The Tech Troglodyte

Prospective Member Guide

Fall 2025

Take Nothing but Pictures, Leave Nothing but Footprints, Kill Nothing but Time

VPI Rescue Roster 2025
Blacksburg, VA

Call 911 first. Ask them to request mutual aid
from Blacksburg Volunteer Rescue Squad.
Call in this order until someone answers.
Please avoid publicity.

Phil Benchoff	(540) 200-8086
Zenah & Wil Orndorff	(540) 230-5960 or 5996
Molly Lucier	(540) 357-1656
Brian Ekey	(540) 200-8443
Tommy Polson	(571) 228-0985
Andrea Futrell	(540) 230-2264
BVRS Field Supervisor	(540) 315-2674

Meetings

Every Friday night while classes are in session in Smyth 146 at 7:00P.M.
Visit our web site at `http://vpi.caves.org/`.

CAVES ARE PROTECTED BY LAW

Caves are a unique nonrenewable natural resource.
They are protected so that future generations can enjoy them.

IN VIRGINIA, MARYLAND, and WEST VIRGINIA CAVES IT IS ILLEGAL TO:

- Write or mark on the walls
- Litter or dump spent carbide
- Break or remove mineral formations
- Disturb bats or other living organisms
- Remove or disturb historic or prehistoric artifacts or bones

(Code of Virginia 10-150.11 et seq.)
(Maryland Natural Resources Code 5-1401 et seq.)
(West Virginia Code 20-7A-1 et seq.)

Help enforce the law by reporting all persons violating the law to the cave owner or nearest law enforcement authority.

Thank you, and cave safely.

The Virginia Cave Commission

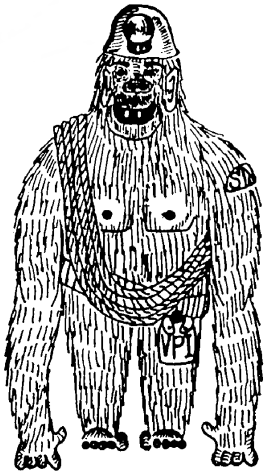
Cover drawing by Sam McCarter

The Tech Troglodyte

A Journal of the VPI Cave Club
Student Grotto of the National Speleological Society
PO Box 558 — Blacksburg, Virginia 24063

Prospective Member Guide

This issue of the Trainee Trog is dedicated to Ray Sira and Eric Hahn, two members of our caving family who we lost tragically and too soon. Eric's drive to explore, push the limits of caving, and to pull others up to the heights he sought has left a lasting impact on this club. Ray was a rock: the friendly face at every single event, who's smile, laugh, and kindness will not be forgot. Training new cavers was a passion both shared; keep them in mind next time you're caving with newbies or partying around the picnic fire.



2025-2026 Grotto Officers

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Tech Troglodyte

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Fall 2025

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President's Message

Section 2 of By-law II of the V.P.I. Cave Club lays out the requirements every trainee must meet before earning full membership. These rules aren't just there to look official, they're enforced in the interest of speleology and, more importantly, for your safety and protection underground.

Caving demands grit, but even more, it invites a profound respect for our existence in the depths of an extreme environment. It also requires intentional training, solid team work, and steady patience. Your training should be more than just a signoff sheet: each step should be taken with intention, building knowledge and skill along the way. This Training Trog isn't just a set of recommendations from some of the greater veterans of cave exploration, it's also steeped in decades of VPI Cave Club history, tradition, and the lessons learned from those who came before you. It's your choice should you choose to carry on that future, or say "screw this."

As you step into your prospective membership phase, embrace the process. Make mistakes; preferably the ones you can survive. Endure our nonsense. Learn from it all. Because someday, the reputation of one of the greatest grottoes in the western hemisphere might just rest with you.

Gracie Cornish, `president@vpicaveclub.org`
President
VPI 511

Safety Chairperson's Message

Welcome to the VPI Cave Club! Caving is dangerous. Don't do it!... But since we're here, let's go over some basics.

Safety is more than rules and gear. Safety is about knowing your limits, communicating them, and staying curious. These three things will help you more than any single knot or piece of equipment. This training manual is your toolkit. It's here to teach you, alongside VPI members, the skills you need to take care of yourself underground and to help you track your progress toward membership. Use it, ask questions, and make it your own.

Limits aren't weaknesses. They show where you're at today. Limits can change with experience, confidence, or even the conditions underground. One method might work well for someone else but not for you and that is okay. If your trip leader(s) should know something, such as an injury, a significant stress trigger, an allergy, or something else, tell them. The more they know, the better they can plan and keep the trip safe and comfortable for everyone.

If something doesn't seem right, speak up. Pay attention not only to potential hazards but also to the safe ways things are done and why. Don't be afraid to ask questions as they can only be helpful! Understanding the reasoning behind choices will make you more adaptable and confident underground. We learn from every trip, even the "oops" moments, and we improve as a team. This manual is just the starting point. Take these ideas, put them into practice, and you will soon discover that caving is not just about skill, it is about trust, curiosity, and looking out for each other. Welcome to the club and welcome to the adventure. See you underground!

Meredith Blanco, `safety@vpicaveclub.org`
Safety Chairwoman
VPI 474

Your First Cave Trip

What does it take to prepare for a cave trip? Your first trip, and every trip thereafter, will help you figure out what *you* need to do to get ready. But there are a few common things you should always think about.

Talk With Your Trip Leader and Plan

For every trip you'll ever do, you need to talk about going caving with someone first! Usually there is a "trip leader" planning the trip. When you get your membership, this might be you! Before you are underground, it is important to make sure that everyone on the trip have shared expectations for the trip. Communication is key!

- **Who is coming?** The trip leader should know who is coming on the trip–no last-minute surprises or additions! Trip leaders may impose limits on how many people can go on their trips, to protect the cave, respect landowner wishes, or simply for their own peace-of-mind. To help the trip go smoothly, you should tell the trip leader about any allergies, medical conditions, phobias (e.g. claustrophobia), or other things that could impact the trip.
- **What are we doing?** How wet is the cave? Is vertical or horizontal? It's important to know how long the trip leader is planning to be in the cave, so that you can prepare. If the trip has a goal, it is important that is shared with participants in advance: no-one wants to turn a trip, so you need to know if you will be mapping cave in waist-deep water for 10 hours. All these details help you know what gear you need to bring, and what gear you may need to borrow.
- **When and Where?** When and where are you meeting? At a cave entrance or a signout location? Mix-ups like that have cost far too many trips valuable time. Similarly, tell the trip leader if you're running late!!! Finally, know your ETA (when your trip leader thinks you will be back) and your callout time (rescue will be dispatched), and clearly explain this to your parents, roommate, or anyone else who might be expecting you!

Equipment and Clothing

For a caving trip, you should have:

- **A helmet** On your first few trips, you'll borrow one from the club.
- **Three (3) sources of light** (may be provided by the club): You should plan to bring spare batteries, too.
- **Gloves**: nitrile-dipped gardening gloves are a great and cheap option. Leather gloves also work.
- **Warm Clothing**: The temperature in nearby caves is around 54°/F. If you sit still for a long time, this will feel very cold! Cotton absorbs water, so plan to wear a good synthetic **base layer**, like workout tights.
- **"The Muddy Layer"**: Cotton sweatshirts and jeans absorb water and soak up mud. After your first few trips, you'll want a **long-sleeved synthetic top** that will keep you drier and warm. For the bottom, you will want abrasion-resistant pants: **jeans** are still fine if you have a good base layer.
- **Knee pads**: crawling in caves will beat up your knees. Protect them!
- **Socks**: A good pair of **wool hiking socks** work well.
- **Footwear**: Closed-toed shoes with ankle support are a must! This means no sneakers! Your shoes will get muddy and wet, so many cavers like PVC or rubber "Wellies" rather than leather hiking boots.
- **Pack**: This can be an old backpack you don't care about getting muddy, torn, or broken. A drawstring bag will work for your first few trips. Cheap 20L drybags are a good upgrade. In your cave pack you should have:

  - Food/Snacks
  - Water
  - An extra layer, such as a fleece
  - Any Medication you might need
  - a candle, a trash bag, and a lighter
  - spare light and batteries

  On your first few trips, your trip leader may have extras of everything, but you should be prepared to watch out for yourself.

- You should leave a clean change of clothes, and valuables like your phone or wallet, outside the cave.

The list of other handy things to have is endless: a watch, a camera, water purification, toilet paper.... Talk to more experienced cavers like your trip leader for ideas!

Additonal Considerations

- **Car Keys**: Everyone on the trip should know where they will be kept, in case of an emergency.
- **Pack check**: Check the contents of your pack with your trip leader before leaving on the trip.
- **Keep communicating**: Before and during the trip, communicate with the trip leader. If you are late or if something is on your mind, *tell them* so they can help you have fun and be safe.
- **Be respectful of Landowners and their property**: No-one has to let you go in their cave. Leave gates as you find them, mind livestock, and leave places better than you found them.
- **If you see something, say something**: If someone or something seems unsafe tell your trip leader or talk to the club's safety chair so that the issue can be addressed.

The VPI Cave Club Constitution

CONSTITUTION OF THE VPI CAVE CLUB STUDENT GROTTO OF THE NATIONAL SPELEOLOGICAL SOCIETY (As amended April 26, 2024) (Bylaws as amended Sept 27, 2024) (Annotated Version)

The Constitution of our club contains all the basic rules for operation of the club as an organization. The Constitution and Bylaws also contains the guidelines we follow to remain safe underground and protect our fragile environment.

Below is an annotated version of the VPI Cave Club Constitution. The Constitution is in this font *while the annotations are in the font you are reading now. The annotations will expand upon the basic ideas put forth in the Constitution, explaining why we follow certain rules in some cases and demonstrating concepts in other cases.*

Article I
Name

The name of this organization shall be the *VPI Cave Club, Student Grotto of the National Speleological Society* (VPI is an acronym for Virginia Polytechnic Institute).

The National Speleological Society, or NSS, is the largest caving organization in the USA, and VPI is one of the original grottos of the NSS. Although regular members of the club are not required to be NSS members, it is highly encouraged. The NSS helps cavers and caving in general through funding of cave conservation and educational efforts, organization of a yearly convention where state of the art ideas and equipment are presented, and publishing a monthly magazine containing exploration and technology not only within the USA but also worldwide.

Article II
Purpose

The purpose of this club shall be to promote interest in, and to advance the science of speleology; to promote conservation of caves and safety in their exploration; and to encourage fellowship among those interested in caving.

New techniques and gear are constantly becoming available. Involvement with the club is an opportunity to see these in use, try them out, and find out what works best for you. In addition to new commercial products, cavers regularly innovate and modify their gear for specific cave tasks and difficult environments. Membership in the club is a great way to contribute to the caving community any new ideas of your own. The Cave Club is also a good place to meet people who share your interest in caving and many other non-caving activities.

Article III
Membership

Section 1: There shall be three classes of dues paying members: *full*, *associate*, and *prospective*. There shall be two qualifiers, *inactive* and *life*, as described in the By-Laws.

A. Full membership shall be restricted to students, faculty, or staff of VPI&SU who have completed membership requirements as stated in the By-Laws. Full members shall have access to club records and files and may use club equipment.

i. Life members are considered to be associate (defined below) until they have submited written notice to the Secretary or Treasurer each semester. Non-life full members are automatically registered to vote when their dues are paid.

ii. Any full members may choose associate membership. Full membership may be reinstated upon written notification of the club treasurer during the first two meetings of any subsequent semester.

B. Associate membership shall be reserved for those who have completed requirements for full membership but are not students, faculty or staff of VPI&SU. Associate members have all privileges of full membership except for the holding of an elected office and voting. Full and associate members shall have access to club records and files and may use club equipment.

i. Faculty or staff who are full members may, for any semester for which dues have been paid, choose associate membership. Full membership may be reinstated upon written notification of the club treasurer during the first two weeks of any subsequent semester.

ii. Students who are full members and who anticipate being absent from campus for a semester may choose associate membership for that semester.

By paying your Cave Club dues and getting this guide, you have already become a prospective member of the club, commonly called a trainee. You can cave with us, attend and speak at meetings, participate in any club activities, and generally hang out and have a good time with the club. While caving with us, you will be learning first-hand the things you need to know to be a safe, self-sufficient caver. That is what our Training Program, described in the By-Laws, is all about. Completion of the Training Program will result in full membership privileges such as access to the club gear and files, leadership of official club trips, and for students the ability to run for office.

C. Any individual may be invited verbally by the president and vice president to become a prospective member upon recommendation of a full or associate member. The prospective member must be willing to uphold the purposes and policies of the club. A prospective member may attend and address meetings, but may not vote or hold elected office.

Section 2: Honorary members may be recognized at the discretion of the club for their outstanding achievements or contributions to the club or the interests of the club. Honorary membership is a ceremonial title and holds no bearing on actual membership status.

Section 3: Dues shall be paid in a timely manner in an amount as stated in the By-Laws.

Section 4: Any prospective, associate, or full member may face disciplinary action, including possible loss of membership privileges, as defined in the By-Laws.

Article IV
Officers

Section 1: The elected officers of this club shall be: president, vice president, secretary, and treasurer. Election procedures are defined in the By-Laws.

Section 2: All elected officers must be enrolled as full-time students at VPI&SU throughout the duration of their term. The President and Vice President and Treasurer must be full or associate members at the time of the election. The Secretary can be a full, associate or prospective member. If an officer is not an NSS member, membership must be applied for, within one month of the election.

Section 3: In the event of extenuating circumstances, including but not limited to events preventing meetings, caving, training of new members, or other club activities, the voting membership of the club shall have the option to declare a state of emergency by 2/3rds majority vote. The purpose of the state of emergency will be to allow the club to temporarily suspend portions of the bylaws that prevent normal operations of the club because of the conditions of the emergency. Upon the end of the state of emergency a special election will take place at the next regular meeting in order to fill cave club officer positions with traditionally eligible members. Should the vote to end the state of emergency fall at a time when meetings are not happening, the vote will occur at the next meeting of the club, and the state of emergency will extend until it is voted upon at that said meeting. During a state of emergency the following policies will go into effect:

A. Any full, student member may hold office regardless of part-time or full-time status.

B. In the event that there are not enough willing student members to hold office, the club may elect non-student associate and full members, as defined in Article III, Section 1.b to take on the responsibilities of the Vice President and/or Secretary as acting officers

C. A state of emergency has no effect on a member's voting status, except,

D. In the event that fewer than 3 members are eligible to vote, associate members will be allowed to vote to approve new members.

E. During a state of emergency the items herein supersede any and all conflicting bylaws or directives

The VPI Cave Club is a Student Organization at the university, so our officers must be students. As an official grotto of the NSS, those officers must be members of the NSS. There are many older associate members (alumni and others) of the club that participate actively in the club, but ultimately this is a student group and is run by students. The final "emergency" clause was added at the begining of the COVID-19 pandemic, as there was worry that university policy around student organizations, and legitimate risk of disease, would prevent training of new members.

Article V
Committees

Section 1: Standing committees shall be the Equipment Committee, Safety and Techniques Committee, Publicity Committee, Project and Program Committee, Conservation Committee, Supplies Committee, and Executive Committee.

Section 2: Special and ad hoc committees may be established by the president or by action of the club by simple majority vote.

Committees are important to organizing club activities that are not caving: the club entrusts committees to plan events and bring motions before the club so that we spend less time in meetings. Some committees, such as the Scholarship committee, are granted budgets and spending power by standing rule or bylaws. The bylaws have more extensive rules surrounding committees

Article VI
Amendments

Section 1: Amendments to this Constitution may be submitted by motion of any full member and then tabled after passing with a simple majority of votes from full membership.

Section 2: An amendment must be voted on no later than three meetings subsequent to its proposal, and the full and associate members of the club must be specifically notified of the date of the vote and the nature of the amendment in writing.

Section 3: A 3/4 majority vote of the full membership shall be required for the adoption of any amendment.

Article VII
By-Laws

Section 1: The club shall establish a set of By-Laws for the purpose of amplifying and explaining in detail certain sections of the Constitution.

Section 2: The By-Laws may be amended as follows:

A. A motion to amend the By-Laws may be introduced by any full or associate member.

B. If the motion is "seconded" it is automatically tabled.

C. The secretary must notify the members of the amendment in writing.

D. Final action shall be taken at the next meeting by a 2/3 vote of the full membership.

The Constitution and Bylaws describe how we run our organization, and while we have amended them quite frequently in recent years, the are intended to be relatively static. Note that the requirements are for 3/4ths and 2/3rds of all full members respectively to vote in favor of an amendment.

Article VIII
Dissolution

Pending a 3/4 or greater full membership vote in favor of dissolving, all assets remaining after meeting outstanding liabilities shall be assigned to the National Speleological Society. However, if the named recipient is not in existence or no longer is a qualified distributee, or unwilling or unable to accept the distribution, the assets of this organization shall be distributed to a fund, foundation, or corporation organized and operated exclusively for the purposes specified in Section 501 (c) (7) of the Internal Revenue Code of 1954 (or corresponding provision of any future U. S. Internal Revenue Law).

The club formally incorporated in 2024, in order to process credit card payments and file taxes. A clause like this was required as part of our application.

By-Laws

Safety Code

Believe it or not, the VPI Cave Club is one of the most active caving organizations of its size in the world. We log several thousand caver-hours underground per year, and our safety record is very good. We have had our share of accidents and near misses, but as a whole this is a very good group of experienced cavers. However, caving is an inherently dangerous sport; you can get hurt and you can die. As a result, SAFETY should be on the forefront of every caver's mind. It is very important that you learn to evaluate situations carefully and do your best to minimize the risks. Mother nature always sides with the hidden flaw, so it's important to check and recheck the way you do things underground.

The rules below are simple, yet represent lessons learned the hard way by the cavers that have come before us. Following these rules on any club trip is a very serious matter, and violation of them will result in disciplinary action being taken by the club against you.

Section 1: General Safety

A. Never cave alone. It is recommended that at least three people be on any caving trip: at least one full or associate member on horizontal trips and at least two full or associate members on vertical trips.

Two full or associate members are needed on vertical trips. We like to have at least one experienced person at the top of a drop checking everyone's gear as they get on rope, and at least one experienced person at the bottom to give a belay and to assist the rappeller if there is a problem on rope. Many common problems you might encounter on rope are more easily solved by an experienced caver below you. This item of the constitution is one of the foundations of our "members must be the first and last of a group up or down the rope" policy.

B. Everyone participating in a trip should be physically and mentally capable of caving on that type of trip. Mind altering substances will not be used immediately prior to or during a cave trip.

Safety on a caving trip is EVERYONE's responsibility. If you feel that something on a trip is unsafe, or you are unsure about your or someone else's ability or physical condition, be confident that it is your right to bring this issue up with the trip leader. Safety concerns should be raised with the trip leader, and will be addressed on equal terms and with mutual respect no matter who brings up the issue.

C. No one should exert themselves or be forced to exert themselves beyond their limit of endurance.

On a club trip, you will never be compelled to do something you are not able to do, or that you do not want to do. If you are tired and need to turn back, or do not feel comfortable with a particular climb, tell the trip leader. It is better to shorten a trip than to cave to exhaustion and require assistance getting out.

D. If all lights fail, wait in place.

Caves are totally dark; without your light you will be unable to avoid dangerous situations such as pits or falls, and at the very least you will quickly become disoriented and lost if you start moving around. All club caving trips are signed out, which means others know where you are and when you are due back. If you wait patiently you will remain safe and others will come to find you within a reasonable time.

E. Avoid jumping.

The light cast from your headlamp underground is much different than regular room light or sunlight because it emanates from a single source. This makes it difficult for your eyes to determine the depth of drops and the slope of the ground at the bottom. Many broken or twisted ankles have resulted from cavers jumping down a small incline only to discover it is more slick than believed, or deeper than they thought. In addition to the danger of injury, you do not know the strength of the floor you are jumping on, and you do not know if you will be able to climb back out of what you have jumped into.

F. All equipment should be in working order and pass inspection before entering the cave.

For your own safety you should take care of your gear. You will also have a much better time on the trip if your equipment works correctly the whole time. And remember that you are an important part of the group; if you're having gear problems, everyone else's safety and enjoyment will be affected also.

Section 2: Equipment

A. General equipment per person:

1. Hard hats with suspension, chin-straps, and a mounted light source are mandatory while caving.
   We strongly recommend a quality caving or climbing helmet with a four-point suspension and certification by CE and/or UIAA standards. Ask an experienced member for advice on a helmet purchase as this is one of the most important pieces of gear you will buy. A good, comfortable, and safe helmet will last you for many years. Wearing your light source on your helmet leaves both hands free to climb, crawl, and otherwise move safely about the cave. Use of a hand-held light risks losing or breaking your light if you drop it.
2. At least three (3) sources of light, each providing sufficient light to exit the cave under reasonable circumstances.
   A helmet-mounted headlamp is commonly used both as a primary and secondary light source. The third source can be a flashlight (Mini Mags or simple LED lights work well) or another headlamp carried either on your person or in your pack.
3. Supplies for light sources.
   If you carry several electric lights, consider using lights that use the same spare parts and batteries. A multi-tool, such as the Leatherman, is great for in-cave repairs of many types of gear including both carbide and electric lights.
4. Heat source.
   Caves in our area are typically 52-54°F (11-12°C). If you are wet or need to sit for a long time underground, you will get dangerously cold in a short period of time. Carry a candle and lighter or perhaps a carbide lamp.
5. Trash bag or space blanket.
   Believe it or not, a trash bag is a very important piece of emergency gear. If you get wet and cold while caving, cut a hole in the bottom of the bag for your head to fit through and pull it over your body. The bag serves as a vapor barrier that drastically slows evaporative cooling from your clothes and body. If you put your carbide lamp or a candle under the bag with you, it becomes a "heat tent" which will conserve your body heat and prevent hypothermia. Hypothermia is the most common and most serious danger faced while caving. Be sure to read and understand the article which details the symptoms and treatments for hypothermia.
   A trash bag is also a great place to put your muddy gear after a trip.
6. Energy ration (candy bar, etc.).
   Everyone has their own preference of caving food, from candy bars to spaghetti. See what others bring along, try different things, and decide for yourself what works best. Pay attention to your own body and its energy needs. Be sure to include water with your "energy ration." Cave water is not drinkable, and even slight dehydration will make you weaker.
7. Gloves, heavy boots or shoes, heavy clothing, or cave specific clothing are advisable.

For your first trips, you will generally be fine wearing old blue jeans, a long sleeve shirt, and sturdy hiking boots with good soles and decent ankle support. Sneakers are not a very good choice. Your clothes will take a lot of abuse; don't wear anything near or dear to your heart. If you are slight of build or tend to chill easily, wear a layer of polypropylene long underwear, or at least carry this with you. Wearing several layers is a very good technique for regulating your temperature underground. Cotton long underwear and sweatpants are not very good for caving as cotton soaks up a lot of mud and water and never dries out.

B. Appropriate type and quantity of equipment shall be taken on all caving trips.

You should bring a pack to carry your stuff in. If you are going to a cave you haven't been to before, ask some of the experienced members if there is anything specific you might need to bring on the trip such as vertical gear or extra clothes. Pay attention to what experienced members carry with them to each cave and think about why each item is included.

Section 3: Procedure

A. Always inform someone of the whereabouts of the caving trip, the expected time of return and appropriate phone numbers.

Sign-out is the PROCESS of letting someone reliable know where you are going and what time to expect you back. If you are not signed back in by that time, a rescue party will come looking for you. Sign-out is NOT just signing a piece of paper at someone's house. Someone must be watching over it for it to work properly. The VPI Cave Club provides a sign-out sheet posted at a local caver's house. Your sign-out should always include the full names of participants, location of cave, date, time leaving town, estimated time of your return (ETA). When you get back, add a check indicating that you are back, the length of the trip, and comments.

B. Observe surroundings: respect landowners' wishes and be considerate of their property.

Most of the caves in this area are located on private property, which means it is a PRIVILEGE, not a right, to explore these fascinating places. For most of the caves, many cavers have invested countless hours in establishing a good relationship or friendship with the landowner. Some landowners do not have a preference for who visits the caves, others are very strict on their policy, and others are somewhere in between. Please be considerate of the landowners' wishes, because one person can ruin the privilege for the entire caving community.

C. If possible, consult someone who is familiar with the cave.

In addition to learning any special gear required in the cave, you will also learn if the cave has any seasonal closures and if there are specific places you should park, landowners to contact in advance, or permits to acquire.

D. All rigging is to be checked by a full or associate member. Ropes should be protected from fraying. All group members should be satisfied with rigging before it is used.

The rigging techniques taught by VPI are very good and apply to a wide variety of situations. As a prospective member of our club, you will be expected to rig using the knots and techniques taught by our members. Once you have achieved membership, you can explore techniques which best suit your caving style.

If you are concerned about the rigging on a cave trip, discuss it with the trip leader. The leader will evaluate the rig and either re-rig as needed or explain the rig to everyone's satisfaction in order to dispel your concerns.

Cavers from other grottos may rig using techniques different from "the VPI way." Keep in mind that different does not necessarily mean wrong or unsafe. Learn as much as you can about knots and rigging techniques so you will be better equipped to evaluate the rigging of others.

E. Never leave a prospective member or other inexperienced caver alone.

Basically, this means that VPI cave trips stick together. For example, don't leave the group to explore on your own. No one should be left behind because they are slower than the rest of the group, or can't fit through a tight space or make it up a climb. No one should leave the cave alone. If someone must leave the cave the trip should be split with full or associate members in each group, or the entire trip should turn back together.

F. A belay should be used on every person on a ladder. No belay shall be used when ascending a rope. Prospective members or other inexperienced cavers must accept a belay when requested to by a full or associate member. Anyone desiring a belay shall have one. The first person to descend a rope shall ensure that those following have a belay. The order of ascent and descent shall be determined by a full or associate member on the trip.

G. An appropriate loop knot should be tied on the lower end of any rope used for rappelling.

This is last, but it is among the most important safety rules in vertical caving. Rappelling off the end of a rope which did not reach the bottom of a drop is one of the most common fatal underground accidents. A knot in the end of the rope will prevent your rappel device (and thus you) from leaving the end of the rope, and also provide a handy loop to stand in while you turn around and climb back up to get a longer rope!

So what if you screw up and break the rules? Someone will speak with the safety chairman, an appointed officer who investigates accidents, near misses, and complaints of safety violations. The safety chairman will discuss the matter with you to find out what happened and to make sure you understand the reasons behind that particular safety rule. If the matter is especially important, the safety chairman may bring it up at a meeting so that everyone can evaluate the incident and learn something useful.

So what if you see someone else screw up and break the rules? During the cave trip you should bring it up to the trip leader. If for some reason you do not feel comfortable bringing it up during the trip, speak with the safety chairman afterwards. Do not worry about pointing the finger at someone else; you may be preventing future accidents by discussing the matter now. The safety chairman will then follow up as described above.

The safety chairman will in all cases be firm but fair. The purpose is not to punish or embarrass anyone, but to make sure everyone understands the importance of our safety rules so that we can all enjoy safe caving experiences. However if someone ignores the safety chairman when confronted on an issue or shows blatant or chronic disregard for safety, the cave club has recourse. See the section of the Constitution on Disciplinary Action for more information.

Membership

Section 1: Qualifiers

A. The qualifier "inactive" applied to any of the membership categories shall denote that said individual has not paid current dues and therefore retains only the privilege of attending and addressing regular meetings. Payment of dues shall result in automatic reinstatement of the membership previously held and all privileges thereof.

Members who have failed to pay dues are not authorized to borrow club gear

B. The qualifier "life" shall be applied to any full, associate, or prospective member of the VPI Cave Club upon receipt of life membership dues. Life members shall have any membership privileges for which they qualify, but are exempt from yearly dues.

Section 2: Training Program:
The VPI Cave Club training program shall develop educated cavers consistent with Article II of the Constitution. The training program shall develop the basic skills to be safe and self-reliant underground. To be qualified as a full or associate member of the club, a prospective member must:

A. Read and understand the Constitution and By-Laws of the Cave Club.

B. Remain a prospective member for at least 10 weeks during which time he/she spends 40 hours underground on at least 6 trips on which at least one full or associate member is present.

New people of widely differing ability and previous experience are constantly getting involved in the VPI Cave Club. In order to maintain a high level of safety and experience, the club instituted a structured training program. No matter if you have never heard of a cave or have been caving for 50 years, in order to become a full or associate member of the club you must go through the training program. At first this seems intimidating, but realize that just by actively caving with us for a semester or two you will complete most of the requirements. The rest is knowledge which will serve you well caving and throughout life in general.

C. Demonstrate elementary climbing skills in a cave.

What this means varies from member to member, but ultimately it only means that you must safely and competently negotiate the types of climbs found in typical area caves. After a few trips with the club, most trainees can confidently display this skill.

D. Demonstrate a working knowledge of belaying methods.

You typically need to successfully belay a climber on a cable ladder and belay a rappeler using a bottom belay. Generally you will practice these after being shown the technique, and then take a skill test another day to demonstrate your working knowledge.

E. Be able to tie a seat with webbing.

The required seat is discussed separately in this guide.

F. Demonstrate a working knowledge of change-over from descending to ascending and ascending to descending.

You should take this test with gear you would typically use on a caving trip, not gear borrowed just for the test. Being able to change-over is an extremely important safety skill in vertical caving.

G. Demonstrate a working knowledge of passing a rebelay while ascending and descending.

H. Demonstrate a working knowledge of rappelling and climbing rope in a cave.

You should take this test with gear you would typically use on a caving trip, not gear borrowed just for the test. Being able to change-over is an extremely important safety skill in vertical caving.

I. Demonstrate how to rig and pad a rope correctly.

This is done on a cave trip after you have been caving for a while. You will be asked to rig several drops; typically one of them is somewhere you have not seen rigged before.

J. Know how to tie (demonstrate the lock off and back off where appropriate) and explain the uses of: bowline, bowline on a bight, bowline on a coil, figure-8, figure-8 on a bight, double figure-8, alpine butterfly, square knot, overhand knot, Münter hitch (and lockoff), water knot, helical, prusik, double fisherman's bend.

The knot section in this guide covers each of these plus some other useful knots in detail. (Knot names taken from On Rope *by Alan Padgett.)*

K. Complete satisfactorily a comprehensive general information quiz.

This written test is usually given as you near the end of the training program, and includes a wide range of topics, among which are caving techniques, details about local caves and cavers, and club history. The best way to prepare for the quiz is to cave often, learn and understand the reasoning behind our rules, and attend club functions where old farts will be talking about "back in the day...".

L. Be endorsed by a full or associate member in good standing.

M. Submit to the editor a suitable article for publication in *The Tech Troglodyte* allowing reasonable time for review and revision.

The Trog editor will accept trip reports and many other kinds of articles. If you're having trouble finding a suitable topic, check with the editor or officers for suggestions.

N. Be approved by a 2/3 majority vote of the full membership.

Disciplinary Action

Section 1: Any prospective, associate, or full member who has allegedly committed an infraction of the VPI Cave Club Constitution, or By-Laws, or upon recommendation of the Safety and Techniques Committee, may face possible disciplinary action in the form of a reprimand, suspension, or expulsion, as defined below.

Section 2: A. Levels of disciplinary action:

i. **Reprimand**: A reprimand shall be the lowest level of disciplinary action and shall be noted in the minutes.

ii. **Suspension**: A suspension is the intermediate level of disciplinary action. A suspension shall be reduction of an associate or full member's rights to those equivalent to prospective member status. A prospective member cannot complete any membership requirements while on suspension. The time period for a suspension shall be fifteen (15) weeks after which time the previous membership status is reinstated.

iii. **Expulsion**: An expulsion is the highest and most severe level of disciplinary action. An expelled person is ejected from the club and club functions and current dues are returned. Previously completed membership requirements are null and void. A person expelled from the club shall not be allowed to restart the training program or regain any level of membership in the club.

B. Procedure:

i. A member of any class may bring a complaint for disciplinary action to the president.

ii. The president shall convene the Executive Committee to evaluate the complaint.

iii. Upon review, the Executive Committee shall bring the complaint to the club, within two regular meetings of the receipt of the complaint, with a recommendation for action.

iv. The Executive Committee's recommendation shall constitute a motion.

v. If the motion is to dismiss the complaint, upon a "second" it may be voted on at the current meeting and requires 2/3 majority vote to pass.

vi. If the motion is for a level of disciplinary action, as defined above, upon a "second" the motion will be tabled until the next regular meeting.

vii. The accused shall be given notice of the tabled motion at least three (3) days in advance of the meeting in which the final vote is to be taken and shall be given ample opportunity to present a defense before the club.

viii. At the meeting following the tabled motion a discussion on the accused's infractions will occur. At the close of the discussion a secret ballot shall be taken to determine whether or not action will be taken on the disciplinary measure.

ix. A vote to take action must be passed by 2/3 majority of full members.

Officers

Section 1: The officers of the club shall be elected by ballot from candidates nominated from the floor. The order of election shall be president, vice president, treasurer and secretary. To be nominated, a member must meet the qualifications of Article IV, Section 2 of the Constitution. A separate ballot shall be voted for each office. A simple majority of the votes cast shall be necessary for election. In case there is no majority, the candidate with the lowest number of votes shall be dropped and a re-vote for the remaining candidates shall be taken. The election shall be held at the tenth regular meeting of the spring semester. The officers elected shall assume their duties at the end of the meeting during which elections were held and hold office until the elections of the following spring. A 2/3 vote of full members shall be necessary to invalidate the election.

Section 2: If the president and vice president are absent during the summer, the president shall appoint a president pro tem from among the full members available.

Section 3: In event of the resignation or release from office of an officer, a special election shall be held at the next regular meeting to elect a member to the office for the completion of the term of office.

Section 4: The duties of the **president** shall be:

A. To preside at all meetings and call special meetings.

B. To act as an ex-officio member of all committees.

C. To represent the club officially in all matters except those which require the cooperation of the treasurer.

D. To make appointments to special committees unless provision is made otherwise in the resolution establishing the committee with the approval of the majority of the committee members.

E. To make appointments to standing committees and to appoint committee chairmen and to remove appointees.

F. To make arrangements for the meeting room.

G. To appoint an editor for club publications.

H. To appoint a club parliamentarian.

Section 5: The duties of the **vice president** shall be:

A. To assume the president's duties during the president's absence.

B. To assist the president as the president shall require.

C. To countersign as authorizing officer vouchers for the expenditures that have been authorized by the club.

D. To be an active participant in the safety committee as director of the new member training program.

Section 6: The duties of the **treasurer** shall be:

A. To have charge of the finances of the club.

B. To keep an accurate record of the finances of the club, including balancing records weekly.

C. To collect any and all dues and fees which the club shall authorize.

D. To give a complete report on the financial status of the club at every regular meeting.

E. To keep a list of the club members and their status, and to make this available to all members, faculty advisors, and at all club meetings.

F. To make disbursements when authorized by motions passed by the club and only when so authorized.

G. To comply with regulations of the VPI Office of Student Affairs pertaining to finances.

H. To allow no transactions to occur without proper receipts.

Section 7: The duties of the **secretary** shall be:

A. To keep a record of all club proceedings of all meetings of the club and place a copy in the club files, within two academic weeks.

B. To keep a phone list of the members of the club and to make this available to all members and faculty advisors.

C. To conduct correspondence for the club as directed by the president.

D. To notify the NSS of changes in officers and other pertinent information.

E. To notify faculty advisors of proposed amendments to the Constitution or the By-Laws.

F. To make note of proxy votes.

G. To provide timely notification to club members of issues as specified by the Constitution or By-Laws.

Section 8: Impeachment

A. An officer may be impeached for specific and willful infractions of the Constitution, the By-Laws, or the policies of the club.

B. Process

i. A motion to impeach stating specific infractions shall be made by a member, committee, or other officer.

ii. The motion shall be automatically tabled upon a "second" to the next regular meeting.

iii. The officer shall be given notice of the motion at least three (3) days in advance of the meeting in which the vote is to be taken, and be given ample opportunity to present a defense before the club.

iv. Final action shall be by secret written ballot and will require a 2/3 majority vote of the full membership for removal from office.

Section 9: Officers who are full members at the time of election shall assume their duties at the close of elections. Officers who are associate members at the time of election shall assume their duties at the first meeting of the fall semester. All officers shall serve until the elections of the following spring. If any office is left vacant by the election of an associate member, the president shall appoint an officer pro tem from among the full members available.

Advisor

If desired, any person may be elected as an advisor to the club by a simple majority of votes from full membership.

Meeting and Quorum

Section 1: A. To constitute a meeting for the transaction of business, a quorum shall constitute one half (1/2) of the full membership either in person or represented by proxy.

B. The secretary shall be notified of each proxy before a vote. Blanket or continuous proxies shall not be held.

C. Meetings shall be held Fridays at 7:00P.M.. during the academic year.

D. Meetings shall comply with Robert's Rules of Order.

Robert's Rules of Order: Newly Revised *(RONR) is a common parlimentary authority. In essence, it describes the process by which motions are adopted in a club like ours. A very brief introduction to Robert's Rules is included in this document.*

Dues

Dues for prospective members, full members and associate members shall be ten dollars ($10.00) per semester. Life membership shall be one hundred and thirty dollars ($130.00), payable in installments, to be paid in full within one year of the first installment.

The club gear is maintained primarily by money raised through dues. The club publications, including this one, are paid for by dues. Our dues are very low and paying them should be a high priority for even financially strapped members of the club. You must have paid dues to receive the Tech Troglodyte Prospective Member Guide *and to complete the membership program.*

Committees

Prospective members are truly welcome and encouraged to participate in the club's committees. The Publicity, Conservation, and Project and Program Committees are always in need of new ideas and active participation. In addition, several ad-hoc committees form throughout the year for the organization of club events and parties. These committees are often led by trainees.

Section 1: It shall be the duty of the **Safety and Techniques Committee** to:

A. Supervise the new member training program.

B. Encourage safe caving practices and recommend disciplinary action where necessary.

C. Present periodic programs on current safety practices.

D. Submit a written report to the president upon request.

E. Oversee maintenance and inventory of club rescue gear.

F. The Safety and Techniques Committee shall consist of the safety chairman, the president, the vice president, former safety chairmen, former presidents, and vice presidents, and anyone that the president or safety chairman deems necessary.

notice how many members are on this committee. Somewhere around 200 members of the club should be eligible

Section 2: It shall be the duty of the **Publicity Committee** to:

A. Communicate with incoming freshmen and the student body on the availability and activities of the club.

B. Submit articles to the school newspaper, etc., on the club's activities.

C. Publicize any activities which may be open to other groups.

D. Submit to the files such material that may be printed by or about the club.

E. Submit a written report to the president upon request.

Section 3: It shall be the duty of the **Conservation Committee** to:

A. The chairman of the Conservation Committee shall be a member of the National Conservation Committee of the NSS.

B. Encourage projects and better practices in cave conservation.

C. Instruct new members on the principles of cave conservation.

D. To bring to the attention of the club any violation of the club's policy of conservation.

E. To scrutinize the mailbag for any material related to cave conservation.

F. Submit a written report to the president upon request.

Section 4: It shall be the duty of the **Project and Program Committee** to:

A. Plan and coordinate club projects, special activities, and social functions.

B. Plan and make arrangements for programs to be presented periodically at the regular meetings.

C. Submit a written report to the president upon request.

Section 5: It shall be the duty of the **Supplies Committee** to:

A. Buy equipment for the club store for sale to the club members and prospective members out of a special revolving fund established for this purpose.

B. Make equipment available for sale at all meetings to all dues paying individuals.

C. The fund shall be increased by semesterly appropriations until such time that it becomes self-sustaining. The fund shall be allowed to draw upon the club treasury in the form of loans when additional funds become necessary.

D. Keep an accurate and up to date record of the finances of the club store, including giving a financial status report within one week of a request from the treasurer, and submitting a complete report of the store's activities to the treasurer at the end of the fall and spring semesters.

Section 6: It shall be the duty of the **Executive Committee** to:

A. Preside over disciplinary proceedings.

B. Act for the club in emergency situations when it is not feasible for the club to meet.

C. The Executive Committee shall consist of the officers, the head of the Safety and Techniques Committee and other person(s) appointed by the president.

Section 7: It shall be the duty of the **Equipment Committee** to:

A. Maintain an inventory of Club equipment.

B. Maintain the storage and dispersal access of Club equipment.

   i. Club equipment shall be checked-out by dues-paid members as restricted in Article III.

   ii. Club equipment shall only be used to support Article II.

C. Establish an equipment check-out policy to include how long equipment may be checked-out and the required condition of equipment upon return.

   i. Gear checked-out that does not conform to this policy, is grounds for a 21-day suspension from the privilege of accessing the Club equipment cache.

   ii. Club equipment not checked-in, or checked-in damaged from negligence, shall be replaced by the Member who checked out the equipment.

D. Maintain Club equipment in a safe condition, and quarantine equipment that is not in safe condition.

   i. Quarantined equipment may be sold, gifted, repaired, or destroyed at the discretion of the Equipment Committee. All gear sale proceeds will return to the Club General Fund.

E. Maintain Club identification markings on all non-infrastructure Club equipment.

F. Identify equipment capability gaps for common Club activities.

G. Recommend the acquisition of new equipment when necessary.

Club Files

Section 1: Maintenance: The president shall appoint a person to keep and maintain the files.

Section 2: Substance: The club files shall consist of cave maps, trip reports, meeting minutes, cave related publications, membership related material, and historical material.

Section 3: The file chairman shall submit a written report to the president upon request.

Club Trips

Club trips are caving trips which are recognized by the VPI Cave Club and which follow the spirit and intent of its Constitution and By-Laws. A caving trip is recognized if it has at least one full or associate member on it and it is properly signed out. (See By-Laws, Safety Code, Section 3.A for definition of a properly signed out trip.)

Club Savings

Section 1: The club shall establish a savings fund to be placed in an interest drawing savings account.

Section 2: The savings fund shall be drawn upon only for investments of long range importance to the club.

Section 3: The savings fund shall be increased by semesterly appropriations when possible.

Club Publications

Section 1: The grotto shall publish a periodic journal to advertise grotto projects, trips, and other activities. It shall further contain material of scientific and technical interest to the caving world.

Section 2: The title of this publication shall be: *The Tech Troglodyte*.

Section 3: The format and journalistic style shall be set by the editor.

Section 4: The circulation of this publication shall be to all members and prospective members who have paid current dues. In addition, the NSS library and all other grottoes which offer their publication in exchange shall receive this publication. An exchange editor will be appointed by the president for these duties, and he/she will cooperate with the mailbag person to keep an updated exchange file.

Basic Caving FAQ

The annotated Constitution and other articles in this guide cover the majority of the topics required for safe and responsible caving. This article provides more details on some of the topics not covered in depth elsewhere.

What is sign-out? What is the proper sign-out procedure?

Sign-out is the PROCESS of letting someone reliable know where you are going and what time to expect you back. If you are not signed back in by that time, a rescue party will come looking for you, thinking you are lost, injured, or something has gone terribly wrong. Sign-out is NOT just signing a piece of paper at someone's house. Someone must be watching over it for it to work properly.

The VPI Cave Club provides a sign-out sheet posted at a local caver's house. The sheet includes the names of participants, location of cave, date, time leaving town, estimated time of arrival (ETA), check back, length of trip and comments. See Table 1 for an example.

Table 1: Sample of a VPI Cave Club Trip Signout Sheet

DATE	CAVE	NAMES OF ALL PARTICIPANTS	ETD	ETA	BACK	HOURS	COMMENTS
2025-08-21	Tawney's	A.I. Cartwright, Horace Virginianus, Phillip Ballister	09:00	21:00	x	3.5	"Back in my day!"
2025-08-22	Pig Hole	Gracie Cornish, Eric Landgraf	Noon	Midnight			

A. Be sure the sign-out sheet has all of the necessary information:

   - Full names of all participants.
   - Phone number of trip leader.
   - Cave name and location. Most caves are well known and there is little question about where they are. New or obscure caves (locations) present a problem. Leave a map at the sign-out if possible. If you want your cave to remain a secret, leave the map in an envelope.
   - ETA. This is the time you expect to arrive back into town. This includes travel time, getting organized, cleaned up, getting lost, and signing back in. If you miss your ETA, we assume the worst and call out a search party to come looking for you. We will attempt to contact you at your house first (sometimes people forget to sign back in). Do not be too liberal on your ETA because if something does happen, you may be miserable for some time.

B. Do not forget to sign back in AND return all borrowed gear (especially club gear). It is a good idea to get in the habit of doing this. All club gear should be returned cleaned and repaired. If a piece of equipment was damaged on your trip, please notify sign-out that it needs to be repaired.

C. The sign-in and sign-out times should be reasonable. Do not have an ETA between midnight and 8A.M., if using the club's sign-out: this is unfair to those checking it. To avoid confusion, please put "noon" or "midnight" instead of "12:00 A.M./P.M.". Military time is good.

D. Once you get back into town, a simple "check" in the box is all that is necessary. It is always fun to leave the time of trip and a comment. Be creative!

E. A rescue callout is a very serious matter. People will drop whatever they are doing to join the rescue effort. They may risk their jobs or miss important activities. Talk of a rescue may cause the landowner to close the cave. If you miss your ETA for some reason other than a legitimate need for rescue, you will be very unpopular.

F. Be considerate of the sign-out residents. They provide a valuable service to the caving community. Consider inviting them along on your trip. Do not dump trash at sign-out.

What are landowner relations?

Most of the caves in this area are located on private property, which means it is a PRIVILEGE, not a right, to explore these fascinating places. For most of the caves, many cavers have invested countless hours in establishing a relationship or friendship with the landowner. Some landowners do not have a preference for who visits the caves, others are very strict on their policy, and others are somewhere in between. Please be considerate of the landowner's wishes, because one person can ruin the privilege for the entire caving community.

Here are a few tips:

A. **If you don't know, don't go!** Before you visit a cave, please ask a member about the proper policy for visiting the cave. These policies are constantly changing, almost to the point where it is hard to keep up with the latest information.
B. Leave gates as you find them. If it was closed and locked, open it, pass through, close and lock it behind you. If it was open, leave it open. The last thing a farmer wants to do is chase down his cattle on a Saturday night because of an open gate.
C. Respect the grass and crops. Some of the landowners make a living off of livestock, which feed on the grass. Do not destroy the grass. Do not spin your tires in the grass.
D. Some caves are listed as bat hibernacula by the state and are off-limits during the winter months.
E. Double check for litter just before you leave. Clean up after yourself and others who may have carelessly left some litter behind.

Which Thermal Underwear Works Best?

Short answer: Polypropylene.

Longer answer: Air is the best insulator. The more air trapped in a material, the warmer you will be. This is the main reason that thicker clothing is warmer; more air is trapped against your body. The insulating value of a typical dry piece of clothing will be mostly a function of this trapped air, and a smaller function of the actual material. If your clothing is completely soaked, its insulating value is mostly a function of the trapped water, over 20 times worse than it was dry! The real advantages of modern fabrics are that they do not hold as much water, and they dry much faster.

The retained moisture percent is defined as the amount of water a completely dry fiber will absorb from the air at a standard condition of 22°C and 65% relative humidity. It is expressed as a percent of the dry fiber weight. If you get soaked and wring out your clothes, this is about the percentage by weight of the clothing which will still have the insulating value of water (over 20 times worse than before). The lower this number is, the warmer you will be. Although caves are not 22 °C and 65% relative humidity, the data below clearly show the superiority of modern fabrics over natural fibers with respect to retaining good insulating properties after getting wet.

These numbers are for heat conduction. Once you are wet, the convection of evaporating water will dramatically increase your rate of heat loss (unless you are wearing some kind of vapor barrier such as a plastic suit).

Air	1.0
Polypropylene	6.0
Silk	7.0
Polyester	7.0
Wool	7.3
Acrylic	8.0
Polyamide	10.0
Viscose	11.0
Cotton	17.5
Water	26.0

Relative thermal conductivity of common clothing materials of equal thickness.

Polypropylene	0.05
Polyester	0.40
Acrylic	1.30
Polyamide	4.50
Cotton	8.00
Silk	11.00
Wool	16.00

Retained moisture percent (22 °C, 65% relative humidity).

Data from http://www.MountainDesign.com.au and Consumer and Industry Services Management, University of TN.

Conservation

Caves are a non-renewable resource. Caves and their inhabitants are extremely fragile and sensitive to changes in the environment. Human activity can easily upset the natural balance in a cave, causing far-reaching changes. For example, if loud, frequent traffic in a cave chases away a population of bats, other organisms that feed on the bat guano will perish.

Everyone who enters, be they frat boys, boy scouts, vandals, or highly skilled and responsible cavers, affects the cave in some way. Certain changes to the cave during exploration are unavoidable. We trample paths into the dirt floors, and we slowly polish the rocks in a pinch. It only takes one careless trip to drastically change a bright, untouched and beautiful passage into a dusty, tired, and worn-looking thoroughfare. The only absolute way to preserve a cave is to just not go there.

Cavers see the value of cave exploration and mapping. The best compromise is to go caving while keeping in mind a very basic understanding: even with the greatest of care, you WILL change the cave as you pass through it. Try to minimize your impact and preserve caves before the harm begins by following the guidelines below.

- Make sure that everyone on your trip, especially novices, understands the need to treat the cave gently, and has the skill and knowledge required to actually do so.
- Leave the bats in peace. Avoid waking them, especially in winter, by moving quietly through the rooms and not shining your light on them. Repeatedly waking bats from hibernation depletes their energy reserves, severely decreasing their chances of surviving until spring. White Nose Syndrome (WNS) has already destroyed local bat populations to under 1% of their previous numbers![1] See https://www.whitenosesyndrome.org/ for more information on what you can do to protect bats.
- Stay out of streams unless it is unavoidable. Remember that crayfish, salamanders, and other critters are very difficult to see, especially after the water is muddied by the cavers in front of you.
- Do not touch the formations, whether live or dead, whenever possible. The dust and mud on your clothes, and the oils on your skin, can halt or change the growth of live formations and may ruin the looks of any formation. Be especially careful when moving through a passage with low-hanging soda straws and other pretties. Studies suggest that it takes an average of 120 years for one cubic inch of a speleothem to form.
- Do not remove any wildlife or formations from a cave, and do not intentionally break any formations. Not only does this damage the cave and ecosystem, but it is also illegal! Many states, including Virginia, have laws against this and enforce it by severe fines or jail time.
- Stay on the main trail where others have gone before you, especially in sensitive or fragile sections of the cave. Most of the caves you will visit have been traveled many times before by other cavers; look for “elephant tracks” to guide you.
- Clean up any trash you generate, and pack out any trash you find along the way. If it isn’t your trash, carry it out anyway. Others are less likely to leave trash lying around an already clean passage.
- Take care of all bodily functions before you enter the cave, and pack out what you cannot hold until later.

Hypothermia

Hypothermia is a general cooling of the body core when more heat is lost than is produced (this is known as *exposure*). The most common causes are wet clothing (they lose much of their insulating value), wind (it cools the body by evaporating moisture from the clothes), inadequate clothing, caving to exhaustion, and combinations of these situations. As

[1] https://www.nps.gov/articles/what-is-white-nose-syndrome.htm

your body temperature gradually lowers, your cognitive ability diminishes, and you may not realize you are in danger. Without treatment, hypothermia leads to death. Cavers in this area are especially susceptible to hypothermia since cave temperatures are low and many caves are wet and muddy. Keep an eye on your fellow trip members; if someone is displaying any of the warning signs below, take immediate action. Remember that the hypothermic person is not thinking clearly, so you must decide what treatment steps are necessary.

The best way to prevent hypothermia is to minimize exposure. Don't sit for too long on the cave floor; if you start to feel cold or begin to shiver, get up and move around. Sitting on your pack or gloves adds a barrier between you and the heat-sucking cave. Eat something to provide your body with extra energy to generate heat; drink enough water to stay hydrated. When getting wet in a cave is unavoidable, plan in advance by wearing appropriate clothing and bringing extra clothes in a sealed bag. In stream crawls, keep your chest out of the water. In short, keep yourself as warm and dry as possible, and give your body every advantage to staying energetic.

Warning Signs of Mild to Moderate Hypothermia

- uncontrollable fits of shivering
- vague, slow, slurred speech
- memory lapses; incoherence
- immobile or fumbling hands
- frequent stumbling; lurching gait
- drowsiness
- apparent exhaustion; inability to get up after a rest

Treating Mildly Hypothermic Cavers

- encourage more activity
- get the patient away from the wind and water
- strip off all wet clothes and get the patient into dry clothes
- give the patient warm drinks, but do NOT give alcohol, caffeine, or nicotine
- be sure the patient eats so he can recover his energy
- protect the patient from heat loss to the cave floor using packs, rope or other available material
- use a heat tent to limit exposure
- if exposure cannot be reduced and/or the patient is not warming up, leave the cave!

Treating Moderately Hypothermic Cavers

- if patient is having difficulty moving safely through the cave or has become exhausted, get him into a sleeping bag or heat tent
- add heat to the head, neck, chest, and groin for most effective warming (spent carbine containers make good heat packs)
- leave the cave after the patient has warmed and recovered enough energy to cave safely

Warning Signs of Severe Hypothermia

- disorientation and confusion
- physical activity is uncoordinated
- shivering has stopped
- stupor or unconsciousness leading to coma

Treating Severely Hypothermic Cavers

- evacuation - call a rescue

- keep the patient awake
- you may help the patient drink warm drinks, but due to the risk of choking, give nothing by mouth if the patient is extremely disoriented or uncoordinated, or semi-conscious
- place the patient in dry clothes (or naked if all clothes are wet) in a sleeping bag or heat tent and add heat packs to his head, neck, armpits, and/or groin
- protect the patient from heat loss to the cave floor using packs, rope or other available material
- the use of "skin-to-skin" heating by a warm caver is not recommended. The warm caver will soon become a second hypothermic patient.

Roberts Rules

If you hang around the club for more than a couple weeks, you'll notice we occasionally have to do *BUSINESS* to spend money, schedule events, vote in members, and do other important tasks that are part of keeping the club going. Everyone complains bitterly about this, because it takes forever. But it would be much faster if folks knew the rules we followed.

Robert's Rules of Order: Newly Revised, 12th edition (often shortened to "Robert's" or "RONR") is currently our "Parlimentary Authority", as specified by the constitution. Basically, it lays out the order in which we do business, and has suggestions on how to both ensure business is done "fairly", and how to handle conflicts relating to procedure. This document is a very brief (and incomplete) introduction to those rules.

The rules have a precedence; first is *always* the club constitution and bylaws. After that, is *RONR*, then "Standing Rules" (which include any ordinary motions which prescribe actions for the club), and finally custom.

For the club to do business, we must have a **quorum** at a **meeting**. Meetings are scheduled in the bylaws; special meetings may be called by the chair. Quorum is defined as half of the voting members, represented in person or by proxy (see the bylaws for information on proxies).

At the start of the meeting, the **Chair** (usually the President) calls the meeting to order. In the absence of an **agenda** we procede with:

1. Reading and approval of the **minutes** from the last meeting
2. Reports by officers and committees
3. Unfinished business & "general orders" i.e. scheduled business
4. New business

This is typically followed by any programs, trip reports, and planning of trips.

The Chair runs the meeting, and their job is to keep order: *respect for the chair* is required for the meeting to run quickly and smoothly. In questions regarding the rules, the chair makes all calls (though they may be in error).

To take action at a meeting, one must state it as a **motion**. These are sometimes formulated as resolutions, containing an optional preamble, "Whereas" prefixing clauses of background information, and a body prefixed with "Resolved" and then an action. For example:

> I move: **Whereas** the expedience of club meetings is important to conducting business, **Resolved** that the members shall not reference the Carbide Lamp Test during the meeting.

Typically, it would be sufficient to say something like:

> I move to prohibit discussion of the carbide lamp test at meetings.

If a motion has multiple actions to be taken, it may have multiple "Resolved" clauses.

Simple motions like these are used for most actions the club can take, and are only **in order** during "new business" in the order of business. A member must "obtain the floor" (usually stand up and be recognised by the chair), and present the motion. After another member has **seconded** the motion, the chair repeats it, and the club begins debate. Once the chair has repeated the motion, it can only be modified by an **amendment**.

After debate has closed, the chair "puts the question", i.e. calls for a vote. Because of proxies in our club, we often vote by putting up fingers, instead of voice vote. *For most motions*, a majority of those voting carries; thus, if a quorum is present, with 2 members voting "aye" and 1 "nay", it is said that "the ayes have it", regardless of how many members constitute a quorum! Abstains should not be counted.

A motion is only considered **in order** if it is made at the appropriate point in the meeting—typically this is "New Business", however, motions arising out of committee reports may be handled immediately.

A list of common motions during debate

During **debate**, a new motion may not be brought before the club unless it is a **secondary motion**. These common ones can be moved so long as you have the floor, must be seconded, and are (broadly) not debatable:

- Postpone indefinitely - immediately end debate on a motion
- "Lay on the table" or "table" - end debate, to address other business that is not in order
- Postpone definitely - schedule a future time to discuss the motion (e.g. the next meeting). Debate limited to when to postpone.
- Refer or Commit - direct a committee to amend and redraft the motion for consideration at a future time, instead of amending on the floor.
- Limit debate - set a time at which the chair will end debate, modify the time for which any member may speak, or modify the number of times a member may speak.
- Previous question - go directly to a vote.

After someone seconds it, these motions will go directly to a vote. Further, motions can be made to amend the main motion. Amendments may be debated.

Notes on special types of motions

RONR describes several motions which require a higher threshhold than a simple majority of those voting. The ones most pertinent to the cave club are prescribed by our own constitution and bylaws.

- 3/4 of full membership to amend the constitution
- 2/3 of full membership to amend the bylaws
- 2/3 of full membership to admit a new member
- 2/3 of full membership to permanently remove a member from the club

None of these are a "2/3" vote, wherein 2/3rds of those *voting* must vote in favour: these all require a vote of the full membership, i.e. to admit a new member, if there are 15 voting members in the club, 10 must vote in favour (functionally, 10 is the quorum for making this motion at all). In these types of motions, an abstention is functionally the same as a "no" vote, and should be counted.

Cave Rescue

Occasionally, things go wrong during cave exploration. Cavers may be unable to exit a cave because they are injured, lost, sick, or stranded. Or, they simply fail to meet their signout time. In any of these cases, the response is a cave rescue callout.

Caves are remote environments: both access and communications take a very long time compared to surface rescue operations. Cell phones don't work underground, and caves are incompatible with helicopters and ATVs. In addition, most folks in the rescue world aren't cavers; a cave rescue involves cavers rescuing cavers.

As of August 2025, the Blacksburg Volunteer Rescue Squad (BVRS) has the only cave rescue team in Virginia recognized by the Virginia Department of Emergency Management (VDEM). The newly formed Central Appalachian Cave Rescue Team (CACRT), centered around Harrisonburg and with members scattered across the region, will soon be a second recognized team. Black Diamond Search and Rescue out of Norton, Virginia in extreme southwestern Virginia has some cave rescue capability. Other qualified teams, like the Chattanooga Hamilton County Cave and Cliff Rescue Team, are several hours away but might respond in long or complex rescues.

The VPI Cave Club has an illustrious history of successful cave rescue operations, maintains a limited rescue gear cache, and holds occasional cave rescue trainings. In the early 2010s, cave rescue response became more formalized due to changes in the emergency response system, leaving authorities having jurisdiction (AHJs) unwilling to turn rescue operations over to rescuers not affiliated with an agency. This cultural/political change led to the founding of the BVRS Cave Rescue Team, which was a logical move since there was already a lot of overlap between BVRS and the caving community.

The BVRS Cave Rescue Team comprises mostly VPI Cavers who are members of BVRS, and who have a combination of cave rescue training, other technical rescue training, and caving experience. Many of the members have high levels of medical training as well. The team usually has 25 to 30 active members. While this may seem like a lot of people, due to their remote nature cave rescues tend to eat up resources, and any significant rescue operation will need caver volunteers (termed "emergent volunteers" in the rescue world).

Because of this, any VPI member or prospective member should get at least some cave rescue training. The Cave Club has run internal cave rescue trainings referred to as "plastic rescues", and BVRS holds several cave rescue trainings each year which are generally open and announced to the VPI Cave Club. In addition, VPI Cave Club members and prospective members can take courses offered by the National Cave Rescue Commission (NCRC), several of which are offered locally on an approximately biennial basis. The NCRC is an internal organization of the NSS that develops cave rescue techniques and curriculum, conducts training, and coordinate resources. It is *not* a response agency. For more on NCRC, visit `https://caves.org/ncrc/`. The most important part of being an effective cave rescuer is becoming a skilled, strong caver who can play well with others.

When the BVRS Cave Team is requested, they will alert a long list of qualified cavers, asking them to respond immediately, be ready to respond, or to stand down. Because of this, its always good to have your gear ready to go (or nearly so) so that you are prepared in the unlikely event of a cave rescue.

If things go wrong on your cave trip

If you are caving and have an injured or sick teammember who cannot exit the cave under their own power or needs assistance to do so, you should follow the procedures as outlined on the most recent NCRC medical card, also found in the "VPI Cave Club Member Drive" and included here! Having a hard, laminated (or rite-in-the rain) copy of the card in your pack, along with a basic first aid kit as outlined on the card, is a best practice. Figure 1 shows the current (2025) version of the card. [2]

The location of the incident is frequently hazardous – for example, in rock fall, water, near exposure, or in air flow. Because of this, the injured or sick caver should be moved if possible to a safe, dry, and warm location.

[2] Used with permission, CC-BY-NC-ND 4.0

Figure 1: NCRC Medical Card (2025)

Every caver should have some basic first aid skills. Taking a class in basic first aid is a great way to keep those skill sharp. More advanced classes from Wilderness First Aid to Wilderness First Responder to EMT, Wilderness EMT, and beyond exist. The higher the level of training you have, the better you'll be able to perform should things go wrong underground.

ALWAYS assume hypothermia and treat it as outlined on the medical card. Even if the patient is warm, they won't be for long, at least not in the caves in the central Appalachians. And as the card instructs, start moving if you can (self-rescue). If you think the patient is unable to exit with assistance under their own power in a timely manner, send for help. In many cases you may split the party with one group going for help while the others aid in self-rescue. If at all possible, keep at least two people in each group!

Immediately following an incident, avoid unnecessary risks! You cannot help the sick or injured party if you become injured yourself. Take the necessary actions in a purposeful and controlled manner.

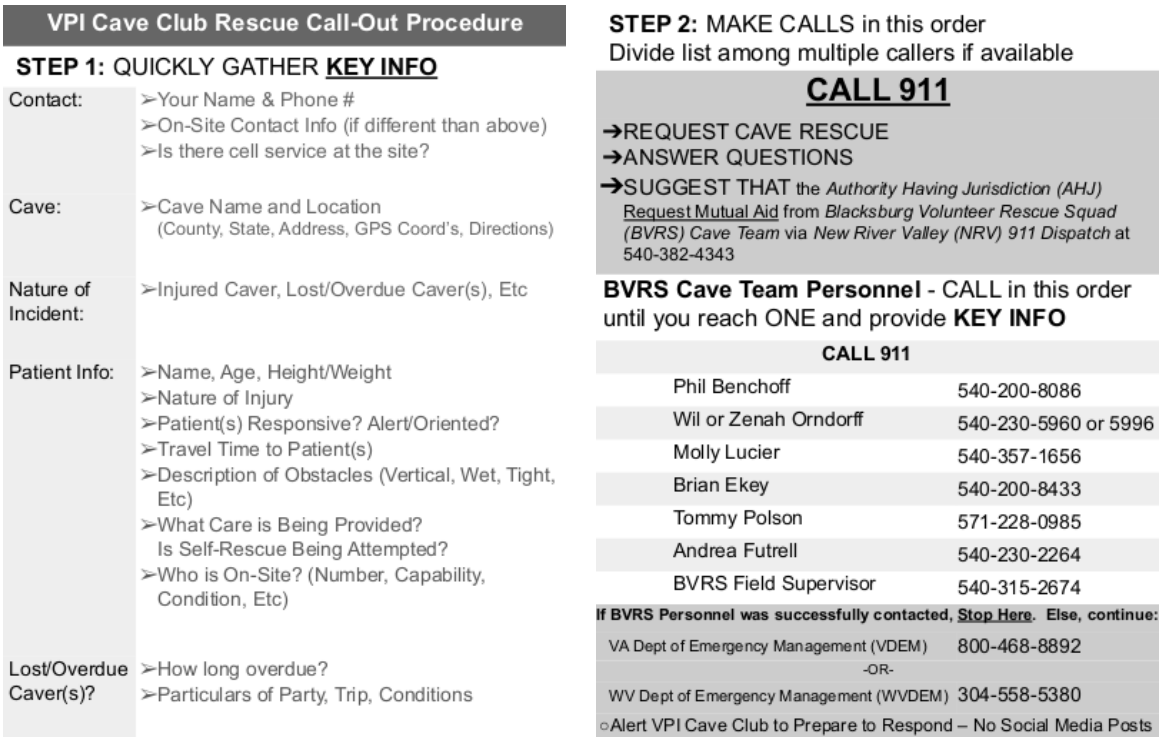
When the party going for help arrives at the surface, they need to find a location where they have communications and then call for rescue. While in some instances an incident can be safely managed without an agency response, it is better to err on the side of caution. To initiate an agency response, follow the procedures on the Rescue Callout Card, as shown as Figure 2. The VPI Cave Club maintains this cave rescue callout card that every member and prospective member should keep with them when going on a caving trip (OK to leave in the vehicle if close to the cave). The card is reprinted and distributed to cavers periodically, especially after updates. The most recent version resides in the "VPI Cave Club Member Drive". Various cards have existed over the years, with the current one assembled in 2024 by Eric Steinberg. Please remember that the most recent version is the one that should be followed, as the individuals and agencies occupying specific roles may change.

At time of writing (Aug 2025), the key steps if caving near Blacksburg are:

1. call 911, tell them it's a cave rescue, and ask them to request mutual aid from the Blacksburg Volunteer Rescue Squad's Cave team
2. call BVRS cave team members until one responds.

Once rescue is initiated, you should follow the instructions given by the responding agency. If you are waiting for them to arrive, rest, eat, drink, and perform any gear maintenance so you are ready to return to the cave if needed. Depending on the incident and the people and agencies responding, you may or may not participate in the rescue operation. It's pretty common for members of the reporting party (cavers on the trip where the incident occurred) to guide rescuers to the patient.

Rescuers will not all arrive at once, and you can expect law enforcement from the authority having jurisdiction (usually the Sheriff's department) to show up, as well as local emergency medical personnel and surface support. These folks



VPI Cave Club Rescue Call-Out Procedure

STEP 1: QUICKLY GATHER **KEY INFO**

Contact:	➢Your Name & Phone # ➢On-Site Contact Info (if different than above) ➢Is there cell service at the site?
Cave:	➢Cave Name and Location (County, State, Address, GPS Coord's, Directions)
Nature of Incident:	➢Injured Caver, Lost/Overdue Caver(s), Etc
Patient Info:	➢Name, Age, Height/Weight ➢Nature of Injury ➢Patient(s) Responsive? Alert/Oriented? ➢Travel Time to Patient(s) ➢Description of Obstacles (Vertical, Wet, Tight, Etc) ➢What Care is Being Provided? Is Self-Rescue Being Attempted? ➢Who is On-Site? (Number, Capability, Condition, Etc)
Lost/Overdue Caver(s)?	➢How long overdue? ➢Particulars of Party, Trip, Conditions

STEP 2: MAKE CALLS in this order
Divide list among multiple callers if available

CALL 911

➔REQUEST CAVE RESCUE
➔ANSWER QUESTIONS
➔SUGGEST THAT the *Authority Having Jurisdiction (AHJ)* Request Mutual Aid from *Blacksburg Volunteer Rescue Squad (BVRS) Cave Team* via *New River Valley (NRV) 911 Dispatch* at 540-382-4343

BVRS Cave Team Personnel - CALL in this order until you reach ONE and provide **KEY INFO**

CALL 911	
Phil Benchoff	540-200-8086
Wil or Zenah Orndorff	540-230-5960 or 5996
Molly Lucier	540-357-1656
Brian Ekey	540-200-8433
Tommy Polson	571-228-0985
Andrea Futrell	540-230-2264
BVRS Field Supervisor	540-315-2674

If BVRS Personnel was successfully contacted, Stop Here. Else, continue:

VA Dept of Emergency Management (VDEM)	800-468-8892
-OR-	
WV Dept of Emergency Management (WVDEM)	304-558-5380

○Alert VPI Cave Club to Prepare to Respond – No Social Media Posts

Figure 2: VPI Cave Club Callout Card 2025

may show up prior to the Cave Rescue Team or may authorize local cavers who aren't part of a team to begin rescue operations. One thing you can do if you are on site is to offer help on very basic tasks, for instance establishing entrance control to keep track of who goes in and out of the cave.

When you respond to a cave rescue

At some point in your caving career, you are going to get the word that there is a cave rescue happening and that your help may be needed. In this case, your job is to follow the instructions given to you by the people conducting the rescue callout. You may be asked to stand by and be ready to respond if needed. You may be asked to report to an intermediate staging area, such as the BVRS station. Or you may be asked to coordinate with other cavers and carpool to the scene (cave where the incident occurred).

When responding, you should always bring enough food and water for at least 24 hours, and extra warm clothing and sources of heat. In addition, it's a good idea to bring a sleeping bag and pad. And maybe a folding chair and book, knitting project, deck of playing cards, et cetera.

Upon arrival at the incident, you or a representative from your group will coordinate with personnel at the scene to see if and where you are needed. For many cave rescues you will simply sit in staging for the rescue's duration: more folks responded than are needed, which is a good thing in case things go wrong. Better to have excess resources than inadequate resources.

Cave rescues can be the ultimate hurry up and wait scenario. It's beyond the scope of this article to describe every possible situation. One key thing to remember is that you need to know who you are working for, and who works for you. You may be put in charge of a team sent into the cave to perform a specific task (aka task force). Specific tasks, each with their own skill set, include rigging, transporting gear, carrying the litter (stretcher), searching for lost persons, running communications equipment, and assisting in surface operations. Be aware that adrenaline and emotions can run high in rescue situations: be calm and purposeful in your actions.

Your effectiveness during a cave rescue will depend on your skill level, your physical fitness, biometric parameters, degree of technical rescue and/or medical skills/training, and how well you are known to the folks running the rescue.

After a rescue

After all the rescuers are out of the cave and the site is cleared, it's time to go home. This can be the most dangerous part of your response. On multiple occasions rescuers have fallen asleep at the wheel driving home from cave rescues, and there have been too many close encounters with deer to count. Consider sleeping at or near the scene and make the return trip after you have rested and in daylight hours.

At some point after the rescue, a responding agency (like BVRS) will hold a debrief. Rescues are stressful: the debrief helps review what went well and where teams could improve, but with some distance from the incident. Attend one if you can: you'll learn a lot, and may have valuable insight to add!

What can I do to be an effective cave rescuer?

- Go caving! Being a physically fit caver with a strong skillset who knows their way around many caves will make you incredibly valuable in cave rescues.
- Get cave rescue training! Participate in local training and practice scenarios run by the VPI Cave Club or the BVRS Cave Team and consider taking National Cave Rescue Commission classes, several of which are offered locally on a biennial basis.
- Get medical training!
- Forge relationships and be collegial.

A Few Good Knots

Only fourteen knots are required for your membership test. They have been selected to provide a common set of tools for all members, and these tools will be sufficient for most rigging. You should be able to tie all of these knots as easily as you tie your shoes; lives may depend on your ability to tie them when you're tired, hungry, cold, confused, and in darkness. Learn, practice, and master these knots.

Learning to tie knots from printed material is not easy; get personal instruction from a member with vertical experience if you can. Animated images on the Internet are also helpful.

Terms and Functions

A few terms are used to describe knots and rigging.

- The *working end* of the rope is what you tie to the anchor.
- The *standing line* is the part of the rope between the anchor and load. It is the part you rappel or climb.
- The *running end* or *free end* is the end of the rope that is not attached to the anchor. It is the part of the rope you are not supposed to rappel off.
- A *bight* is formed when the rope is doubled back but does not cross itself.
- A *loop* is formed when the rope is doubled back and crosses itself.
- A *knot* or *true knot* is formed when a rope is tied to itself. *Fixed loops*, *mid-line loops*, and *stopper knots* are true knots.
- A *hitch* is used to fasten a rope some object or another rope. The rope or object you are hitching to is not part of the knot; a hitch will fall apart if the rope or object is removed.
- A *bend* is used to fasten one rope to another.
- Knots, hitches, and bends are all *ties*, but it is usual to call all of them knots.

Selection and Characteristics

Here are some things to consider when selecting which knot you will use for a particular job.

- Is the knot suitable for the type of material you are using? Different types of material may require different knots. Knots that work in webbing may not work in rope. Many of the knots seen in typical knot references do not work well in the stiff and slick synthetic ropes used for caving.
- How secure is the knot? Security of a knot refers to how well the knot maintains its shape under load. Many knots that are very secure under constant tension will fail in situations where the rigging is alternately loaded and unloaded. An additional overhand knot is often added to secure the primary knot.
- How strong is the knot? Bending or twisting a rope reduces its strength. Most sources will give figures of 20-50% strength reduction with a typical knot.
- Is the knot suitable for the load?
- How likely is the knot to capsize? Capsizing refers to a failure of a knot where its structure changes under load. The best example of this is what happens when the free end of a square knot is pulled.
- Does the knot jam? Some knots will jam after heavy loading. The difficulty of removing a particular knot may require the use of tools that damage the rope (requiring the damaged section of rope to be discarded).
- Can the knot be tied under tension?
- How compact is the knot?
- How much rope does the knot require?
- How hard is it to examine the knot and tell if it is tied correctly? It is important that each person who will use some rigging be able to examine it and confirm that it is rigged correctly.

Tying a Knot

Tying a knot is more complicated than just arranging the rope like one of the illustrations. Here are some steps to follow.

- **Select** knot that is suitable for the job and material.
- **Tie** the knot.
- **Dress** the knot by arranging all parts of the knot in the correct orientation. When tying a knot with webbing, try to keep the webbing as flat (not twisted) as possible. Re-traced (re-threaded) knots (like the re-traced figure-8) also require special care.
- **Set** the knot by taking up the slack on all parts of the knot. Be sure to maintain the correct orientation.
- **Secure** (backoff, backup) with an overhand loop, double overhand loop, or specialized method. Knots used to secure another knot should be as close as possible to the main knot and oriented to fit tightly against it. (Sometimes the backoff is part of the knot and must be done prior to setting, e.g. bowline with Yosemite finish.)
- **Inspect** the finished knot and securing knot. Do not leave unsecured or incorrect knots in the rigging. It may not be obvious to others that it is not ready to use.

Once you learn to identify and tie the required knots, spend some time learning different techniques of tying them. The references section of this document lists several good places to learn specialized techniques that will help you tie the knots quickly and correctly in a variety of situations.

Required Knots

Notes on the Illustrations

To provide the clearest information for learning to recognize and tie the selected knots, some of the illustrations show knots that are not complete or are not quite in the form that they should be used. In particular, knots are shown before being set, without the required backoff, or with tails and loops of incorrect size.

Overhand Knot

The *overhand knot* (or *thumb knot*) is the simplest of all knots. Its most common use is to secure (or backup) a more complicated knot. Of the fourteen required knots, four are based on the overhand knot (overhand knot, water knot, square knot, double fisherman's bend), and four are secured with overhand knots (bowline, bowline on a coil, and helical).

- When used to secure a knot, two forms of the overhand knot are possible: the *inside* form and the *outside* form. The inside form is preferred since it is more compact and symmetric, and the two ropes lay parallel to each other.
- There are two possible orientations for the inside form of the overhand knot depending on which way the the turn is taken around the standing part. Viewed from the side, the knots slope in opposite directions. Choose the one that puts the backup knot closest to the main knot.
- Two turns can be taken around the standing rope to form the *double overhand knot*.
- The overhand knot can be used as a stopper knot (e.g. to keep a line from running through an opening), but it is prone to jamming. A figure-8 is a better choice.
- When tied with the ends of two ropes, this knot is more properly called a *half knot*.

Overhand knot | Overhand knot (inside) | Overhand knot (outside) | Double overhand knot | Double overhand knot

Figure 3: The overhand knot

Water Knot

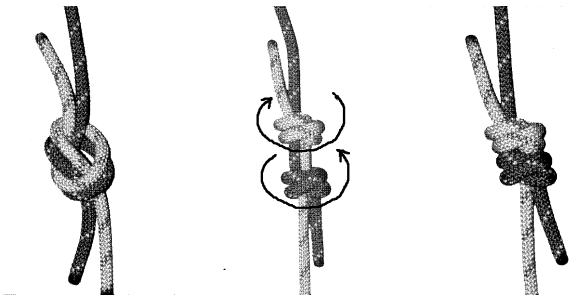
The *water knot* (or *ring bend*) is most often used to bend two lengths of webbing together. It is easily tied by tying an overhand knot in the end of one length of webbing and then re-tracing the knot with the end of the other length of webbing. This technique is called a "re-trace" and is also useful with the figure-8.

- Only retains 50-60% of the webbing's strength.[SP96, p51]
- Does not require overhand backups in webbing. Be sure to leave the tails several inches long though.
- Dress knots in webbing carefully so the two strands remain flat and parallel to each other.

Double Fisherman's Bend

The *double fisherman's bend* (or *grapevine knot*) is a very secure knot that can be used to bend two similar pieces of rope. It is prone to jamming with heavy loads and can be difficult to remove. With three turns on each overhand, it is called a *triple fisherman's bend* or *barrel knot*. The triple fisherman's bend is as strong as the rope and is the only bend that should be used with Spectra[SP96, p52].

The double or triple fisherman's bend is often used to bend two lengths of rope that will be used for a rappel.



Water knot (This knot is usually tied in webbing, but rope is shown for clarity.)

Double fisherman's bend

Double fisherman's bend

Figure 4: The water knot and the double fisherman's bend

Square Knot

The *square knot* (or *reef knot*) is a binding knot. It's easy to tie, compact, and can be tied while maintaining some tension in the line. If the tail and standing part of one of the ropes get pulled, the knot will capsize with one rope forming a girth hitch around the other. If this knot is used as a bend and something snags one of the ends, the knot can capsize easily. The problem is worse if the materials used are of different size or stiffness.

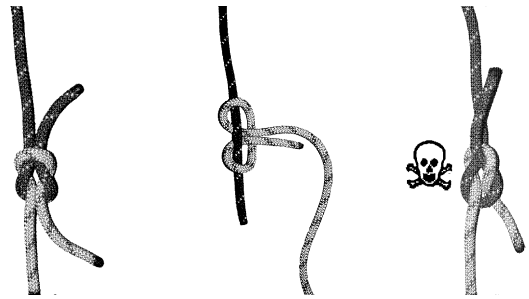
- The most common way to tie a square knot is to take the two ends of the ropes and tie a half knot right-over-left and then another left-over-right.
- The tails of the square knot should be parallel to the standing parts of the ropes and on the same side of the knot.
- Use the square knot to tie the free ends of a coil of rope.
- Use square knots to tie a seat harness with webbing.

The Wrong Way There are three incorrect knots you can end up with when you attempt to tie a square knot. Which one you have is determined by the orientation of the tails with respect to which side of the knot they are on and if they come out of the knot along side of the standing part.

- **Granny Knot** – This is probably the most common error. The tails are on the same side of the knot, but do not follow the standing part out of the knot. If you intended to tie a square knot with the right-over-left left-over-right method, you got one of them backwards. This is the only one of the three incorrect knots you can end up with when using that method of tying. This knot is not secure and will pull out of most materials. Don't use it for anything.
  Look down at your shoes. Are the loops of the bow knot extended across your shoe or along its length? If the loops go along the length, you have the granny form of the bow knot. Fix your shoes before someone notices.
- **Thief's Knot** – This knot has free ends that come out of the knot parallel with the standing part of the rope, but on opposite sides of the knot. It will not support much of a load and should not be used in rigging.
- **What Knot** – This knot has free ends that do not follow the standing parts out of the knot and the tails are on opposite sides.

Bowline

The *bowline* creates a fixed loop on the end of a rope. Four of the required knots are based on the bowline (bowline, mountaineering bowline, bowline on a coil, bowline on a bight) and knot texts will show many more variations. This



Square knot (unsecured) | Square knot (capsized) | Granny knot

Figure 5: The square knot

knot is easy to tie, easy to inspect, and not prone to jamming. After you learned to tie your shoes, you should have learned this knot. If you didn't, learn it now.

- The free end must have a backup knot. The most common choice is the overhand knot. An even more secure choice is the double overhand knot. A *Yosemite tie-off* will put the free end of the rope outside of the loop.
- The single bowline can be re-traced to form a knot with the same structure as the bowline on a bight.
- The free end should be inside of the major loop (except with the Yosemite tie-off). Although the "left-handed" form of the bowline is thought to be just as strong as the properly tied version, the free end is more likely to snag on something and capsize the knot into a slip knot.
- When a bowline is tied around something, it is easy to tie if you start with an overhand knot. See the section on the helical knot for an example of this method of tying.

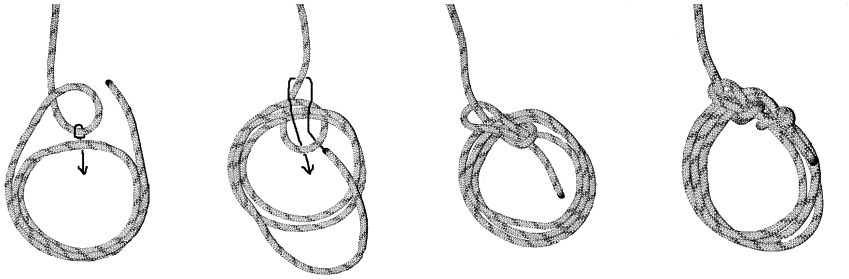
Tying the bowline | Bowline before setting and securing | Finished bowline | Securing with a Yosemite finish | Bowline with Yosemite ready to set

Figure 6: The bowline

Bowline on a Coil The *bowline on a coil* is used to attach a person to a belay line if a harness is not available. The use of multiple major loops (usually three) helps distribute the load and is more comfortable for the person on belay.

- A rope in not a harness. Use this knot only in cases where a harness is not available and no webbing is available to tie a harness.
- This is not a knot to be used in equalizing rigs. All of the coils must be around the same object.

- The orientation of the minor loop and the way the end of the rope passes through it are the same as a regular bowline.
- The bowline on a coil should be secured with an overhand knot around all of the major loops[GH97, p123].



Starting position. The coil that makes up the major loops would be around your waist.

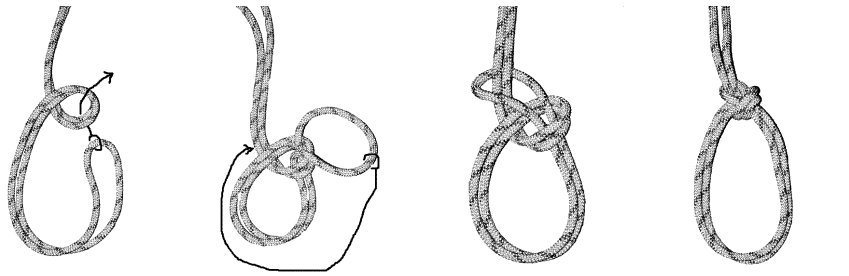
Before setting

Set and secured. Note that the backup knot goes around all of the loops.

Figure 7: The bowline on a coil

Bowline on a Bight The *bowline on a bight* is a mid-line knot used to create a fixed loop.

- You can tie this knot around something by tying a single bowline with a long free end around the object first, then re-trace the free end through the knot.
- The relative size of the two major loops can be adjusted.
- This knot may be used in an equalizing rig and it is the only one of the required knots that can be.



Start by forming the minor loop in the bight

Pass the end of the bight through the minor loop. Spread the end of the bight to form a loop and fold it back over the knot.

Bowline on a bight before setting.

Completed knot.

Figure 8: The bowline on a bight

Figure-8

The *figure-8 knot* can be used as a stopper knot (e.g. to prevent a rope from passing through a pulley). Its more common uses are in the forms tied in the bight or re-traced. No securing knot is required, but many people prefer to add an overhand backup.

High Angle Rescue Techniques[VH99, p 62] lists the following as reasons the figure-8 family is preferable to the bowline family:

- more likely to be tied correctly
- more likely to be remembered
- a lot easier to tell if it is tied correctly
- remains stable if loading comes from a direction different from what was intended
- more likely to remain tied after repeated loading and unloading
- less likely to invert and become untied when pulled across an obstruction or when the tail of the knot is pulled
- tends to weaken the rope less

I still prefer the bowline in a lot of situations. The bowline is a lot less likely to jam and it consumes much less rope than a figure-8.

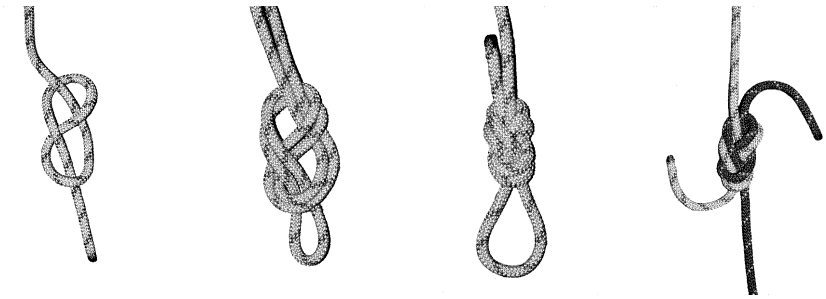


Figure-8 | Figure-8 on a bight before setting | Completed knot | Re-traced Figure-8 on a bight used as a bend

Figure 9: The Figure-8

Figure-8 on a Bight A figure-8 knot can also be tied in a bight to form a fixed loop. This knot is usually tied near the end of a rope and used as a main rigging knot. The same knot can be tied by tying a figure-8 in the rope, passing the free end around something, and re-traced the knot. Re-threading a figure-8 with another line will form a figure-8 bend, a very secure knot.

- Use as a main rigging knot.
- Use to form fixed loops on climbing slings.
- Use to form a fixed loop in the end of a rope being lowered down a drop for rappelling.
- Requires some attention to dressing.
- Does not require an extra knot to secure.
- Use an alpine butterfly or an inline figure-8 if the knot is to be loaded in opposite directions on both tails.

Double Figure-8

The double figure-8 is similar to the figure-8 on a bight, but it provides two loops (which may be of different sizes). This is the knot of choice for equalizing rigs. (See [SP96, p 46].)

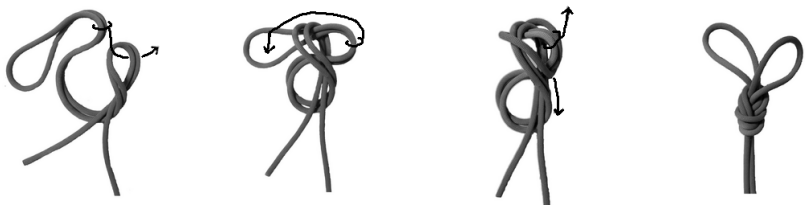
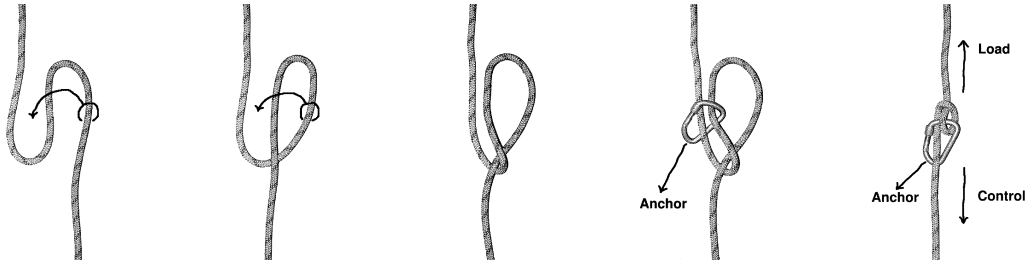


Figure 10: Double Figure-8

Münter Hitch

The *Münter hitch* (or *Italian hitch*) is a friction hitch formed from a rope and locking carabiner. It can be used to belay single-person sized loads and can serve as an emergency rappel method.

- The Münter hitch will automatically reverse directions depending on if you are letting out or taking up rope. You should set the knot in the direction you are going to use it to avoid several inches of slack when the knot reverses.
- The carabiner must be the locking type, and it must be large enough for the knot to pass through when changing directions. A pear-shaped locking caribiner is the preferred type.
- The Münter hitch provides good friction no matter what the angle between the ropes and caribiner. (Some belay methods using devices like a figure-8 are quite sensative to the angle of the ropes.)
- When used as a rappel method, the Münter hitch kinks the rope more than other methods.
- The Münter hitch may be used to provide extra friction to the rope feeding into another rappel device.
- The Münter hitch is commonly used as part of a *load releasing hitch*.
- The Münter hitch may be locked off with a *mule knot*. Demonstrating a tie-off for the Münter hitch is a requirement for membership.



Form a bight in the rope.

Grab the end of the bight and twist it once.

Grab the end of the bight and twist it again.

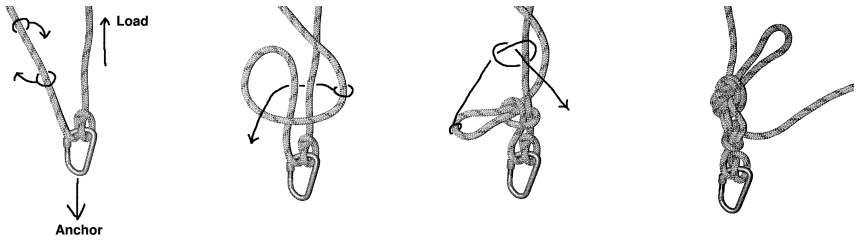
Attach a locking carabiner.

Set the knot by pulling the end of the rope that will be attached to the load.

Figure 11: The Münter hitch

Mule Knot

The *mule knot* can be used to tie off a Münter hitch. This combination is sometimes known as the *MMO* or *Münter-Mule-Overhand*.



Form a loop in the free end close to the main knot.

Pass a bight from the free end around the standing line and through the loop.

Set the knot and pull a long loop through.

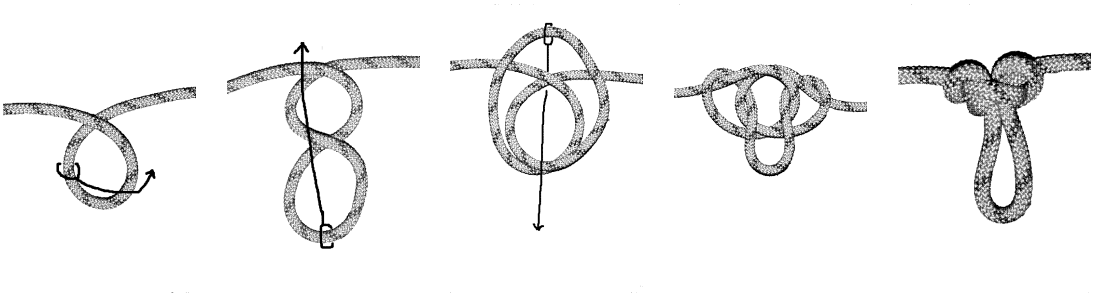
Secure the loop to the standing line with an overhand knot.

Figure 12: Locking off the Münter hitch with a mule knot

Alpine Butterfly

The *alpine butterfly* (or *lineman's loop*) is a mid-line fixed loop. It can support a load in either direction along the main line.

- Use to bypass a damaged section of rope. Two alpine butterflies and a carabiner can be used to bypass a longer section of rope.



Grab the main line and turn once to form a loop (shown). Turn again to form a second loop.

Fold the second loop over the first.

Pass the second loop around the main line and through the first loop.

The completed alpine butterfly before setting.

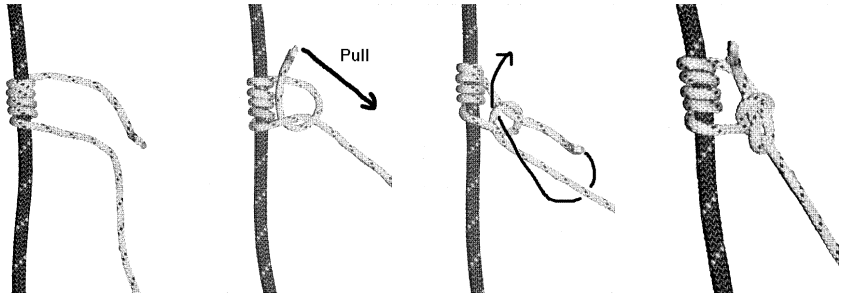
The completed alpine butterfly. Note that the loop should be longer than shown.

Figure 13: The alpine butterfly

Helical

The *helical knot* (or, *ascender knot*) is a friction knot used with rope climbing systems to attach a smaller sling (7-8mm) to the main line (11mm). When there is no tension on the sling, the knot slides freely. When the sling is loaded (parallel to the main line), the knot grips the rope and will not slide.

- This knot is usually tied with four or five turns around the main line.
- The figures show the knot joined with a bowline. This is the most common way to tie the Helical knot, but careful attention must be paid to securing the bowline with an overhand knot, or better yet, a double overhand or Yosemite finish.
- A figure-8 tie can also be used.
- The helical knot may be adjusted without detaching the other end of the sling from your harness.
- The helical knot is a bit harder to tie than a prusik, but moves easier and grips the main line more securely.
- If necessary, this knot can be used to attach a flat webbing sling to the main line.
- It is best to tie this knot with a minimum of slack. It will stretch when loaded.
- Never apply any downward pressure on the top coils of a loaded helical knot. This may cause it to slip. If it slips far enough to press down on the top of another knot, disaster may result.
- Slide a helical knot up the main line by pushing it up from the bottom, not by gripping the knot.
- Tie the top knot first and remove it last. That way you will not end up hanging by your heels if you slip.



The helical starts with four or five wraps around the main line.

The overhand method of tying a bowline. Start with an overhand knot and pull the end to form a loop.

Finish the bowline.

Knot before setting and securing. Remove as much slack as possible and use one of the usual methods for securing a bowline.

Figure 14: The helical

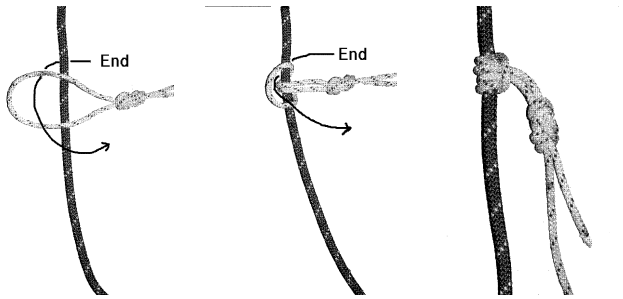
Prusik

The *prusik knot* is a friction knot similar to the helical.

- Once set, the prusik knot must be loosened before it will move freely. It is this property that makes the helical knot more popular for ascending.
- The prusik knot may be loaded in either direction.
- The prusik knot is often used to attach rope pads.
- The prusik knot is used as a safety in hauling systems.
- Tie the top knot first and remove it last. That way you will not end up hanging by your heels if you slip.

A Few More Good Knots

In addition to the required knots, there are a few more knots which are being used frequently by cavers and worth learning or at least recognizing.



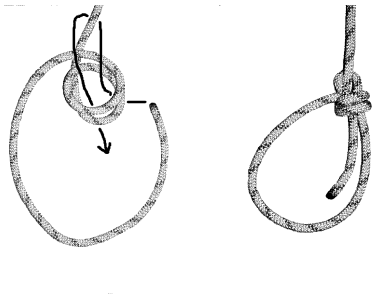
Begin with a figure-8 on a bight.

Pass the sling and knot around the main line and through the loop.

The finished prusik.

Figure 15: The prusik

Mountaineering Bowline The *mountaineering bowline* is identical to the single bowline except that it has two minor loops. This was previously a required VPI knot and is still occasionally seen in caving. It has few practical benefits when compared to the bowline and VPI no longer recommends or teaches it, but it is perfectly safe. One of the backoff methods used for the single bowline should be used with the mountaineering bowline.



Method of tying the mountaineering bowline

Mountaineering bowline (not secured)

Figure 16: The mountaineering bowline

Doubled Tucked Sheet Bend

The *sheet bend* is a knot used to bend two ropes of unequal thickness or stiffness. The thicker or stiffer rope is used to form a bight, and the thinner or more flexible rope is passed through and around the bight. This is a knot subject to some controversy. Depending on which reference you use, the *standard* sheet bend will be shown with the tails on the same or opposite sides of the knot. Some references show both and call one "left handed" and claim it is inferior to the other. The references that the author trusts the most ([Ash44, #66][Day86, #31][Tos98, p68]) all show the proper knot with the tails on the same side.

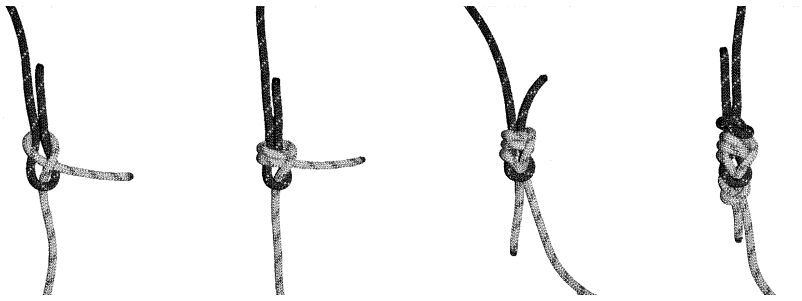
An examination of the knot offers some insight in to the controversy. Ashley explains:

> The so-called oft-quoted "principle of the knot," that "no two parts which would move in the same direction, if the rope were to slip, should lie alongside of and touching each other," plausible though it may

appear, does not seem important. — [Ash44, #64-65]

An excellent example of this is the sheet bend. The sheet bend (#66) violates the alleged "principle" at every point where it can, but it has good nip and does not slip easily. The Left-Hand Sheet Bend (#67) conforms to the so-called "principle" to a remarkable extent, but has poor nip and is unreliable. — [Ash44, #66-67]

- Can be used to bend ropes that are not the same diameter or even to attach webbing to a rope. The smaller or more flexible rope should be tied around a bight of the larger rope. In the pictures, the bottom (light-colored) rope would be the smaller or more flexible one.
- Securing this knot is required.



Sheet bend. Note the orientation of the tails.

Double sheet bend

Doubled, tucked sheet bend ready to secure.

The finished doubled, tucked sheet bend

Figure 17: The doubled, tucked sheet bend

Figure-9

The figure-9 knot is similar to the figure-8 on a bight. It is used for the same things as the figure-8, but is claimed to be stronger and less likely to jam. The strength factor may be significant in rigging using rope of 9mm or less. (See [SP96, p 46].)

Load Releasing Hitch

The load releasing hitch is used to attach a load to an anchor when it may be necessary to release the load in a controlled manner, such as moving the load to another anchor. (See [SP96, p 226].)

Inline Figure-8

The inline figure-8 is used to form a mid-line loop where the tension on the loop is in the same direction as the tension on one of the tails (such as to a backup anchor). (See [SP96, p 49].)

Additional Information

Books

- *On Rope*[SP96] – Considered the best reference on North American rope techniques. Knots, rigging, safety, equipment, and many other subjects are covered. The illustrations are good for learning to tie knots. I think every vertical caver should read this book.

- *The Handbook of Knots*[Paw98] – This is the book I recommend if you want a good general-purpose knot reference. The book covers a fair number of climbing knots and has very good color photographs. Amazon.com has some sample pages you can preview.
- *Art of Knotting and Splicing*[Day86] – My favorite general-purpose knot book prior to Pawson. The book uses black-and-white photographs to show the knots and has some discussion on techniques of tying them.
- *The Klutz Book of Knots*[Cas85] – This is a small and inexpensive book that covers 25 of the most useful knots. It comes with cord and has die-cut cardboard pages so the knots can be practiced next to their illustrations. It is an ideal book to get people started with tying knots that are useful for everyday life.
- *The Morrow Guide to Knots* [BR82] – This is one of the most popular books on knots. It has step-by-step color photographs and shows multiple techniques for tying knots. I find Day to be a better reference since this book is lacking several of my favorite knots (alpine butterfly, Ashley's bend, buntline hitch, and a few others) and it is not as thorough in its text.
- *Vertical*[War94] – Knots, rigging, safety, equipment, and many other subjects with a focus on European (or Alpine) techniques. This book is a great companion to On Rope.
- *Mountaineering: The Freedom of the Hills*[GH97] – Broad survey of mountaineering topics (camping, rigging an knots, climbing, rescue, much more).
- *CMC Rope Rescue Manual*[Fra98] – Another general-coverage book. The focus is on rescue rigging and not caving.
- *The Ashley Book of Knots* [Ash44] – Probably the most complete collection of knots ever assembled. 3800 knots and variations are described. Ashley is referenced in almost every other knot book. This book is fairly old and it does not account for caving/climbing applications. The illustrations are not all that good for learning to tie the knots.
- *The Complete Rigger's Apprentice*[Tos98] – This book focuses on rigging for sailing. The chapters on knots, tricks and puzzles, and "sheer ingenuity" are probably the most useful. If you are blessed with a need to work with wire rope, there is also a lot of material on its splicing and use. Toss is expected to release a new book called *Working Knots* sometime in the summer of 2000.

Internet

- `http://www.realknots.com/` - Ropers Knots Page
- `https://www.animatedknots.com/` - Animated Knots

References

[Ash44] Clifford W. Ashley. *The Ashley Book of Knots*. Doubleday, 1944.

[BR82] Mario Bigon and Guido Regazzoni. *The Morrow Guide to Knots*. William Morrow and Company, Inc., 1982.

[Cas85] John Cassidy. *The Klutz Book of Knots: How to Tie the World's 25 Most Useful Hitches, Ties, Wraps, and Knots*. Klutz Press, 1985.

[Day86] Cyrus Lawrence Day. *The Art of Knotting and Splicing*. Naval Institute Press, fourth edition, 1986.

[Fra98] James A. Frank, editor. *CMC Rope Rescue Manual*. CMC Rescue Inc., third edition, 1998.

[GH97] Don Graydon and Kurt Hanson, editors. *Mountaineering: The Freedom of the Hills*. Mountaineers (Society), sixth edition, 1997.

[Paw98] Des Pawson. *Handbook of Knots*. Dk, 1998.

[SP96] Bruce Smith and Allen Padgett. *On Rope*. National Speleological Society, 1996.

[Tos98] Brion Toss. *The Complete Rigger's Apprentice*. International Marine, 1998.

[VH99] Tom Vines and Steve Hudson. *High Angle Rescue Techniques*. Mosby, Inc., second edition, 1999.

[War94] Alan Warild. *Vertical: A Technical Manual for Cavers*. Speleological Research Research Council Ltd, 1994.

Belaying

A belay is a redundant safety system used during rope work or climbing that prevents major injury in the event that a caver falls or goes into an uncontrolled rappel. It is important for the person on belay to stay alert and be ready to give instruction that will ensure the safety of the person on rope. Belays are required on VPI trips while climbing cable ladders, when novices are rappelling, and are recommended during dangerous climbs/maneuvers.

In general, remember:

- Anyone who wants a belay gets a belay.
- If a member asks you to take a belay, you must accept it.
- Always wear gloves.
- Both the belayer and climber must be careful to not allow too much slack in the belay line.

Bottom Belay

A bottom belay is the most common type of belay used by the VPI cave club. The person giving a bottom belay holds the bottom of the rope being rappelled on and weights the rope in the event of an uncontrolled rappel (Fig 1) so as to place additional friction on the rappel device. The belayer should *never* be in rockfall. If the rope is too short to belay safely, the belayer should attach a piece of webbing or another rope to the bottom. If there is no way to safely belay, no belay should be given. On a longer rappel, there will be more rope stretch (and the rappeller starts out with more rope weight), but a very effective belay can still be given by attaching an ascender to the rope and running away, thus changing the rope angle and eliminating much of the rope stretch. Belays are typically given by a more experienced member on the trip. Belayers should always wear gloves and a good helmet.

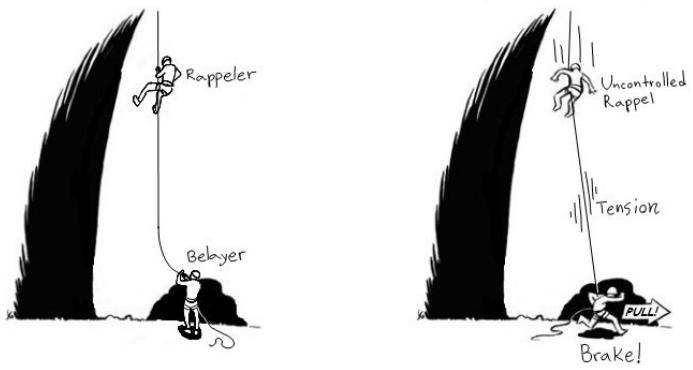


Figure 18: Belayer tensions rope during an uncontrolled rappel

Any time a bottom belay is given, the calls in Table 2 should be used to ensure the safety of the rappeller.

Even after you become a member and stop receiving bottom belays, you should always use “On rope” and either “Off rope!” or “Rope free!” to indicate that you are entering rope/rockfall zones and detached from the rope/safe from rockfall. The calls are just as much about rockfall danger as they are about communicating what you’re actually doing to the rope.

Always:

- Stay out of rockfall.
- Concentrate on the rappeller; do not talk or be distracted by other cavers.

Table 2: Calls for bottom belay

Rappeller	On Rope!	I am approaching the ledge and getting on rope.
Rappeller	Ready to rappel!	I am safely attached to the rope.
Belayer	Belay is on!	I am in position and ready to belay.
Rappeller	Rappelling!	I am about to rappel.
Belayer	Rappel away!	I am expecting you to rappel.
Belayer	Belay is off!	I am no longer giving a belay.
Rappeller	Off rope!/Rope free!	I have detached from the rope and am out of rock fall

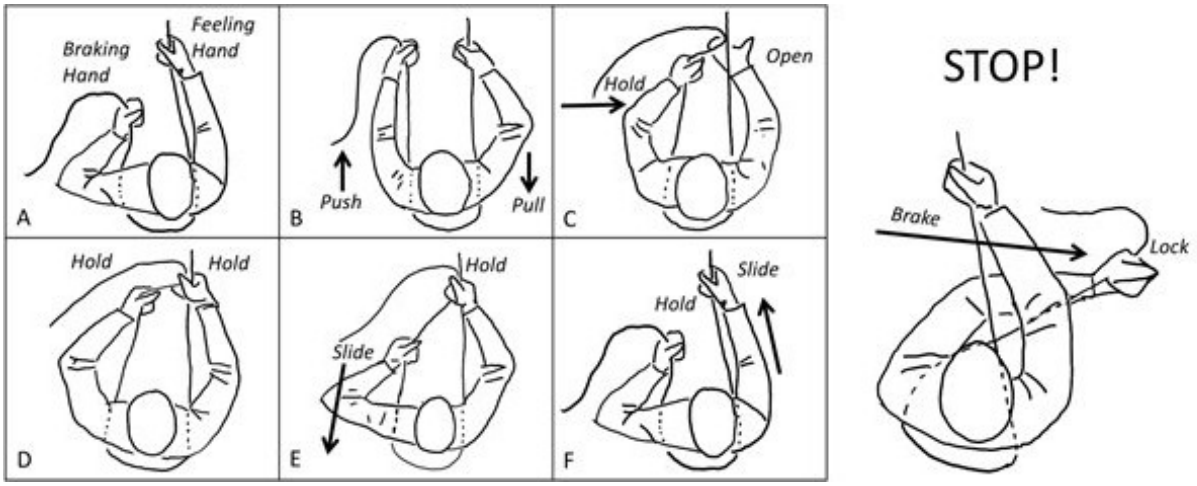


Figure 19: How to safely reduce rope slack and brake against the body during a body belay

Top Belay

A top belay should be used when climbing anything that feels unsafe or when climbing a cable ladder. Top belays should never be used for vertical work (SRT). A top belay can be given with rope or webbing attached to the climber's harness. If a harness is unavailable, the climber can be secured using a bowline on a coil (see section on knots). Both the climber and the belayer need to be alert and ready to respond to each other so that the climber does not have to fight the belayer.

All belays must be anchored to a secure rigging point. If a body belay is used, the belayer must be securely positioned so that they are not pulled from their position when catching a fall: tying in to an anchor point is recommended. Body belays are less ideal when the climber is clearly larger than the belayer. In such instances, a munter hitch or another belay device can be used. When giving a belay, *under no circumstances should the brake hand of the belayer leave the rope*. Figure 19 shows how to safely take up rope slack during a body belay and how to stop a fall. Note how the brake hand never leaves the rope so that the belayer maintains control at all times. In the event that the climber becomes unresponsive to calls, the belayer should lower the climber as safely as possible to the ground, after informing them that they are about to do so.

Any time a top belay is given, the following calls should be used to make climbs safer. Ensure that both the belayer and climber are familiar with the calls

Always:

- Be sure you are solidly anchored before starting the belay.
- Have enough rope or webbing to lower the climber to the floor or other safe location in case of emergency.
- Keep the belay tight as communication may be poor between the climber and the belayer.

Table 3: Calls for top (cable ladder) belay

Climber	On rope!	I am about to attach to the rope
Belayer	OK!	I will stop kicking rocks down the pitch
Climber	Ready to climb!	I am safely attached to the rope.
Belayer	Belay is on!	I am in position and ready to belay.
Climber	Climbing!	I am about to climb.
Belayer	Climb away!	I am expecting you to climb.
Belayer	Belay is off!	I am no longer giving a belay.
Climber	Off rope!	I have detached from the rope and am out of rock fall.
Climber	Falling!	This needs no explanation.
Climber	Slack!	I want more rope so that I can move freely.
Climber	Tension!	Pull the rope tight. DO NOT say “Take up slack.”
Belayer	Slow!	Climb more slowly
Belayer	Stop!	Stop climbing

Table 4: Other Calls

Anyone	**ROCK!**	A rock or other object is falling. The term “rock” is used no matter what is falling. Do not look up.
Climber	**Clear**	Some obstacles are passed one person at a time. This is an indication that you have passed and are the next person may begin. It is used by some people to indicate that they are off rope and out of rock fall.
Anyone	**STOP!**	Do not rig in, begin climbing, or whatever you just indicated. Wait for additional communication.
Anyone	**Re-peat**	Repeat the last call. It is often better to just wait for the call to be repeated.
Anyone	**OK**	Acknowledgment of last message.
Rigger	**Rope**	I am lowering rope down the pit. Stand clear of the coil and the bottom.

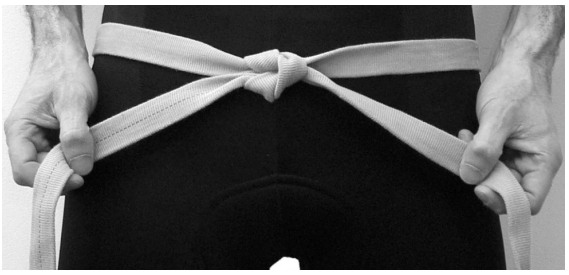
Other Calls

There are many calls used in caving. The previous two sections cover common rope belay calls. In table 4 are some other imporant ones, that you will need to know.

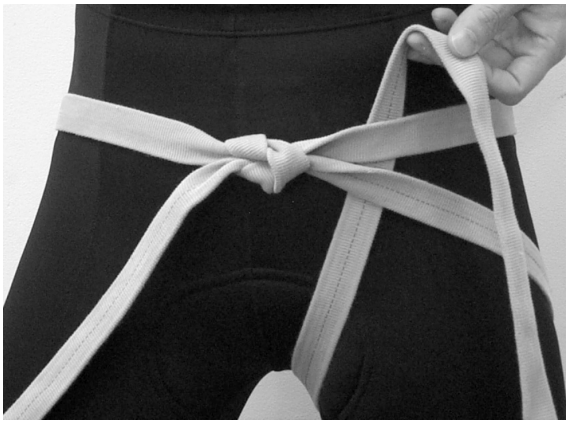
VPI Tied Seat Harness

The seat harness illustrated here was perfected in the mid 1980's by Jim Washington and has since become required knowledge for all VPI members. It uses a single length of webbing to provide a safe and effective seat harness. There are many other ways to tie a seat harness. Some are easier, but they do not have the redundancy that this one provides; if you cut any one piece of webbing on this harness it will not fail completely. Some are more complicated, and while usually more comfortable and just as safe as the VPI seat, they are usually more time-consuming to tie. Even if you know and prefer another type of tied seat, you will still need to learn how to use this one as part of your membership requirements. Since many cavers around you will be using this design, you should be familiar with it anyway.

To tie this harness you will need 20-30 feet of one inch tubular webbing, depending on your size. Using a longer piece is not recommended as it only makes tying and untying more complicated.



Step 1



Step 2

Step 1: Find the center of the webbing (some people mark the center with a Sharpie or tape) and place it in the middle of your back just above your hips. Bring the ends around to your front and tie a square knot. It should be tied reasonably snug as the harness will tend to loosen while being worn.

Step 2: Bring one end around the back of your leg, up between your legs, and behind the waist strap and leg strap.

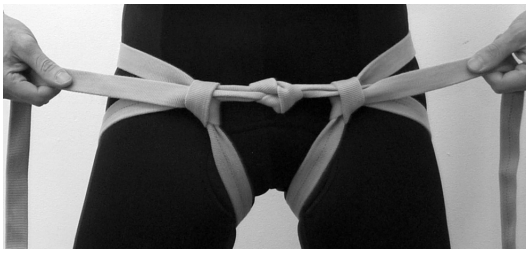
Step 3

Step 4

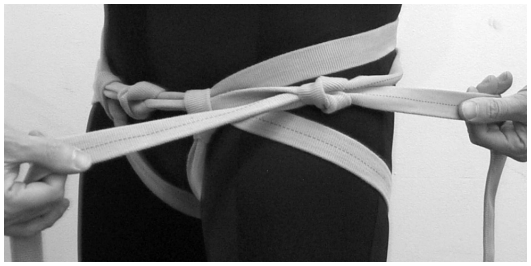
Step 3: Bring the webbing down in front of the waist strap and leg strap, then underneath the leg strap (toward your crotch), leaving a bit of loop.

Step 4: Feed the end back through this loop to create an overhand knot.

Step 5: Repeat steps 2–4 to complete your other leg loop.



Step 6



Step 7

Step 6: Squat down and make sure the leg loops are snug against your crotch and butt. Work the webbing through the overhand knot until the leg loops are snug (but not cutting off the circulation). When you stand up, the leg loops will be tight. Watch out (men especially). The leg loops must be snug at the top of your leg or the harness will become very uncomfortable to climb in as it loosens up.

Step 7: Take one end of the webbing and pass it behind your back, Tie a square knot at your side with the other end, forming another loop around your waist.

Step 8

Step 10

Step 8: Loop the webbing around your waist and finish each loop with a square knot until all of the webbing has been used. You should have at least enough for two waist wraps.

Step 9: Secure each tail of the last square knot with an overhand knot. Use extra overhands to take up any left over webbing. Most cavers place these last knots on the opposite side of the body from where the rope will run while rappelling. This keeps knots and extra webbing safely out of your way.

Step 10: Place your carabiner, or other point of attachment, around ALL of the pieces of webbing at the front of the harness.

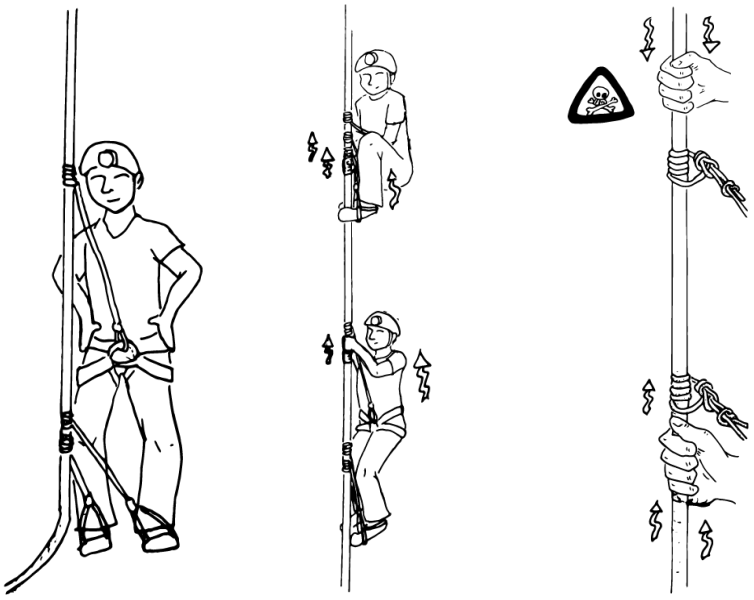
Climbing on Knots

Before having club vertical gear, the club taught new cavers first how to climb rope “on knots”. Using climbing knots is a cheap alternative or back up plan when mechanical gear is broken, forgotten, or unavailable.

The premise is that three pieces of small diameter (6-8mm) accessory cord will be secured to the caver - one on each foot and then the third attached to the harness. You must have three points of attachment because only one is attached to your harness. These cords will be attached to the climbing rope using a climbing knot, typically a helical or prusik knot. These knots can be pushed up the rope, but will not come back down it the line is weighted. By alternately advancing the knots at your feet and the knot at your chest, you will climb up the rope one squat at a time in an inchworm fashion. There are a few good pointers that will make this process easier.

1. **Learn to tie your knots!** There is a huge difference between well-tied and poorly-tied knots - even if they’re both safe one will be much easier to push up the rope.

CAUTION: It is always important to tie a knot correctly. While correctness ensures efficiency, the climbing knots can be deceiving and you do NOT want them to unravel.



(a) Tied in (b) Progression (c) Always push up from below.

Figure 20: Climbing on knots. Move your knots one at a time. Do not pull down on the helical, or it will release

1. Positioning landmarks for yourself on the rope: Tie your topknot at eye level, and your foot loops at knee level. Figure 20 (a)
2. Focus on getting your feet underneath you and stepping up with your legs. It’s much less tiring than pulling your body up with your arms. Figure 20 (b)
3. Advance the knots by pushing up from UNDERNEATH. Figure 20 (c)

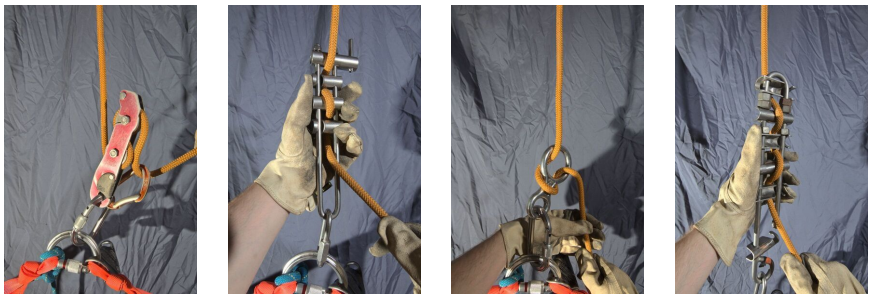
CAUTION: If you grab the climbing knot directly or weight the knot from above, it is likely to unlock and start free rappelling down the rope (Figure 20 (c)). This can result in a situation referred to as a “heel hang”, where the top knot slips down until it is stopped by the bottom knots. If there is momentum, a full rappel where all 3 knots lose their friction is possible. It is a difficult or deadly position to be in. Be mindful of where you are putting your hands!

Rappelling

Many of the local caves require SRT (single-rope technique) to fully explore. We refer to these as vertical caves. The basic skills required to go to these caves are rappelling and climbing rope. Both of these will be taught to you at the club's vertical training sessions, and learning these skills at one of the vertical sessions is required before your first vertical caving trip.

Rappelling is the act of going down the rope. The overarching premise of good rappelling technique is to remain in control at all times. Most rappel devices (descenders) allow the user to remain in control with just one-handed operation. When many people start off, they have a tendency to grab the rope with their free hand above the descender. While this sometimes helps with comfort and stability, it is not necessary. That free hand can usually be put to better use helping the caver navigate the drop or more smoothly operate their device.

There are many different kinds of descenders. Those most commonly used by cavers are the rack, Figure-8, bobbin, and micro-rack. Each has advantages, disadvantages, and nuances to their use. **Talk to someone who can teach you the nuances of the device if you are planning to use it.** Rappelling is one of the most dangerous things we do in caving, and you should have a solid understanding of your device and its operation before acting as an independent member on a vertical trip.



Bobbin Micro Rack Figure-8 J-Rack

Figure 21: Rappel Devices

As a member, you will need to know how to safely rappel on and lock off all of these devices, even if you do not use them yourself, so that you can ensure the safety of the trainees in your care. As you pass your rappelling and changeover tests, you should become very comfortable using your chosen descender. Anything used to attach a descender (quicklink or carabiner, depending on the device) should be locked and screwed down.

Figure-8

The Figure-8 is light, compact, and cheap. Many people rappel for the first time on an Figure-8.

- The Figure-8 is best for shorter drops. It doesn't have enough variability to use on longer drops (over about 150ft): at the top you'll be struggling to move, and at the bottom you could lose control.
- Brake on a Figure-8 by changing the angle of the rope, wrapping it around your butt, or squeezing the rope. Rappel gloves should always be used with a Figure-8.
- A Figure-8 does not last very long, especially on muddy Virginia ropes. If you go vertical caving a lot, consider buying another kind of descender.

Rack

- Racks are safe to use on drops of any length; many people will prefer an 18+ -inch rack on drops over 400 feet.
- The biggest danger with a rack is "zipper rigging," or putting the rack on the rope so that the rope pushes the bars *off* the frame. This can be avoided by using racks with U-shaped bars and making sure the rope runs over the curved sides, as well as always rigging with the open side of the frame to the right and bringing the rope *over* the first bar/hyperbar.
- The second big danger with a rack is "Sudden Accidental Disconnect," in which the rack, when unweighted, twists in the carabiner and sits on the gate. Upon reweighting, the rack can break the gate off of the carabiner and detach from the harness.[3] If you use a carabiner to attach your rack, make sure it has a *captive eye*[4] or add a *Captiv*[5] to keep the rack from twisting over the carabiner gate. Another option is to use a quicklink. Always be vigilant of your rack connection while you are getting on rappel.
- The proper way to control speed with a rack is to jam the bars together, or add a bar if necessary. Changing the rope angle or squeezing the rope to brake are not instances of good rack technique. Therefore the hand *on the bars* is your "brake hand," and you should have a hand on the bars at all times.
- Five or more bars should be used when going over a lip, to prevent a three-bar rappel. [6]
- "Feeding" a full size rack (pushing rope through from the bottom of the rack) is acceptable to some extent (usually to get moving) but should not be necessary if you have good technique. If you do it you need to be very careful to push only the minimum amount of slack; large bights can cause you to drop two bars at once. Be especially careful feeding at lips.

Micro-Rack (U-Frame rack)

A micro-rack is a small u-frame rack, often with one or two hyperbars. There are long and short frame versions. The long are more versatile, since you can brake by moving the bars as you would on a rack.

- **Never feed a micro rack;** the center bar(s) can come off, leaving you with essentially a two-bar rappel.
- Micro racks are safe to use up to 200' drops.
- Many lighter cavers find that a short frame micro is not usable on old/stiff/muddy/glazed rope, which will be the majority of the rope you rappel on. A long frame micro or a bobbin is a more versatile alternative.

Bobbin

A bobbin uses two fixed spools and often a braking carabiner to control rappel speed. They are often used in alpine technique and are less common in the States. Some (Stops) have an "assisted braking" feature included. Stops are not for novices, and bobbins in general are not recommended for people who are new to ropework. If you are thinking of using a bobbin, **start with one without assisted braking.**

- The most basic rig for a bobbin is to insert the rope in the shape of an S between the two spools so that it comes out the top of the bobbin, and then to run it through a separate braking carabiner.
- Brake on a bobbin with braking carabiner by changing rope angle *upwards;* the opposite of braking with a Figure-8. Your brake hand is your right hand.

[3](1992, December). CUEVA CHEVE, OAXACA, MEXICO. *NSS News: American Caving Accidents Report 1991*, *50 #12*, 342.
[4]`https://www.rockexotica.com/products/pirate-wireeye-screw-lock-carabiner`
[5]`https://www.petzl.com/US/en/Professional/Connectors/CAPTIV`
[6]Sótano de las Guaguas, San Luis Potosí, Mexico. (2013, August). *NSS News: American Caving Accidents Report 2011*, *71 #3*.

- If the rope is too stiff to S-rig, a C-rig is an alternative with less friction. **Never bottom belay a C-rigged bobbin**; this can cause it to break open, leaving the user in a free-fall to the bottom. Trainees, who always get bottom belays, should not C-rig bobbins. If you do end up *having* to use a C-rig, communicate before using it with the person who will be belaying you. Feeding an S-rigged bobbin is not the worst thing in the world, and it's preferable to an uncontrolled rappel with no possible belay. The rope should also exit the top right of the bobbin when C-rigged. Ask an experienced bobbin user to show you.
- **Never use a quicklink or small carabiner to attach a bobbin to your D-link.** When unweighted and weighted again it can twist and open the gate, leaving the bobbin unattached to the rope.[7] The safest way to handle this is to use only the carabiners which Petzl recommends for use with their bobbins, or other oval carabiners, preferably round stock.
- "Old-style" gates - stamped metal instead of plastic - should generally not be used. They can "stick" open and appear to be closed, resulting in potential freefall after the device has been visually checked and a successful test rappel has been completed.
- Choose brake carabiners carefully; if they are the size of regular biners, the top of the bobbin can become trapped in them! If a large brake biner must be used, clip it into the bobbin attachment carabiner and not the D-link. The Raumer Handy and Petzl Freino both mitigate this problem.
- If using a Stop, despite it being called "assisted braking," the brake should NOT be used to control your speed! This can damage the rope. Use a brake carabiner like you would with the other style of bobbin; the "brake" is there to make certain technical maneuvers faster.

Climbing with the Frog System

The "Frog" system is ubiquitous in caving. It was perfected as part of the alpine technique in continental Europe and is used by most VPI cave club members today. The club's loaner vertical systems are all set up for frogging—so-called because of the motion made while ascending rope. This is only a brief introduction to the components, setup, and use of the frog system. There are many resources with more detailed and nuanced advice that you should consult when you're ready to build your own kit.

Components

The frog system has only a handfull of major components:

- **Seat harness with central D-link** – the harness is specific to caving, and is built to keep the attachment point low for improved efficiency. The D-link is a large half-moon quick-link or speciality carabiner (e.g. Petzl Omni) designed to be loaded in multiple directions.
- **Chest ascender** – the chest ascender has a small twist in the bottom to keep it flat on the user's chest. The Petzl Croll is representative. This device captures progress from your steps.
- **Chest harness** – this secondary harness is not life support, and is used to keep the chest ascender upright so it can take up slack. There are many styles with different tradeoffs in comfort, bulkiness, and gear loops. Try some!
- **top ascender with footloop** – sometimes called the "handled" ascender or "jumar", this is the key piece of your system. When standing upright in your footloop (made of about 8 feet of static cord and attached to your top ascender with a locking carabiner), your ascenders should be "kissing". The Petzl Basic is a popular non-handled top ascender.

[7] Futrell, Andrea, and Bill Storage. "Lori Cori Cave Accident Analysis." NSS News, June 2005, pp. 10.

- **Short and long Cowstails** – typically tied with 6 feet of dynamic rope, these lanyards have carabiners on the ends. The short cowstail should be about 16in (40cm) long, including the carabiner, as this is the length of a compact descender and a Figure-8 knot. The long cowstail is where you connect your second ascender, should not exceed your reach straight up, and is the key limiting factor in step length. The carabiners in this assembly should be locking—NCRC requires locking carabiners on the cowstails for all of their courses.

Safety

Before getting on rope, check your system. Any straps on your seat harness must be tightened and doubled back. Your central D-link must be fully screwed down. Any locking carabiners should be locked, so they don't open on rope. While you're here, make sure all life support equipment is attached correctly to the D-link with load-rated connectors or rope, and make sure all equipment is in good condition: carabiners should be springy, metal parts free of abnormal bends or cracks, and soft goods should show minimal wear.

While climbing, *always* maintain two gripping points of contact between the rope and your seat harness: i.e. your chest ascender AND top ascender should always remain on the rope, even when you're not moving. A moving or unproven ascender *may not* catch you in a fall! The only times one point of contact is acceptable are when rappelling, or when clipped into a knot or anchor with a cowstail.

While using a traverse line, clip both cowstail carabiners to the line, and move them one at a time to pass knots, (so you always have one point of attachment).

Climbing

Climbing with the frog system is should be easy when you have it well adjusted. A poorly-adjusted system is difficult to use and will tire you out quickly.

To get on rope and climb:

1. Check that your system is correctly rigged and safe!
2. Clip your chest ascender onto the rope. If you're at the bottom of a drop, pull all the slack through so you can sit in your harness just off the ground.
3. Tighten your chest harness. It will keep you close to the and help feed your chest ascender.
4. Clip your top ascender with your footloop to the rope. This is attached to your harness with your long cowstail.
5. Put your feet in the footloop, grab the rope above your top ascender, and stand up. Kick your feet under you to keep you upright, as if you're standing from a squat. You may need to pinch the rope between your feet below you for it to feed the chest ascender.
6. Once you are sitting on your chest ascender, push your top ascender up to the limit of your reach, and repeat the prior step and this one until you are at the top.

Depending on your body proportions, you may find that your reach exceeds your leg length: if you can't get your feet under your butt to stand up, try lowering your top ascender (or shortening your long cowstail) until you can. If your footloop is the correct length, this is your max step (for your fitness level).

To get off rope at the top of a pitch:

1. Climb to the bolt or other anchor.
2. Clip your short cowstail to an approach line, if any.

3. Disconnect your ascenders and step away from the ledge.
4. Reposition the rope on the rope pad, if any.

If the anchor is far away from the top of the pitch, and there is no approach line, keep "ascending" the line until you are a safe distance from the lip, before disconnecting either ascender! You may need to stay clipped in while adjusting the rope on the rope pad.

Other Resources

More nuance of the frog system is extensively described by other sources. Some good starting points:

- `https://www.derekbristol.com/frog` – Derek Bristol's website is an excellent resource and is full of videos on how to use various ascending systems.
- `https://caves.org/caves/optimizing-the-frog-system-for-rescue-rescuers-perspectives/` – "Optimizing The Frog System For Rescue: Rescuers' Perspectives" is a recent NSS blog post on how to set up and use the frog system, and is brilliantly illustrated. Check it out!

Vertical Caving Tips and Etiquette

General Information

- Never step on rope or climbing equipment.
- Practice with new equipment or systems above ground before trusting them underground.
- Have someone check your personal rig (seat, knots, locked biners) before climbing or rappelling.
- Always check and understand the rigging.
- Don't weight any carabiners across the gate.
- If you drop something or kick off a loose rock yell "ROCK!" even if it isn't a rock.
- If someone yells "ROCK!" don't look up; your helmet does a poor job of protecting your face.

Rappelling

- Make absolutely certain to tie a figure-8 knot in the bottom of the rope so no one rappels off the end.
- Never take your controlling (brake) hand off the rope!
- Don't jump away from the wall while rappelling; walk smoothly down the wall.
- If you use a rack, know what the dangerous "idiot" or "zipper" rig looks like. Get a member to describe or show it to you so you can recognize and avoid it.
- When rappelling past a lip, make sure the rope is correctly contacting the rope pads.
- Learn how to lock off your rappel device.
- Learn how to change-over from rappel to ascending.

Climbing

- Climbing systems should contain three points of contact or two points with attachments directly to the seat.
- Carry a spare prusik or mechanical ascender with you.
- Technique is an important part of climbing rope. Every system gets maximum efficiency if you use your legs. Keep your feet under you, and keep your torso close to the rope.
- After ascending a rope, find a safe place away from the lip to remove your gear.
- When getting off rope, remove your seat safety or top knot last.

Belays – General

- Anyone who wants a belay gets a belay.
- If a member asks you to take a belay, you must accept it.
- Always wear gloves.
- Both the belayer and climber must be careful to not allow too much slack in the belay line.

Belays – Top

- Always be sure you are solidly anchored before starting the belay.
- Have enough rope or webbing to lower the climber to the floor or other safe location in case of emergency.
- Keep the belay tight as communication may be poor between the climber and the belayer.

Belays – Bottom

- Stay out of rockfall.
- Concentrate on the rappeler; do not talk or be distracted by other cavers.

Self-Belay

Self-belaying is a technique that is employed on climbs or cable ladders where a fixed rope has been rigged alongside a relatively easy climb or cable ladder. A self-belay utilizes a mechanical ascender that the climber moves up the rope as he climbs.

- ASCENDERS ARE NOT DESIGNED TO TAKE SHOCK LOAD. Do not employ this technique if you cannot maintain tension between yourself and the ascender on the rope.
- Bring a spare ascender or prusik so that you can switch to ascending the fixed line if you need to.

Gear

Always inspect all gear prior to a trip. Obvious cracks, bends, deep scratches, and excessive wear in your gear mean it should be replaced immediately. Ropes and other "soft" components should be visually checked before the trip, and inspected by hand during rigging, derigging, and cleaning. "By hand" means that as the rope goes through your hands, feel for sections which bend differently or change diameter as well as visible external damage. Any discontinuity or damage to a rope or sling should be cut out or the piece replaced.

Color Codes

Color codes are unique two or three color bands that identify personal equipment. Once you have been in the club awhile or have amassed some gear, it is a good idea to pick one out. Before you buy your tape, check `https://cc.n3pb.org` to see what colors local cavers are using.

Tie-offs for Rappel

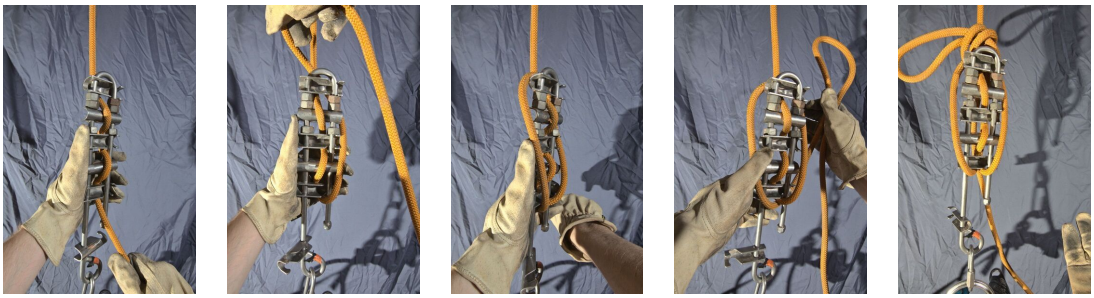
To change over from rappelling to climbing, or to stop mid-rope for any reason, it is important to tie off (or "lock off") your descender. Once you complete a tie-off, your device will hold you in place, and it is safe to take your hands off of it.

Here we demonstrate simple, effective lock-offs for the 4 most common descenders used in caving. *There are many safe ways to tie-off each device*, however we have chosen these because they are simple, inspectable, similar to each other, and secure with any diameter rope. While there are easier ways to tie off other devices, such as a Figure-8 with horns, a J-rack with hyperbar, a U-rack with 2 hyperbars, or a stop-type bobbin, the lockoffs presented here will work on those devices.

Lock-off for a J-Rack

This is a common tie-off for a J-rack without hyperbars. The rack pictured in figure 22 is rigged "lefty", but the concept works for all J-racks.

1. Rig your rack for rappel
2. Pass brake strand between rack and rappel strand
3. Pass a bight of rope under the last bar and back up to the rappel strand
4. Use the bight of rope to tie an overhand knot around the rappel strand



Rigged for rappel | Pass the brake strand over the frame | and then back under the bars | grab a bight | tie an overhand with the bight

Figure 22: J-Rack

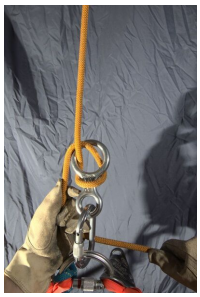
Lock-off for Figure-8 (no hooks or horns)

A basic Figure-8 is a good cheap device for vertical caving. *All* members should know this tie-off, in case someone shows up to your trip with a Figure-8. To free the rope as shown in the second pane of figure 23, it is sometimes necessary to tie a loop knot below your 8 and stomp on it: attach your top ascender to the rope before doing this.

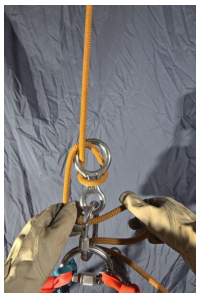
1. Rig your Figure-8 for rappel
2. Pass brake strand between Figure-8 and rappel strand
3. Pass a bight of rope through attachment carabiner
4. Use the bight of rope to tie an overhand knot around the rappel strand

To avoid the Figure-8 becoming girth-hitched as in Figure 24, you can rig the rope through the Figure-8 attachment carabiner. *(This will cause additional wear on the carabiner, make sure to inspect the carabiner before use).* This is also a much faster rappel.

Rigged for rappel



Pass the brake strand over the loop



Pull a bight through the attachement carabiner

Use the bight to tie an overhand

Inspect your work

Figure 23: Figure-8 tie-off

A Collapsed Figure-8

A Faster Figure-8 rig

Figure 24: Figure-8 caveats

Lock-off for Bobbin

This bobbin tie-off is not the fastest, but will work for most combinations of bobbins and braking carabiners, and is secure on almost all ropes. Figure 25 shows the best rig with a standard carabiner, while figure 26 shows this tie-off completed with both a standard carabiner and a Raumer Handy.

1. Rig your bobbin for rappel
2. Pass brake strand between bobbin and rappel strand
3. Pass a bight of rope through the attachment carabiner
4. Put the bight over the bobbin

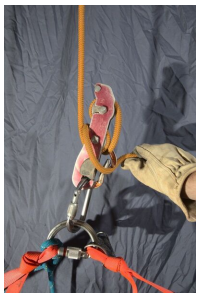
Lock-off for a Micro-Rack (1 hyperbar)

Most micro-racks have at least one hyperbar. If yours does not, tie it off like a J-framed rack. Follow along in Figure 27.

1. Rig your micro-rack for rappel

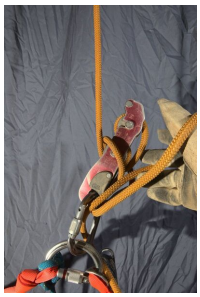
Rigged for Rappel

pass the brake strand between the frame and the rope



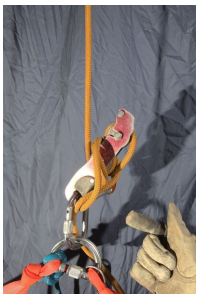
Clip the brake strand into the brake carabiner

Pass a bight through the attachment carabiner



Bring the bight over the frame

Figure 25: “Simple” Bobbin tie-off



Completed tie-off

The same tie-off with a Handy

Figure 26: Completed Bobbin tie-offs

2. Pass brake strand over hyper-bar
3. Pass a bight of rope through the micro-rack, under the last bar
4. Twist the bight and put it over the hyperbar again.

Changeovers

Before your first vertical trip, many cavers will insist you learn how to change over, from climbing to rappelling and from rappelling to climbing. Practice this skill often. It is the basis for more complicated rope maneuvers such as a rebelay, and may well save your life. The explanation here is focused on the Frog System. The principles involved hold for other systems, as well. In general, you should maintain 2 gripping points of attachment between the rope and your seat harness (e.g. chest and top ascenders).

Changeover From climbing to rappelling (for everything but the full size rack):

- Thumb the cam of the top ascender to lower it, positioning it as close to chest ascender as possible

Rigged for rappel

pass the brake strand over the hyperbar

Pass a bight through the frame, and give it a twist

Loop the bight over the hyperbar.

Figure 27: U-Rack “Micro Rack” tie-off

- Rig and tie off rappel device below the croll, as close to chest ascender as possible.
- Stand up in footloop. This should unweight your chest ascender. remove chest ascender from the rope. Sit down.
- If your top ascender cowstails is weighted put chest ascender back on rope, shorten footloop, and repeat steps 1-3 again.
- Thumb the cam of the top ascender to lower it again, positioning it as close to the tied-off descender as possible.
- Test rappel (do not weight top ascender cowstail, or you’ll have to do all this again).
- If test rappel was successful, remove top ascender from the rope and rappel away.

From rappelling to climbing:

- Tie off your descender (unless it’s e.g. jammed, you have hair caught in it, etc.)
- Put your top ascender onto the rope above your descender.
- Step up in your footloop, and attach your croll above your descender. This is an athletic maneouver.
- Derig your descender and climb.

Note: a long J-rack is at least 14”: most people cannot rig this below their croll *and* not weight their long cows tail. In the interest of maintaining “2 points of contact” with the rope, there are many goofy solutions to change over:

- Feed slack through Croll, clip short cows tail to top ascender, and rig rack between devices. Should the top ascender fail, you’ll shock load the chest ascender, or load the rope below your rack. This is likely as dangerous as having no second point of attachment.
- Carry a second ascender. Clip it on your short cowstail and put on the rope directly below your top ascender. Remove croll. This requires extra gear most frog users don’t carry.
- Tie a knot below the chest ascender and clip short cowstail to it. Remove croll and change over. This strategy makes it very difficult to unweight the top ascender for final steps.

If you are using a J-rack with a frog system, you should evaluate these methods and do what’s most comfortable for you.

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Rebelays

Rebelays are a recent addition to the VPI membership requirements, but are by no means a new or novel technique: they have been in use for somewhere north of 50 years in European caving. Some of the finer considerations involved in rebelays are beyond the scope of this document (Refer to *Alpine Caving Techniques* or a similar manual for a more detailed introduction). Here we present merely the basic technique, exclusively for the frog system and for single-bolt rebelays.

On ascent

While in-cave, you will encounter most rebelays on descent, first, we will present them here by ease of navigation. To pass a rebelay on ascent is straightforward, and forgiving of poorly-adjusted gear:

1. Climb to the rebelay. *Do Not* jam your top ascender into the knot.
2. Clip your short cowstail into the eye of the bolt. If this isn't possible, clip it into the loop of the knot. Avoid clipping it into the belly of the rebelay (that is the slack in the upper rope).
3. Stand in your footloop and detach your chest ascender. Quickly move it over to the ascending rope above the rebelay, and take out the slack so you are sitting on it. *Always* move your croll before your upper ascender.
4. Move your top ascender to the ascending rope.
5. Continue climbing. Detatch your short cowstail as you pass the level of the bolt.

On descent

There are many variants of how to pass a rebelay on descent. Here we present one that is safe, works for most free-hanging rebelays, and readily accomodates cavers of unusual stature (provided their footloop is of correct length).

1. Rappel to the level of the rebelay. *Do Not* get stuck in the belly (that is the slack in the upper rope): you should stop at the level of the bolt if at all possible.
2. While keeping *one hand* on the *brake strand* of your descender, clip your short cowstail into the eye of the bolt. If this isn't possible, clip it into the eye of the knot, or the connector. You can also tie off your descender here.
3. Rappel until your full weight is on your short cowstail.
4. Place your upper ascender with footloop just below the knot.
5. Remove your descender from the upper rope, and install it on the lower rope. Pull out all slack! *Optional*: tie off your descender.
6. Stand in your footloop to remove your short cowstail from the bolt. At this point you should have full control of your descender: carefully lower yourself onto it.
7. Prove the descender with a short test rappel. Then remove your ascender and continue rappelling.

Variations

European cavers often will stand or kneel in the belly of the rebelay to pass it on descent, and to feed rope on ascent. This is totally possible when you are of average height and proportions, but can be challenging for particularly tall or short cavers. Using your footloop on descent speeds things up dramatically for those cavers.

Occasionally you will encounter a "standing rebelay", where the rebelay is on a ledge. This is much easier to pass, as you don't have to stand in your footloop to weight and unweight things.

If a rebelay has more than one anchor bolt, clip your short cowstail to both loops (if rigged with a double-loop figure 8 or a bowline on a bight) or to the lower loop (if rigged with an alpine butterfly or figure 8). Sometimes a "courtesy" loop will be rigged immediately below the anchor knot, to make it easier.

Rigging and Padding a Rope

There are nearly as many ways to rig as there are vertical cavers. Your teachers and peers will want you to optimize your rigging for efficiency, coolness points, and sometimes (if they've just taken a class), unnecessary complexity. Your rigging should be *easy to use*(if possible), easy to inspect, and ***safe*** (above all else). If your rigging can be used to navigate the pitch without endangering cavers or damaging the rope, **it is fine**. You may hear disagreements about what constitutes "safe", so get ready for some cognitive dissonance. At the end of this article there are some specific points that you should take away; all the rest is suggestions and ways to optimize your rigging as you practice.

Every drop will present its own unique set of obstacles that need to be overcome. By keeping in mind a few guidelines, you can make rigging safe and effective.

Rigging Principles

Think about rigging like a **safety chain**: you have an anchor, something that attaches to the anchor, the rope, yourself and your attachments to the rope, and the knot at the bottom. Every piece of this chain should be safe and secure. A chain is only as strong as its weakest link.

- Do not step on the rope. Moving rope could catch on you and pull you down a pit, and it can dirty the rope (and is disrespectful to the rope's owner).
- Try to keep the rope orderly as you rig; rig with one end and then flake (out of a bag or off a coil) the end you feed down the pit so that it does not tangle. If you are rigging directly from a coil, rig with the outside end and feed the inside end down the pit.
- As you feed the rope down the pit, check it for weak or fuzzed spots and other potential problems. Ropes and cable ladders should be checked every time you use them.
- Start rigging far enough away from the pit that even the rigger is not free climbing in a dangerous area, and rig high when possible.
  - Always clip in when getting on rope or working around the edge using either your cow's tails or an ascender
  - Use the appropriate tail clip on any ascender clipped into a horizontal rope (see the climbing section). Additionally, make sure your cow's tail is clipped into something that will actually stop your fall, not just clipped into the rope; in this case, you will just hit the bottom right next to the rope.
- Lock carabiners and screw them down.
- No nylon on nylon contact in places where the rope will be weighted and mobile.
- The rigging should allow the caver to easily and safely get on and off rope. Rigging high tends to help with this.

- The rig should avoid hazards which may damage the rope or injure the caver.
  - The rope should not run over sharp rocks. Some hazards can be padded, but always try to completely eliminate the danger by simply rigging in such a way that it cannot contact the rope.
  - Always carry enough rope pads, and prioritize your rope pads based on where they may be most effective. Remember that almost anything can be used as a rope pad in an emergency.
  - Always pad ropes as if you intend to climb on them. And keep in mind that it is not uncommon to have to climb up a drop that you intended only to rappel down. An improperly padded rope can fail quickly if it is climbed on due to the bouncing nature of frog technique.
- The rigging should be as simple as possible and easily inspected for damage or wear. Simple rigs are safe rigs, and if it looks tidy it's easier to inspect.
- Always tie a loop or stopper knot in the end of the rope before passing it down the drop.
  - A double overhand is the best stopper knot; a Figure-8 on a bight will also provide a footloop. Our bylaws specify a loop knot, but most members will pass you on this test with a double overhand.
  - This will prevent anyone from rappelling off the end of the rope and will make a changeover easier if the rope was too short.
  - The first rappeller (usually the member who rigged) is responsible for untying the knot at the end of the rope once they reach the ground. All members on the trip should double check that it is untied before hauling up the rope so that the knot doesn't catch on anything on the way up.
- Always yell "ROPE!" before passing it down the drop.
- **Do not rig in or rappel into a waterfall.** If you see a waterfall and you are not *certain* that your rig will avoid it, do not descend the pit.

Selecting the appropriate rigging point for a drop can be challenging. Often, the best rig point won't be obvious from the top of the pit, and what looks like a great rigging point may place the caver in a dangerous situation further down the drop. Whenever possible, consult with other cavers who may be more familiar with how the cave you will be visiting should be rigged.

Once the rope is down the pit, take a good look at how it runs, over what edges, etc. This is like a preview of how the rope will behave when weighted.

The first person to descend should always be experienced and prepared to change-over and return to the top if the rigging turns out to be unsuitable for any reason. Sometimes it will take several tries to rig an unknown drop correctly.

Anchors and anchor interfaces

Anchors are the thing we actually rig to: usually trees, rocks, stalagmites, or bolts. Anchor interfaces are what we use to attach a rope to the anchor. In our club these interfaces are usually a "friction wrap," "fixed loop," webbing, or knots attached to bolts with carabiners or quicklinks. It's important to match the anchor to the correct type of anchor interface.

Anchors

- For trees, a friction wrap, fixed loop, or webbing can be used.
  - Always pad trees, especially where the main line makes its first bend.
  - Never rig to dead trees.

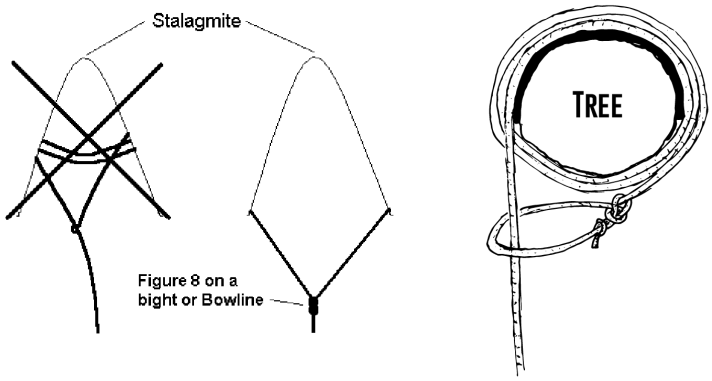

Figure 28: Left: rigging to stalagmites. Right: Friction wrap and safety line

- For rocks or stalagmites, a fixed loop should be used. Special considerations for rocks and stalagmites:
  - Never use a friction wrap on stalagmites. The wraps can work their way over the top of the formation which could cause the rig to fail. See figure 28
  - Check for cracks or fractures.
  - Never rig to a stalagmite if there is the possibility of tension being applied in any direction other than downward. If the rig point is lower than you will be when you get off rope, be careful that you don't pull the loop off the rig point.
- Be sure the rig point will not move under load.
- Pad all sharp edges.

Anchor Interfaces: Friction wrap or tensionless hitch: trees

- Only use this rig on trees. Pros: preserves the 100% of the strength of the rope (no reduction from knots); a little better for the tree (doesn't cut into the bark as badly as a fixed loop). Cons: uses a lot of rope.
- Generally, three to five wraps around a tree will provide enough friction to prevent the rope from slipping and tensioning the knot. Smaller trees require more wraps. To test if enough wraps have been made, tension the end that will be rappelled on, and add more wraps if it slips.
- When properly rigged and loaded, the main line should pass straight through the tie off without deviating. *The tie off should not have any tension when the main line is loaded.* Note the slack in figure 28.
- When wrapping the tree, the main line should be at the bottom of the friction wrap and the tie off knot should be at the top. Use a carabiner to attach the tie off knot around the main line to avoid nylon-on-nylon contact.
- A safety line is shown in figure 31. In this configuration, make sure that when the safety line is loaded the intermediate knot (around the main line) will not collapse. An Alpine Butterfly is a great knot for this application.

Rigging with webbing: trees, rocks, stalagmites

Sometimes, the rigging will be done with webbing, which extends the effective length of the rope. There are two methods of rigging with webbing: "wrap three pull two" and basket hitch.

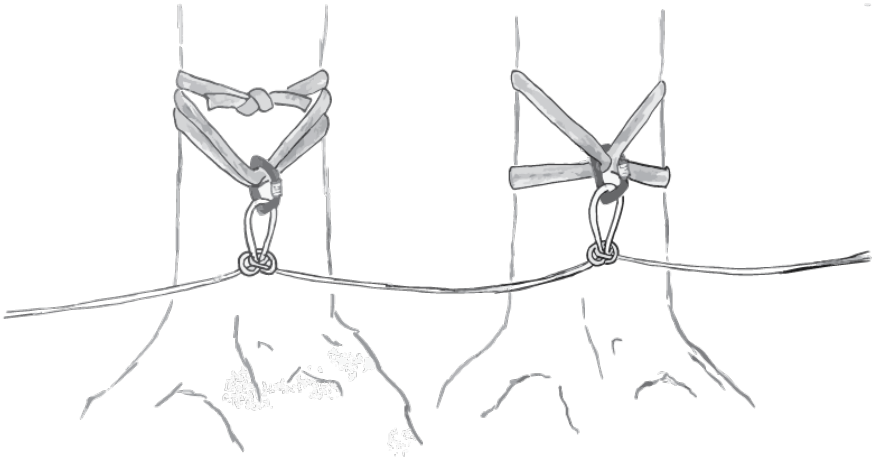

Figure 29: Wrap 3, pull 2 with webbing (left); basket hitch (right)

Wrap three pull two

- Wrap the webbing three times around the object and tie off with a water knot. Remember to set water knots by pulling hard on all four ends.
- Place the knot at the point of least tension by pulling and loading the two loops without the knot.
- Keep the total angle of the webbing at the carabiner less than or equal to 60 degrees.
- Advantage: stays where you put it.

Basket hitch

- Make a loop of your webbing using a water knot. Put one side of the loop around the tree and clip both ends together with a carabiner. Make sure the angle of the two loops in the carabiner is less than 60 degrees. One downside to the basket hitch is that it can tend to slip down a tree: best used in the "crotch" of a tree.

Fixed loop: stalagmites, large rocks, trees

- Fixed loops are often used to rig stalagmites or breakdown blocks, but are fine to use on trees. A retraced Figure-8 works fine; a bowline is quicker and easier. You may see a "fixed loop" with an additional wrap or even a clove hitch in the major loop of the bowline; these techniques help locate the rope at a certain height on the anchor. See Figure 30 and Figure 32 for examples.

Bolts

- Bolts are usually set in pairs. Bolts are usually rigged using a double Figure-8 on a bight (Figure 32), a bowline on a bight (Figure 30), or a Figure-8 and an alpine butterfly. This third configuration is useful for bolts that are far apart as it uses less rope.
- Each loop is adjusted so that both bolts will be loaded equally when the rope is weighted at the angle at which it will be used. This means they are **sharing** the load (see "angles & tension" for more), or **equalized**.

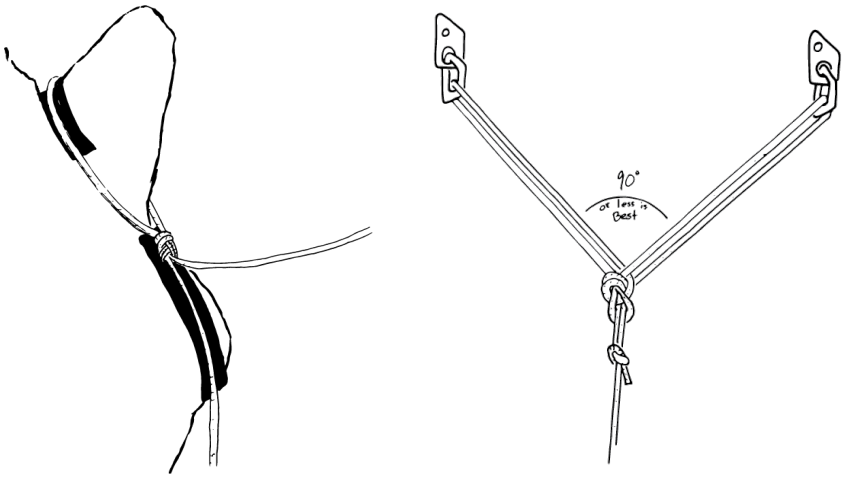

Figure 30: Rigging with a fixed loop to a horn (left). Rigging on bolts with a bowline on a bight (right).

- Always check the integrity of the rig point. Make sure bolts are in good shape and hangers are secure (they should not be able to rotate). If you plan on doing a lot of vertical caving, **carry an adjustable wrench** so that you can tighten any loose bolts you find. Bolts are more likely to fail than giant rocks. Do not hesitate to rig to a natural anchor if you do not have faith in the bolts.
- Self-equalizing rigs are rarely used, because in the event of a bolt failure, it will always result in a shock load to the other bolt. However, they may be appropriate when there is a lot of horizontal travel as you descend the pitch (since it will keep both bolts loaded). Because of the risks involved, we do not illustrate them here.

Angles & Tension

The tension in a line between two anchors is related to the angle the rope forms, as shown in Figure . The smaller the angle, the lower the load on each anchor. The angle should be about 60 degrees, which is approximately the angle between your pointer and pinky fingers when stretched out making "devil horns". When the angle is 120 degrees, each line is taking 100% load. At 150 degrees, each line is taking 200% load. As the angle increases past 120 degrees, the tension increases very rapidly. The angle should not exceed 120 degrees, which is approximately the angle between your thumb and pinky when stretched out.

To see why this matters, consult the strengths of items in Table 5. You should have a sense for some of these numbers as you learn to reason about vertical caving: while the forces that a 1kN person generates while climbing are not enough to damage 11mm rope, it still reduces your safety factor dramatically, and you haven't even accounted for the knots in the system.

Make sure that the materials you're using are as strong as they should be. Nylon can be damaged by sunlight, abrasion from rocks or other rigging mistakes, heat generated by rappelling, or contact with acid or bleach. Metals can corrode. Bolts may be badly set, loose, or non-stainless.

Rigging Test

As you have seen, there's a lot that goes into rigging! Let's try to define the most important takeaways. What most members are looking for in a rigging test is this:

- Rigging starts far enough away that everyone can get on and off rope safely

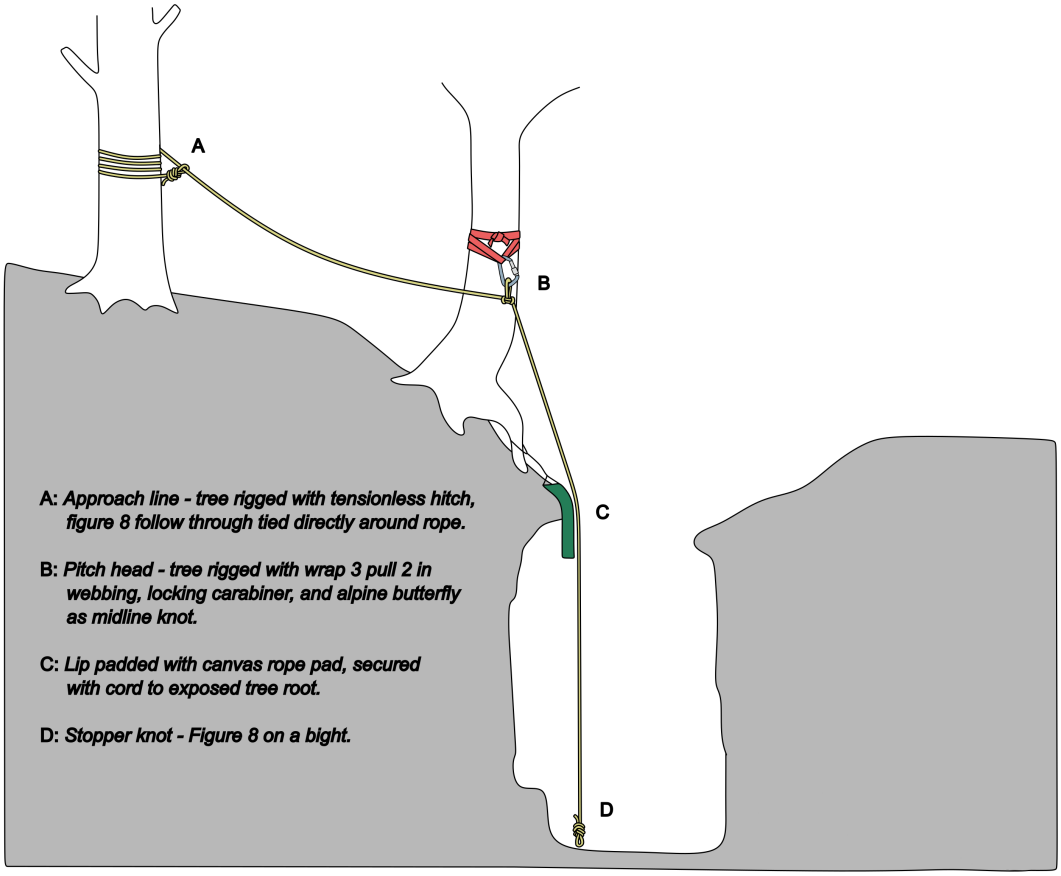

Figure 31: Rigging an entrance pit with trees

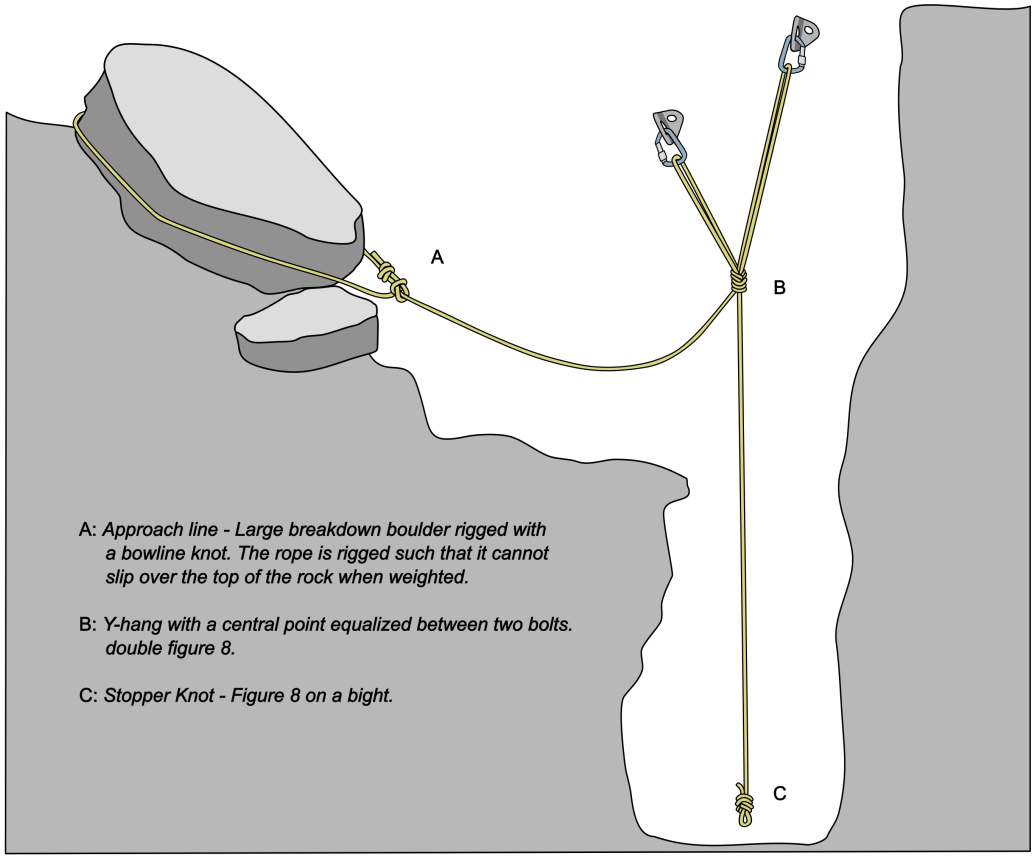

Figure 32: Rigging an underground pitch

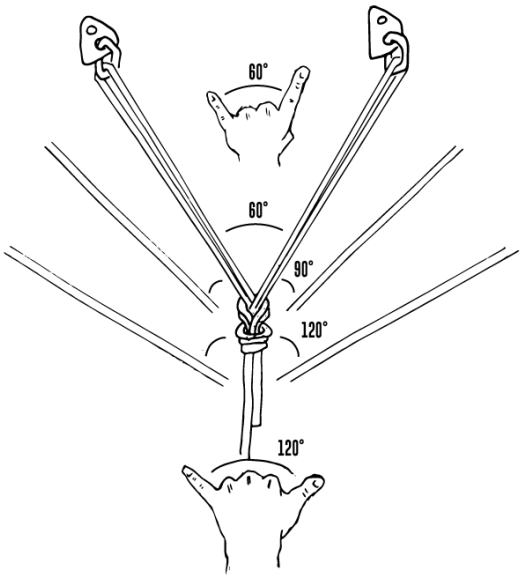

Figure 33: Tension in rigging

Gear		Failure Strength: lbf, (kN)
PMI Static Rope	11mm	6407, (28.5)
	10mm	5957, (26.5)
	9mm	4114, (18.3)
	8mm	3260, (14.5)
PMI Accessory Cord	9mm	3327, (14.8)
	8mm	3214, (14.3)
	7mm	2675, (11.9)
	6mm	1619, (7.2)
	5mm	1214, (5.4)
	4mm	787, (3.5)
Beal Dyneema Cord	5mm	2697, (12.0)
Tubular Webbing	1”	4000, (18.7)
	5/8”	2300, (10.0)
Petzl Croll	Shell Failure	2250, (10.0)
	Rope Sheath Damage, 11mm	1370, (6.1)
	Rope Sheath Damage, 9mm	1040, (4.6)
Petzl Basic	Shell Failure	3877, (17.2)
	Rope Sheath Damage, 11mm	1370, (6.1)
	Rope Sheath Damage, 9mm	1040, (4.6)
Oval Maillon	10mm	11020, (49.0)
	7mm	6060, (30.0)
Black Diamond Positron Carabiner	Gate Closed	5620, (25.0)
	Gate Open	1798, (8.0)
	Cross-loaded	1798, (8.0)
Cable ladder	Rung failure	900 (4.0)

Table 5: Table of Rope/Webbing/Hardware Strength

- Anchors chosen are safe; appropriate interface used for each anchor;
- angles between anchors do not exceed 120 (ideally less)
- Prospective member did not endanger themself while rigging
- Knot tied in the end of the rope
- Prospective member yelled "Rope!" before throwing anything down the pit, and "Rock!" if debris was knocked loose
- Knots are tied, backed off, and identified correctly. Some members may be more lenient with knot issues than others. By the time you are taking your rigging test, you should be fluent with all required knots.
- Rope is padded correctly and safe for all members of the trip to descend and ascend
- Carabiners are locked and screwed down
- The explicit requirement in our bylaws is that you "rig and pad a rope." Some members may want you to demonstrate all four types of rig: fixed loop, friction wrap, rig to bolts, webbing interface. Some may be fine with one or two of the methods. The convention is that your rigging test should be done in a cave or rigging environment you have not previously seen rigged, but there are always exceptions.
- Many members will use your rigging test as a series of teachable moments, and try to incorporate nuance and complexity. If this is overwhelming, it's okay to ask them to give you detailed feedback at a later time. Remember that if your rigging is safe, you should stand by it and they should pass you, even if they would have done it differently.

As a member, you should also be able to inspect other peoples' rigging and rigging that you encounter fixed in a cave. Remember the safety chain: is the anchor solid? Is the anchor interface tied correctly and made of undamaged materials? Are carabiners locked and screwed down? Is the rope in good condition? Do you know its history? Are you able to check the entire rope for damage before trusting your life to it? Are you, the caver, technically prepared for any mid-rope obstacles like rebelays? Is there a knot at the end of any rope you are rappelling? These are the kinds of questions you should be asking yourself and others as you go on vertical trips, even when you are not rigging.

At the end of the day, what's in this article is a set of guidelines. Remember: Easy to use; easy to inspect; safe.

Rigging is a lifelong improvement process and requires practice. This guide is not at all comprehensive. For further information, please seek out some other resources:

Additional Information

Books

- *Alpine Caving Techniques*[MT02] – Now out of print, this is the premier English-language book on the "alpine" style of rigging. This book has an excellent and detailed introduction to vertical and rigging principles, and introduced many advanced and lightweight techniques to English-speaking cavers. However, much of the information on gear selection and bolting is extremely dated, and has been surpassed by newer publications.
- *On Rope*[SP96] – The second edition of this book is a thorough introduction to American ("indestructible") rope techniques. While those techniques are losing favor, and the book itself is quite dated in it's illustrations, it is still a worthwhile read. Look out for the upcoming 3rd edition.
- *Vertical*[War94] – this is a good companion read to the other books here, prepared for the Australian market. It's most recent 5th edition was published in 2008, so it is slightly less dated, however most copies the editor can find on the internet are prior editions.

- *Caving Technical Guide*[EFdS13] – the latest and most current publication in French vertical technique, published by the French Federation of Speleology and the French Caving School. British equimpent vendor Starless River notes: "while less utterly comprehensive than Alpine Caving Techniques, some of the ideas are newer, and the layout and presentation appears much more user friendly for those teaching the information contained. Not a replacement for ACT but very definitely a useful adjunct"

Internet

- `https://www.derekbristol.com/rigging-overview` Derek Bristol's YouTube channel and website offer a wealth of videos on rigging techniques. These are well worth watching.

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[EFdS13] École Français de Spéléologie. *Caving Technical Guide*. Federation Français de Spéléologie, 2013.

[MT02] Georges Marbach and Bernard Tourte. *Alpine Caving Techniques*. Speleo Projects, Caving Publications International, 2002.

[SP96] Bruce Smith and Allen Padgett. *On Rope*. National Speleological Society, 1996.

[War94] Alan Warild. *Vertical: A Technical Manual for Cavers*. Speleological Research Research Council Ltd, 1994.

How to be a Trainee

by Anonymous 1983

Being a trainee is great because no one expects anything out of you. If you play your cards right, your time as a trainee should be the best years of your life. While you are not expected to know everything, there are a few things you should learn quickly if you want to last long.

Bumming gear is an art. Since it is unlikely that you own your own gear, try to mention what you don't have to the person who is taking you caving. Preferably this should be done before you reach the cave entrance, but if you forget just stay calm and try to be suave: "Hey man, you mind giving me some water?...What about some carbide?...A helmet and lamp?..."

If you make it to the cave, you're doing good, but don't blow it there. If you are in a dangerous place and want a belay[8] demand one. You may feel they resent you for slowing them down, but they resent trainee scum anyway. What will get them more upset is having to rescue you if you have an accident (not that kind of accident). Once a year they have a rigging/rescue session, which stresses cave safety because once you see the rigging you won't ever want to be rescued.

You should be sure to enjoy your caving trip not just because you are a masochist[9]. Be sure to look around once in a while and take in the sights and formations[10] It should be a fun and exploring experience.

One final thing, don't let this happen to you: "A change of clothes? Oh, I don't mind going home dirty... What did you say about your trunk?"

If you make it home you're doing great.

[8] A safety line.

[9] A person who enjoys caving.

[10] A funny looking rock. If pointed out, you say, "Ooh ahh."

Glossary

General Caving Terms

- **Borehole** - Wide open walking passage. See “Pennsylvania Borehole.”
- **Breakdown** - Rocks that have fallen from the ceiling, often into a pile. Don’t worry, that *probably* happened years and years ago.
- **Chimneying** - Described in the elementary climbing section. This will make sense once you’ve been to Links.
- **Grim** - This passage sucks. Good thing we’re doing it anyway.
- **Karst** - Hilly land characterized by many underground systems and boulders formed by dissolution of limestone and other calcium-based minerals.
- **Phreatic** - Cave passage formed below the water table. Usually roundish.
- **Ridge Walking** - Walking around looking for signs of new cave entrances. Ridge Talking is getting permission to do so.
- **Speleothem** - A pretty rock formation. Usually made of calcite or gypsum.
  - **Coralloid** or **“popcorn”** - Coral-shaped. Small nodules of rock that form on the walls, floors, and ceilings in caves. Will motivate you to buy kneepads.
  - **Flowers** - Flakes of (usually) gypsum extruded or precipitated from pores in rock or sediment.
  - **Flowstone** - Calcite surface deposited by flowing water. Can be slippery.
  - **Helictite** - Small, crooked, irregular formations controlled by capillary action.
  - **Soda Straws** - Baby stalactites. Thin, hollow, translucent formations.
  - **Stalagmite** - The ones on the floor. You “mite” trip on them.
  - **Stalactite** - The ones on the ceiling. You “mite” hit your head on them. Wait...
  - **Rimstone / Gour** - Formed by minerals deposited around the edge of a pond or puddle: often resembling a dam.
- **Stream Crawl** - You’re going to be on your stomach and you’re going to get wet.
- **Sump** - a passage in a cave that is submerged under water
- **Surveying** - The process of collecting cave passage data. Hopefully used to someday produce a map.
- **“TT”/Too Tight** - Survey designation that means it’s for Tommy. which tommy?!!! Yes
- **Vadose** - formed above the water table. Usually sharpish. Sometimes wet.

Knots Terms

- **Bend** - A knot used to fasten one rope to another.
- **Bight** - The rope is doubled back but does not cross itself.
- **Hitch** - A knot used to fasten a rope to some object or another rope. The rope or object you are hitching to is not part of the knot; a hitch will fall apart if the rope or object is removed.
- **Knot / True Knot** - Formed when the rope is tied to itself. Fixed loops, mid-line loops, and stopper knots are true knots.

- **Loop -** Formed when the rope is doubled back and crosses itself.
- **Main Line / Standing Line -** the part of the rope between the anchor and load. It is the part you rappel or climb.
- **Running End / Free End** - the end of the rope that is not attached to the anchor. It is the part of the rope you are not supposed to rappel off.
- **Working End** - refers to the section of rope you're actively manipulating. The end that you're using to tie the knot when you rig.

Vertical Caving and Rope Terms

- **Ascender** - A mechanical device that slides one way and "cams" in the other direction, holding to the rope. Used for climbing rope. See also "Jumar" and "Croll".
- **Belay** - A variety of techniques used to exert tension on a rope to slow or stop a falling climber or rappeler.
- **Cowstail** - a short length of rope and associated carabiners used for positioning on-rope, passing obstacles, and connecting your Jumars to your D-link.
- **Croll** - A chest ascender made by Petzl. Also a general term for chest ascenders.
- **Descender** - Device used to go down a rope.
  - **Figure Eight** - A device used for twisting and blackening rope. Also rappelling.
  - **Rack** - a rappel device used for long descents. Has variants ("micro rack") that are appropriate for most caving.
  - **Bobbin -** a style of rappel device with fixed spools. Some vertical experience is preferred to use bobbins.
- **D-link** - Central half-moon link in your harness. Sometimes an "omni" after Petzl's carabiner of the same name. Where you attach your Croll and your Cowstails
- **Jumar** - A handled Ascender. Itself the name of one of the first mechanical ascenders on the market. Sometimes used as a verb.
- **Prussik** - An ascending knot. You won't actually tie a prussik to prussik. It's unlikely you'll be prussiking with any knots at all, as this verb often means "to ascend a rope".

Acronyms

- **BATS** - Battlefield Area Troglodyte Society. An NSS-chartered grotto based out of Fredericksburg.
- **BCRG** - Blacksburg Cave Rescue Group. This is an email list.
- **BFR** - Big Fuckin' Rock. Alternatively, should you be leading a Boy Scout trip, Big Friendly Rock. An extremely large chunk of breakdown. Usually a good rig point.
- **BNC** - Big Name Caver. An (in)famous caver.
- **BOG** - Board of Governors. The head of the National Speleological Society, consisting of twelve Directors elected by NSS members and an appointed five person "Executive Committee." In charge of managing the various committees of the NSS.
- **BRG** - Blue Ridge Grotto. Another NSS grotto, based out of Roanoke.
- **BVRS** - Blacksburg Volunteer Rescue Squad. Will pull you out of a cave, on the town of Blacksburg's dime.

- **CACRT** - Central Appalachian Cave Rescue Team. Who you call when Blacksburg are too busy (pending certification by VDEM).
- **CHUD** - Cannibalistic Humanoid Underground Dweller. From the 1984 cult classic of the same name; a cave adapted human which preys on its feeble, weak, above-ground dwelling cousins. Common throughout the New York area.
- **CE** - *Conformité Européene.* A stamp or marking on certain products sold in the EU indicating that the item meets standards for consistency and safety. Explosives, measuring tools, and helmets and other safety gear are some (un)common caving-related items covered by regulations.
- **CE** - *Chinese Export.* Hmmm....
- **COG** - Congress of Grottos. An advisory body that meets yearly at the NSS Convention where representatives of NSS Internal Organizations (IOs) discuss and vote on issues of concern to the IOs and NSS members. The COG sends a report of their meeting to the NSS Board of Governors, who must respond to any issues raised by the COG.
- **DIP** - Drunk In Public. The charge of having consumed enough sweet, sweet alcohol to visibly affect behavior in a public place. Alternatively, swearing. A class 4 misdemeanor.
- **IMO** - Inner Mountain Outfitters. A long-established vendor of caving gear
- **NCRC** - National Cave Rescue Commission. An NSS internal organization responsible for training cavers in cave rescue operations.
- **NCRC-ER** - Balister's second favourite curse word.
- **NRVG** - New River Valley Grotto. Grotto based out of Radford, VA.
- **NSS** - National Speleological Society. "For over 70 years, the National Speleological Society has promoted safe and responsible caving practices, effective cave and karst management, speleology, and conservation." The NSS is the governing body of which all grottos are a part and the largest caving organization in the world. Their motto is "Take Nothing but Pictures, Leave Nothing but Footprints, Kill Nothing but Time."
- **OTR** - Old-Timer's Reunion. A once a year event where all cavers, not just old farts, gather to cave and party.
- **PBR** - Pabst Blue Ribbon. The elixir, so named for a state-fair prize won in 1893 (allegedly). This 4.72% American-style lager forms the backbone of any reputable grotto.
- **PMI** - Pigeon Mountain Industries. Rope and vertical gear manufacturer.
- **PSC** - Potomac Speleological Club. Not a Grotto (don't call them a grotto). Best known for survey around Germany Valley in WV, and "Milling Around"
- **RASS** - Richmond Area Speleological Society. NSS grotto based out of Richmond, VA.
- **SCCi** - Southeastern Cave Conservancy, incorporated. A non-profit corporation dedicated to conserving and protecting caves throughout the southeast. If you see Bill Stringfellow at an event, he'll ask if SCCi is included in your will.
- **SIVTAC** - Somewhat Inactive Virginia Tech Armchair Cavers. A collection of people who, despite any possible connections, are not representing the VPI Cave Club or Virginia Tech in general during whatever they may or may not be up to.
- **TAG** - Tennessee-Alabama-Georgia. The tristate area is known for a number of large, deep pits (and less well-known long horizontal caves). Also known for the TAG Fall Cave In event, a sort of Burning Man for cavers, held annually in Georgia.
- **UIAA** - *union Internationale des Associations d'Alpinisme /* International Climbing and Mountaineering Federation. Yet another safety stamp.

- **UL** - Underwriters Laboratories. A stamp or mark indicating that a product meets the safety standards set and reviewed by Underwriters Laboratories, an American consulting company that performs safety testing. Similar to the CE stamp on European goods.
- **USDCT** - US Deep Caving Team. A nonprofit that does not cave in the US.
- **VAR** - Virginia Region (of the NSS). Refers to grottos in Virginia and surrounding states. Also refers to Spring VAR and Fall VAR, two caving events held by VAR grottos.
- **VPI** - Virginia Polytechnic Institute (Cave Club) - You and us. Blamed for everything bad that happens at OTR, Convention, the TAG Fall Cave-in, and other events where cavers gather en mass.
- **VSS** - Virginia Speleological Survey. The group that would publish the next edition of "Caves of Virginia" if they were allowed to tell people about caves.
- **VTC** - Vertical Training Commission. An NSS commission that does what we do, just worse.
- **WVACS** - West Virginia Association for Cave Studies. Large grotto based in West Virginia. Maintains several bunkhouses for use by cavers.
- **WVASS** - West Virginia Speleological Survey. "A voluntary association of cavers and caving groups, each of which pursues its own interests. . . there is cooperation because we have a common desire: to gather and maintain information about West Virginia caves and karst."
- **WVCC** - West Virginia Cave Conservancy Inc. "A nonprofit organization dedicated to conserving and protecting important cave and karst resources of the Virginias for future generations."

Caver Slang & Other Terms You Will Encounter

- **Adequate** - You're a trainee. This is the highest endorsement you'll ever get until you get your membership. Try really hard to not be inadequate.
- **Alpine Start** - Sometime between 3am and 3pm, depending on who told you your cave trip was leaving early.
- **A.I. Cartwright** - Our mascot! Lives in Clover Hollow; once you're vertically trained, you can pay him a visit. Also the name of our highest and most esteemed award.
- **Air Rappel** - A high-risk, high-reward method of rappelling that involves forgoing descenders, voluntarily or otherwise.
- **Armchair Caver** - Caver who spends more time and energy discussing and arguing caving than caving.
- **Backsight** - Measurement taken from a new point to a previously established point in a cave survey. Take 'em, don't mess 'em up.
- **Banquet** - Annual semi-formal event hosted by VPI to celebrate and recognize landowners and outstanding VPI-ers.
- **BAT** - An award you could get if you're very, very adequate.
- **Bat Ranch** - Caver Disneyland (see Cosmic Energy Vortex).
- **Biner** - Carabiner. Also called a "krab" by the *Eurotrash*.
- **Biner Pop** - Accidentally opening the gate of your biner while in use. Results from using a single locking carabiner with a rappel rack. Don't.
- **Bomb-Proof/Bomber** - Overengineered and/or operating with many redundant systems. Alternatively, a very sturdy rock or other rigging point.

- **Booty** - Unmapped or, more often, untravelled cave passage; virgin passage.
- **Brain Bucket** - Helmet. Also an award.
- **Cave Booger** - Spend six hours in dusty air and you'll find dirt everywhere.
- **Cave Bum** - Blacksburg's finest. Try to finish your degree before ending up here.
- **Cave Tan** - A fine layer of dirt and/or bruises.
- **Clino** - Inclinometer. A device used to measure the vertical angle between two points.
- **Club Files** - The collected publications, correspondences, maps, and miscellaneous documents of the VPI Cave Club. Nobody has ever actually seen the club files in person, but we're sure they exist.
- **Cosmic Energy Vortex** - See "Bat Ranch".
- **Death March** - A very long and tiring caving trip. Alternatively, a cave that requires a very long and tiring hike to get to (everything in TAG). Follow not the one-armed man.
- **Dead Bottom** - A small, open-air pit found in karst regions that doesn't contain any other passage. Watch your step!
- **Disto** - A laser survey device used to measure the distance and angle between two points. Superior to both "Bric" and "suunto"; inferior to "Brunton".
- **Dump** - Spent carbide left in caves. Now an historic relic.
- **Eurotrash** - Bobbins, rebelays, alpine technique, and everything else Moneyhun likes.
- **Faffing** - Taking your time to yardsale your cave gear, Milling Around the entrance, and generally ensuring you have a Gentleman's Trip
- **Foresight** - A measurement taken towards a newly established point in a cave survey.
- **Gentleman's Trip** - "Gentlemen" don't take Alpine Starts. It's a miracle they ever get in the cave.
- **Kegged** - Getting "kegged" happens when you miss your signout time but *didn't* require a rescue: all members on the trip share the cost of a keg for the next party. Also happens when you somehow forget how to fill out your signout correctly.
- **Keyboard Caver** - See "Armchair Caver".
- **Milling Around** - the process of creating new cave, perfected by the PSC and the gansta mappers
- **Nerd Caver** - An overeager caver who is unprepared for even beginner cave trips.
- **Nuisance Drop** - A short rappel that can't/shouldn't be free-climbed, requiring much time to be spent rigging and getting on & off rope. Sometimes called a "Ladder Drop", because cable ladders are faster.
- **Old Fart** - Old caver. Do they reminisce about carbide caving? Do they miss meetings to hang out at the Pub? Were your favorite caves still unformed when they started caving? Old fart..
- **Picnic** - Annual camp out and bonfire held in April in Bland County.
- **Pretties** - Speleothems, specifically the clean white ones.
- **Quarry** - One particular small, abandoned limestone quarry near the Bat Ranch. Great for vertical training.
- **RASShole** - A RASS member.
- **Robert's Rules Of Order** - Ask Landgraf.

- **“Rock!”** - Do not look up.
- **Sign Out** - Don’t miss it. See “kegged.” There are no short trips to sign out
- **Scoop** - To cave through virgin passage without surveying it.
- **Sherp** - Stuck hauling equipment for another caver or for the expedition. See “USDCT”.
- **Smart End** - The end of a tape measure taken by the third member of a survey team (the “point”) from one point to the next point down the passage. The **Dumb End** is left with the caver using the instruments so that he or she can relay data to the sketcher.
- **Speleomercenary** - Will help you with your borehole lead, never your dig.
- **Speleopolitican** - A caver who is more interested in the management and goings-on of grottos and the NSS than in actually enjoying caving. Same genus as an armchair caver.
- **Speleoseminar** - A temperate and abstinent gathering held after every meeting, a discussion on the finer points of caving technique and etiquette.
- **Spelunker** - See ‘Nerd Caver’.
- **Spelunk** - The noise made by a nerd caver after an air rappel.
- **Sten** - StenLight S7. A high end LED caving lamp.
- **Troglodyte** - A primitive, cave-dwelling humanoid. Alternatively, a caving publication.
- **Type-2 Fun** - It sucks, but I’m doing it this weekend and next weekend and the next.
- **Wellies** - Wellington boots. Calf-high boots that keep the water in.
- **White Nose/WNS** - A fungal infection found in bats. Devastating to the regional bat population. Requires gear decontamination if traveling to a WNS-negative zone.
- **Work Weekend** - One or more days spent doing odd jobs for landowners in exchange for letting us host social events on their property.
- **Zebra** - Short for “zebralight.”

Membership Requirements Signoff Sheet

Name: _____

This sheet is an integral part of the training program, which leads one down the path to becoming a member of The VPI Cave Club. After completing these requirements you will have the skills that are needed to safely explore vertical and horizontal caves. It's not as hard to fulfill these requirements as it may seem, for most of them will be learned while caving, while others are learned with a little practice and thought.

Have an active member of the VPI Cave Club sign this sheet in the appropriate place as you fulfill each requirement. Give this sheet to the vice president when all the requirements have been met (except for the compehensive general quiz). This sheet will be archived when you are voted in as a member of the club: keep it neat! GOOD CAVING!!!

1. Read and understand *The Constitution and By-Laws of The VPI Cave Club*.

   Date | VPI Nr | Signature | Comments

2. Remain a prospective member for at least 10 weeks during which time he/she/it must spend at least 40 hours underground on at least 6 trips on which at least one full or associate member if present. (see attached sheet for recording of trips).

   Date | VPI Nr | Signature | Comments

3. Demonstrate elementary climbing skills in a cave.

   Date | VPI Nr | Signature | Comments

4. Demonstrate a working knowledge of belaying methods.

   Date | VPI Nr | Signature | Comments

5. Demonstrate a working knowledge of passing a rebelay while ascending and descending.

   Date | VPI Nr | Signature | Comments

6. Demonstrate a working knowledge of rappelling and climbing rope in a cave.

   Date | VPI Nr | Signature | Comments

7. Be able to tie a seat harness with webbing.

   Date | VPI Nr | Signature | Comments

8. Demonstrate how to rig and pad a rope correctly.

   Date | VPI Nr | Signature | Comments

9. Be able to change-over from ascending to descending and from descending to ascending (using the same gear he/she/it uses when caving).

   Date | VPI Nr | Signature | Comments

10. Submit to the editor a suitable article for publication in *The Tech Troglodyte* allowing reasonable time for review and revision.

Date	VPI Nr	Signature	Comments

11. Be able to tie and explain the appropriate uses of the following knots:

- bowline
- bowline on a bight
- bowline on a coil
- figure-8
- figure-8on a bight
- double-loop figure-8
- alpine butterfly
- overhand knot
- square knot
- water knot
- helical
- prusik
- double fisherman's bend
- Münter hitch and tie-off

Date	VPI Nr	Signature	Comments

12. Pass a comprehensive general information quiz.

Date	VPI Nr	Signature	Comments

13. Be endorsed by an active member in good standing.

Date	VPI Nr	Signature	Comments

14. Be approved by a two thirds vote of the active membership.

Date	VPI Nr	Signature	Comments

Notes

- For The Constitution and By-Laws, knots, techniques, etc. see *The Tech Troglodyte Prospective Member Guide*.
- For additional knot descriptions see *On Rope* by Bruce Smith and Allan Padgett.
- Updated to reflect the Fall 2024 bylaw changes.

Help Improve the Training Program

We hope the training program has provided you with most of the basic information you need to cave safely and responsibly. Your comments will help us improve it. Did you find errors in the *The Tech Troglodyte Prospective Member Guide*? Are there other things you think should be covered? Is there too much information on some subjects? Let us know.

Caving Hours Signoff Sheet

Name: _____

This sheet is a very important part of your training. On this sheet should be recorded all the underground time you have spent with the club as a trainee. Remember that you need to have at least 40 hours underground on at least 6 trips to be a member. It never hurts to have more though. Also note that only a member (associate, active etc..) can sign you off for the hours below. Cave on!

Cave	Date	Member's Signature	Hours	Comments

Name: _____

Cave	Date	Member's Signature	Hours	Comments

Credits

The *Tech Troglodyte Prospective Member Guide* is a group effort by the VPI Cave Club community. Numerous people have contributed their time and knowledge to make it what it is (and keep it from being what it isn't). We hope this document has provided you with most of the basic information you need to cave safely and responsibly. Your comments will help us improve it. Did you find errors? Are there other things you think need to be covered? Is there too much information on some subjects? Let us know.

The following people have made major contributions to this version:

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- Liz Alzubi, NSS 71950 VPI 498
- Sam McCarter, NSS 67783 VPI 454
- Penelope Voster, NSS 68586 VPI 501
- Phillip Moneyhun, NSS 67770 VPI 451
- Phil Benchoff, NSS 44765 BVRS 5603
- Mark H. Eisenbies, VPI 313, NSS 32075
- Steve LePera, VPI 351, NSS 40845, BVRS 5666
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- Gracie Cornish, NSS 73946 VPI 511 BVRS 5621
- Meredith Blanco, NSS 68996 VPI 474
- Nick Socky, NSS 34313 VPI 429

NSS Conservation Policy

The National Speleological Society believes:

- Caves have unique scientific, recreational, and scenic values
- These values are endangered by both carelessness and intentional vandalism
- These values, once gone, cannot be recovered
- The responsibility for protecting caves must be formed by those who study and enjoy them.

Accordingly, the intention of the Society is to work for the preservation of caves with a realisitic policy supported by effective programs for: the encouragement of self-discipline among cavers; education and research concering the causes and prevention of cave damage; and special projects, including cooperation with other groups similarly dedicated to the conservation of natural areas. Specifically:

All contents of a cave – formations, life, and loose deposits – are significant for their enjoyment and interpretation. Therefore, caving parties should leave a cave as they find it. They should provide means for the removal of waste; limit marking to a few, small, and removeable signs as are needed for surveys; and, especially, exercise extreme care not to accidentally break or soil formations, disturb life forms or unnecessarily increase the number of disfiguring paths through an area.

Scientific collection is professional, selective, and minimal. The collecting of mineral or biological material for display purposes, including previously broken or dead specimens, is never justified, as it encourages others to collect and destroy the interest of the cave.

The Society encourages projects such as:

- Establishing cave preserves
- Placing entrance gates where appropriate
- Opposing the sale of speleothems
- Supporting effective protective measures
- Cleaning and restoring over-used caves
- Cooperating with private cave owners by providing them knowledge about their cave and assisting them in protecting their cave and property from damage during cave visits
- Encouraging commercial cave owners to make use of their opportunity to aid the public in understanding caves and the importance of their conservation.

Where there is reason to believe that publication of cave locations will lead to vandalism before adequate protection can be established, the Society will oppose such publication.

It is the duty of every Society member to:
Take personal responsibility for spreading a consciousness of the cave conservation problem to each potential user of caves. Without this, the beauty and value of our caves will not long remain with us.

For more information on cave conservation, check out the The NSS Cave Conservation and Management Section WWW Page. NSS website: `http://www.caves.org`

Cave softly amid the pretties & nasties, & remember what peace there may be in rappelling. Circumvent ugly stream crawls unless you are truly masochistic. Carry first-aid. Encourage membership in the NSS, & write for the publications though cave politics be for turkeys. If a person appears in doubt of who he is, he may be a speleopolitician. Beware. Consider that if two rights & a wrong go to a dead end, a right & two lefts may not get you back to where you remember. Whenever possible, use Suuntos instruments. Be comforted in the face of rising streams & sudden rockfalls; someone will come to get you out in four to six hours. Strive not to eat cave creatures, dead or alive. Remember Roppel, & keep it holy. Exercise reasonable caution, especially in virgin territory. Know not no knot, & know what knot to use when. Be assured that pushing wet sumps by carbide light often leaves you in the dark. Therefore, attempt not naked the "Grim Crawlway of Death."

Surrender gracefully the things of youth: solvency, sobriety, Moral Majority, & keep not your gorp in plastic bags. Be heartened amid impending starvation that the stuff at the bottom of your pack is edible, if you scrape it first, & reflect that, however miserable you may feel, it would only be worse on a photo trip.

You, caver, push the limits of your endurance, but please call it guano when it sticks to your overalls. You are privileged to go to Hell, provided you embrace agreeable politics & have landowner permission. Therefore, learn to abide grotto functions, pay your dues, party (not to excess), leave gates as you found them, & remember to carry three sources of light. Keep always in mind that caving is an activity peculiar to the living. Be safety conscious, & enjoy.

Speleorata