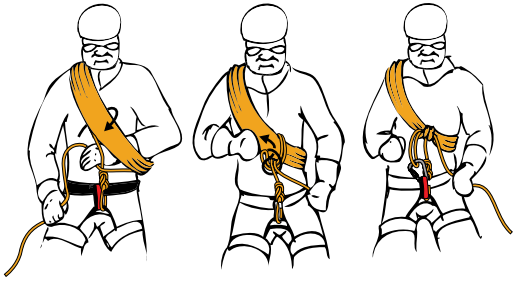
Progress along ferrata rope
It is necessary to have clipped at least one loop of the ferrata set to the steel cable as a belay.

Hazardous reuse of ferrata set after a fall
No manufacturer allows reuse of the set after absorbing a fall. A set has to be immediately discarded after a fall. Therefore, every team should have a short rope for additional belay, or a spare ferrata set to complete the tour.

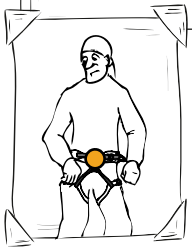


Rope friction ferrata sets vs. sets with a tearing webbing fall absorber
The disadvantage of rope friction sets operating on the principle of rope friction in a metal plate is the influence of weathering and wear and tear on the functionality of the set. As the rope gets dirty and "hard", the force needed to make the rope in the metal plate moving is higher. Therefore we recommend to discontinue to use rope friction ferrata sets even that their lifetime hasn´t reached its maximum and use only sets with a tearing webbing fall absorber.

Shortening the rope
The correct way to shorten the rope around the body, serves to make the rope more manageable and allows rope for use in an emergency. After the coils are tied off with an overhand knot, the rope is tied via a carabiner through the loop of this knot to the harness for safety.



Tying in on a glacier
We tie in to a sit harness. In a two-member team through a carabiner with locking mechanism. In multiple-member team the persons at the ends tie directly to their sit harnesses (figure-eight knot), the others tie through carabiners with locking mechanisms (Alpine butterfly, figure-eight knot). Team members at the ends must carry spare ropes for case of crevasse rescue. Each team member must have a Prusik knot on their rope and those in the middle must also have Prusiks in the direction to the other team member.



Recommended tying-in on the sit harness

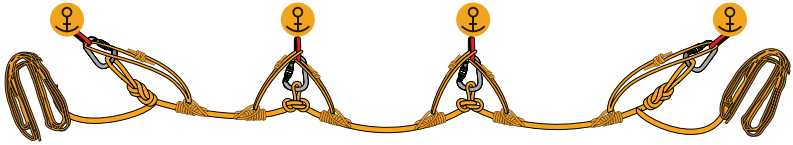
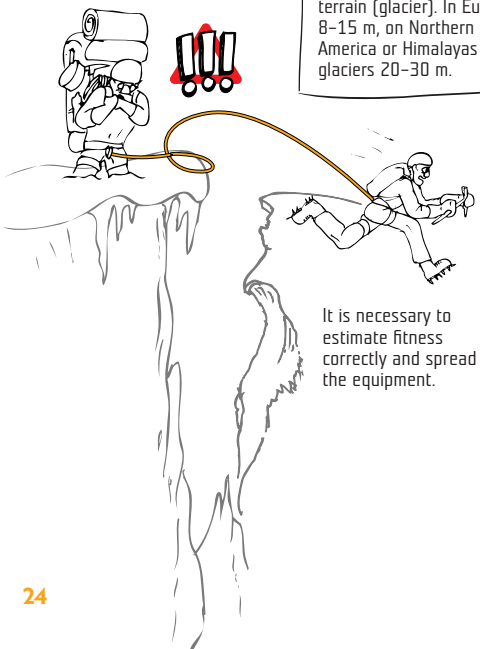


Figure eight knot
first and last person in the group

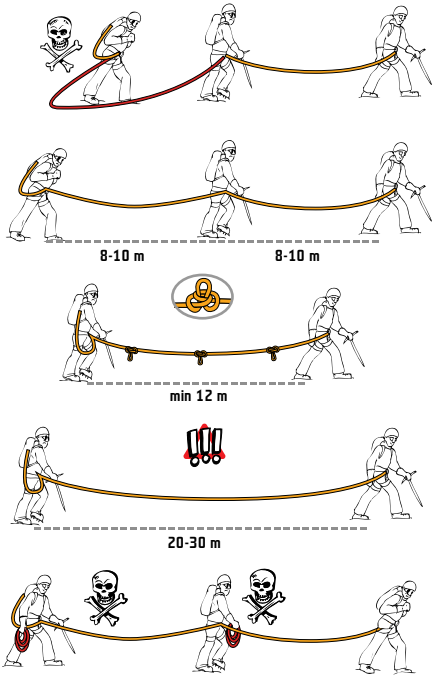
Alpine butterfly
persons in the middle of the group

Rope team on a glacier
The length of rope between the team members is determined by the character terrain (glacier). In Europe 8–15 m, on Northern America or Himalayas glaciers 20–30 m.

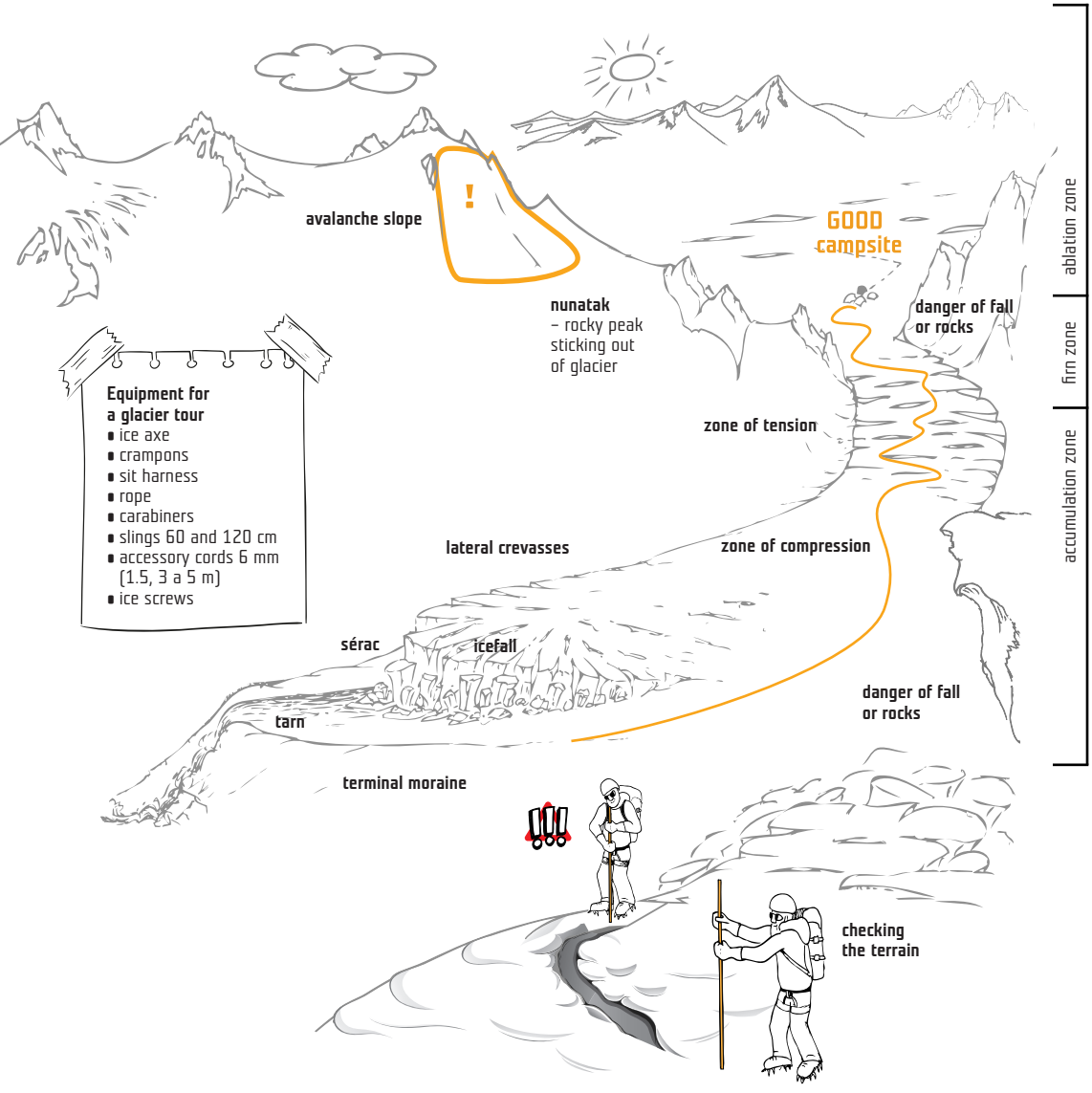


It is necessary to estimate fitness correctly and spread the equipment.

Tight rope
The basic principle of safety is to keep the rope tight among team members. If the rope is loose, there is a danger of sweeping more members in a crevasse as a result of late fall arrest..

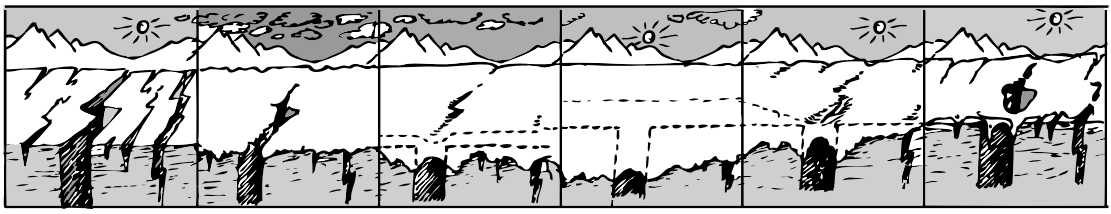


Carrying of slings is very dangerous!



Equipment for a glacier tour

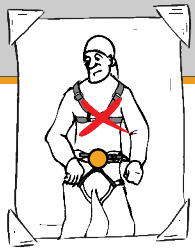
- ice axe
- crampons
- sit harness
- rope
- carabiners
- slings 60 and 120 cm
- accessory cords 6 mm (1.5, 3 a 5 m)
- ice screws



bare ice | *first snow* | *cracks begin to be covered* | *huge snow pack* | *melting season begins* | *bridges barely holding*

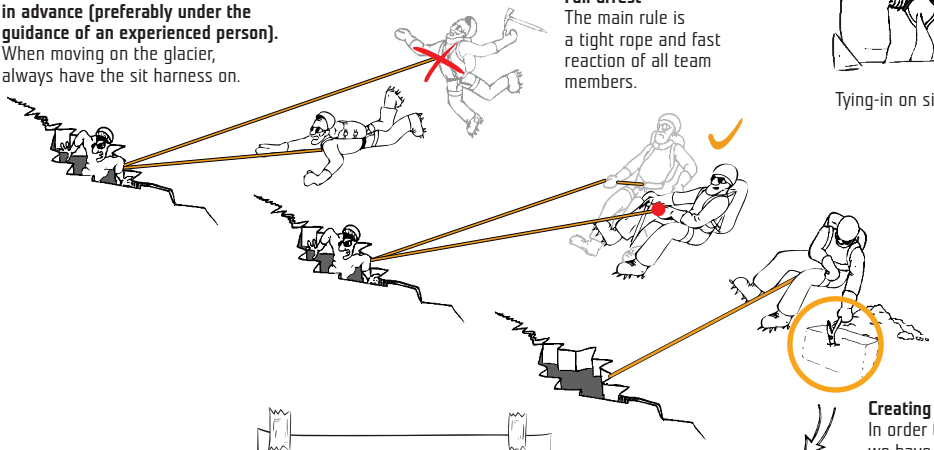
CREVASSE RESCUE

Rescue has to be properly trained in advance (preferably under the guidance of an experienced person).
When moving on the glacier, always have the sit harness on.

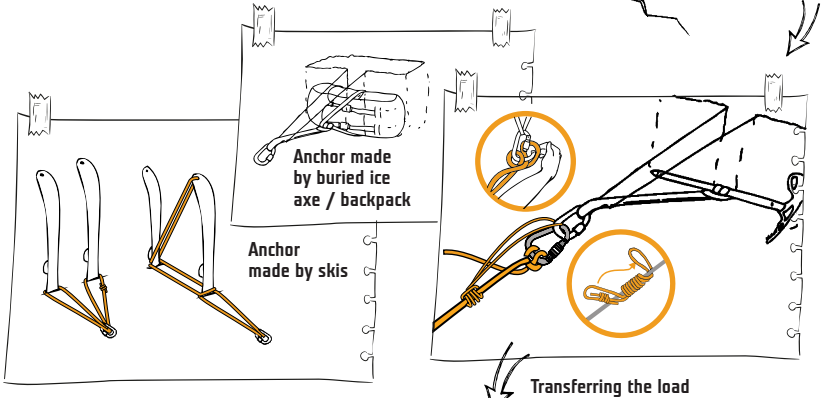


Tying-in on sit harness

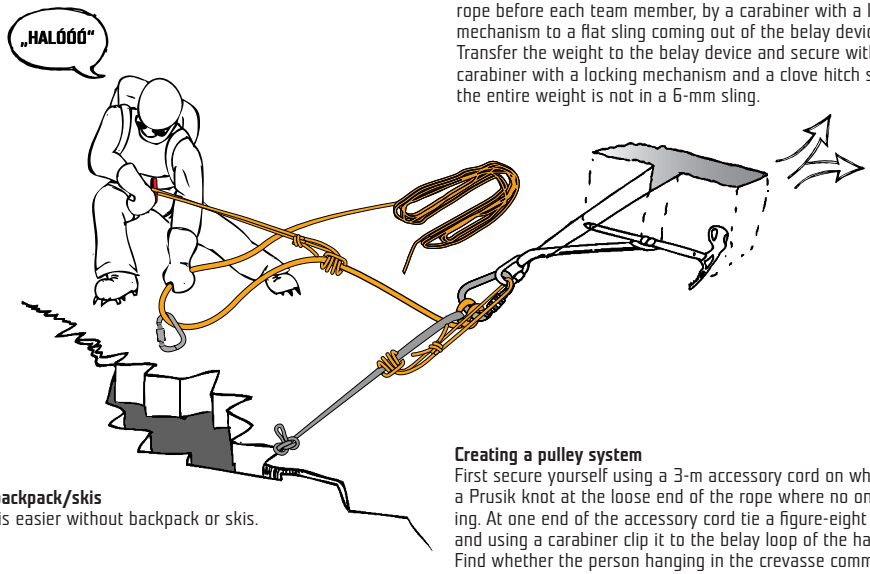
Fall arrest
The main rule is a tight rope and fast reaction of all team members.



Creating a belay station
In order to arrest a fall we have to create a safe anchor in the snow as fast as possible.



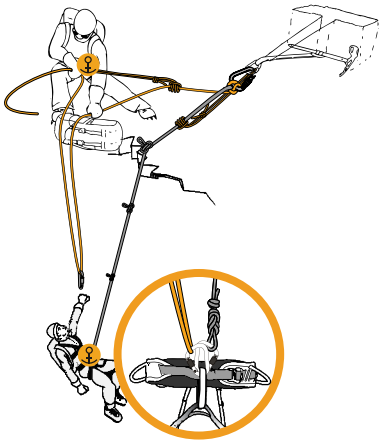
Transferring the load
Connect the accessory cord, tied by a double Prusik on the rope before each team member, by a carabiner with a locking mechanism to a flat sling coming out of the belay device. Transfer the weight to the belay device and secure with one carabiner with a locking mechanism and a clove hitch so that the entire weight is not in a 6-mm sling.



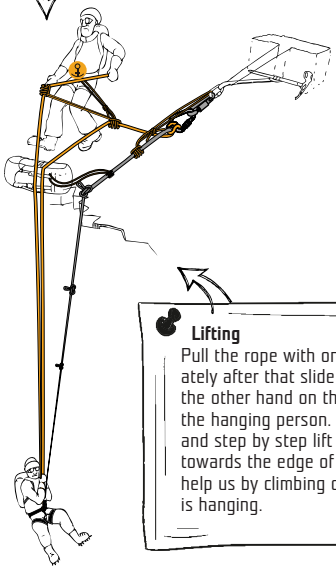
Lifting backpack/skis
Rescue is easier without backpack or skis.

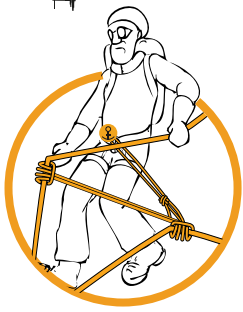
Creating a pulley system
First secure yourself using a 3-m accessory cord on which we tie a Prusik knot at the loose end of the rope where no one is hanging. At one end of the accessory cord tie a figure-eight knot and using a carabiner clip it to the belay loop of the harness. Find whether the person hanging in the crevasse communicates and is able to move and if so, hang a carabiner on the loose end of the rope and lower it to the person.

Lifting with the help of the afflicted
The basic method in case the afflicted person is able to communicate and move.



Reverse safety knot
The person hanging in the crevasse clips the carabiner to the belay loop of their harness. On the opposite end, using the auxiliary rope, the rescuer makes a safety knot against rope sliding using the Prusik knot. The safety knot must be on a place where the rescuer can reach this knot easily.

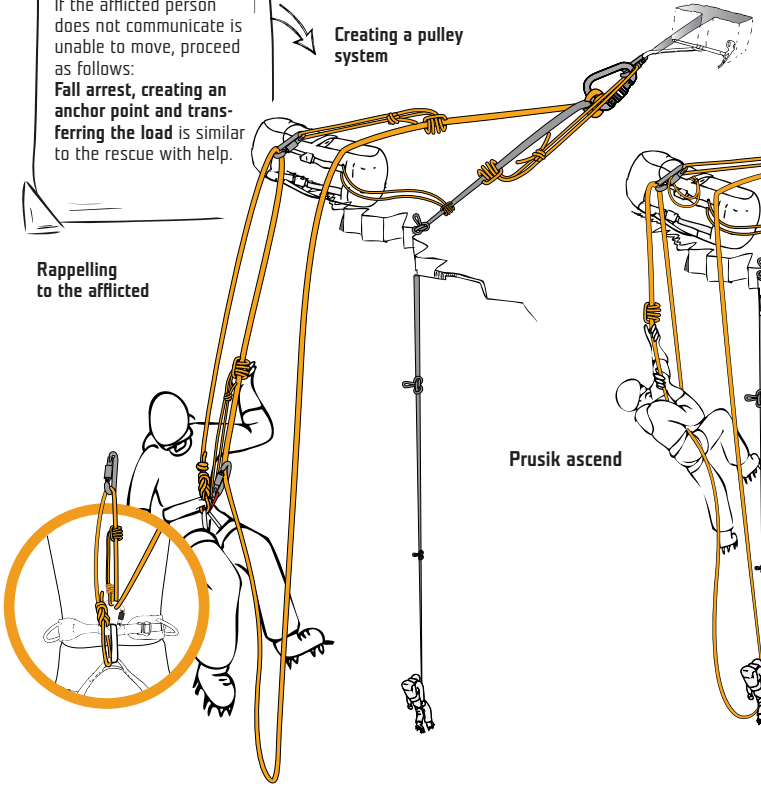




Lifting
Pull the rope with one hand and immediately after that slide the Prusik knot with the other hand on the rope in direction to the hanging person. Repeat this movement and step by step lift the hanging person up towards the edge of the crevasse. He can help us by climbing on the rope on which he is hanging.

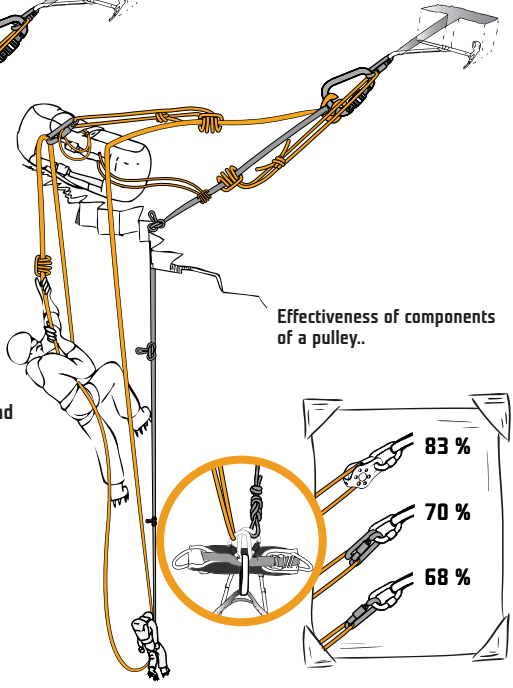
Crevasse rescue without the help of the afflicted
If the afflicted person does not communicate is unable to move, proceed as follows:
Fall arrest, creating an anchor point and transferring the load is similar to the rescue with help.

Creating a pulley system

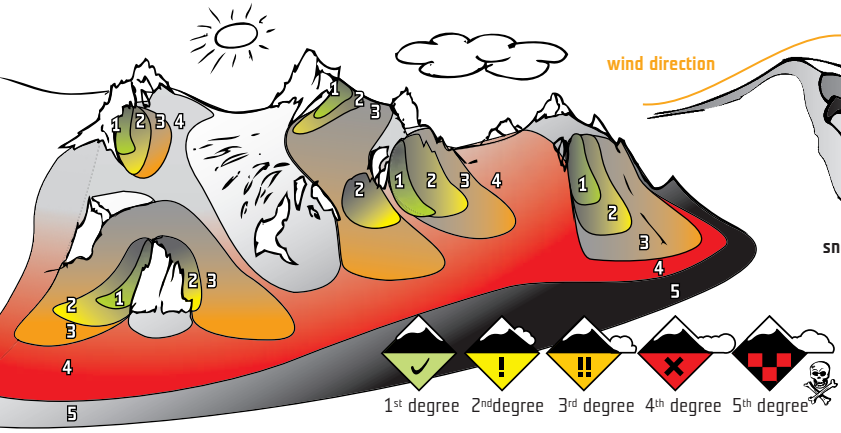


Rappelling to the afflicted

Prusik ascend



Effectiveness of components of a pulley..



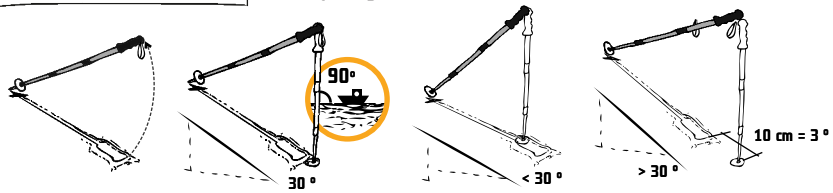
Where avalanche occurs

Shady slopes but also shady parts of gullies otherwise facing the sun. Under intense sun, watch out for slopes with rocks. Massive warming also affects shady slopes. New, melting snow or snow brought by wind.

Slope angle

The steeper the slope, the higher the risk. Most avalanches fall from slopes of >30° angle.

How to guess the slope angle?



How to guess the slope angle.
Print the pole to the snow.

Lift its bottom end loosely attach the other one to it so that it hangs freely

Lower the lifted pole end so that the perpendicular pole makes a mark

Every 10 cm after the mark means 3° steeper slope. If the mark lies in the print it means that the angle is decreasing.

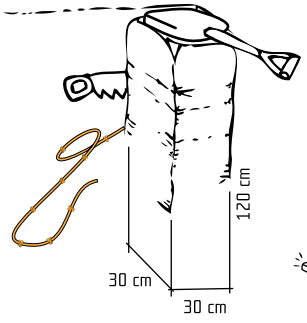
Basic avalanche equipment:

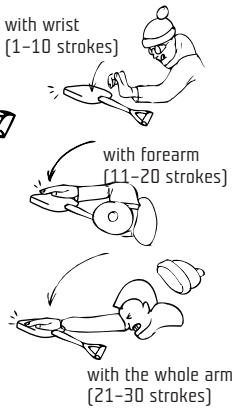
- avalanche probe
- avalanche transceiver
- shovel
- first aid kit
- enough liquids
- charged mobile phone with the number of the Mountain Rescue Service

1	compact ice	nothing
2		knife
3		pencil
4		1 finger
5		2 fingers
6		fist

If the difference between neighboring layers is higher than 3, the risk of avalanche is high.

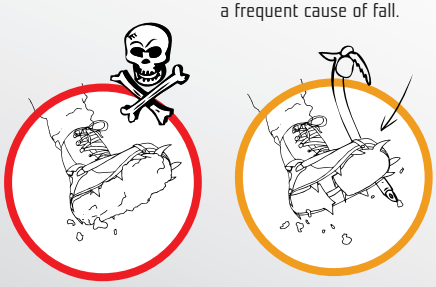
Compression test





Compression test
The place for the test must be safe, must represent avalanche terrain and must not be damaged. Place the shovel flat on the snow column and knock the blade of the shovel with increasing intensity. Make note of the force (which knock) necessary for slide and also the depth of the critical layer.

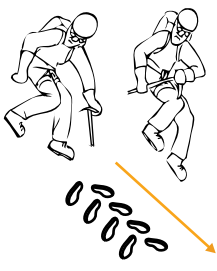
Snow balling on crampons is a frequent cause of fall.



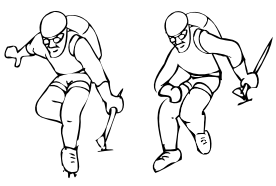
Self arrest

Watch out for crampons, they are sharp and can easily injure you.

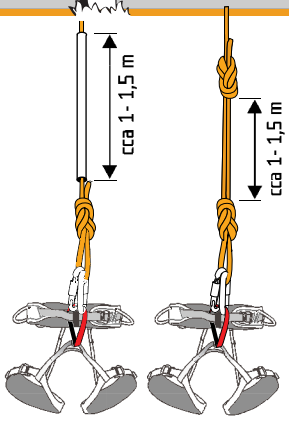
Techniques of ascent with crampons



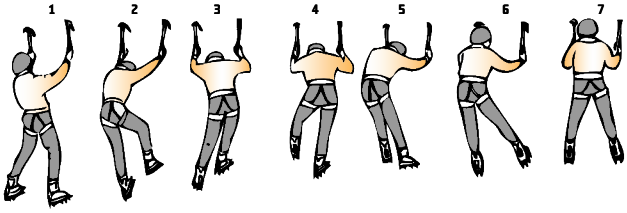
Techniques of descent with crampons



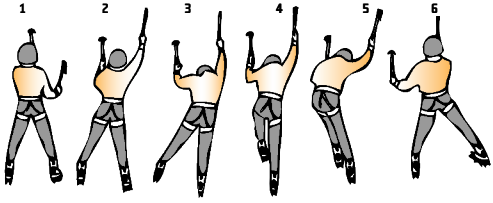
Advanced descend technique with the crampons.



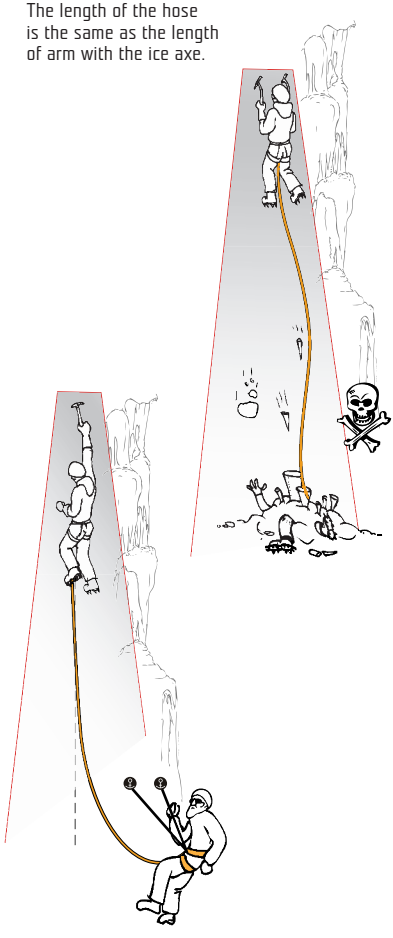
Top-rope ice climbing
Protection of rope by a hose. The length of the hose is the same as the length of arm with the ice axe.



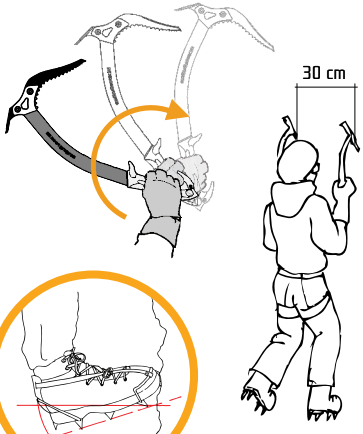
Classic ice climbing technique



Triangle ice climbing technique



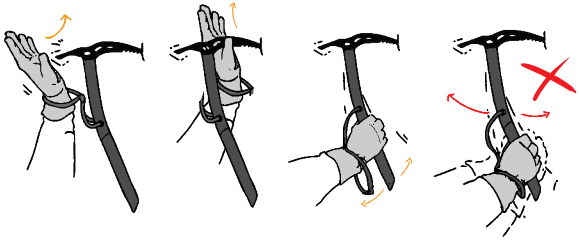
Correct position of the belayer
Aside from the ascent line so that ice falling from above does not endanger the belayer staying on the belaying station. With increasing height of the climber the fall cone of ice fragments increases

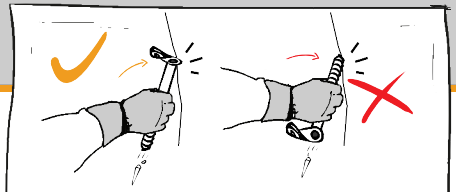


Using an ice axe
With loose wrist and firm forearm.

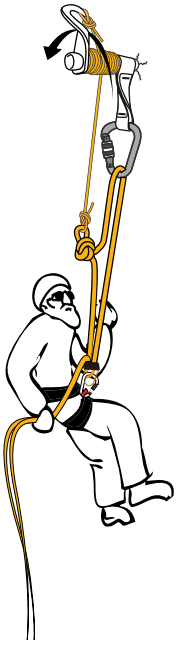
Using the crampons
Kick from below. Maximum use of natural footholds in the ice..

Releasing an ice axe
When removing the dug ice axe, move the spike only up and down, not sideways (risk of breaking the spike).

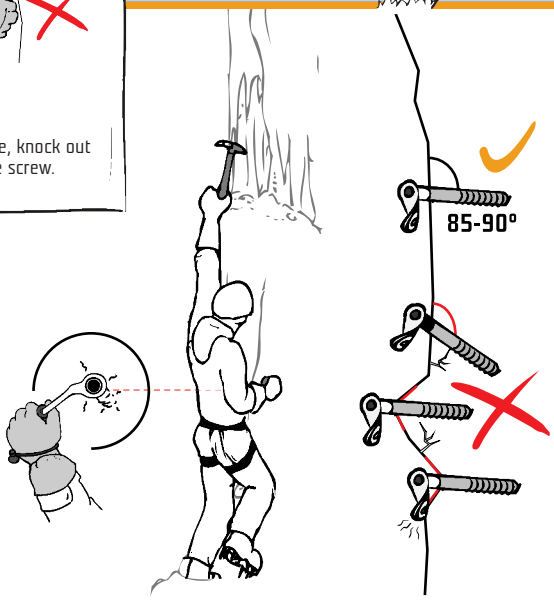




Taking out snow from the ice screw
After screwing the ice screw out of ice, knock out or blow out snow remaining in the ice screw.



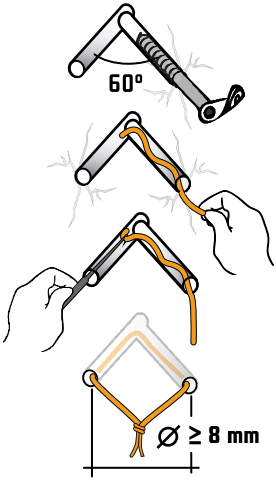
Rappelling from the ice screw
Advanced technique! Suitable only for short rappels and fixed eye screws. Tilt handle may cause tangling to the sling! Only works in short rope lengths!



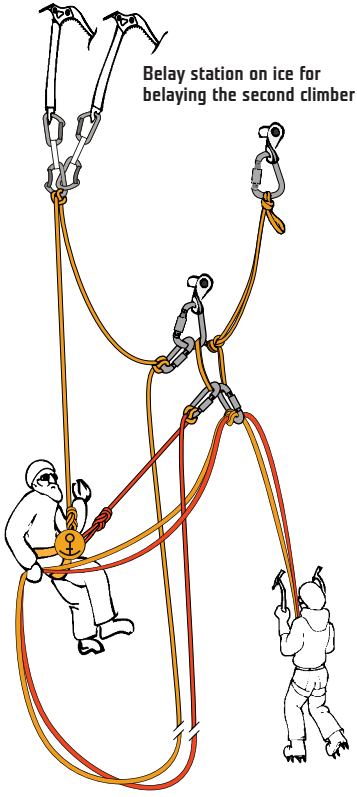
Screwing in the ice screw
Preferably at waist level or slightly above. Screw in a quality ice from a stable position. Screw in the entire ice screw, to the head of the ice screw.

BELAY STATION IN ICE

Abalakov ice anchor
Use the longest possible ice screws (22 cm).

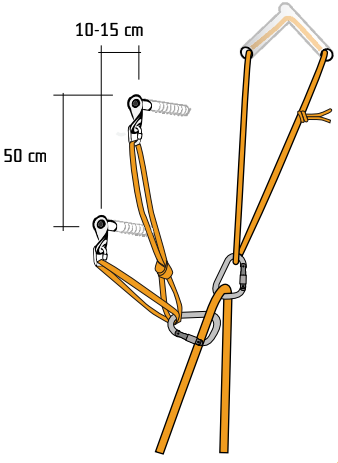


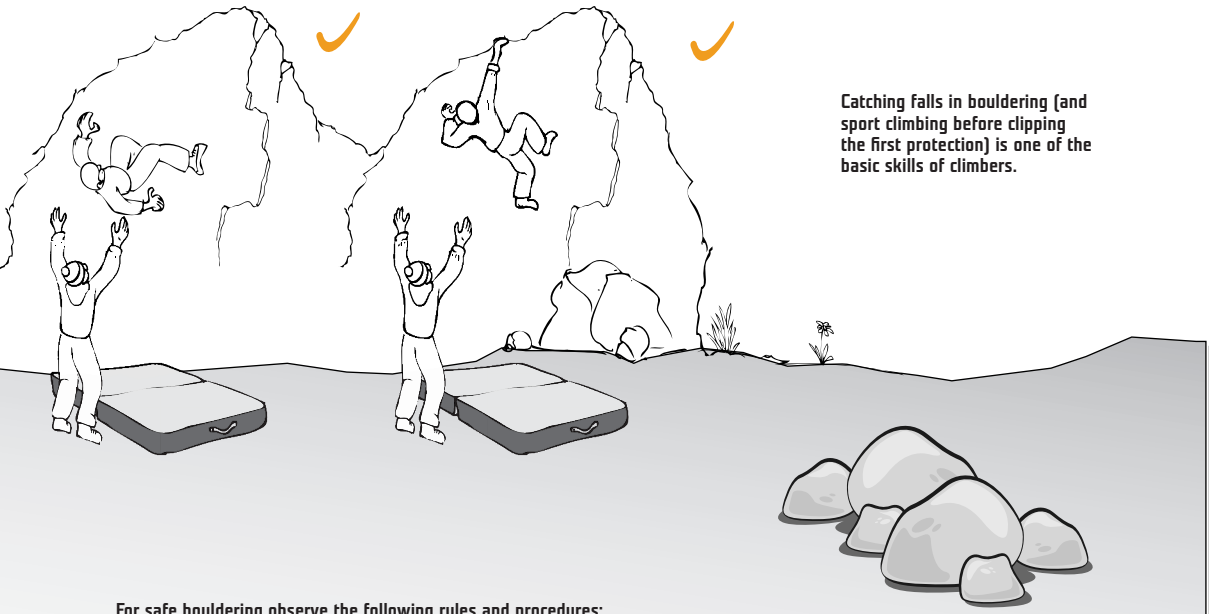
10 cm = 6 kN
15 cm = 10 kN
20 cm = 12 kN



Belay station on ice for belaying the second climber

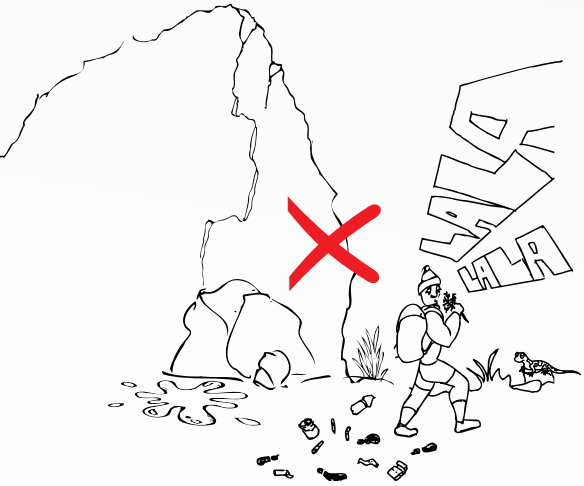
Belay station on ice for top-rope ice climbing
Always use the longest possible ice screws (22 cm) and secure a screw belaying station with an Abalakov ice anchor belaying station.



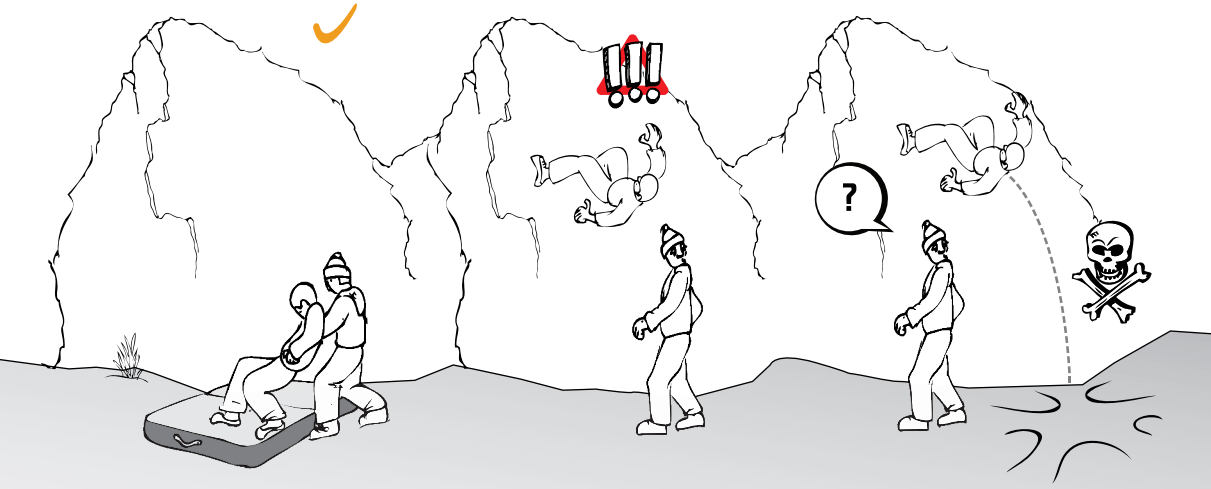


Catching falls in bouldering (and sport climbing before clipping the first protection) is one of the basic skills of climbers.

For safe bouldering observe the following rules and procedures:
Watch the climber constantly.
Two hands are always better than one hand.
Two spoters are always better than one spotter.
Try to rotate the climber before hitting the ground so that he hits the ground legs first.
Bouldering is a social event but when you go bouldering on your own, always let someone know when and where you go.



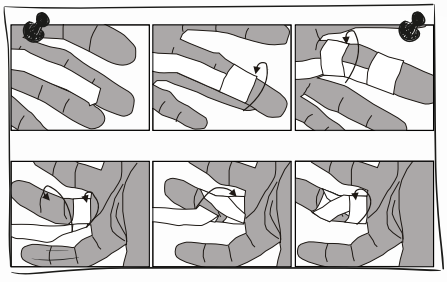
- Do not waste magnesium unnecessarily and clean the holds and marks after climbing.
- Make sure no rubbish is left after you.
- Do not shout, do not break branches
- Use a crashpad, protecting the surroundings of rocks and your ankles
- Make it a habit to bring a first aid kit to the rocks
- Before visiting a new area, find out sufficient information about habits, classification, parking and camping there.



What to bring?

Crashpad
Once eccentric luxury, today inseparable part of boulder-ing. Bouldering mat protects climbers from bad landing, absorbs impact of the body and protects your ankles and back. It also protect the surroundings of rock from erosion. Bouldering mats may seem somewhat expensive but believe us that materials used for their production are not cheap. And most importantly – how much do you value your back?

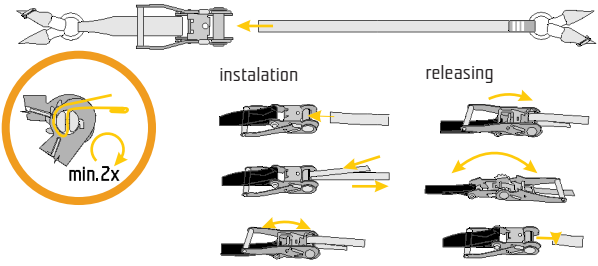
Brushes
Remember that too thick Mg layer decreases friction which the holds provide. Brushes on sticks are suitable for cleaning places out of reach. Never use wire brushes, they damage the rock.



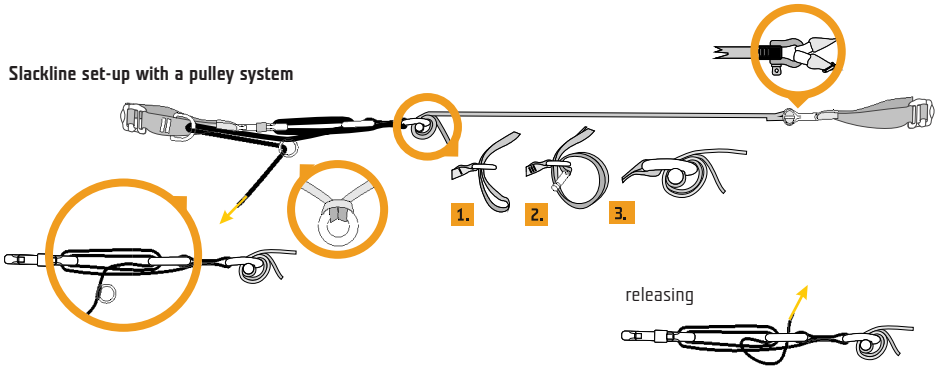
Accessories
- Rug for cleaning climbing shoes
- Tape
- Nail clipper
- Wear the warmest jacket you have – it will not let you get cold and you can warm your climbing shoes under it
- A warm hat is absolutely necessary.

Slackline can be put up virtually anywhere, in the park, garden, rocks, camping place, over the river, etc. Walking on the slackline is the ideal training of balance we can make use of in any sports activity. The surrounding of the slackline, its height and length have a great influence on the difficulty.

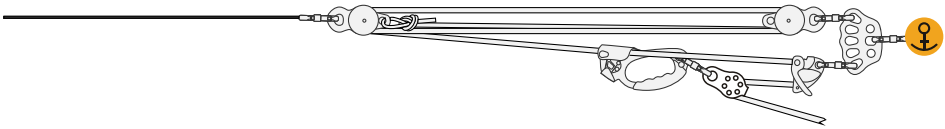
Slackline set-up with a rachet

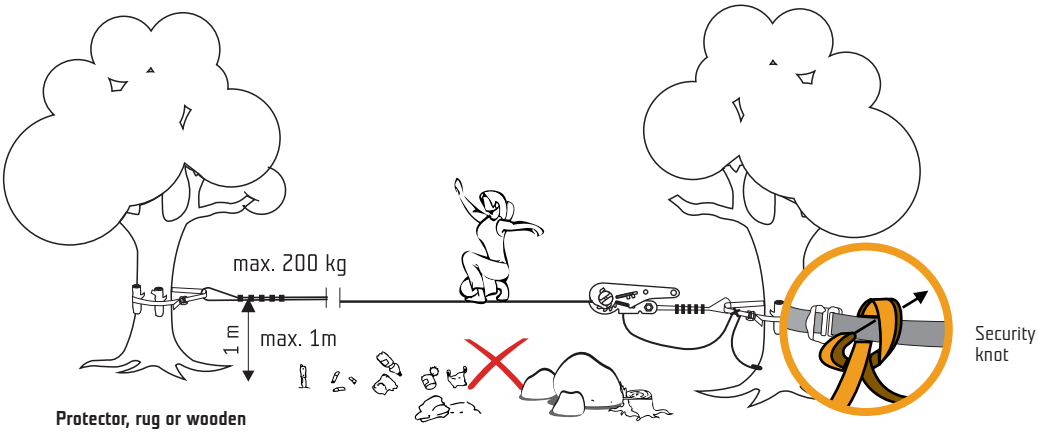


Slackline set-up with a pulley system



Slackline set-up with a pulley system



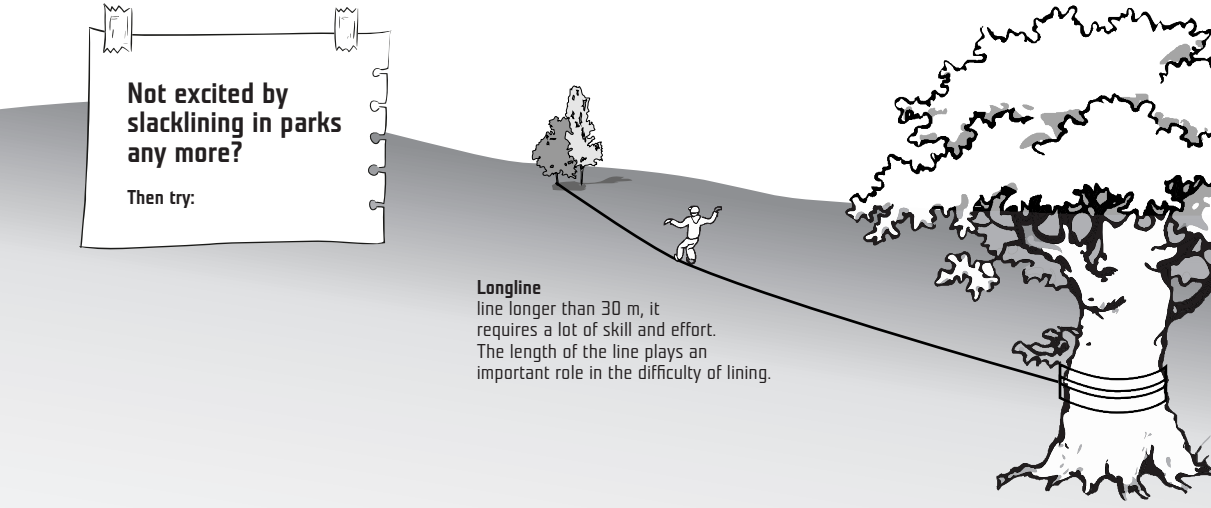


Protector, rug or wooden plugs protect the tree as well as the line from damage.

The ground beneath the line should be even. Remove all dangerous objects from beneath the line.

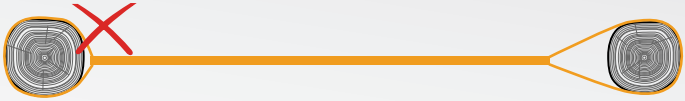
Not excited by slacklining in parks any more?

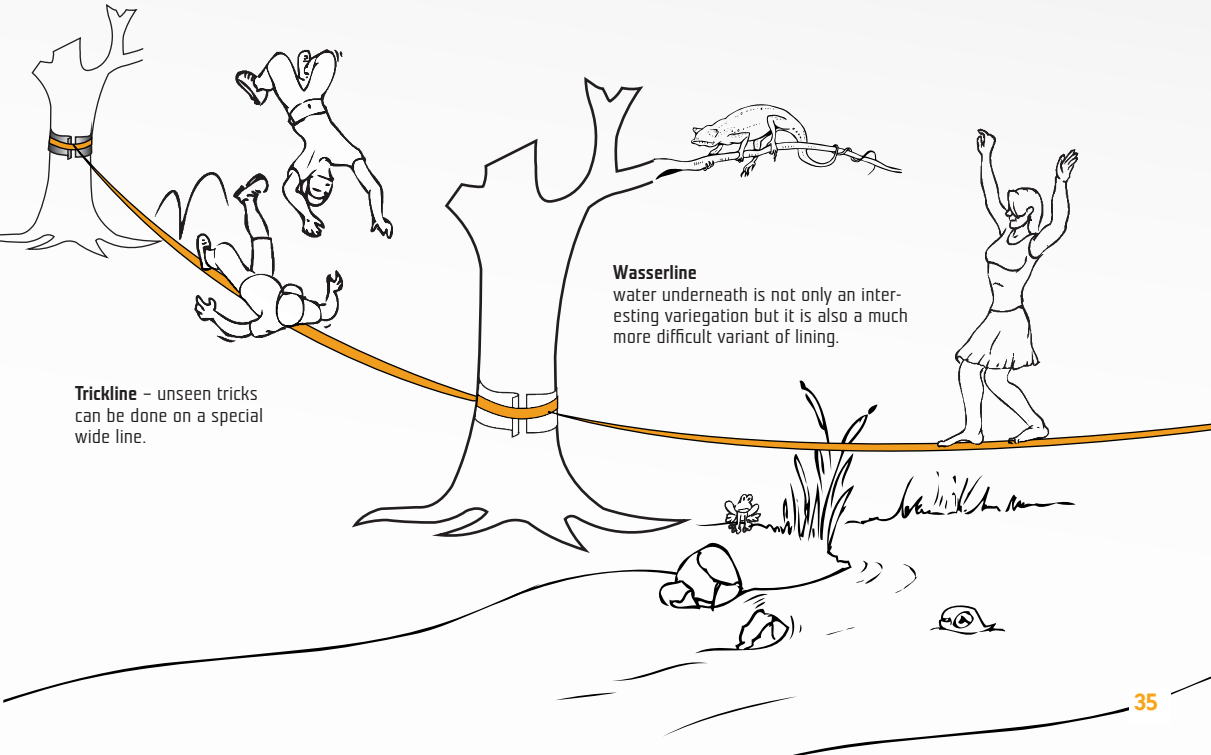
Then try:



Longline
line longer than 30 m, it requires a lot of skill and effort. The length of the line plays an important role in the difficulty of lining.

As in the case of belay station, also for slackline a sharp angle of the anchor point is better in terms of load distribution.

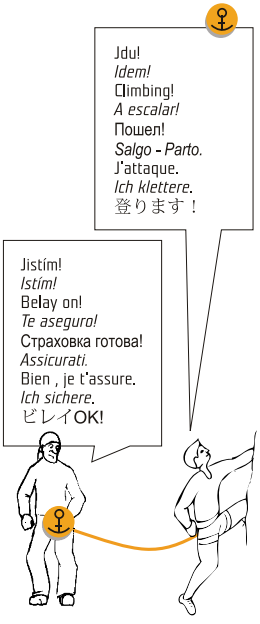


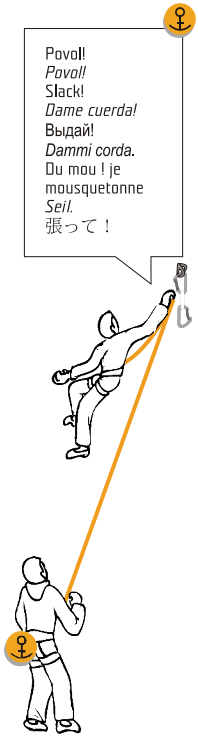


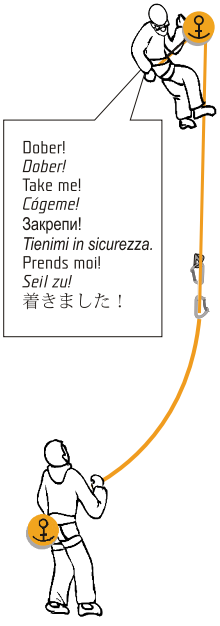
Trickline – unseen tricks can be done on a special wide line.

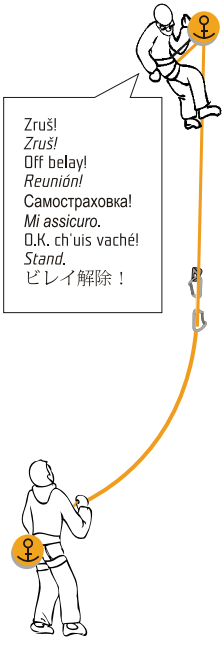
Wasserline
water underneath is not only an interesting variegation but it is also a much more difficult variant of lining.

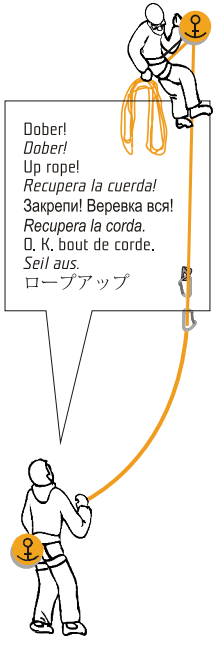
Caution! It you are not 100% sure that your partner has given the command Off belay/Safe, do not off-belay! Double check whether the Off belay command was indeed said. Take the climber off belay only when it is absolutely clear that your partner is secured at the belay station!

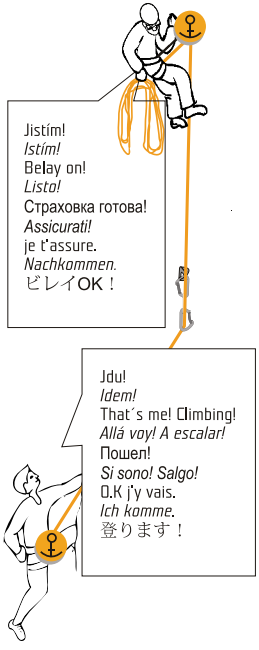












Accessory cord – a cord of diameter 4–8 mm which does not have the properties of a rope.

Aid climbing – advancing on the wall using pitons, friends, nuts and other artificial aids used for ascent as well as belay.

Belay – belay station, anchor point.

Belay system – all mechanical parts of belay, i.e. harness, rope, belay station, protection points (bolts, glue-in anchors, etc.).

Big wall – a very high wall whose climbing lasts up to several days.

Bolt – a protection point anchored in the rock; hanger plate is screwed on a bolt. Quickdraws are clipped in it. Bolts are not for rappelling!

Bouldering – climbing without a rope at the height of jump.

Campus board – an overhang board with horizontal slats designed for strength training.

Chalk – slang. Magnesium for better grip and friction.

Chest harness – for optimised body position when hanging or falling; only to be used together with a sit harness.

Chimney – a rock cleft large enough to fit the climber's body into. To climb such a structure, the climber usually uses opposite pressure on the vertical walls.

Crampons – metal framework with spikes attached to boots to increase safety on snow and ice.

Crash pad / bouldering mat – a portable mattress used in bouldering as protection against injuries from a fall.

Dry-tooling – climbing with crampons and ice axes on a rock without snow and ice.

Fall factor – fall factor determines the hardness of fall. It is calculated by dividing the length of the fall by the active length of the rope.

Friend – mobile spring-loaded camming device used in routes mainly in tradiotional climbing.

Glue-in anchor – a steel securing eye in rock. Quickdraws are clipped in glue-in anchors. It is usually possible to rappel from a glue-in anchor.

Half rope – a thin rope used as two lines. Only one line may be used in each protection point. Used in traditional climbing, on ice and mixes.

Ice axe, Ice tool – a handy tool for safety and balance, having a pick/adze head and a spike at the opposite end of the shaft.

Jumaring – ascending on a rope using hand/chest ascenders held in hand, tied by a sling or carabiner to the harness to the leg.

Multi-pitch route – in climbing walls higher than the length rope; climbers proceed in a rope team from one belaying station to another

Nuts – metal pyramidal objects of different sizes used as mobile protection points. Suitable for narrow chinks.

Pitch – the distance between two belay stations.

Piton – a mobile anchor and belay device hammered into cracks and joints in traditional climbing.

Protection point – any point that catches a fall of the leader (glue-in anchor, bolt, friend, nut, piton, thread, etc.).

Quickdraw – connecting element (2 carabiners connected by a sling) between the rope and stable protection points.

Ring – a protection point anchored to the rock (mainly on sandstone) used mostly for rappelling or lowering.

Route – a climbing line of any distance.

Single rope – the only type of rope used to belay the leader with a single line of rope. Used mainly in sport climbing.

Thread (Wormhole) – two holes in rock or ice connected by a channel. Passing through a sling creates a protection point or a belay station.

Topo – a schematic plan of a route

Tube – belay device used mainly in belaying in sport climbing.

Twin rope – a thin double rope, 7.5–8 mm Both lines are inserted into protection points.

Let's rock!

Emergency

112
EU countries

911
most of North America

999
(e.g. UK, China or some African countries)

Most GSM phones have pre-programmed calling to these numbers even in case of insufficient credit and some even without a SIM card.

FIRST AID

Find out the state of consciousness of the injured. It is very important to thoroughly inspect the injured and exclude the presence of massive bleeding.

If irresponsive to verbal or painful stimulus, focus on the presence of basic life functions:

Breath: If not breathing, tilt the injured person's head back and check and release oral cavity.

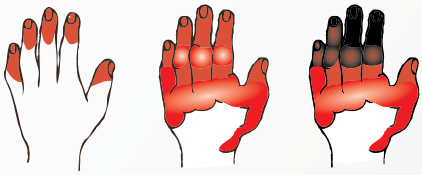
Pulse: If impalpable, initiate cardiac massage. Put backs of hands of your crossed arms with elbows stretched on the breast-bone in the intersection of the line between the nipples and the centre of chest.
For 30 compressions of chest breathe in twice. Compress the heart approximately 100x/min.

Artificial respiration: Press the nose with thumb and forefinger, open the injured person's mouth with your lips and breathe in.

The key is prevention

It is necessary to be at least in a 2-head team when going climbing or doing other sports. Always be physically well prepared. Have a charged mobile phone and a first aid kit handy.

FROSTBITES

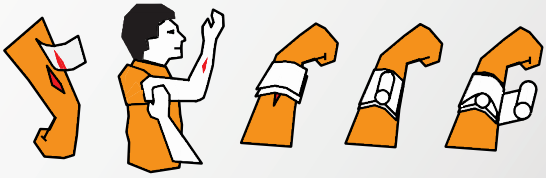


1st degree 2nd degree 3rd degree

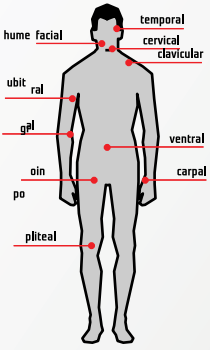
Systematically warm up frostbitten parts of body, remove rings, watches, etc. Frostbitten parts of body must not be rubbed as this could damage the tissue.

First aid for bleeding

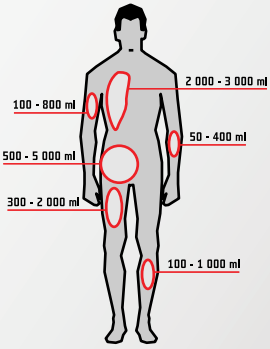
Perform wound toilet and wipe edges with disinfection.
If it is a massive haemorrhage, create a pressure bandage.
If blood splashes in a pulse rhythm, raise the limb above heart level. Press the pressure point and attach a sterile cover.
Fix the pressure layer by a bandage and tighten the whole bandage under moderate pressure
= **PRESSURE BANDAGE**



Pressure points



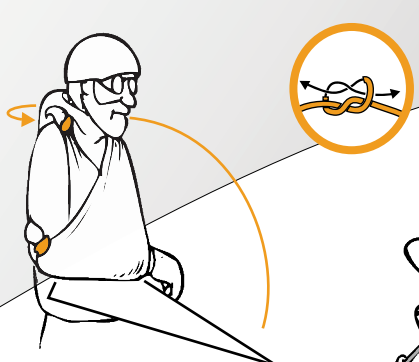
Blood loss



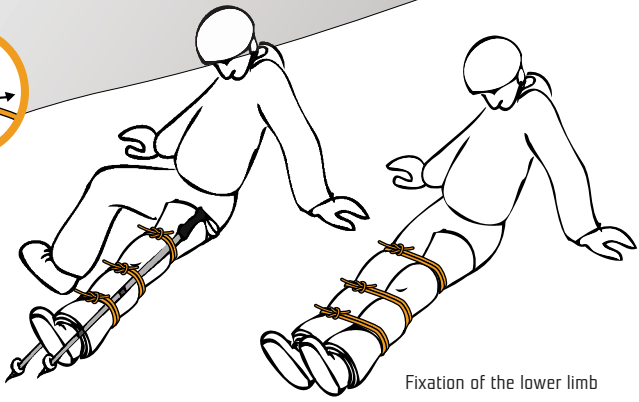
Strangulation

Write down the time of strangulation

Fixation of broken limbs



Fixation of the upper limb



Fixation of the lower limb

ALTITUDE SICKNESS: BASIC RULES

Never keep ascending with symptoms of altitude sickness!
(shortness of breath, rapid heartbeat, weakness)
Stop until the symptoms disappear completely.
If you are feeling worse, descend immediately!
Do not wait until the morning! Descend to the altitude where you last felt well after waking up.
Never leave a person with altitude sickness alone!

ACCLIMATIZATION AND ALTITUDE SICKNESS

A few rules

"NOT SO HIGH"
no more than 300–400 meters of altitude / day stay for 2 nights every 1000 meters of altitude

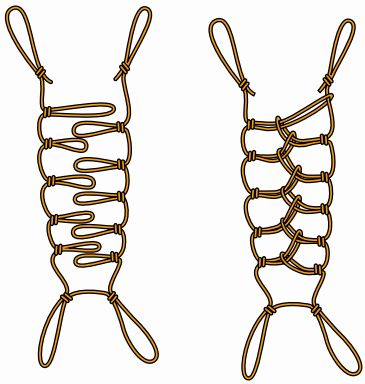
"NOT SO HIGH"
proceed slowly and smoothly in acclimatization

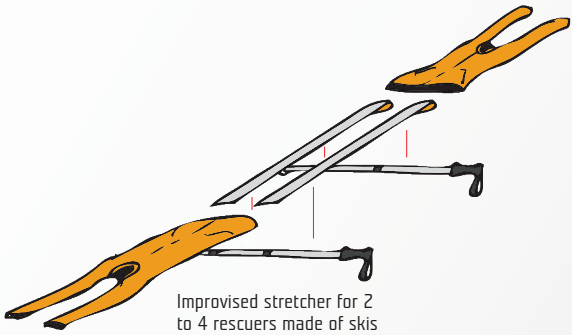
"CLIMB HIGHER, SLEEP LOWER"
ascend additional 100–200 meters of altitude above the camp return and stay for the night

"LISTEN TO YOUR BODY"

EMERGENCY PROCEDURES,
transport

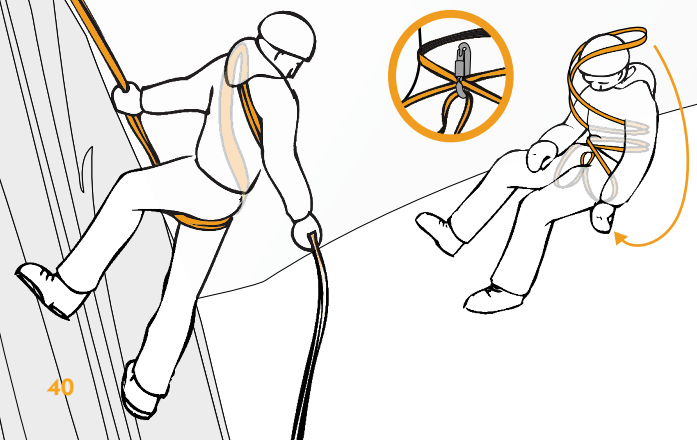
Improvised stretcher for 2 to 4 rescuers made of a rope



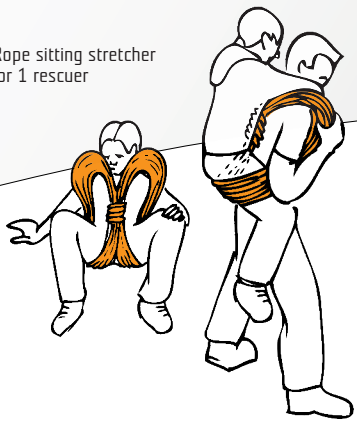


Improvised stretcher for 2 to 4 rescuers made of skis

Improvised harness from a 150-cm sling
If the person is unconscious, add a chest harness



Rope sitting stretcher for 1 rescuer

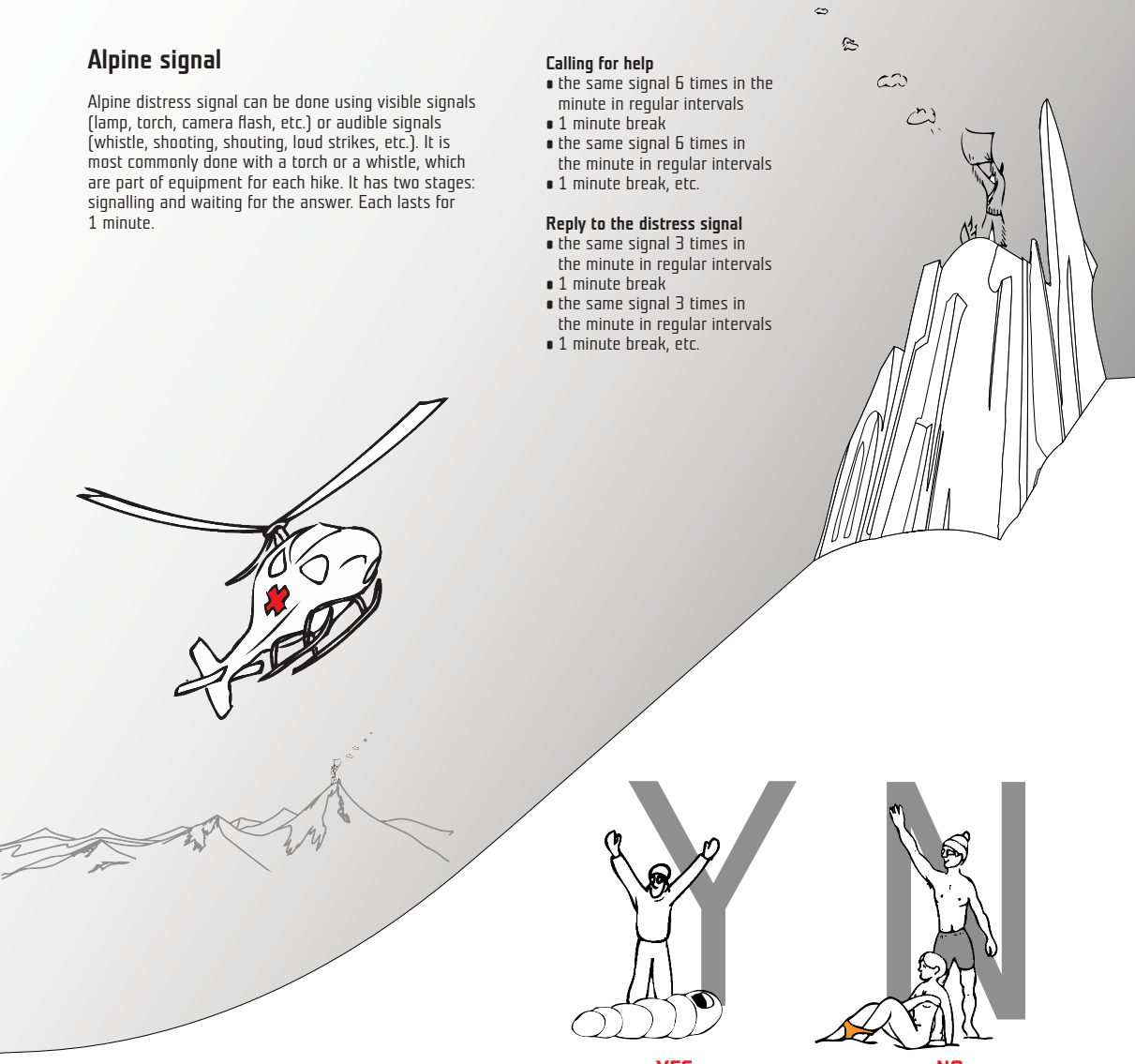


Alpine signal

Alpine distress signal can be done using visible signals (lamp, torch, camera flash, etc.) or audible signals (whistle, shooting, shouting, loud strikes, etc.). It is most commonly done with a torch or a whistle, which are part of equipment for each hike. It has two stages: signalling and waiting for the answer. Each lasts for 1 minute.

Calling for help
- the same signal 6 times in the minute in regular intervals
- 1 minute break
- the same signal 6 times in the minute in regular intervals
- 1 minute break, etc.

Reply to the distress signal
- the same signal 3 times in the minute in regular intervals
- 1 minute break
- the same signal 3 times in the minute in regular intervals
- 1 minute break, etc.



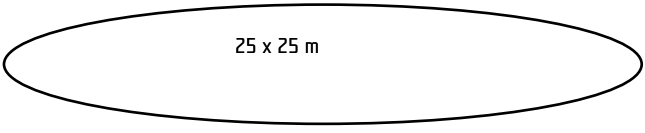
YES
we need help

NO
we do not need help

Behaviour when a helicopter is used

- draw attention to yourselves (we are here)
- clearly mark the hiding place
- when you hear the helicopter, form letter Y with your arms
- stand with your back to the wind, heading to the landing area
- properly secure all loose items in the lace of landing (clothing, backpacks, etc.)
- approach the helicopter only after the rotor has stopped or if instructed so by the crew

Follow the instructions of the crew!



TEN RULES FOR SAFE CLIMBING

1. Quality equipment
Use only certified and for the certain activity recommended equipment whose history you know and read carefully the instructions for use.

2. Warm up before climbing
Stretching and warming-up protects your joints, ligaments and muscles from injury.

3. Partner check
Before every route check with your climbing partner: tying knot, locking of harness, placing of the rope in the belay device, placing the carabiner in the belay loop, screwing of the locking mechanism of the carabiner, and finally securing the rope with a knot at the end.

4. Pay full attention to belaying
You have your climbing partner's life in your hands. Therefore grip the braking line of the rope in hand at all times and watch out constantly.

5. Correct position of the belayer
Choose the right place for belaying and watch whether your climbing partner does not deviate from the route.

6. Communicate
Always let your partner know what is going on. Always inform your partner before sitting out to the rope or before expected fall. The belayer also has to inform the climber if some complications in belaying occur.

7. Be careful when passing the rope through
You can only lower your partner from anchor points, from a carabiner with a locking mechanism or from two quickdraws facing opposite each other. One quickdraw in the anchor point is not sufficient. It is forbidden to hang the rope to a carabiner or ring which is already occupied by another rope. Friction of ropes may cause their damage or breakage.

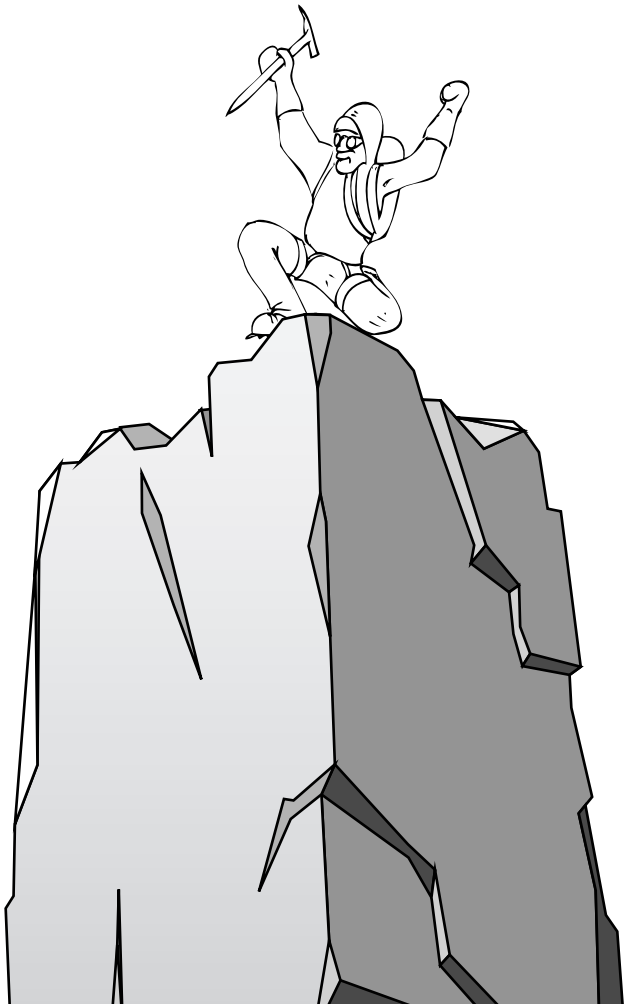
8. Protect your head
A helmet protects against head injuries caused by uncontrolled fall or falling rocks. Keep a safe distance from climbers in neighbouring routes. Helmet in the bag is useless!

9. Be considerate
Wait until your route is free. Respect other climbers, inform them of danger and mistakes you have seen. Observe prohibitions and restrictions in the area where you are.

10. Think of the environment
Behave to the rock, mountain and nature not to devastate them. It is only up to us in what environment we and those who come after us will be.
The weather is also very important factor. Check carefully the weather forecast - especially in the mountains before you go climbing or just for a hike.

Climbing is a risky sport. Without adequate mastering of the belaying technique and use of appropriate equipment there is a risk of fall, injury and in the worst case even death.

The safety during climbing is not only dependent on the gear and climber's experience. Very important factor is also a weather. That is why before you go climbing or to the mountains, check carefully the weather forecast and consider the risk coming from the sudden weather changes mainly in the mountains.



NOTES

GRADE TABLE

UIAA	France	sandstone	USA
5-	4c	V	5.5
5	5a	VI	5.6
5+	5a	VI	5.7
6-	5b	VIIa	5.8
6	5c	VIIb	5.9
6	5c	VII	5.9
6+	5c+	VIIc	5.10a
6+/7-	6a	VIIc/VIIIa	5.10a
7-	6a+	VIIIa	5.10b
7-/7	6a+/6b	VIIIa/VIIIb	5.10b
7	6b	VIIIb	5.10c
7/7+	6b/6b+	VIIIb/VIIIc	5.10c
7+	6b+	VIIIc	5.10d
7+	6b+/6c	VIIIc	5.10d
7+/8-	6c	VIIIc/IXa	5.11a
8-	6c/6c+	VIIIc/IXa	5.11a
8-	6c+	IXa	5.11b
8-/8	6c+/7a	IXa/IXb	5.11b
8	7a	IXb	5.11c
8/8+	7a/7a+	IXb/IXc	5.11c
8+	7a+	IXc	5.11d
8+	7a+/7b	IXc	5.11d
8+/9-	7b	IXc/Xa	5.12a
9-	7b/7b+	IXc/Xa	5.12a

UIAA	France	sandstone	USA
9-	7b+	Xa	5.12b
9-/9	7b+/7c	Xa/Xb	5.12b
9	7c	Xb	5.12c
9/9+	7c/7c+	Xb/Xc	5.12d
9+	7c+	Xc	5.12d
9+	7c+/8a	Xc	5.13a
9+/10-	8a	Xc/XIa	5.13a
10-	8a/8a+	Xc/XIa	5.13b
10-	8a+	XIa	5.13b
10-/10	8a+/8b	XIa/XIb	5.13c
10	8b	XIb	5.13d
10/10+	8b/8b+	XIb/XIc	5.13d
10+	8b+	XIc	5.14a
10+/11-	8b+/8c	XIc/XIIa	5.14a
11-	8c	XIIa	5.14b
11-	8c/8c+	XIIa	5.14b
11-/11	8c+	XIIa/XIIb	5.14c
11-/11	8c+/9a	XIIa/XIIb	5.14c
11	9a	XIIb	5.14d
11/11+	9a/9a+	XIIb/XIIc	5.14d
11+	9a+	XIIc	5.15a
12-	9b	XIIIa	5.15b
12	9b+	XIIIb	5.15c
12+	9c	XIIIc	5.15d

Warning:

Activities at height such as climbing, via ferrata, caving, rappelling, ski-touring, rescue, work at height and exploration are dangerous activities, which may lead to severe injury or even death. Thus the following is essential before use: careful reading and understanding of the instructions for use acquaintance with the possibilities and limitations of the product adequate apprenticeship in appropriate techniques and methods of use understanding and acceptance of the risk involved. In case of doubt or problem of understanding, contact SINGING ROCK.

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This information is not complete.
Take time to read also instructions for use which are part of each Singing Rock product and to practical training.

CLIMBERS FOR CLIMBERS