

Seattle Basic Alpine Climbing Course.

Curriculum Outline for Field Trips 1-7.

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

Students will enter the class and this field trip with a wide range of climbing experience. To account for that, this field trip is only required for students who do not have a top rope belay card from one of the local climbing gyms. Students with a belay card do not have to join this field trip. However, if any of the points discussed below are unclear to you, please feel welcome to join.

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

We don't present all of the belay points at FT1 this first night. Let the students have fun and gain confidence. The full list of belay points is here for reference only, and repeated throughout the course. Some will choose to wear gloves for belay, but this is the student's decision and not required. Approach shoes, boots or rock shoes are all OK. Goal is for students to get a feel for belay; and to begin feeling comfortable 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'). The climber then puts weight on the rope. Slack in the system and rope stretch will be experienced. Only after the climber has fully weighted the rope, does the belayer lower the climber. Repeat with increasing height only after belayers show competence. Both of the belayer's hands should be on the brake rope when lowering. For very new climbers the belay should be tested on the ground.

- Harness correct fit & use per manufacturer. Waist belt snug around the waist and above the hips. Buckle tails secured out of the way. Compare harness differences with your partner, different buckles, etc.
- Helmet: Snug and comfortable fit per manufacturer. Helmet is optional for top-rope climbing on the Magnuson climbing walls .Tie in: Identify tie-in points for your harness. Tie-in with re woven 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: Tie in both climbers. Identify 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. Establish sequence for check.
- Communication between climber/belayer: Established sequence: On belay? Belay is on. – Climbing. Climb on. - Off belay. Belay off. Up rope. Slack. Discuss why using your partner's name. Discuss plan for being lowered, vs rappel.

Here is a nice discussion on communication and challenges in various climbing situations:

<https://americanalpineclub.org/resources-blog/2017/1/19/4xm1fcsag6b7xqf1p1w1qp7vdpp1ha>

- Rope handling and rope management: Keeping a hand on the brake rope at all times, being aware of brake position, and moving hands only when in a brake position.
- PBUS: Pull - Brake - Under - Slide. Pulling rope in for top-rope belay,
- Tube belay device: Examine the rope bends, and understand brake rope and brake position. Compare strong and weak brake positions. Discuss palm down vs. palm up.
- Belay stance: Discuss: How to anticipate direction of force on belayer; orient stance to protect brake hand; distance to the wall; weight of climber vs. belayer, and consequences. Decision whether belayer is anchored or not is considered 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 weighed 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.
- Big Picture: Both climber and belayer should keep an eye out for potential hazards: Watch your climber for pendulum swings, other climbers, etc. Very important considering our small crowded space, and many climbers wearing heavy boots. Situational awareness.
- If time permits, the functioning of a GriGri or other assisted belay devices can be discussed.

Video Links:

- Top rope belay: <https://youtu.be/CFIz4cBFVro>
- AAC Universal Belay Standard: [https://www.youtube.com/watch?v=BOIAYx-d4HE\[7\]](https://www.youtube.com/watch?v=BOIAYx-d4HE[7])
- Rewoven figure 8 knot: <https://www.youtube.com/watch?v=tFffbKXSgNI&t=4s>
Note: The dressing knot can be an overhand knot as well.

- **Knots:** - Rewoven figure 8. What is a well dressed knot?

Field trip 2 - Anchors and Rappel

Objective:

- Understand climbing anchors and recognize good vs bad 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 if applicable question an anchor's quality.
- First introduction to rappel on the ground.
- Note: This is a new field trip. Feedback by students and instructors is very welcome.

Freedom of the Hills:

Chapters #10 and #11 of 9th edition

Required gear:

Helmet, belay device, 2x locking carabiners, 1x large locking pear shaped carabiner, 120cm sewn nylon sling, 2' prusik loop (hero loop).

Overall set up:

- Up to 30 students per night, divided in six 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.

Climbing anchors:

- This section of the FT can be best run in Goodman C, at the climbing wall in the basement, or along the South wall.
- Discuss the need and use of anchors in a single pitch and a multi pitch setting. Where do we need anchors and what are they used for? Discuss exposure (below and above) and 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.

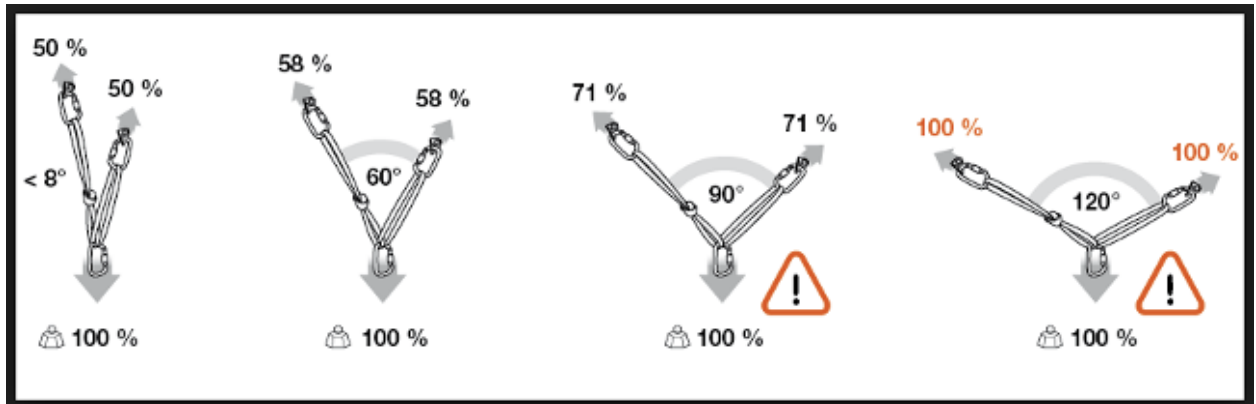


Diagram from Petzl, also see FoTH #9, p. 188.

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

Other frequently used acronyms are - note the differences.

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

Solid, Redundant, Equalized, No Extension (SRENE)

- Anchors to introduce:

Note: This is not a complete set of anchors that are used in crag or alpine settings, rather a

selection of anchors that students might know and that will be used during this course. Also see slides 14-19 in [Basic Lecture #1.](#))

For each of the anchors, discuss the EARNEST concept and find powerpoint and shelf if available.

- Two quickdraw anchors: Not an alpine anchor, however, often used in crag settings.
 - Sliding X:
 - discuss why a single sling or a simple sling without an X is not a good option;
 - discuss equalization and extension of sliding X;
 - discuss limiter knots in sliding X.
 - Cordelette with powerpoint:
 - discuss options for 2- and 3-point anchor;
 - discuss equalization;
 - discuss powerpoint and shelf;
 - Quad:
 - discuss use with bolted anchors;
 - discuss how to clip in - 2 or 3 strands, not 4!
 - discuss equalization
 - Tree anchor: One or several slings wrapped around a sturdy and well-rooted tree or a big boulder or rock horn.
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- Discussion on locking carabiners and non-locking; how to use them
 - Attaching to the anchors

Video link:

- Anchor rigging. Sewn sling w/figure 8 is the course default method for anchor rigging, similar to the cordelette with powerpoint. In the class we focus on the first method shown in the video. There are several different rigging options, for example the second one shown in the video.
<https://www.youtube.com/watch?v=bktB2dicMOA>

Rappel: first practices for a horizontal or low angle rappel

- 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 reliance on the system during a rappel vs. climbing;
- 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. See slides #24/25 of [Basic Climbing Lecture #1](#)
- Set up of rappel:
 - Extension from personal anchor; discuss the length of extension
 - Back-up or third hand with hero loop or autoblock off belay loop;
 - Check system before removing personal anchor: Anchor, belay, rope
 - Importance of hands on rope for the entire rappel; explain where the hand goes

- Voice commands

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 or alpine boots or approach shoes, climbing harness, helmet, belay device, 2x locking carabiners, 1x large locking pear shaped carabiner, 120cm sewn nylon sling, 2' prusik loop (hero loop).

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 rappelling and can rappel *smoothly*, only then add the auto-block. Students with rigid sole boots are recommended to wear hiking boots or running shoes. Idea is to make it easy for new rappellers. The general set up for a rappel has been introduced at Field Trip #2.

- Partner check.
- Safe assembly and use of a personal anchor (sewn nylon sling or PAS).
- Rappel with extension, but without auto-block. Experience a safe and smooth rappel. Avoid 'catch-and-release' rappel, discuss impact on rappel and anchors.
- Rappel with extension and auto-block.
- If time permits, add practice on Munter belay. This can be done in a top rope set up on the slabs.

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

Task: Students make 3 climbs and descent via rappel, as time allows. Many will choose to wear gloves for rappel, but this is optional and students decision. Footwear: Rock shoes, approach shoes or boots, students' choice.

- Partner check.
- Climbing technique. In control, balance & use of foot holds.
- Safe assembly, and use of Personal Anchor System for rappel. (see video below).
- Safe assembly, and use of extended rappels. (see video below).
- Safe assembly, and use of auto-block. (see video below).
- Use of rappel commands.
- Rappel safely, and comfortably with a belay device.
- Rappel with a device while wearing a pack.
- Demonstrate a leg wrap while on rappel.
- Demonstrate a Fireman's belay.

Video Links:

- Rappel with extension: <https://vimeo.com/113362076>
Also see: <https://www.mountaineers.org/blog/how-to-extended-rappel>
- General overview of rappels. It should be noted that in this AAC video, the use of a PA is not very consistent, also single rope rappels are unusual for most alpine climbs. Still, the video makes a few very good points. <https://youtu.be/ZCZjMG7UjQ>
The accompanying text is also a good read: <https://americanalpineclub.org/resources-blog/2018/2/14/rappelling>
- Several different rappel extensions are shown and discussed in this AMGA video: <https://vimeo.com/263894231>

Station 3: Belay Weight Drop and Belay Tie-off (Basement).

Task: The Station Leader raises the bag simulating a 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 force involved, and the importance of considering the direction of force. Once the bag is raised to the top, slowly lower the bag. Belaying a leader can be simulated by lowering a bag, while the belayer keeps an appropriate amount of slack and tension. 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.

- Full Partner check. (see FT1 Station 1)
- Use of climbing commands.
- Rope handling and rope management. Keeping a hand on the brake rope at all times, being aware of brake position, and moving hands only when in a brake position.
- Should the belayer be anchored, and not anchored? When and why? Discuss with students and instructors.

- 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. With full control, and with all tie-off knots well dressed and secure. With a belay device tie-off, the mule knot can be done either on the spine of the belay carabiner, or on the rope.
- Belay escape. The knots for prusik and backup can be non-releasable Figure 8 knots.
- Repeat the exercise with a munter belay, keeping in mind that the munter brake position is multi-directional.

Video links:

- Belay and tie-off with munter. Note, there are several different ways how one can tie a Munter. The demonstrated method is only one of them.
<https://www.youtube.com/watch?v=xDGRLgFYGco>
- Tie-off with tube device (slip knot on carabiner spine): <https://vimeo.com/17441295>
Note: What they call "Plate" is what we call the belay device / ATC.
- Tie-off with tube device (mule knot): <https://www.youtube.com/watch?v=bQtjrog18xY>
- Note that most comments in this video are not specific for the Petzl Reverso, they also apply to other tubular belay devices.
<https://vimeo.com/80477504>

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

- This station is best introduced for each group as a demonstration with one rope team that consists of two volunteer students. Many aspects can be discussed with the group during this demonstration. Following that student **Task:** This is mostly an experience and learning station. Little if any previous knowledge should be expected. Students will be evaluated for connecting themselves to an anchor at FT3. The standard anchoring technique is the rope, not a Personal Anchor sling. The climber ties a clove hitch in her/his end of the rope and connects to the power point of the anchor via a locking carabiner. Working in pairs students experience leading and following sequence. Switching roles, and repeat. ts will practice this.
- One student is belayed by the other student and leads a short route through the boulders. The student who leads clips through already placed 'fixed' pro. Begin with a partner check.
- From bolts near the top of the boulders the leader rigs a SERENE anchor from fixed anchor bolts, and connects to the focal point, using the climbing rope in a safe manner. A single clove-hitch is recommended as tie-in to the anchor, a second connection is not required (students choice). Partners check each other's connection to anchor, and anchor rigging.
- Leader, belays their partner up directly from the anchor with a munter.
- Upon reaching the belay the follower (aka the second) also connects to the anchor with the climbing rope in a safe manner. Single clove-hitch recommended, a second connection is not

required (students choice). Partners check each other's clove-hitch connection to the anchor, & anchor rigging.

If time permits answer questions about:

1. Anchor rigging.
2. Body belays. Video: <https://www.youtube.com/watch?v=Tw6ChiFHXZI>
3. Prusiking along a fixed line.
4. Guide Mode for belaying a second. ONLY if time allows, and if students are able to demonstrate mastery belaying with a munter. Practice using the munter is priority.

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 will stay together for the morning or afternoon. This will allow the instructors to get a better picture of the students.

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 at least climb 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. OK 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 climbs and descent via rappel, or more. 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 focal point 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.
- Climbing technique. In control, demonstrating balance & use of foot holds.
- Safe assembly, and use of Personal Anchor System for rappel.
- Safe assembly, and use of rappel extension.
- Safe assembly, and use of auto-block.
- Use of rappel commands.
- Rappel safely, and in control with a device.
- Rappel while wearing a pack.
- Demonstrate a leg wrap while on rappel.
- Demonstrate a Fireman's belay.

Video Links: See Field trip 2, station 2

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

Task: Ask the student to talk about, and demonstrate their strategy for belaying a leader. Instructor raises the bag simulating a top-rope belay. Raising the bag is a good time to give the belayer a quick drop. The drop is to give the belayer an idea of the force involved, and the importance of considering the direction of force. Once the bag is raised to the top, slowly lower the bag. Lowering the bag simulates belaying a leader. 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 student's decision and not required.

- Full Partner check. (see FT1 Station 1)
- Use of climbing commands.
- Rope handling and rope management. Keeping a hand on the brake strand of rope at all times, being aware of brake position, and moving hands only when in a brake position.
- Belayer anchored, or not anchored? When, & why?
- Belayer position/stance considers direction of force.
- PBUS belay with device. Pulling rope in for top-rope belay, and Pulling (feeding) rope out when belaying a leader.
- Tie-off the belay to go hands free. Showing full control, and with all tie-off knots well dressed, snug, and secure.

Video Links for belaying a leader, see FT 2. See FT 1 for belay tie-off videos.

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

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

- Partner check.
- Safe assembly, and use of Personal Anchor System.
- Safe assembly, and use of rappel extension.
- Safe assembly, and use of auto-block.
- 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.

Alternate rappel method using any 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. If only two locking carabiners can be used, the climber must avoid rope friction against the belay loop.
- Rappel with the 3 locking carabiner rappel method, extended and with auto-block, including partner check.
- Be careful about rope running over the locking mechanism to open the gate.
- Check - as much as possible on the flat roof - if the student's carabiners provide enough friction with the given rope. Size, shape and orientation of carabiners have an impact on friction. Doubling up on the top carabiner -the one furthest away from harness- can provide additional friction.

Video link:

- <https://www.youtube.com/watch?v=IsIG-Clp2qA>
Note: We typically rappel from two strands of rope

Field trip 5 - Crevasse rescue practice

Learning and practice session at Kite Hill in Magnuson park

See FT #7 for details on the evaluation

Deling's drawings of a crevasse set-up:

<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>

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

Snow Travel.

- Assess the runout.
- Step kicking.
- Walking in balance.
- Descending using plunge step.
- Use of crampons for snow travel. Points not too sharp. Basic crampon use only (snow travel, not ice climbing).
- Ice axe self-belay grip, and Self-arrest grip.
- Self-belay when snow conditions favor use of axe shaft. Soft enough for substantial shaft penetration depth. Note: Self-belay is often done with self-arrest grip.
- Low dagger position / High dagger position. When snow conditions favor use of axe pick. Snow conditions too firm for significant axe shaft penetration.

Video Link: <https://www.youtube.com/watch?v=qid9w1E7G0A> - Crampon use.

Self-Arrest.

Assess runout before each slide. Self-arrest positions are practiced and tested without wearing crampons, but understanding self-arrest is most effective when wearing crampons.

- Start with head uphill/facedown
- Start with head uphill/faceup
- Start with head downhill/face down
- Start with head downhill/face up

Glissade.

Assess runout before glissading. Discuss dangers of glissades. Self-arrest positions are practiced and tested without wearing crampons, but understanding self-arrest is most effective when wearing crampons.

- Safe ice axe position and grip.
- Proper body and feet position.
- Roll into self-arrest to the left side.
- Roll into self-arrest to the right side.

Introduction to snow anchors.

Working in teams of 3 students hold a simulated crevasse fall, then transitioning from holding the fallen climber, to building & connecting to a snow anchor (aka, escape the belay). This is a simulated fall only (not a full load). An exercise for building snow anchors, and connecting to the anchor with a friction hitch to escape the fallen on rope. Not a full crevasse rescue scenario, since time is limited.

- Snow anchors. T-Slot. - We no longer decide what type of anchor to make for the first anchor in advance. Our previous method (vertical ice axe) is a poor anchor for soft snow conditions, and doesn't work well for hard snow either. Another option is the T-slot. Ice axe, or picket buried horizontal with a sling girth hitched. This type of snow anchor can be very fast, and secure with common spring/summer snow conditions. It is also pretty fast with hard snow.
- Friction hitch connected to anchor.
- Friction hitch backed up to anchor. With clove hitch (adjustable), bight of rope tied with an overhand, figure 8, or other knot to a locked carabiner.
- Body belay using Slip-Slap-Slide technique

Field trip 7

Glacier Travel & Crevasse Rescue Evaluation.

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](#)).

Roping up for glacier travel & crevasse rescue - for multi-rope team glacier travel (two or more rope-teams).

Students work together as a rope-team of 3 climbers. Simulating a crevasse fall response, with one person directing the response. Rotating with everyone having a turn as the person directing the

response. Students are evaluated on safely demonstrating the 6 key points described below. This station covers the entire crevasse rescue, not only the rigging of a raising system (Step 6).

Deling Ren has set up a very nice illustration on Crevasse rescue:

<https://1drv.ms/b/s!AjL5vMRx18wDgb8UhXOQxUX1T6PIGg>

1) Roping up for glacier travel.

Details: For a rope-team of 3 climbers; divide the rope into 4 lengths, with both end climbers carrying $\frac{1}{4}$ of the rope (aka rescue rope). Carrying the rescue rope inside the pack might be easier than coils on the body. Coils on the body are considered advanced.

Two carabiners (at least one locking) for tie-in connection to rope (butterfly, overhand, figure 8, clove-hitch).

2) Holding the fall.

Details: 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.

Details: Includes building a snow anchor; and then transferring the weight of the fallen climber from the climber holding the fall to the snow anchor. 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. Type of snow anchor used is dependent on snow conditions. Details for holding a crevasse fall, building snow anchors, and escaping are practiced at both FT4, and the SIG Snow FT.

Note: Prusik is the course default friction hitch although other friction hitches are welcome.

Back-up for friction hitch (prusik, klemheist, rope grab, etc): Because both friction hitches and rope grabs fail a rope's sheath at around 4 kn (1 kn = 225 lbs.) it's important to back-up the prusik connection using the loaded rescue rope 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 knot to a locked carabiner at the snow anchor's powerpoint.

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

Details: A number of ways to do this safely. All involve being connected to the snow anchor's power-point in some way. Bonus points if your method allows for quick descent to the fallen climber should they require emergency first aid.

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

Details: Rappelling to an unresponsive fallen climber may be the quickest way down. 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) Raising systems, including rope entrenchment considerations.

Details: 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.

Usually either a drop loop 2:1, or 3:1 (Z) pulley system. One of these two raising systems will usually 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. If you only learn one pulley system, make it the drop loop 2:1.

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

- <https://www.youtube.com/watch?v=hkPmNPgrBVY> - Roping up for glacier travel.
- <https://www.youtube.com/watch?v=sfGNZA7nE18> - T-slot and other snow anchors.
- <https://www.youtube.com/watch?v=Z07LXfplRNs> - Transfer load, and escape.
- <https://www.youtube.com/watch?v=EhlanzaBtp4> - Check victim, and drop loop.
- <https://vimeo.com/145012490> - Prusik, and rope grab limits - 4kn. (Bonus video for geeks).
- Deling's drawings of a crevasse set-up:
<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>

Further reading:

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:

- Anchor set up and transferring the load to an anchor: <https://vimeo.com/265007409>
- Backing up a picket anchor: <https://vimeo.com/265009761>
- Approaching and preparing the lip of the crevasse: <https://vimeo.com/265008195>
- Rappelling down to the fallen climber: <https://vimeo.com/265010472>
Note the different rope ascending technique.
- 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 scenario:

In order to help SIG leaders and students with practicing Crevasse rescue, we provide you with the scenario below. Please keep in mind that this is only one of many scenarios that can happen. The

first five steps outlined above are more important in the real world than a hauling system. Please take this scenario as an initial guideline and expand from there; discuss how different scenarios could impact your rescue. This scenario will be used during the Crevasse rescue Field trip.

Scenario:

A rope team of 3 mountaineers is traveling on a crevassed glacier. A is the leader, B is in the middle and C is at the end. There is no other team in sight. They are tied into the rope with 15m between the climbers, the two climbers at the end each have 15m extra rescue rope in their packs. They are tied in with two carabiners, at least one of them is a locking carabiner (**#1, Roping up for glacier travel**). The snow is firm, not icy.

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. Half way 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. (**# 2, Holding the fall**).

Climber A is completely in the crevasse, climbers B and C can hear noises from climber A, however cannot understand. Climbers B and C communicate that climber B can hold the weight of climber A. While keeping slack out of the rope, climber C approaches climber B. Climbers B and C agree that climber B is comfortable holding the weight of the fallen climber A, and that the snow is firm enough that one T-slot or deadman anchor made with an ice axe (or a picket) is solid (*During the evaluation this will be a vertical rebar. In the real world a quick initial anchor might be preferred depending on conditions). Climber C sets up an anchor and attaches the rope to the anchor with a prusik. Climber B cautiously gets up, transfers the load to the anchor and then guards the anchor. The friction hitch is backed up on the anchor with a solid knot.. Before tying out of the rope, climber B attaches to the anchor. Climbers B and C agree that there are no immediate dangers in the area, such as rock fall, further crevasses etc. (**#3, Anchor the rope, including back-up to friction hitch or rope grab. Communication between rope-mates holding the fallen climber**).

Climber C safely approaches the crevasse secured by a prusik with no slack along the rope that is attached to the power point of the anchor. At the edge of the crevasse climber C can now assess the situation and communicate with the fallen climber A: Climber A has fallen 10ft into the crevasse, dislocated a shoulder during the fall, cannot climb, however, has no further injuries that require immediate action. (**#4 Safely approach the crevasse, and communicate with fallen climber**).

Climber C communicates with climber B. They agree that they need to haul climber A out of the crevasse. Since the rope that climber A hangs on is badly entrenched in the snow, they agree on a drop-loop as a hauling system. Climber C communicates this plan to climber A. (**#5 Make a plan, including how to quickly assist a fallen climber who does not respond and may require emergency first aid.**)

Climber C then attaches a pulley and a carabiner on the bight of rope, lowers it down to climber A, and makes sure that climber A clips the carabiner in the belay loop. Climber C pads the lip of the crevasse with an ice axe to avoid entrenchment of the rescue rope. Climber C then moves back to climber B while maintaining the prusik. Climber C attaches to the anchor, sets up a progress capture (long prusik), communicates with climber A. Climbers B and C start hauling climber A out of the crevasse. (**#6 Raising systems, including rope entrenchment considerations.**)

Beyond this scenario:

What is not covered in this scenario are for instance a variety of snow conditions that impact the ability to arrest and that have consequences on building anchors, injury of the fallen climber that requires immediate attention, presence of other rope teams. This scenario also does not cover other hauling systems, how to get the fallen climber across the edge of the crevasse, how to secure the rescued climber, check the integrity of the rope, how to extract the party, etc.

Most real life crevasse falls can be minimized by proper rope handling and good arrest, and typically won't need a hauling system.

Field trip pass/fail:

Students should be able to go through the described scenario during the Field trip without too many pointers from instructors and fellow students. Students should have a general understanding of the process.

Situations that would lead to a fail 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 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.