Module 8 - Braking & Belay

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9.1 The Chain of Safety

Abseiling has many complex parts and has many interlinking pieces. Each link in the chain depends on the other links for support, with the whole system being as strong as the weakest link.

The five parts to this chain are:

Rigging
Rope
Harness
Abseiling device
Abseiling technique

Regardless of the Abseiling device used, there is a way to Abseil correctly. Being able to Abseil does not mean doing it correctly, you may just have been lucky not to hurt yourself. Knowing what to do and doing it correctly is the essence of style. A smooth technique puts less strain on the system. Less strain means greater safety. To develop the style, we should go through the pre-jump checklist:

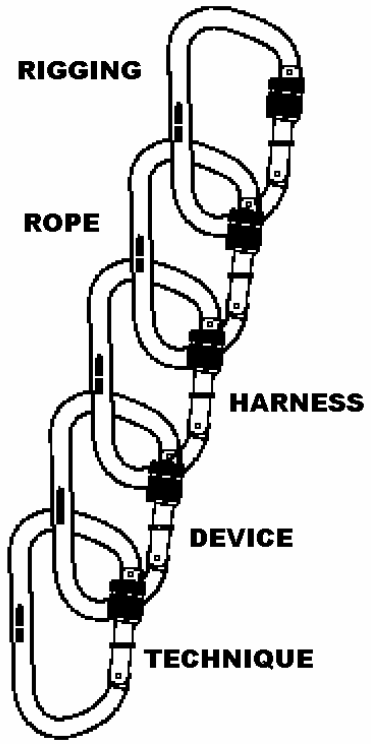

fig 8.1 The Chain of Safety

1. Check for loose clothes or hair that might get caught in an abseiling descender.
2. Place any extra gear on your off side (the side opposite the control hand/hip side.)
3. Helmet and gloves on?
4. Helmet chinstrap tight and excess strap tucked away?

   Check the chain:

Rope	- Is it in good shape?
Rigging	- Safe and Sound?
Harness	- Fitted and adjusted correctly?
Abseiling Descender	- Rigged correctly?
Technique	- How will the jump be negotiated?

5. Signal the intention to start the descent
6. Start the descent.

9.2 Braking & Belaying

One of the most important but quite often overlooked areas of abseiling is braking and belaying. This part of Abseiling in most definitely a skill, which takes time to learn and perfect. Many people see the Brake or Belay component as an unimportant role and are tempted to allow people with a few jumps to take control of each other on an open jump.
Don't fall into this trap, bad Break and Belay techniques cause almost all of the normal operational accidents on a site. The inability to correctly stop, hold and lower

participants requires experience, and this takes time to develop.

Although both the Braking and Belaying activities are similar, in that they relate to the control of an Abseiler on line, they differ in that:

Braking:
Control of an Abseiler while on line by applying pressure to the Abseilers line while they descend. Control of the line is from the base of the abseil.

Belay:
Controlling of a safety line attached to personnel or equipment as a backup in case of primary line or Abseiler failure / problem. Can also be belayed via primary line. Control of line is normally from the top of the abseil.

In either situation, on a natural cliff site certain precautions need to be understood and addressed. These relate to safety issues and include equipment, techniques and the Rockfall Zone.

All levels of Abseiling Leader undertake braking and belaying and no one is exempt form the process. At no time should this job be relegated solely to Assistant Abseiling Leaders as they are actively increasing their skill levels and are not a general 'dogs body' destined to undertake all the unwanted jobs.

Further, there is a skill level involved in this activity on the same scale as experienced Abseilers. In that, once experienced one can discern the feel of a descent as apposed to a fall through touch as well as sight. Only experience allows for the **SAFE** control and brake of participants were the correct amount of 'slack' line is allowed and the participant in a problem situation is controlled without injury.

9.3 Equipment Braking or Belaying

Equipment for either Braking or Belaying is similar. The Abseiler requires no additional equipment as the gear relates to the Brakeman or Belayer. In that the general safety gear includes:

- Helmet
- Prussic Cord
- Abseiling Rope
- Gloves
- Harness, and personal equipment
- Belay or Descent device (Sticht Plate, Figure 8, Karabiners, Mechanical Belay Devices, Italian/Munster Hitch)
- Additional Line (for Belay purposes normally)

9.4 Braking

Braking is the Control of an Abseiler while on line by applying pressure to the Abseilers line while during the descent. Control of the active line is from the base of the abseil..

As discussed earlier, the responsibilities of the Brakeman are:
1. Supervises the descent of participants on their line.
2. Ability to apply the brake to assist a student, if difficulty arises.

3. Supervises the removal of the line from the descender.
4. Notifies the Jumpmaster that the line is clear.
5. Supervises the clearance of people from the Rock Fall zone.
6. Control the Rock Fall zone and base of site.

During abseiling, the Brakeman at the bottom or base of the cliff can effect or control a descent by applying pressure or pulling down on the abseiling rope. This increases the friction in most abseiling descenders (beware of Rappel Racks / Brake Bars / Stop devices). If an Abseiler were to be injured during a descent and unable to control their descent, the Brakeman can easily stop their descent and in some cases lower the Abseiler to the ground dependant upon the actual cliff face. Many people view the job of Brakeman as a waste of time and quite boring. The job is important and has to be done, if a situation arises, the Abseilers descent should stop immediately, they should travel **no more than 1 metre** once the problem occurs.

The Brakeman should be able to 'feel' the speed of the decent through the rope apart from simply watching the Abseiler. It is up to the Brakeman to ensure that the speed of descent is not to fast and to slow people down where they go to quickly so as to exceed their level of control.

The Brakeman is one of the lynch pins in site safety, which is why they must be an Assistant Abseiling Leader or higher. The control a good Brakeman has allows them to slow, lower, hold and control any descent.

In holding a participant, the tricks of the trade as it where are simple and some go back to top belay methods. Using a device to control a lower, such as a whaletail, figure 8 or such, or simply running the rope around your back and using your weight and both hands to control a difficult situation are common place to the experienced Brakemen. Be warned that to ensure a smooth descent under device aided lowering requires practice, as most people use a Figure 8 which caused a jerking in the descent unless practiced.

The other important factor is knowing how much slack to allow, to little and you brake the Abseiler throughout their descent. Most Abseiler are intolerant of being 'held-back' and feel that you slow them up for no reason, the flip side is of course too much slack. With a lot of slack, you won't be able to arrest a fall if it happens, you need to judge how much line to give the Abseiler. If you do succeed in stopping their freefall, they will be suffered an accelerated stop which can cause injury. Abseiling rope is static, as such it has little or no give.

Generally, if you have the line just off the cliff face, resting in your hand on it without pressure is about right. Pulling it in will restrict the descent, and letting it out means you lose any hope of control. You need to find the sweet spot, again, experience is the best teacher.

As Abseiling Leaders, you are required to have the skills and experience to control all Braking situations. Your level of experience should be sufficient so that you can pass on the correct procedures to other intending to become Brakemen.

The hardest part of braking is to hold or lower a person with full control, this is then complicated if you are working two lines, one for a participant and the other for an Abseiling Leader. Don't be afraid to ask for help. Get the other Brakeman to close down

their line and help out, or get another Assistant or Abseiling Leader to give you a hand. With practice it will become second nature and you will know how to cope with the various situations that occur out on a cliff.

The holding and lowering techniques above may not work for everyone, but irrespective, trying to hold with one hand, various mechanical devices and long term techniques are key. The correct way to apply the brake is simple, try to avoid the sudden jerk on the rope, this can cause injury in its own right. Applying controlled pressure will slow and stop a descent easily, putting less stress on the rig, yourself and the Abseiler.

9.4.1 Long Term Braking

There are a number of ways to lessen the strain of holding a brake for an extended period of time. The two main methods are to use your descender, pull up the slack, lock off and sit. Strange but it works, however make sure you don't swing the Abseiler or pull them from the wall. The second way is to pass the rope behind your back under your armpits. Holding both ropes in your hands out in front. Remember always, that to control the descent of an Abseiler requires that the Brakeman stand in the Rockfall zone. Every precaution should be taken, such as wearing a helmet and standing to one side of the rope, or back from the cliff. Give yourself every chance as an injured Brakeman can't help a falling Abseiler, you must however always be in a position to do the job properly, if you aren't someone will probably suffer some injury.

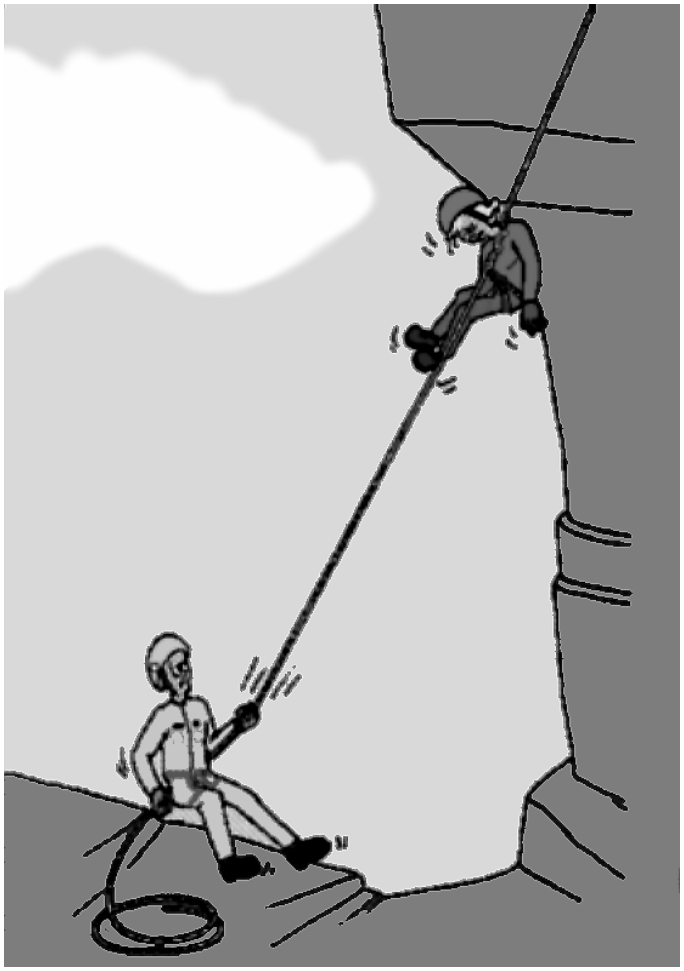

fig 8.2 Holding as a Brake

9.4.2 Braking Techniques Summary

Control the amount of slack allowed to lessen possible 'fall' distance. However, allow sufficient line for the Abseiler to descend at their choice of rate
Don't rely on arm strength, use friction techniques such as bringing the line around your back or under your shoulder blades and using the off hand to handle heavy or long-term holds.

Use your descent device to assist in holding the Abseiler for long terms. Lock into your device and sit taking up all strain on the harness. On release take hold of the line before standing, release pressure slowly to avoid any slippage. Utilise others nearby to assist if required.

Practice control and slow lowering of Abseilers on line. Control and techniques are the key, not physical strength.

Practice control of twin lines and using your off hand. Increase your skill levels
Do not allow yourself to be distracted while an Abseiler is on line
Maintain safety of the base of the cliff and understand the 'shatter bounce' theory of the Rock-Fall Zone.

9.5 Braking Calls

There are often variations in the calls used by various groups or parties. However, the following is the list of recommended calls as used with the Scout Association for Abseiling activities.

Call	Called By	Meaning
READY (Ready on Line #)	Jumpmaster	Confirmation of Brakeman ready
ABSEILING	Jumpmaster	Participant is beginning Descent
HOLD	Jumpmaster	Brake on Line
BRAKE	Jumpmaster	Brake on Line
HOLD	Participant on Rope	Brake Me, Stop my descent
BRAKE	Participant on Rope	Brake Me, Stop my descent
HEADS	Jumpmaster	Rock / Item Dislodged and falling
ROCKS	Jumpmaster	Rock / Item Dislodged and falling
CLEAR	Brakeman	Line Clear
CLEAR ON '#'	Brakeman	Specific Line is Clear
OK	Either	Acknowledgment

Table 8.1 Braking Calls

9.6 Belaying

Controlling of a safety line attached to personnel or equipment as a backup in case of primary line or Abseiler failure / problem. Can also be belayed via primary line. Control of line is normally from the top of the abseil.

9.7 Belaying Calls

There are often variations in the calls used by various groups or parties. However, the following is the list of recommended calls as they fall within the province of most recreational and professional groups and cover most belaying activities.

Call	Called By	Meaning
ON ROPE	Participant on Rope	Ready to Move
READY	Belayer	Acknowledgment
HEADS	Belayer	Rock / Item Dislodged and falling
ROCKS	Belayer	Rock / Item Dislodged and falling
TAKE IN	Participant on Rope	Take up Slack in rope
THAT'S ME	Participant on Rope	All slack rope in taken in
SLACK	Participant on Rope	Provide some slack in rope
MOVE WHEN READY	Belayer	Belayer ready, move when ready
MOVING	Participant on Rope	Starting to move now
HOLD	Participant on Rope	Lock belay and support my weight
BRAKE	Participant on Rope	Lock belay and support my weight
CLEAR	Participant on Rope	Belay no longer required, line clear
OFF BELAY	Belayer	Belayer finished, no longer operational
OK	Either	Acknowledgment

Table 8.2 Belay Calls

Belay calls as with all calls given in a dangerous activity must be given clearly and concisely so that each party knows what is happening. They must also not be run together as this can cause confusion. Each call given should be responded to. The response of 'OK' is normally used.

9.7.1 Belaying Terminology

Two additional terms that are used in Belaying refer to the safety line:

- **Active Rop**e: This is the line working between the participant and the Belayer, controlled by the Belayers **active han**d.
- **Inactive Rop**e: This is the spare rope already taken up or ready to be paid out, and controlled by the **inactive han**d.

9.8 Basic Belaying Principals

As with all systems used in Abseiling, there are basic principals which apply to the safe working and operation of a Belaying system, these principals must be observed:

- The system must be anchored separately from the primary descent anchor
- The Belayer must be anchored to another system, independent of the belay and not tied into the belay system itself.
- The Belayer must be closely positioned, however clear of the primary system, and
- The Belay system should be set-up as close to the working line of the primary system to as to avoid and minimise rope angle changes.

9.9 Management of a Belay

As with most activities in Abseiling, the Belay component has a requirement of the way the rope or line is handled. In bottom Braking techniques enough slack is allowed so as not to impede the descent of the participant on line. Similarly in Belaying, there is a minimum of slack, while not actually supporting the participant enough needs to be left to allow freedom of movement, unless of course you are

lowering on Belay.
The next item of management is the choice of equipment to allow the control of the Belay. Primarily a belay is made using one of the devices designed specifically for that purpose. Examples of these are:

9.10 Rockfall Zone

The Rockfall zone is an area where anything dropped from the top, or knocked lose by the Abseiler will land. The zone has two parts, the 'Fall Area' where items falling directly down will land, and the 'Shatter Bounce Area', which covers where any item may land which bounces against the rock face on the way down, or simply keeps going when it first hits the ground. Normally the Rockfall zone refers to rocks or other items, such as gear, cameras and equipment that may be dislodged and go over the cliff edge, or rocks, stones and twigs kicked lose by an Abseiler. A safe area away from the Rockfall zone is equally difficult to define. If a shaft is narrow, rocks tend to ricochet back and forth as they fall, complicating our ability to define the Rockfall zone. Large open spaces actually provide more predictable Rockfall zones as there is little for items to ricochet off.

Since the largest number of cliff site accidents are from Rockfall, keep the Rockfall zone clear of any bystanders and ensure that someone landing, is clear before the next Abseiler starts down. If not working as a Brakeman yourself, keep clear of the Rockfall zone whenever possible:

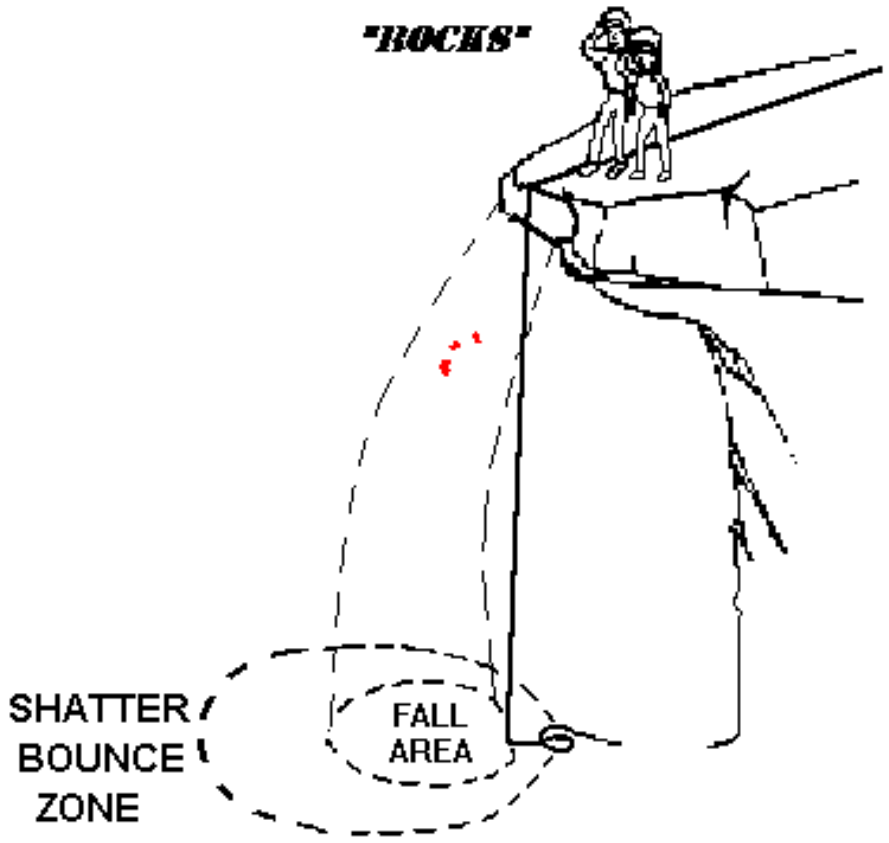

fig 8.3 Safety at and for the Base of a Jump Site

After completing a descent, remove everyone (and yourself if not braking) away from the Rockfall zone immediately.

While others are descending and you or others want to watch, keep clear of the Rockfall zone.

Keep away from the edge, to avoid the possibility of dislodging a rock.

Be cautious, stay alert, and respond to the emergency warning, **"ROCKS"** or sometimes **"HEADS".** If heard, **DON'T LOOK UP!** Put your head down and pull in your shoulders.

Be extra cautious not to dislodge anything during an ascent or descent. If anything is accidentally dropped, immediately shout the alarm, "ROCKS!!!!!". If half the cliff face falls away, let the Brakeman know to get out, with really big rocks or slabs of rocks falling, you wouldn't want to be under it, so tell them.

Since the largest percentage of vertical accidents are from Rockfall, keep clear of the Rockfall zone whenever possible. Remember the following points:

- After completing a descent, remove yourself from the Rockfall zone immediately.
- While others are descending, keep clear of the Rockfall zone.
- Keep away from the edge, to avoid the possibility of dislodging a rock.
- Be cautious, stay alert, and respond to the emergency warning, "ROCKS".
- Be extra cautious not to dislodge anything during an ascent or descent. If anything
- is accidentally dropped, immediately shout the alarm, "ROCKS!!!!!".

9.11 Equipment *Techniques*

The Abseiler requires additional equipment compared to the Brakeman or Belayer. In that the general safety gear includes:

- Helmet
- Prussic Cord/s
- Slings
- Abseiling Rope
- Gloves
- Harness, and personal equipment
- Descent device (Figure 8 Descender/s, Spare Karabiners, Mechanical Descent Devices, Variable or Non-Variable Friction Device)
- Additional Line (for Line Transfer purposes)
- Additional gear for an Abseiler about to descend:
- Choice of Descender for site
- Additional Karabiner/s
- Possibly additional descenders for line transfers
- Rescue Knife / Shears (conditional)

9.12 Self Belaying

A Prussic knot can be used as an optional safety device, to prevent accidental falling. The Prussic knot is positioned on the abseiling line above the figure 8 descender and connected to the karabiner attached to the harness. The Abseiler will then place their hand above the Prussic knot and drag the knot down as they go. It is ideal for use on long descents where a brakeman may be ineffective.

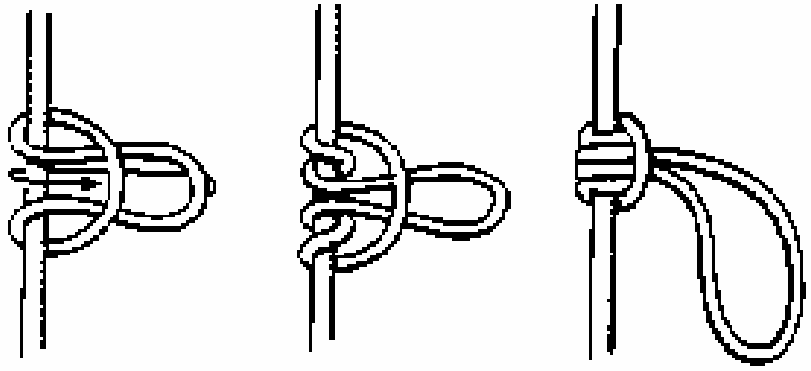

fig 8.4 The Prussic Knot

The one disadvantage of this system is when a student slips and the Prussic knot grips tightly, the student cannot raise themselves up to loosen the Prussic knot to continue.

9.13 Prussicing

(see: Module 6, Knots & Ropework specifically Prussic Knot, French Prussic, Kleimheist and Backmann.)

This is the term used to describe the way in which to ascend a fixed rope using loops of cord, one for the foot (one for the other foot, if no cliff face to help the climb up) and one to the harness. You will need to experiment with the lengths of loop that you use, but as a rough guide, the loop to the harness should be about 500mm (20 inches) long and the one for the foot should be about 1.25 metres (4 feet). The standard Prussic knot is fine for Prussicing, but on wet or muddy ropes, you may need to increase the holding power by adding in more turns. Only one loop is moved at a time. The loop connected to the harness should always be above the foot loop for safety reasons.

9.14 Mechanical Rope Ascent

There are many mechanical devices available for ascending fixed ropes. Most mechanical ascenders come in pairs, one left-handed and the other right handed. There is a ring cast into the bottom of the device for attaching of a tape sling. This sling is cut and tied to length to suit the individual. A sling may be attached to both ascenders, but the usual and most efficient method is to use only one sling. The other ascender is attached directly to the karabiner attached to the harness. Both ascenders are then attached to the rope, with the ascender with the sling placed above the other ascender connected to the harness. The relevant foot is placed in the sling and the ascender is moved up as far as the arm will allow. Weight is now applied to the rope, through the ascender, by standing in the sling. Simultaneously, the other ascender attached to the harness, or a chest harness is moved up the

rope until just below the weighted ascender. This procedure is continued until the desired height is attained. With practice, this is a very rapid and safe method of gaining height, but it must be remembered that the rope must be fixed in the first place.

Used properly, an ascender should last many years. However if dropped on a hard surface hairline cracks may appear, rendering the ascender useless. Care as for karabiners and descenders, and there should be no problems.