

Sitka Mountain Rescue Team  
Technical Standards  
1-15-91 adopted  
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1. Knots and Hitches:

Many different types of knots are available for use in mountain rescue operations. Our emphasis is safety and simplicity. The fewer type of knots that are used, the easier it is to set systems up. Thus, variations of the figure eight knot (the single, the double, the modified, etc.) remain the mainstay of the knot standards listed below.

Tying into harness loops: Use a follow-through figure eight knot

Tying into the end of a rope: Use a modified figure eight (nonrescue loads) or a double figure eight for rescue loads.

Tying two ropes together: Use a figure eight knot with ends parallel. Leave 6” tails.

Mid-rope tie-in: Use a modified figure eight.

Adjustable tie-offs: Use a clove hitch for either mid or end of rope situations, but back up the system by tying a figure eight knot into the rope and clipping it into the anchor system with a biner.

Tying off a belay device: Use a blocking knot with a slip knot safety and a dimmer switch.

Tying webbing to make a sling: Use a water knot with at least 3” tails.

Tying webbing to make a Harness: Use a water knot or a square knot with a half of a double fisherman on each side to back it up.

Tying Kernmantle cord together: Use a double fisherman knot with at least 3” tails.

2. Harnesses

All rescuers will use a seat harness with a chest harness integrated with webbing or kernmantle cord.

3. Anchor Systems

In mountain rescue, all anchor systems must be bombproof; In other words, there can be no possibility of anchor system failure. In nearly all cases, an independent anchor system will be required for each belay, lowering, or raising system used. Anchor systems should be built to hold rescue loads (600 lbs.) plus withstand shock loads. To ensure protection, all sharp edges should be rounded or sufficiently padded.

Natural Anchors: Our policy is to utilize natural anchors before using artificial ones. Acceptable means of attaching webbing or slings to natural anchors such as trees and rock knobs include the following:

- Basket bight
- Wrap three pull two
- Tensionless tie off
- Girth Hitch

Artificial Anchors: Artificial anchors are used only when sufficient natural anchors are not found. They include the following:

- Pitons
- Nuts and Chocks
- Bolts driven in suitable rock
- Pickets and Flukes
- Deadman anchor materials

Equalizing Anchor Systems: Marginal anchor points may be integrated into a bombproof anchor system by utilizing one or more equalizing systems. To reduce friction no more than three anchor points should be used for each equalizing anchor system.

Load Sharing Anchor Systems: Marginal anchor points may be integrated into a bombproof anchor system by utilizing one or more anchor points. Anchors may be attached by clove hitch converting equalizing system to load sharing on a horizontal system or prussiked into main line on vertical system.

#### 4. Belaying, Rapelling and lowering:

Rapelling: Selection of a rappel device should be based upon personal familiarity with the device and the ability to easily tie off while hanging free. Acceptable devices include:

- Munter hitch
- Stitch Plate
- ATC
- Tuber
- Figure 8
- Brake rack

All rappelling will be done with a belay or an auto belay on a separate line.

Belays: A separate safety belay will be used for all lowering, rappelling, or raising systems. For lowering or rappels, for all loads, use the tandem prusik belay or a modified french prusik belay. All Prusik systems shall be equipped with LRHs. Prusik cord must be a minimum of 8mm cord for rescue loads and 6mm for personal loads.

Lowering with a single person load: Use of rappel devices is acceptable.

Lowering with rescue load: Use a brake rack or a Tuba.

## 5. Raising systems

Load Releasing Hitch: Use 10m of a minimum of 8mm nylon low stretch kernmantle cord and 2 locking carabiners. Tie a Radium Release Hitch as follows:

1. Tie a figure 8 on a bight and clip it into the load-side carabiner on its spine side.
2. Clip the standing part of the cord up through the anchor carabiner, back down through the load carabiner; bring back up to the anchor and tie a Munter Hitch onto the anchor carabiner on its gate side. Ensure that the Munter Hitch is in the release position with the in-feed rope towards the gate side of the carabiner. A reasonable length for the hitch is 10 to 15 cm.
3. Secure the Radium Release Hitch using a bight to tie a half hitch around the entire stem below the Munter Hitch, and then back it up with an overhand on a bight knot, again around the entire stem.
4. Tie a figure 8 on a bight at the other end and clip it to a secure anchor.

Load Releasing Hitches will be established on all rescue systems (raising or lowering) and will be located between the apex of the anchor system and the working lines.

Raising Systems:The choice of raising system is dependent upon the weight of the load, the amount of hauling personnel available, equipment available, and the terrain. Usually the system of choice will be the simplest one that is able to do the job. Typically these include the following:

- 1:1, 2:1 or 3:1 Z
- 4:1, 6:1 or 9:1 piggyback

More elaborate systems are generally unnecessary. All raising systems will employ both a haul line and a belay line. Both haul line and belay lines will have LRHs. The standard hauling cam will be a triple wrap prusik or a modified french prusik. The safety cam will be tandem prusiks using a prusik minding pulley or a modified french prusik on a standard pulley. The haul line will be low stretch rope. No mechanical cams are allowed in the raising system, except for personal use by rescuers for pulling the haul line during raising.

## 6. Litter Evacuation systems:

Litter Rigging:Except on low angle terrain (less than 40 degrees), a litter will always be lowered or raised and belayed by two independent systems. For high angle lowerings and raising, both the belay line and the lowering/hauling line will run from their independent anchor systems down to a long tailed bowline or a master biner which will also hold the litter spider rigging and the litter attendants safety line.