

## Tacoma Intermediate Snow Skills Curriculum 2019

**Purpose:** Build competent basic glacier rope leaders

- Ensure Intermediate student understanding and knowledge of basic skills/topics so they may adequately teach basic students
- Build on student knowledge of basic skills:
  - Critical thinking through the steps of crevasse rescue and the haul systems
  - Snow anchors
  - Snow belays
- Discuss circumstances and decision making on a glacier climb
- Start introducing 2 person team travel
- Building the community - Have a good time and give the students a chance to get to know each other.

### **Required Reading:**

*Mountaineering: The Freedom of the Hills, 9th Edition,*

Chapter 3 - Camping, Food, and Water

Chapter 16 - Snow Travel and Climbing

Chapter 17 - Avalanche Safety

Chapter 18 - Glacier Travel and Crevasse Rescue

Chapter 27 - The Cycle of Snow

[\*Snow Anchors for Belaying and Rescue. D. Bogie, A. Fortini.\*](#)

[\*Backing up an Anchor for Crevasse Rescue. L. Goldie.\*](#)

[\*Self Arrest with Crampons. J. Martin.\*](#)

[Drop Loop Crevasse Rescue](#) by Gregg Gagliardi

Crevasse rescue videos by AMGA instructor Jeff Ward:

- [How to Rope Up for Glacier Travel](#)
- [How to Transfer a Fallen Climber's Weight to a Snow Anchor for Crevasse Rescue](#)
- [How to Back Up a Snow Anchor for Crevasse Rescue](#)
- [How to Rappel Into and Ascend Out of a Crevasse](#)
- [How to Prepare a Crevasse Lip for Rescue](#)
- [How to Haul a Climber Out of a Crevasse](#)

## **Recommended Reading:**

*Staying Alive in Avalanche Terrain, 2nd edition.* Bruce Tremper, ISBN 1594850844

*Snow Sense.* J.Fredston and D.Fester, ISBN 0964399407

*Snow Travel: Skills for Climbing, Hiking, and Moving Over Snow.* M. Zawaski.

## **General design principles**

1. **Handling prerequisites.** We will spend little to no time on prerequisites in lectures and at the field trip. A detailed list of all prerequisite skills, topics and knowledge is listed below. Students are responsible for these knowing and understanding these items, and may be test on them in the exam.
2. **Non-interactive lecture content.** We will minimize or avoid lecturers reciting any non-interactive presentation content that students can simply read about on their own. All such content will be included in the reading, manual and/or handouts provided to students before the lecture. The students will be expected to read it ahead of the time, and may be tested on it during a short quiz prior to the lecture. The lecture time will be used mainly for clarification, to answer questions, go more in-depth over quiz questions, etc. The discussions will largely be driven by student questions.
3. **Skills practice at lectures.** To the extent it's possible and practical, we'll utilize lecture time to practice rope skills (crevasse rescue, passing pickets, belaying a follower, etc.) that can be practiced in the clubhouse. In order to save field trip time, we'll try to minimize situations where students are being introduced to a skill for the first time during a field trip (except in cases where this is obviously unavoidable, such as snow evaluation or snow anchor construction).
4. **Testing skills at field trips.** For critical skills that were introduced and practiced at the lecture, the emphasis on the field trip will be on testing, not just more practice. Students will be required to only test on 2 person crevasse rescue at the Intermediate Snow Skills field trip.
5. **Skills from the Basic course.** Although technically, these are prerequisites, we will make an exception and spend time on reviewing and practicing some of the critical skills that Intermediates students are expected to teach to Basic students, with emphasis on correct technique and teaching methods. This will include ice axe arrest and roped team travel.
6. **Expedition-related skills.** These skills that are generally not needed when climbing peaks in PNW, such as fixed line travel, will only be optionally covered if time allows.

## **Prerequisite knowledge or skills**

Content from prerequisite courses, material covered in the manual/handbook, or assigned reading that shouldn't be occupying a major portion of the module, and that should only be covered briefly as a refresher/review/test at lecture(s)/exam, or as a homework or prep work for lectures/FTs:

**Covered in the manual, assigned reading, or in a prior lecture:**

1. Gear and gear selection for winter mountaineering – highly individual based off of goals.
2. Physical conditioning – highly individual based off of current conditioning and goals.
3. Nutrition/hydration on winter climbs.
4. Mountain weather.
5. Avalanche: types of avalanches, parts of avalanche path, terrain traps, runouts, slope angles, snowpack analysis, assessing runouts/angles in the field, snow tests.  
(NOTE: AIARE1 is a requirement for passing the Intermediate Glacier Travel unit)
6. Winter camping techniques and emergency shelter construction (snow caves and trenches).
7. Safe travel techniques, ice axe arrest.
8. Key components of a trip plan and emergency plan.
9. Responsibilities of a climb leader vs. those of a rope lead on a climb.
10. Glacier climb trip plan:
  - a. Route: terrain, weather/avy considerations, waypoints, segment bearings/distances, retreat
  - b. Timeline: estimating duration/ETA of each segment (e.g., Munter method), turnaround time.
  - c. Stove/fuel systems: estimating fuel needs.
11. Route finding on a glacier.
12. Tools for risk assessment (e.g., red-amber-green and similar).

**Covered in another course:**

13. Navigation: Use of topo maps, recognizing terrain features, use of UTM grid, reading distances/bearings.
14. Avalanche rescue, etc. (AIARE1 is not a prerequisite, but required for passing the Intermediate Glacier Travel module).
15. Human factors that affect decision-making (Leadership Seminar).
16. Rappel set-up and anchor equalization (Self-rescue and Anchors Module)

**Topics/skills taught in the course**

Content that either was not covered earlier, or that should be discussed and practiced more in-depth in this module:

**1. Snow travel techniques**

- a. Importance of traveling as team (rope teams need to travel in close proximity to each other)
- b. Importance of keeping the rope taut
- c. When and why to rope up vs. travel un-rope.
- d. When and why to pitch it out vs. travel as a rope team without placing anchors.
- e. How to rope up for glacier travel (Rope team spacing):
  - Adjusting for terrain, when traveling through:
    1. Crevasse field
    2. Rocky terrain (ex. going up the Disappointment Cleaver on the DC route of Rainier)

- A note on short-rope: students should be informed that it is a high risk technique even for guides, and must not be attempted without professional training.
- f. When to use/how to space stopper knots.
- g. Wand placement.
- h. Ice axe arrest:
  - Teach this more in-depth with emphasis on correct technique,
  - [Pros and cons of feet up versus feet down.](#)

## 2. Snow belay techniques

- a. Various ascent/descent techniques, and when they should be utilized (slope angle vs time vs safety)
  - Free Soloing/Un-roped Travel
  - Self-belay
  - Running belay/Simul-climbing
  - Hip belay
  - Carabiner-ice axe belay
  - Boot axe belay
  - 2 point anchored belay
  - Teleferique method (optional, if time allows, introduced but not practiced until IGT)
  - Chariot belay (optional, if time allows, introduced but not practiced until IGT)
- b. How to belay across a snow bridge.
  - Belaying the leader/team members up a snow bridge
  - Belaying the leader/team members down a snow bridge
- c. How to protect the traverse. When to use:
  - Pickets/Running belay
  - Fixed Line (covered in Intermediate Glacier Travel Module)
- d. Belaying the follower with ATC in guide mode, transition to lowering, block and tackle (taught in anchors and self-rescue otherwise)

## 3. Anchors and anchor construction

- a. Assessing the strength of snow for climbing and anchor building
  - Snow hardness test (finger test),
  - Snow compression test (snowball test)
- b. Snow Anchors - characteristics of each, hardware modes of failure, snow failure (shear or compression) and best anchor for different snow conditions.
  - Pickets
    1. Vertical Top Clip
    2. Vertical Mid-Clip/Sierra
    3. Deadman
    4. T-slot
  - Bollards

- c. When to use different anchors (speed vs. slope angle vs. safety vs. conditions)
  - Soloing (no anchor)
  - Running belay (picket line)
  - Carabiner Ice-Axe Belay
  - Hip Belay
  - Prusik belay (belaying in/out of rest spots on a glacier)
  - 2-piece anchor
  - Bollards

#### 4. Rescue techniques and Hauling Systems

- a. When to use a 3:1 (z-pulley) vs 2:1 (c-pulley) system
- b. How to prepare the lip of the crevasse for rescue
- c. 3:1 (Z) pulley decisions:
  - Initial anchor - what is the best anchor to use
  - Should the middle climber get up or should you build a second anchor
  - Using a bachmann vs prusik
  - Should you back-up the friction hitch or build a second anchor first
  - What do you do if:
    1. You lose or do not have a second pulley
    2. Lose your ice axe
    3. Lose a picket
    4. Webbing isn't long enough for good spacing of anchors
  - Which side of the 2nd pulley should your chest prusik be on when going from the lip back to the anchor (between both pulleys or after the second pulley)
- d. Rappelling into and ascending out of a crevasse
  - When it is necessary
  - How to do it (primarily how to ascend when on rappel)
- e. Rescue of a middle climber
- f. Seattle [crevasse rescue method](#)
- g. Introduce Canadian drop loop 6:1.

#### 5. Emergency shelters

- a. Build and spend a night in an emergency snow shelter (cave or trench) in winter conditions.
- b. Reflect on how this experience should dictate what you pack on a climb.

### Schedule

#### 1. Lecture 1 - Rescue Techniques and Emergency Shelters

- a. Topics:
  - Rescue Techniques, Emergency Shelters, and field trip expectations (curriculum listed above).

- b. Discussion:
  - Field Trip expectations
  - Questions/clarification on the lecture topic
- c. Skills Practice (stations):
  - Students do a dry run of the entire 6:1 sequence.
  - Optional, if time allows: include rappelling in and ascending out of crevasse.
- d. Homework:
  - Study the 6:1 drop loop video and handouts for the field trip.
  - Study handouts and videos about snow travel, snow anchors, and snow belays for lecture 2.
  - Create a trip plan for a glacier climb: (will be critiqued by instructors and other students).
    1. 3 day climb of Mount Rainier
    2. Season June (however, think about how your plan might change with the season and snow conditions).
    3. Emmons Glacier Route
    4. 4 leaders, 8 students

## 2. Lecture 2 - Snow Travel, Anchors, and Belays

- a. Topics:
  - Snow travel, anchors, belays (curriculums listed above).
- b. Prep work:
  - Study handouts about snow travel, snow anchors, and snow belays.
  - Create a trip plan for a glacier climb, to be critiqued by instructors and other students
    1. 3 day climb of Mount Rainier
    2. Season June (however, think about how your plan might change with the season and snow conditions).
    3. Emmons Glacier Route
    4. 4 leaders, 8 students
- c. Discussion:
  - Insights, questions, and lessons learned from the trip planning exercise.
  - Choosing appropriate snow travel/anchors/belay techniques over a few different scenarios.
  - Questions/clarification on the lecture topics.
- d. Skills Practice:
  - Belaying follower in guide mode, transition to lowering, ascending a rope, passing a picket, block and tackle.

## 3. Field Trip Day 1 (dedicated to snow anchors, snow belays, and emergency snow shelters)

- a. **Anchors:** assessing snow quality, building and testing all types of picket anchors and understanding their modes of failure, including vertical top-clip, vertical mid-clip (Sierra) pickets, and horizontal mid-clip (deadman) picket.
  - Show strength of each anchor in the conditions.
  - Show how the strength changes with compacting and not compacting the snow.

- Attempt to get failure with each type, and try to help students understand modes of failure.
- b. **Belays:** running belays, carabiner ice-axe belays, and belaying a follower off a master point at a snow anchor with ATC in guide mode with a transition to lowering the follower.
- c. **Shelters:** constructing and spending a night in snow shelters (snow caves or trenches).

**4. Field Trip Day 2** (dedicated to 2-person rope team setup and 6:1 crevasse rescue practice)

- a. **Setup:** preparing a team to rope up for glacier travel, including taking coils, isolation loop tie-in, setting up as a 2-person team, when and how to use stopper knots in the climbing rope).
- b. **Rescue:** time permitting, complete 6:1 sequence on a 2-person team, including holding a fall, building an anchor while in arrest, equalizing the anchor, rappelling into and ascending out of crevasse, setting up 2:1 and then 3:1.

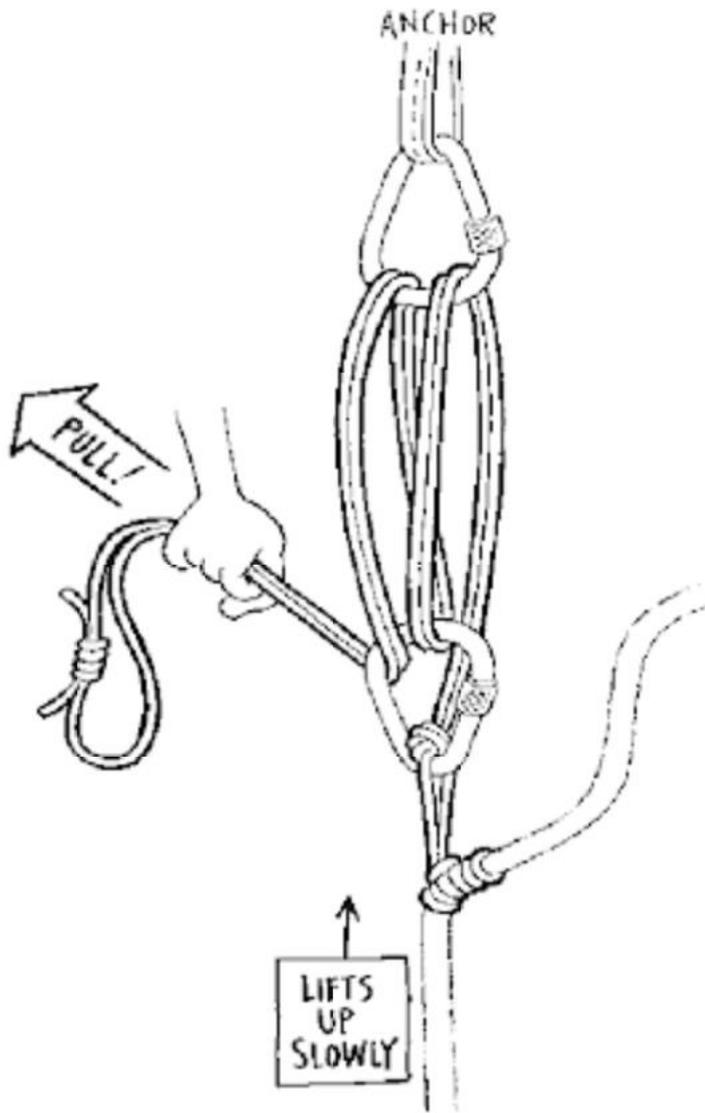
## **References**

1. Ice axe arrest (*Snow Travel: Skills for Climbing, Hiking, and Moving Over Snow*. Zawaski).



*Photo 5-1. The ideal self-arrest position for someone with an ice ax, but without crampons.*

2. Block and tackle (Self-Rescue, Fasulo, or [Larry Goldie's article and video](#)).



*Block and tackle.*