

# Seattle Basic Alpine Climbing Course.

## Curriculum Outline for Field Trips 1-7.

### Field trip 1 - Top-rope Belay/Lower, Belay

Students enter the course and this field trip with a wide range of climbing experience. This field trip is required only for students who do not have a top rope belay card from a local climbing gym. Students with a belay card may skip the field trip, but if they are unclear about any of the points below or simply want to practice with their classmates they are welcome to join.

#### **Required gear:**

Climbing harness and tubular belay device with an appropriate HMS/pear shaped carabiner. Mountain boots, approach shoes, or rock shoes are all okay. Helmets are encouraged but optional, and belay gloves are optional. Instructors may bring a GriGri or similar assisted belay device to demonstrate.

#### **Top-rope Belay/Lower with Belay Device. (Goodman C climbing wall).**

We don't present all elements of belaying this first night. Instead let students have fun and gain confidence. The full list of belay points is here for reference and repeated throughout the course. Using belay gloves is the student's decision; they are not required. The goal is for students to get a feel for belaying and get used to hanging on the rope and being lowered.

Working in pairs, students climb and belay each other a very short ways up the wall (maybe 3'-6').

For brand new belayers the take and lower sequence should be first tested while the climber is still on the ground. The climber weights the rope to experience the effect of slack in the rope and rope stretch. After the climber fully weights the rope the belayer lowers the climber. The belayer should use both hands on the brake side of the rope when lowering. Repeat with the climber going successively higher once the belayer shows competence and confidence.

- Cover harness fit and use per manufacturer. The waist belt should be snug around the waist and above the hips. Buckle tails secured out of the way. Compare harness differences with your partner, different buckles, etc.
- Check helmets for a snug and comfortable fit as per manufacturer. Helmet is optional for top-rope climbing on the Magnuson climbing walls.
- Tie in: Identify the tie-in point on the harness. Tie-in with rewoven figure 8, well dressed with a 4"-6" tail. An additional overhand knot is optional and not required; discuss between students and instructors

- Partner check: Both climbers tie in. Identify the points that are checked before climbing: Harness check - fit, buckles, wear; Tie-in check – rope to harness; Belay check - rope/belay device connection to belayer’s harness belay loop, & carabiner locked.
- Communication between climber and the belayer:  
Discuss why you should prefix commands with your partner’s name.  
Established sequence:
  - On belay? – Belay is on
  - Climbing – Climb on
  - Take – Got you
  - Ready to lower – Lowering
  - Off belay – Belay is offOther commands:
  - Up rope
  - Slack
  - Watch me
  - Falling

Discuss the plan for being lowered vs. rappelling.

Here is a good discussion of climbing communication and challenges of various situations:

<https://americanalpineclub.org/news/2017/1/19/4xm1fcsag6b7xqf1p1w1qp7vdpp1ha>

- Rope handling and rope management: Keep a hand on the brake rope at all times, be aware of brake position, and move hands only when in brake position.
- PBUS: Pull - Brake - Under - Slide. Take rope in for top-rope belay.
- Tube style belay device: Examine how the rope bends, and understand the brake position. Compare strong and weak braking positions. Discuss palm down vs. palm up.
- Belay stance: Discuss how to anticipate direction of force on belayer; orienting your stance to protect your brake hand; distance from the wall; the weight of climber vs. belayer, and all the related consequences. Deciding whether to anchor the belayer is situational, and is usually more appropriate for multi pitch climbing.
- Lowering: Be sure to communicate before lowering your climber. Also, look to ensure they have fully weighted the rope before lowering, assuming you can see them. Both hands of the belayer should always be on the brake rope when lowering, and in the brake position.
- Situational awareness: Both climber and belayer should keep an eye out for potential hazards. Watch your climber for pendulum swings, other climbers, etc. This is important considering our small crowded space and many climbers wearing heavy boots.
- If time permits, you may discuss using a Grigri and other assisted belay devices.

### Video Links:

- Quick rewoven figure 8 knot: <https://www.youtube.com/watch?v=GFlwrvvgas0>
- In depth rewoven figure 8 knot: <https://www.youtube.com/watch?v=PJkCaUUhggs>
- Top rope belaying: <https://youtu.be/CFIz4cBFVro>
- AAC Universal Belay Standard: <https://www.youtube.com/watch?v=BOIAYx-d4HE>

## Field trip 2 - Anchors and Rappel

### Objective:

- Become familiar with common climbing anchors. Recognize positive and negative attributes of various anchors.  
Note: Students are not expected to **build** anchors. This is a **leader's task**. However, students should be able to recognize anchors, understand how they work and where to attach themselves, and ask appropriate questions about an anchor's quality.
- Introduce the rappel setup and rappelling while on the ground.

### Freedom of the Hills:

Chapters #10 and #11 of 9th edition

### Required gear:

Harness, helmet, belay device with an appropriate HMS/pear shaped carabiner, two more locking carabiners, hero loop, and personal anchor (sewn nylon sling or PAS). We won't climb, only possibly walk up and down the ramps in the basement. Any kind of approach, hiking or running shoes are fine.

### Overall set up:

- Up to 40 students per night, divided in groups of 4-6 students with one instructor each.
- Each of the two sections should not take more than 60-90 minutes. If there is time at the end of the anchor session, poor anchors can be discussed.

### Introduction to climbing anchors:

- This section of the FT is best run in Goodman C, on the climbing wall in the basement, or along the South wall outside.
- Discuss the use of anchors in single pitch and multi pitch settings. Where do we need anchors and what are they used for? Discuss exposure (below and above) and the weight difference between belayer and climber.
- Discuss the concept of redundancy for anchors; discuss bolts vs trad protection vs. natural protection eg. trees, boulders.
- Discuss and demonstrate how forces change depending on angles of strands of an anchor. Demonstrate with two students as 'anchor points' and a student pulling on the climber's end.

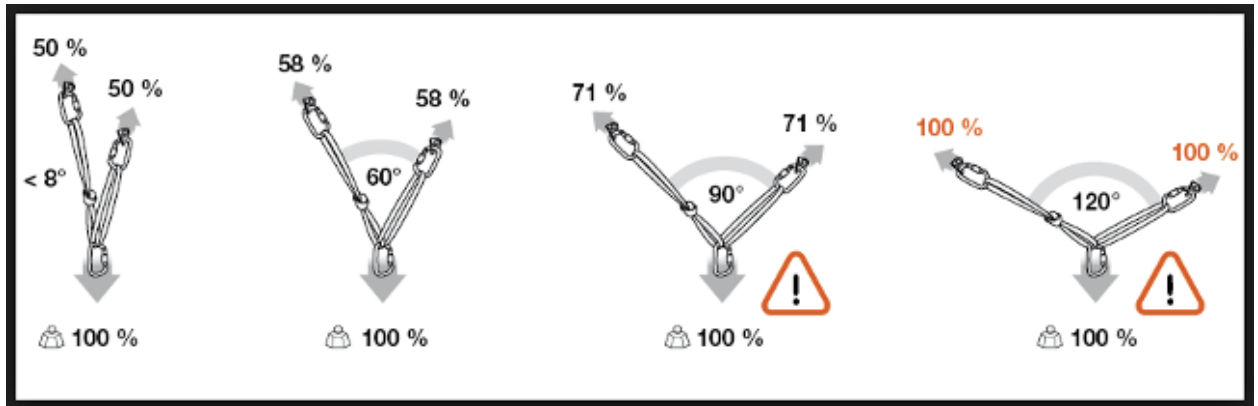


Diagram from Petzl, also see FoTH #9, p. 188.

- Introduce and discuss **EARNEST** concept for anchors:  
Equalized, Angle, Redundant, No Extension, Solid/Strong, Timely (EARNEST)

There are other common acronyms - note the differences.

Solid, Efficient, Redundant, Equalized, No Extension (SERENE)

Solid, Redundant, Equalized, No Extension (SRENE)

- Anchors to introduce:  
Evaluate each anchor using the elements of EARNEST and identify the powerpoint and shelf if available.  
Note: This is not a complete set of anchors used in crag or alpine settings, rather a selection of anchors that students might see used in the course. Also see [Basic Lecture #1.](#))
  - Two-quickdraw anchor: often used in crag settings, but not in the alpine.
  - Sliding X
    - discuss why a single sling or a simple sling without an X is not a good option
    - discuss equalization and extension with the sliding X
    - show how limiter knots affect redundancy, extension, and equalization
  - Sling or cordelette tied off with a hard knot
    - show options for 2- and 3-point anchors
    - discuss equalization
    - identify powerpoint and shelf
  - Quad
    - discuss use with bolted anchors
    - discuss how to clip in (2 or 3 strands, not 1 or 4)
    - discuss equalization
  - Tree anchor
    - One or more slings wrapped around a sturdy tree, boulder, or rock horn
    - Discuss evaluating existing anchors in the alpine and deciding to use, reinforce, or avoid
- Discussion of locking and non-locking carabiners; how to use them
- Attaching to an anchor with the climbing rope or personal anchor. When is each appropriate?

Video links:

- <https://www.youtube.com/watch?v=bktB2dicMOA>
- <https://www.youtube.com/watch?v=TwvPjAjrmA4>

### **Rappel: first practice using horizontal or low angle rappels**

- Note: Students will work on low angle rappel on the ramps or the North Plaza slabs during FT #3. This exercise can be done on level ground. It is more about principles than an actual rappel.
- Watch / discuss harness fit;
- Discuss how we completely rely on the system during a rappel vs. climbing when the system backs up our climbing ability.
- Set up a personal anchor (recommended is sewn nylon sling with a simple overhand knot or overhand on a bight, PAS is ok), and how to attach to an anchor.
- Rappel setup:
  - Extend the rappel device from the harness using the personal anchor. Demonstrate how to set it up with a sewn sling; discuss the length of extension
  - Back up the brake hand with an autoblock friction hitch clipped to the belay loop.
  - Check the system before unclipping from the anchor and committing to the rappel: Anchor, harness, backup friction hitch, carabiners locked, device set up correctly with both strands, extension method, ends of the rope on the ground or with stopper knots. Finally, cinch up the rope and weight the rappel with your harness to test the system before unclipping your personal anchor.
  - Importance of hands on brake strands for the entire rappel; encourage using two hands on the braking side with one of those hands tending the autoblock backup.
  - Voice commands: On rappel! Off rappel! Importance of being heard by your team.

Video link:

Rappelling: <https://youtu.be/7U6tdEevJgs>

## Field Trip 3: Rappel, Belay, Climbing, & Anchors

**Note:** This field trip has four stations. Students who have rappelling experience (10 rappels), and who are comfortable with rappelling from the South Wall, start with Station 2, followed by 3, 4, and 1. Please self-identify during check-in. If you start at Station 4, progression is 4, 1, 2, 3. Start at Station 3, progression is 3, 4, 1, 2. Start at Station 2, progression is 2, 3, 4, 1. Start at Station 1, progression is 1, 2, 3, 4.

### Freedom of the Hills:

Chapters #9, #10 and #11 of 9th edition

### Required gear:

Hiking boots or approach shoes; climbing shoes are optional,

Belay Device

2' Prusik Loop, (aka hero loop) or Hollow Block or similar

2 locking carabiners

1 large, locking pear-shaped carabiner

6 "general purpose" carabiners (do not need to be oval or solid gate)

climbing harness

Helmet

Belay gloves

120cm Nylon sewn sling or PAS for rappelling

### Station 1: Rappel Refresher (Friction slabs, North end of the Program Center).

**Task:** Students at this station make multiple rappels with extension, but without auto-block. Once students are comfortable and can rappel *smoothly*, add the auto-block. Idea is to make it easy for new rappellers. The extended rappel setup was introduced at Field Trip #2.

- Prepare the rig for an extended rappel using a sewn nylon double sling or PAS.
- Clip to the anchor and set up to rappel without an autoblock backup.
- Check the system with a partner. Weight the system to test it before unclipping the personal anchor.
- Rappel without an auto-block. Develop a safe smooth rappel. Avoid jerky rappels, discuss their impact on the rope and anchors.
- Remember commands On Rappel! and Off Rappel!
- Progress to rappel with extension and auto-block.

- If time permits introduce rappelling with the backup method using three locking carabiners. For details check station 3 of Field trip #4.

### **Station 2: Rappel and Climbing (Outside wall, South Plaza).**

**Task:** Students climb 3 routes and descend via rappel, as time allows. Many will choose to wear gloves for rappel, but this is optional and the student's decision. Footwear: Rock shoes, approach shoes or boots, students' choice.

- Partner check: harness, tie ins, belay device.
- Voice commands between partners.
- Climbing technique. In control, balanced, use of foot holds.
- Belay technique. PBUS, brake hand never leaves the rope, proper amount of slack.
- When climber reaches the top, they should
  - Clip into the anchor with their personal anchor.
  - Go off belay and pull up enough rope to get their end back on the ground
  - Untie from the rope, and toss their end to the ground for the next climber.
  - Set up to rappel on a separate rope with extended belay device and autoblock backup.
  - Check their rappel setup before unclipping and committing to the rappel. Weight the system to test it before unclipping the personal anchor.
- Use of rappel commands. Partners should give a firefighters belay on all rappels.
- Rappel smoothly and safely.
- Climb and rappel while wearing a pack.
- Demonstrate a leg wrap while on rappel.

#### **Note on South wall belay and rappel set-up**

The belay and rappel set-up at the South wall is quite contrived: Students climb with a top-rope belay on one rope/anchor and then move on to a different rope/anchor for the rappel. This is done for efficiency purposes in the teaching setting. However, this is not seen at crags or in the Alpine.

We suggest that we mentally separate the belay section from the rappel section, and with that suggest the following sequence:

#### Top-roped climbing:

- Climb on top-rope belay to the anchor at the top of the wall.
- Place a locking carabiner to a part of the anchor that is not used by the climbing rope, for instance the shelf of a powerpoint anchor, or a different set of slings of the quad. This carabiner often has already been placed. Then, secure yourself with the rope using a clove hitch to this carabiner. Take slack out of this connection. Check in with an instructor before moving on. You are secure at the top of the pitch. This ends the climbing section.

#### Prepare the rope for the next climber (or for a rappel)

- Take the climbing rope between the clove hitch and the top rope carabiners, and pull up half of the rope. There might either be a middle marker, or the belayer's end of the rope just leaves the ground. Make a neat pile of the rope or stack it on the rope between your harness and the clove hitch.

- Secure the rope with a clove hitch or an overhand on a bight knot. Tie the knot close to the top rope belay carabiners on your side of the rope. This makes sure that the rope won't slip through the carabiners when you throw it down.
- In order to move to the rappel station (or if you were to rappel on the same rope), you need to attach yourself to the anchor with a personal anchor. Clip your personal anchor to the same place where you attached yourself with the clove hitch. Check with an instructor. You are now safe to untie from the rope.
- Remove the clove hitch that was your attachment to the anchor. Then untie the reweven figure 8 on your harness. (If you were to rappel on this rope, make sure that both ends have a stopper knot, close the system.)
- Take the pile or stack of your end of the rope. Then look down and yell "Rope!". If nobody is in the way and if you don't hear any concerns, throw the rope down. (If you were to rappel on this rope, make sure that both ends have a stopper knot, close the system.)
- Remove the backup clove hitch or overhand on a bight knot. Check with the students at the base that both ends of the climbing rope are on the ground.
- When moving to the rappel station, clip your personal anchor to a handline. Secure yourself with a new carabiner to the personal anchor before opening up the carabiner that secures you now. The same applies when you attach yourself to the rappel anchor.
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### Links:

- Video: rappel with extension: <https://vimeo.com/113362076>  
Article: <https://www.mountaineers.org/blog/how-to-extended-rappel>
- Video: overview of rappelling. <https://youtu.be/ZCZjMG7UJqQ>.  
Note that the use of a PA in this AAC video is inconsistent, also single rope rappels are unusual in most of our climbing situations.  
Article: <https://americanalpineclub.org/news/2018/2/14/rappelling>
- Several different rappel extensions are shown and discussed in this AMGA video: <https://www.youtube.com/watch?v=jmCnNsJDrVA>

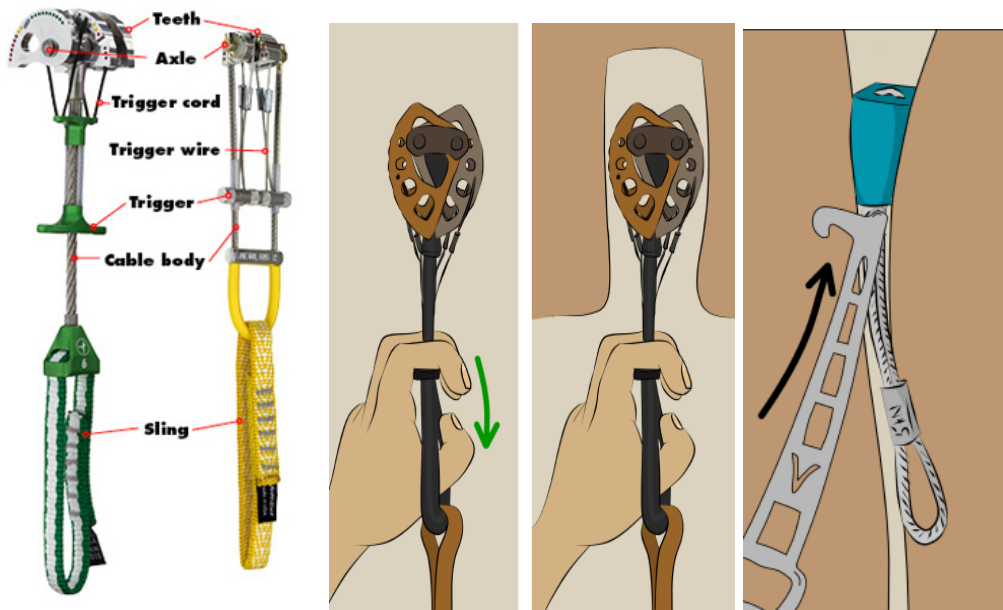
### Station 3: Belay Weight Drop and Belay Escape & Cam Removal (Basement).

**Task:** An instructor raises the bag simulating a climber on top-rope belay. Raising the bag is a good time to give the belayer a quick drop. The idea is to give the belayer an idea of the magnitude and direction of the force involved. Once the bag is raised to the top, lower the bag slowly to simulate a climber on lead. The belayer should keep an appropriate amount of slack. Surprise the belayer with quick drops only when the belayer is positioned in a safe location. Some will choose to wear gloves for belay, but this is the student's decision and not required. Additionally, the instructor should demonstrate a full load transfer to the anchor. The full load transfer will not be evaluated on the field trip.

- Partner check: harness, tie ins, belay device.
- When and why should the belayer be anchored or not anchored? Discuss with students and instructors.
- Voice commands between partners.
- Rope handling and management. Keep a hand on the brake rope at all times, be aware of brake position, and move hands only when in a braking position.
- Belayer position/stance considers direction of force.



- PBUS belay with device. Pulling rope in for top-rope belay, Pulling (feeding) rope out when belaying a leader..
- Tie off the belay to go hands free. Maintain full control and make all knots well dressed and secure. The mule knot tie-off may be done either on the spine of the belay carabiner, or on the rope.
- The belay tie off is complete at this point, the remainder is informative for students but will not be tested on the field trip
- Escape the belay. It is acceptable for the prusik and backup knots to use non-releasable Figure 8s.
- Repeat the complete belay-tie off-escape exercise with a munter hitch belay. Keep in mind that the munter brake position is multi-directional.
- After completing the belay tie offs, demonstrate how to remove cams from cracks using the boards/artificial cracks that are attached to the cage. In-depth instruction on placing active protection is not required, but students should be familiar with the basics of removing passive and active protection.
- Instructions on removing pro should cover the anatomy of a cam, how to operate a cam, and best practices such as identifying the best path for removal before taking action. The instructor may also provide notes on how to remove a stuck cam, such as nudging it towards a wider space using a nut tool, but they should indicate that this is a last resort.



Links:

- Video: belaying with a belay device: [https://www.youtube.com/watch?v=ymJb6tW5\\_BE](https://www.youtube.com/watch?v=ymJb6tW5_BE). The techniques shown in this video apply to any brand of tubular belay device.
- Video: Tying off a belay device on the rope with a mule knot: <https://www.youtube.com/watch?v=bQtjrog18xY>
- Video: Tying off a belay device on the spine of the carabiner: <https://vimeo.com/17441295>. This method ties off on the spine of the carabiner. Note that a “belay plate” is another name for a standard ATC style tubular belay device.
- Video: belay and tie-off with munter: <https://www.youtube.com/watch?v=xDGRLgFYGco>. Note there are several other ways one can tie a Munter hitch.
- Video: Fully escaping a belay using the rope: <https://www.youtube.com/watch?v=fDtOdyCOe4o>

### **Station 4: Belaying a Leader and Follower, & Anchor Rigging/Connection. (South Plaza Boulders).**

The goal for this station is that students understand how a multi pitch climb works by experiencing the roles of a follower and a leader in an easy environment. Students will practice how to belay a leader and how to belay a follower from the top. Students will not lead during Basic climbs.

This is mostly an experience and learning station with focus on the bigger pictures. Little prior knowledge should be expected.

This station starts best with a demonstration of one rope team consisting of two volunteer students. Instructors and students can observe and discuss the techniques and issues at each stage. This can be done on the ground as a traverse along the boulders or on one of the routes.

The practice should include the following steps:

- One student belays the other student who leads a short route up through the boulders. Both partners are tied to the rope. The belayer should be tied to an anchor. The direction of force from a leader fall should be anticipated and considered in the positioning of the belayer with respect to the anchor.
- The leader clips pre-placed ‘fixed’ protection. The belayer needs to pay attention to the leader and should give the leader an appropriate amount of slack. The movement of the leader should not be impacted. The leader should experience in a safe spot how too little and too much slack feels.
- At the top of the boulders the leader rigs a good anchor from fixed bolts. A 120cm sling or a cordelette can be used for this. For two routes a rope has been slung around a solid object (lamp post) representing a tree. The leader then connects to the power point of the anchor using the climbing rope with a clove hitch on a locking carabiner.
- The leader asks the belayer “Off belay”, to which the follower takes the leader off belay and responds with “Belay is off”. The leader then pulls up the rope and sets up a belay for the follower using a belay device in guide mode. Since not every student might have an appropriate belay device for guide mode, a Munter hitch on a carabiner clipped to the anchor can be used as well.

The follower will experience that the rope will move slightly up and down during the process of

setting up the anchor, which will take time. When the anchor is set up and the leader has been taken off belay, a lot of rope will be moved up. Once all of the slack has been removed, the follower will call "That's me". The leader will put the follower on belay and confirm "You are on belay". The commands "Climbing" / "Climb on" will follow. Note that there might not be visual contact between leader and follower.

- The follower climbs up to the belay, unclipping the rope from the fixed protection. On a climb the follower will remove the protection and slings, stash them safely, and bring them to the leader.

The leader keeps on removing slack out of the system while the follower climbs, without yanking on the follower.

- Upon reaching the belay the follower connects to the anchor with a clove hitch on a locking carabiner. The follower can then be taken off belay. The follower then hands over protection and slings to the leader.
- After the demonstration, students work in pairs to experience the leading and following sequence. Switch roles and repeat.

At the end of the session, practice traveling on a hand line with prusik or klemmheist.

## Field Trip 4 - Rock Skills Evaluation (3 stations)

### Note

- These are six half-day field trips spread over three days. Students, please only sign up for either one morning or one afternoon session.
- Different from other field trips, students and instructors stay together for the whole session. This allows instructors to get a better picture of each student.

### General guidelines for evaluations

- **Climb/belay:**  
Goal: proper harness fit, partner check, voice commands, safe and attentive belay (hands always on brake strand, little slack), students can climb at least the easiest routes to the top of each of the towers.  
Criteria to come back: unsafe/incomplete belay set up, no/sloppy partner check, no/sloppy voice commands, too much slack, brake hand not on the rope.
- **Rappel, high anchor:**  
Goal: safe set up of an extended rappel with an autoblock within a reasonable amount of time (~5min), safe rappel, voice commands.  
Criteria to come back: unsafe rappel set up, too much time to set up, unsafe rappel.
- **Rappel, low anchor:**  
Goal: safe set up, safe and controlled start of rappel without shock-loading the anchor. It is okay not to extend the rappel set-up.  
Criteria to come back: unsafe rappel set up, too much time to set up, shock loading the anchor, uncontrolled start, brake hand not on rope.
- **Belay, Basement:**  
Goal: proper set-up including anchor, belay with device and Munter; little slack for top rope belay simulation, understanding concept of lead belay; catching fallen climber; belay tie off with device (on rope or spine of carabiner, student's choice) and with Munter. Hands-free is enough. Safely releasing the tie-off.  
Criteria to come back: Unsafe belay set up, dropping climber during belay, tie-off or releasing tie-off. Brake hand not on rope.

### Station 1: Evaluation - Climbing, and Rappelling (Outside wall, South Plaza)

**Task:** Students make 3 or more climbs and descend via rappel. Many will choose to wear gloves for rappel, but this is optional and the student's decision.

Students demonstrate that they can identify and connect to the anchor safely and set up a rappel without assistance. Students should be able to do this in less than 5 minutes. If they are taking longer, they need more practice. We also want to see that students can climb & rappel in control, and with a moderate level of comfort with the exposure.

- Partner check: harness, tie ins, belay device.
- Voice commands between partners.
- Climbing technique. In control, balanced, use of foot holds.
- Belay technique. PBUS, brake hand never leaves the rope, proper amount of slack.
- Safely set up to rappel with an extended belay device and autoblock backup.
- Check the system visually and by weighting it before unclipping the personal anchor.
- Use of rappel commands.
- Rappel smoothly and safely.
- Climb and rappel while wearing a pack.
- Demonstrate a leg wrap while on rappel.
- Demonstrate the firefighters belay.

**Links:** see field trip 3 station 2.

### **Station 2: Evaluation - Belay Weight Drop, and Belay Tie-off (Basement)**

**Task:** Ask the student to describe their strategy for belaying a leader. The instructor raises the bag simulating a climber on top-rope belay. Raising the bag is a good time to give the belayer a quick drop. The idea is to give the belayer an idea of the magnitude and direction of the force involved. Once the bag is raised to the top, lower the bag slowly to simulate a climber on lead. The belayer should keep an appropriate amount of slack. Surprise the belayer with quick drops only when the belayer is positioned in a safe location. Some will choose to wear gloves for belay, but this is the student's decision and not required.

- Partner check: harness, tie ins, belay device.
- Have the student explain when and why the belayer should be anchored or not.
- Voice commands between partners.
- Rope handling and management. Keep a hand on the brake rope at all times, be aware of brake position, and move hands only when in a braking position.
- Belayer position/stance considers direction of force.
- PBUS belay with device. Pulling rope in for top-rope belay, Pulling (feeding) rope out when belaying a leader..
- Tie off the belay to go hands free. Maintain full control and make all knots well dressed and secure. The mule knot tie-off may be done either on the spine of the belay carabiner, or on the rope.
- Escape the belay. It is acceptable for the prusik and backup knots to use non-releasable Figure 8s.
- Repeat the complete belay-tie off-escape exercise with a munter hitch belay. Keep in mind that the munter brake position is multi-directional.

**Links:** see field trip 3 station 3.

### **Station 3: Low anchor rappel, & alternate rappel method (North Wall).**

Another opportunity to see students rappel and evaluate their readiness to climb. The North wall can be accessed via a stairway at the North end of Goodman Hall.

- Safe assembly, and use of Personal Anchor System.
- Safe assembly, and use of rappel extension.
- Safe assembly, and use of auto-block.
- Check the system visually and by weighting it before unclipping the personal anchor.
- Use of rappel commands.
- Sit-and-spin rappel with device, extension, and auto-block. The small ledge on the wall can be used for the first attempt. In further attempts students should try to avoid the ledge by smearing off the wall only.
- Keep your rappel device weighted. Unweighting can lead to shock loading of your rappel anchor.
- Options and considerations for not extending the rappel device.
- Clip into the anchor with their personal anchor.
- Set up to rappel with extended belay device and autoblock backup.
- Check their rappel setup before unclipping and committing to the rappel.
- Use of rappel commands. Partners should give a firefighters belay on all rappels.
- Sit-and-spin rappel using the low anchor. The small ledge on the wall can be used for the first attempt. In further attempts students should try to avoid the ledge by smearing off the wall only.
- Launch smoothly and safely, keeping the rappel device weighted to avoid shock loading the anchor.
- Options and considerations for not extending the rappel device.

### **Alternate rappel method using 3 locking carabiners (part of Station #3)**

Safe assembly of 2 or 3 locking carabiners rappel method, demonstrated on the ground with extension and auto-block.

- Three locking carabiners are preferred over two. If using just two locking carabiners, the climber must avoid the rope running against the belay loop or personal anchor.
- Also be careful that the rope doesn't run against a locking carabiner mechanism and open the gate.
- Note that the shape of the carabiners (HMS, oval, D-shaped), the size and orientation of the 2nd and 3rd carabiners, along with the diameter of the rope all impact the amount of friction that this set-up generates. The more the ropes get pinched between the 2nd and the 3rd carabiner, the more friction is generated. Rather start off with more friction in first attempts. A test on the horizontal roof does not represent the forces during a vertical rappel.
- When extending the set-up, check that the extension does not get too long, since the three carabiners already provide some extension. An extension with a PAS can be handy for easy adjustment. Also make sure that the autoblock has an appropriate length and does not interfere with the rappel carabiners.

- Rappel with carabiner rappel method, extended and with auto-block, including partner check.

**Video link:**

<https://www.youtube.com/watch?v=IsIG-Clp2qA>

Note: We typically rappel using two strands of rope

## Field trip 5 - Crevasse rescue practice

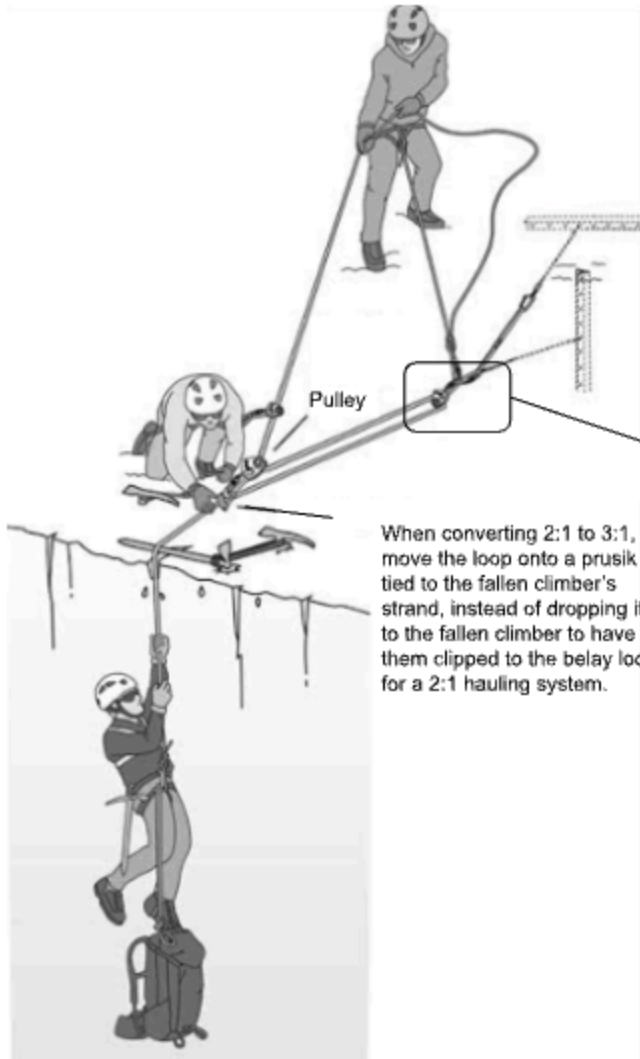
**Learning and practice session at Kite Hill in Magnuson park**

Held at Kite Hill, accessed from the south entrance of Magnuson Park on 65th St, and then north on Lake Shore Drive to E4 parking lot ([link to map](#)).

**See FT #7 for details on the evaluation**

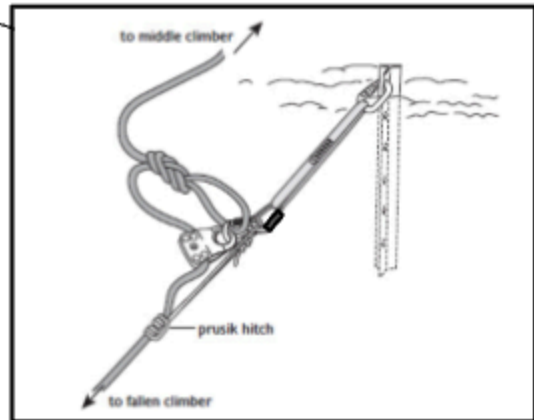
Deling's drawings of a crevasse rescue set-up using a 2:1 hauling system, preferred and evaluated on: <https://www.mountaineers.org/locations-lodges/seattle-branch/committees/seattle-climbing-committee/course-templates/alpine-climbing-courses/basic-alpine-climbing-course/course-materials/crevasse-rescue-2021>

**Also, demonstrate how to convert 2:1 to 3:1 raising system and provide context on when this might be appropriate**



The image on the left shows a progress capture pulley. This is achieved by placing a pulley in between the prusik and backup knot tied earlier. When ready to haul, one needs to untie the backup knot. See image below.

When converting 2:1 to 3:1, move the loop onto a prusik tied to the fallen climber's strand, instead of dropping it to the fallen climber to have them clipped to the belay loop for a 2:1 hauling system.



## Field trip 6 - Snow Travel, and Introduction to Snow Anchors.

### Freedom of the Hills:

Chapter 16, Snow Travel and Climbing, of the 9th Edition.

#### Crampon use

Typically done near the parking lot first thing while the snow is firmest. Afterwards the crampons can be put back in the car so they don't have to be carried the rest of the day.

- Put them on correctly: tight fit, taut straps, nothing loose to trip on, gaiters help.
- Soft snow: kick steps and plunge step as without crampons
- Hard snow or ice
  - Keep all downward points in contact with the snow; smear, don't edge



- Relax ankles and bend knees to keep feet flat on the snow.
- Uphill: straight walk, duck walk, traverse walk.
- Downhill: point feet straight downhill

**Link:** crampon use on hard snow: <https://www.youtube.com/watch?v=qid9w1E7G0A>

### **Snow Travel**

- Situational awareness: be aware of conditions around you.
  - Hazards: rock fall, moats, crevasses, tree wells, streams, etc.
  - Avalanche issues: slope, aspect, convexities, ridges, cornices, terrain traps, etc.
  - Snow conditions: season, open/protected, sunny/shady, time of day
  - Other team members and other parties
- Ice axe use.
  - Identify the parts: shaft, pick, adze, spike
  - How to strap ax to your pack
  - Leash use: no leash vs. short vs. long vs. tethered to harness
  - Use gloves when using your ax: snow can cut up your bare hands
  - Self-arrest vs. self-belay grip: use self-arrest grip unless you have good reason not to
  - Quick ax stow behind pack strap
- Self-belaying: first line of defense against falls.
  - Usually done with self-arrest grip
  - Ax planted in uphill hand
  - Should you slip: push down on ax head, grab shaft with other hand at the snow line, and hold on
- Ax techniques for steep snow too firm to plant the spike deep enough for self belay.
  - Low dagger: hold the adze, plant the pick
  - Middle dagger: hold shaft near the head, plant the pick
  - High dagger: hold the head of the ax from below, plant the pick
  - Traction: hold shaft near the spike, swing it to plant the pick
- Kicking steps.
  - Kick from the knee, scuff your boot sole into the snow, tilt steps slightly into the slope
  - Leader: keep steps short, use just one kick per step if possible, switchbacking vs. going straight up
  - Follower: improve the leader's steps, don't collapse them
- Walking in balance: important when the consequences of falling are high.
  - Balanced position: ax planted in uphill hand, downhill leg is straight, uphill leg bent.
  - Replant the ax when you're in balance.
  - Switchback transition sequence.
  - Use ax in stake position on steepest slopes.
- Descending.
  - Facing out vs. backing down
  - Descend in balance when consequences of falling are high
  - Plant ax well to allow for self belay
- Plunge stepping.
  - Important for efficient downhill travel.
  - Boots with heel rockers make it more difficult.
  - Step confidently forward.
    - Keep toes up and knees slightly bent.
    - Keep weight forward: leaning back makes slipping more likely.

- Avoid kicking heels backward into the snow unless hard snow requires it.
  - Be prepared to self-arrest.
  - Easier when you make your own tracks.
- Rest step.
  - Efficient way to ascend steeper slopes or at altitude; keeps a lower heart rate
  - Establish a rhythm
  - For each step
    - Lock back leg, rest body weight on bone instead of muscle
    - Set front leg on the next step and relax it
    - Take a breath (or several)
    - Lean forward to move center of gravity off back leg
    - Use momentum and both legs to bounce up to the next step

### **Snow anchors**

Introduce common snow anchors. Demonstrate and discuss each one. Have students build/place their own and then test them. Test by clipping a bight of rope to the anchor and having a team of students yank on both strands. This way you won't have to pry open any welded knots.

Important: when testing, clip a loose tether using another rope or cordelette to the tested anchor. Have someone stand behind the anchor and hold the tether to prevent a failed anchor from hitting the team.

- T-slot dead man anchors with a picket. Discuss or demonstrate deadmanning other objects like ice ax, skis, poles, pack, etc.
- Vertical picket with mid-clip.
- Vertical picket with top-clip.
- Snow fluke, if you've got one.
- If there's time, have students build and test a snow bollard.

### **Crevasse rescue scenario**

Most student crevasse rescue practice uses simulated snow anchors. This exercise provides the opportunity to use real snow anchors.

Working in teams of 3, students hold a simulated crevasse fall, then transition the load to a snow anchor so they can escape the belay.

- Rope up for glacier travel and do a partner check.
- Rope lead starts climbing uphill.
- Sometime after the rope is extended, the third person on the team yells "Falling!" and weights the rope. The others arrest to hold the load.
- The team runs through the usual crevasse rescue scenario through building an anchor, attaching the load with a friction hitch, backing the hitch up with a clove hitch or hard knot, and backing up the anchor.
- Since time is limited, stop the scenario at this point.
- Repeat twice more with students rotating their position on the rope.

### **Belaying on snow**

Introduce common snow belay techniques and have students practice each one.

- Boot-ax belay: quick to set up, limited holding power
- Carabiner-ice ax belay: uses a hip belay, a bit stronger, easier to take in slack
- Seated hip belay: may or may not be anchored, a deep bucket seat helps

### **Self-Arrest**

Save for the end of the day so people don't stand around after getting wet.

Principles:

- Self arrest is a last ditch emergency tactic to use when your skills have failed to keep you from falling. Conditions can make arresting very difficult or impossible.
- Self arrest must be practiced enough to become reflexive. When you find yourself suddenly slipping down a slope, you have no time to think. Practice, practice, practice.
- Be aggressive. Arrest immediately before you gather speed. Technique is important, but urgency is even more so.
- Never give up. Trying to arrest slows you down even if it doesn't stop you.

Arrest position:

- Holding the ax
  - One hand on the ax head in self-arrest grip
  - Other hand on the shaft, just above the spike
  - Pick just above shoulder
  - Spike towards the opposite hip
- Body position
  - Press elbows to your side (you are strongest this way)
  - Press chest against the shaft
  - Turn head towards the spike (better leverage and keeps face away from the adz)
  - Pull up with the hand on the spike (this drives the pick into the snow)
  - Arch spine, butt up in the air
  - Dig toes into the snow
  - Keep feet apart, knees slightly bent

Practice preparation

- Instructors and students bundle up with helmets and full rain gear.
- Build up a track
  - Glissade first to compact the snow
  - Create a good starting platform
  - Kick good steps back to the top
- Teach arrest position
  - Demonstrate first
  - Have students practice on both sides
  - Give feedback so they get it right before they ever start sliding
- Demonstrate getting up after arresting
  - Kick feet in
  - Plant ax in stake position
  - Kick steps as you stand up
- Arresting without an axe

- Roll onto front.
- Dig in with hands and feet.
- Clasp hands together in soft snow.

Practice each variation

- Students do better when they learn the variation first on their nondominant side (e.g. right handers start with the ax in their left hand.)
- Instructor(s) demonstrate, first without sliding, then with
- Students simulate it without sliding
- Students perform it while sliding
- Instructors give lots of positive and constructive feedback
- Learn and practice each variation, nondominant side first, then dominant side
  - Feet first face down
  - Feet first face up
  - Head first face down
  - Head first face up
- Do another round with students wearing their packs
- Discuss arresting while wearing crampons
  - Crampons can help you stop faster
  - In the past people have practiced self arrest keeping their crampons off the snow, in theory to reduce the chances of tumbling and ankle/leg injuries.

### **Glissading**

Principles:

- Glissading is fast and fun, but it can be dangerous.
- Check the route before glissading
  - Steepness and snow conditions. Can you control your speed? Could you arrest?
  - Is there sufficient run out if one can't arrest.
  - Other hazards including rocks, moats, trees, cliffs, streams
  - Can you see the whole slope? Unseen steeper portions can hold hazards
    - Scope out the route on your ascent
    - Have someone plunge step down to check before anyone glissades
- Never glissade with crampons

Seated glissade position:

- Sitting with knees bent and feet flat on the snow
- Hold ax with self arrest grip in one hand and shaft near the spike in the other
- Drag the spike on the snow near the hip opposite the hand holding the ax head.
- Position the shaft in line with the direction of travel.
- Rotate the pick so it points away from the body.

Glissading:

- Use the spike and your heels as brakes.
- If you go in the wrong direction, stop and walk to get back on track.
- Self arrest if you can't control your speed.
- Roll away from the spike to arrest. Some people intuitively want to roll towards the spike, so watch for that.

## Field trip 7

# Glacier Travel & Crevasse Rescue Evaluation.

Roping up for glacier travel & crevasse rescue for glacier travel with two or more rope teams.

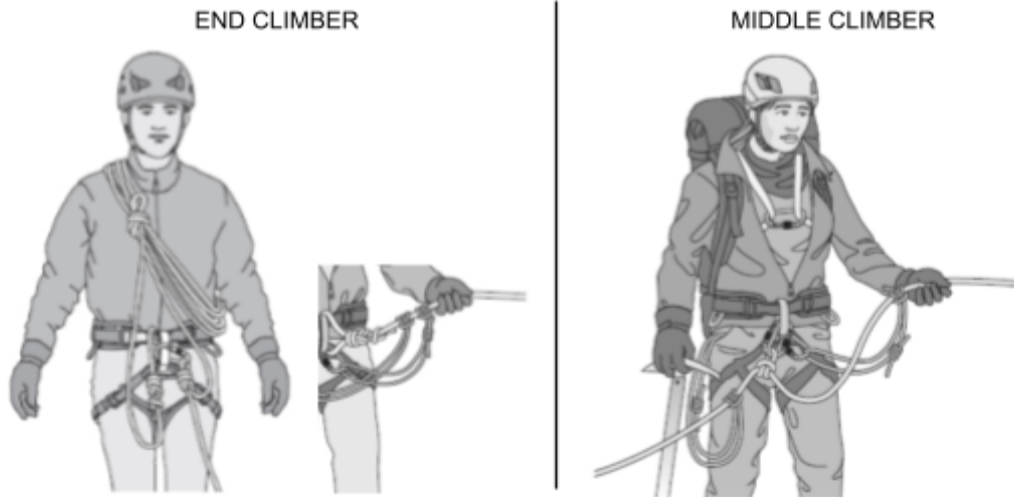
This field trip takes place at Kite Hill, accessed from the south entrance of Magnuson Park on 65th St, and then north on Lake Shore Drive to E4 parking lot ([link to map](#)).

### Six Key Stages of Glacier Travel & Crevasse Rescue

The attached slides provide a good overview of all the key steps involved, by Deling Ren <https://www.mountaineers.org/locations-lodges/seattle-branch/committees/seattle-climbing-committee/course-templates/alpine-climbing-courses/basic-alpine-climbing-course/course-materials/crevasse-rescue-2021>

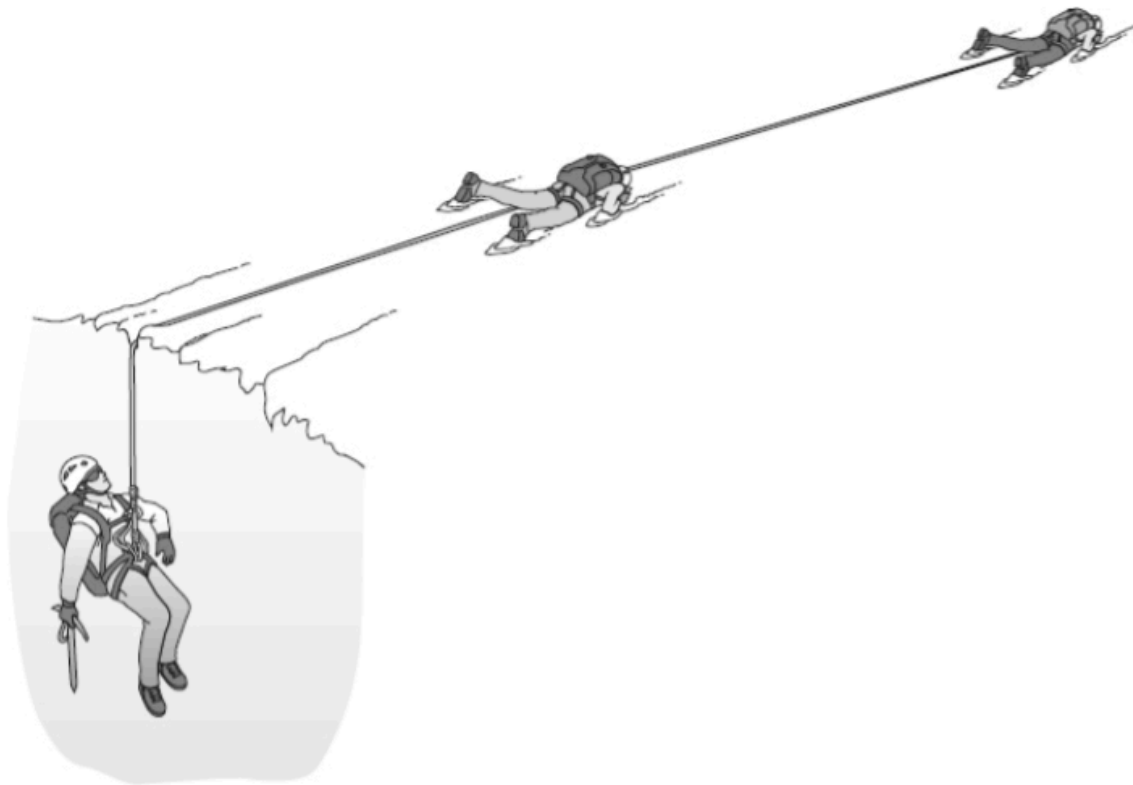
#### 1) Roping up for glacier travel.

- For a rope team of 3 climbers; divide the rope into 4 segments, with both end climbers carrying  $\frac{1}{4}$  of the rope (aka rescue rope).
- The end climber can carry the rescue rope inside the pack. Rescue rope can be carried as coils on the body as well.
- The middle climber clips to the rope with two carabiners (at least one locking with opposite and opposed gates) or a single triple-action locking carabiner for clipping onto the rope via a butterfly knot. An overhand, figure 8, and clove-hitch are acceptable knots to clip as well.
- All climbers are to have their foot and chest prusiks tied into the rope as shown below.
  - Chest and Foot Prusiks should be kept loose.
  - The end climber should have the foot prusik tied closer to the belay loop than the chest prusik. The middle climber may opt to tie chest and foot prusiks on either strand (one on each side without preference or both on only one of the two strands). Note the leader may have recommendations for the location of chest prusik based on the terrain for shortening the rope or for the need to prusik-belay.



**2) Holding the fall.**

- Lean back, or fall away from the fallen climber.
- Make the rope tight between rope-mates.



### 3) Anchor the rope, including back-up to friction hitch or rope grab.

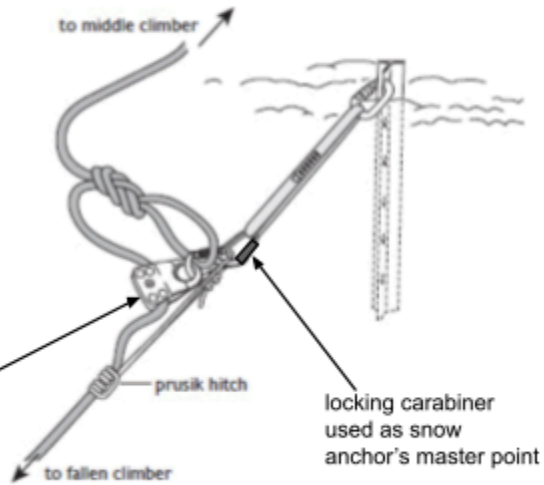
#### Communication between rope-mates holding the fallen climber.

- Climbers shall communicate with one another and confirm if the fallen climber is out of sight but still is weighing the rope, or if communication cannot be established with the fallen climber.  
Note: The scenario used for the evaluation is that the fallen climber cannot be seen and is still weighing the rope. The communication is obstructed.
- Once confirmed that the middle climber can hold the fallen climber's weight in the self-arrest position, the other climber (rescuer) slowly and cautiously walks to the middle climber, minding the prusik to reduce the rope length between them but also ready to arrest in case the middle climber can no longer hold the fallen climber's weight.
- When the rescuer is next to the middle climber, they shall confirm the scenario and the well-being of both the middle climber and the fallen climber, if possible.
- Once the critical well-being of the middle climber is addressed, the rescuer shall proceed to build the anchor to transfer the weight of the fallen climber to it. This is usually done with a friction hitch, or rope grab (Tibloc, Micro-Traxion, Roll-N-Lock, Ropeman, Duck, etc.) from the loaded rope to the snow anchor. The type of snow anchor used is dependent on snow conditions. Details for holding a crevasse fall, building snow anchors, and escaping are practiced at FT 6, and the SIG Snow Overnight FT.  
*Note: Prusik is the course default friction hitch although other friction hitches are welcome.*
- Back-up the friction hitch (prusik, klemheist, rope grab, etc): Both the friction hitches and the rope grabs fail a rope's sheath at a load of around 4 kN (1 kN = ~225 lbs.) and need to be monitored at all times for any cyclic loading that may loosen the hitch. It is therefore important to back up the prusik connection using the knot on a rescue rope just above the prusik directly to the snow anchor. This can be done with a clove-hitch (adjustable), a bight of rope tied off with an overhand, figure 8, or other knots to a locking carabiner at the snow anchor's powerpoint.



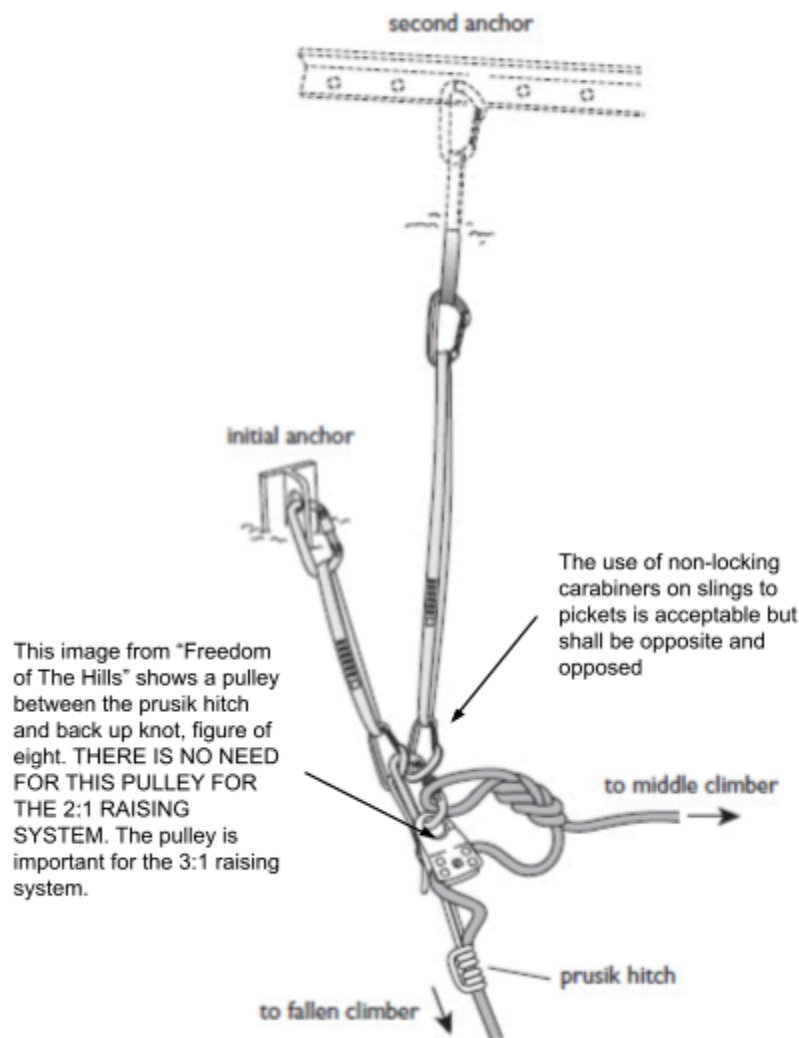
**OPTION 1 - SINGLE ANCHOR (IF UNQUESTIONABLE RELIABLE)**

This image from "Freedom of The Hills" shows a pulley between the prusik hitch and back up knot, figure of eight. THERE IS NO NEED FOR THIS PULLEY FOR THE 2:1 RAISING SYSTEM. The pulley is important for the 3:1 raising system.





### OPTION 2 - BUILT 2 ANCHORS (ONE AT A TIME)



#### 4) Safely approach the crevasse, and communicate with the fallen climber.

- The rescuer checks in with the middle climber again for their well-being, have them tethered to the snow anchor, and detach them from the climbing rope.
- The rescuer communicates the plan with the middle climber and uses them as a second set of eyes if possible to evaluate the set-up.
- When agreed, the rescuer travels cautiously probing for any additional crevasses on their way to the crevasse lip by minding the prusik on the rescue rope, starting at the snow anchor.
- Once at the crevasse lip, ensure the prusik is locked and pointing away from the crevasse. Add a catastrophe knot using a bight on a rope to do an overhand knot, figure 8 as extra protection before getting closer to the lip of the crevasse. Communicate with the fallen climber to check on their well being and needs to get them out of the crevasse.

**5) Make a plan, including how to quickly assist a fallen climber who does not respond and may require emergency first aid.**

- When the fallen climber is unresponsive, the rescuer may choose to rappel down into the crevasse to administer any first aid and clip the loop to the fallen climber's belay loop with a pulley and locking carabiner.
- Assuming the fallen climber is responsive and able to assist, consider your options:  
Can the fallen climber walk or climb out, ascend the anchored rope, assist with a drop loop 2:1, and will a raising system be utilized?

**6) Execute the plan,**

**Raising systems, including rope entrenchment considerations.**

Communicate the plan with the middle and fallen climbers before executing it and ensure they are in agreement and understand the plan.

The scenario assumed for the eval is that the fallen climber is conscious but is not capable of self-rescue using their Texas prusiks to ascend up the anchored rope. No other easy walk or climb-out options are available, needing the rescuer to build a raising system to haul the fallen climber out of the crevasse.

Below is the plan for building raising systems, considering rope entrenchment:

- If the loaded rope is entrenched into the snow, you may choose to abandon the loaded rope for the raise. This may require extra rope; either from a second rope team or planned for by a single rope team with the end climbers carrying extra rope.
- Either a drop loop 2:1, or 3:1 (Z) pulley system will work best with several people available to pull. A 6:1 raising system can be built by adding a 2:1 onto a 3:1 system, or by adding a 3:1 onto a 2:1 system.

Only the set up of a 2:1 system will be evaluated.

- The crevasse lip will be prepared before dropping a loop or a different rope from the second rope team. The image to the right displays the use of an ice ax to protect the drop loop from entrenching into the crevasse lip. Protect this ice axe from falling onto the climber in the crevasse. If possible, smoothening the crevasse lip prior to adding this protection with help of an ice ax is highly recommended.
- If possible, have one person stationed and safely anchored near the crevasse, where they can communicate with and monitor the fallen climber during any raise. Should the fallen climber be jammed up against anything while being raised, it would be easy to injure them with the mechanical advantage of a pulley system combined with several people pulling.



### VIDEO LINKS

There are a number of excellent AMGA videos on the topic of crevasse rescue. Their main focus is a small team rescue, which goes well beyond the Basic curriculum and won't be part of the evaluation. However, many of the same principles apply. The videos make a number of very good points:

- Roping up for glacier travel: <https://vimeo.com/264670737>
- T-slot and other snow anchors: <https://vimeo.com/264670274>
- Backing up a first anchor: <https://vimeo.com/265009761>

Note: In Basic we do not teach the block-and-tackle, instead use a long runner for the second anchor.

- Transferring the load: <https://vimeo.com/265007409>

Note this is for a 2-person rope team, several details are different from a 3-person rope team.

- Approaching and preparing the lip of the crevasse: <https://vimeo.com/265008195>
- Descending into the crevasse and ascending out: <https://vimeo.com/265010472>

Note: This goes beyond what we teach and practice in Basic. It is good to understand the bigger picture of what might be necessary.

- Hauling via C-loop and variations: <https://vimeo.com/265012079>

Note: Instead of a micro traxion we can use a pulley with a Prusik

### Crevasse rescue evaluation scenario:

In order to help SIG leaders and students with practicing Crevasse rescue, we provide you with the following setup that will be used for the evaluation. Please keep in mind that this is only one of many scenarios that can happen. Please take this scenario as an initial guideline and expand from there once you are competent; discuss with your SIG leaders, peers, and other course instructors how different scenarios could impact your rescue.

### This scenario will be used during the Crevasse rescue Field trip:

- Students work together as a rope team of 3 climbers. A is the leader, B is in the middle and C is at the end. There is no other team in sight.  
Simulate a crevasse fall response, with one person (climber C) directing the response: While the team is descending an open slope, the rope leader (climber A) approaches a crevasse with a snow bridge across. The leader alerts the team that the snow bridge looks likely solid enough to cross, however, has some doubts. Climbers B and C remove any slack out of the rope and are ready to arrest. Climber A carefully crosses the bridge. Halfway across, the snow bridge caves in, and climber A falls into the crevasse.
- Climbers B and C can hold the fall by moving away from the fallen climber and arresting as necessary.

- Climber C directs the response as stated in the remaining key stages of six, explained below.
- After the plan (use of raising system as Climber A is not capable of self-rescue using Texas prusiks and there are no other ways for walk-out or easy climb out of the crevasse) is executed successfully, rotate with everyone having a turn as the person directing the response.

### **Field trip pass/fail:**

Students should be able to go through the described scenario during the Field trip without interruptions or pointers from instructors and fellow students. When an instructor interrupts because of safety issues, the student may be asked to come back for re-evaluation

Situations that would lead to a re-evaluation are mostly related to safety of the team:

- Poor rope tie-in, and travel with too much slack.
- No or little communication between climbers.
- Climber C approaches climber B or the crevasse with significant slack in the rope or prusik.
- The initial rope attachment via a prusik is not backed up with a knot.
- Transfer of load without testing the anchor which will take the load.
- No progress capture of the hauling system.
- Climbers B and C always need to be tied into the anchor or have to tend the slack of their rope with a prusik.