



# National Cave Rescue Commission

## Level 3 Student Preparation Guide

NCRC requires all students to demonstrate basic skills prior to participation. Level 3 students must be able to tie the knots listed below, demonstrate basic single rope techniques (SRT) competency, and retention of L2 rigging skills. For all skills, **safety is a top priority**.

This guide provides information to help you practice and prepare for an NCRC seminar, however your entrance testing may be done in a different order. You should also expect to use these skills throughout the week-long seminar. If you have questions, contact your [regional coordinator or the Training Officer](#). The course evaluation criteria, including entrance skills, can be found at here: [NCRC Entrance Skills](#). Another useful resource is the [Virtual Topics in Cave Rescue YouTube](#) page.

You should come to the seminar prepared for caving and learning. Although the seminar follows a carefully prepared schedule of topics, you should remain flexible because conditions or exigencies may require a change in plans. You should plan to be reasonably self-sufficient and comfortable each day (adequate food, water, clothing for current conditions). You should also be prepared for learning both in a classroom and the field environment. Bring a notebook, writing implements, snacks, water, appropriate clothing, and pack to carry your gear.

Instructors are available to help you prepare for the seminar. Please contact the NCRC Training Officer, your Regional Coordinator, or your lead instructor with any questions about knots, SRT, appropriate gear, or entry testing. We also recommend that you work with vertically-proficient members of your local grotto or agency to develop your vertical SRT skills before attending a cave rescue course.

Illustrations of knots and vertical systems are included in this package. Reproducing these examples should work for you, however *any safe and functional technique that meets all of the criteria is acceptable*.

Level 3 Entrance Skills		
✓	<b>Show/Display Personal Field Equipment</b>	Must be in safe, usable condition and marked to identify the owner. Details on page 2.
✓	<b>Tie Knots</b>	There is no time limit for this skill. Efficiency is beneficial but tying correctly should outweigh speed. Details begin on page 3.
✓	<b>Demonstrate SRT vertical competencies</b>	There is a 20-minute time limit. Ascend, pass a knot, down-climb, change-over to rappel, descend past knot, change to ascend, and down-climb. Details begin on page 9.
✓	<b>Demonstrate retention of L2 rigging skills</b>	There is no time limit for these skills. 1:1, 2:1, 3:1, 4:1 Haul systems and Münster Operations should be demonstrated. Details begin on page 13.
Optional pre-seminar SRT and knot tying workshops are available at many trainings and a great way to practice skills before day 1 testing. Note: Level Three (3) Students who fail entry skills testing will not be offered retraining. One retest will be allowed on ONE knot, SRT and ONE rigging station.		

## **NCRC Level 3 Entrance Skill Prep: Required Personal Field Equipment**




Personal equipment must be in safe, usable condition and marked to identify the owner. An identifying mark can include but is not limited to: a name written in sharpie, a specific colored tape combination, or a custom sticker. Whatever your choice, the marking should hold up to field use and washing/decontamination procedures through the week-long training. Equipment deemed unsafe, unacceptable, or out-of-date, during check-in must be replaced prior to the student's continued participation in the course.

- ☐ **CLIMBING HELMET** - UIAA or CE approved mountaineering style helmet with three (or more) point suspension, and non-elastic chinstrap.
- ☐ **THREE (3) SOURCES OF LIGHT** - They should be electric and helmet-mountable.
- ☐ **BOOTS** - Sturdy, rubber soled
- ☐ **RUGGED CLOTHING**- Limit cotton options, consider wool and synthetic base layers. Clothing should be suitable for the training location.
- ☐ **TWO (2) LOCKING CARABINERS** - Independent of your ascending or descending systems.
- ☐ **DESCENT DEVICE** - Any of the following types of devices are acceptable:
  - 1. standard rack
  - 2. four-bar micro rack with a hyper-bar (4 bars total)
  - 3. bobbin with safety carabiner (*Bobbin is a generic term for devices like the Petzl Stop. You can use any of the commercially available brands/models. You must have a safety carabiner, but it is not mandatory that you use it unless the extra friction is needed. Refer to the manufacturer's recommendations.*)
  - 4. rescue eight (with ears)
  - 5. Scarab-type device
- ☐ **COMMERCIALLY SEWN SEAT HARNESS**
- ☐ **ASCENDING SYSTEM** - Must be a functional working system that includes:
  - 1. Two primary gripping points of attachment to the seat harness, one of which should be fully operable with one hand,
  - 2. a tether (or cowstail) attached to the seat harness ready for use but separate from the primary two gripping points. It may have a locking or non-locking carabiner on the free end. (***Tether or cow's tail may be a commercial product designed for this usage or tied. Tied cow's tails(s) must be tied from at least 9mm diameter dynamic rope.***)

*Note: we strongly encourage use of a caving ascending system that employs mechanical ascenders. Frog, Mitchell, and Rope Walker systems are common examples, each of which have key strengths and weaknesses. Choose a system that makes sense for the type of caving you do most frequently. While you might be able to get by with an improvised system, a well-tuned caving system will be better suited to seminar activities. Examples of systems are illustrated near the end of this document, and can be purchased from caving vendors. Be sure to **practice before you attend the seminar**, so you can be confident and competent with your vertical system.*
- ☐ **GLOVES** - Must have leather (or sturdy synthetic equivalent) palms and full fingers
- ☐ **WATER BOTTLES** - Two quart-sized recommended
- ☐ **SMALL, PERSONAL FIRST AID KIT** - Optional, but recommended
- ☐ **SMALL, HEAVY-DUTY PACK** - Used to carry personal gear around underground
- ☐ **2 – 20 FT PIECES OF 1-INCH TUBULAR WEBBING**
- ☐ **CAVE-WORTHY WATCH, PAPER & PENCIL**- Rite-in-the-Rain paper works well

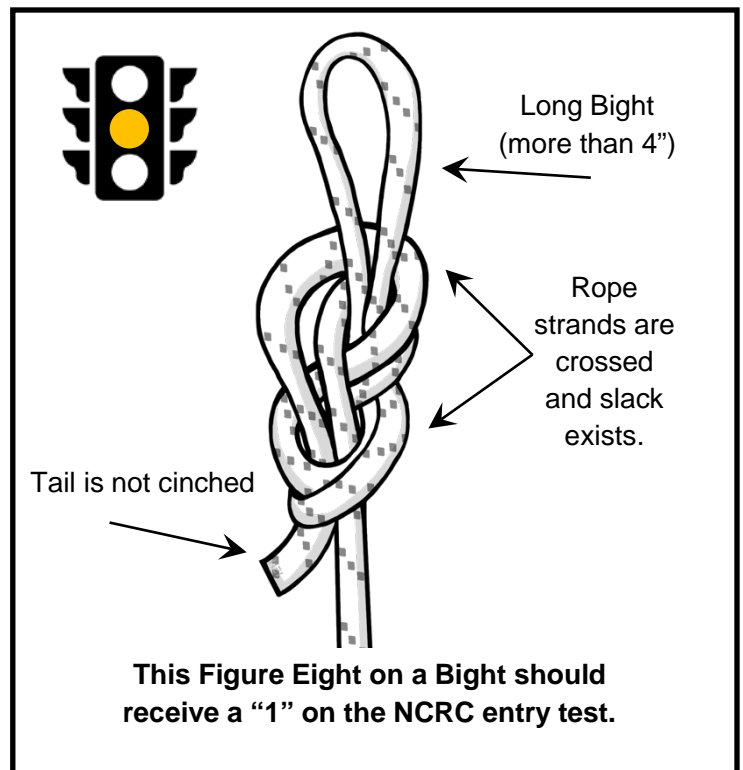
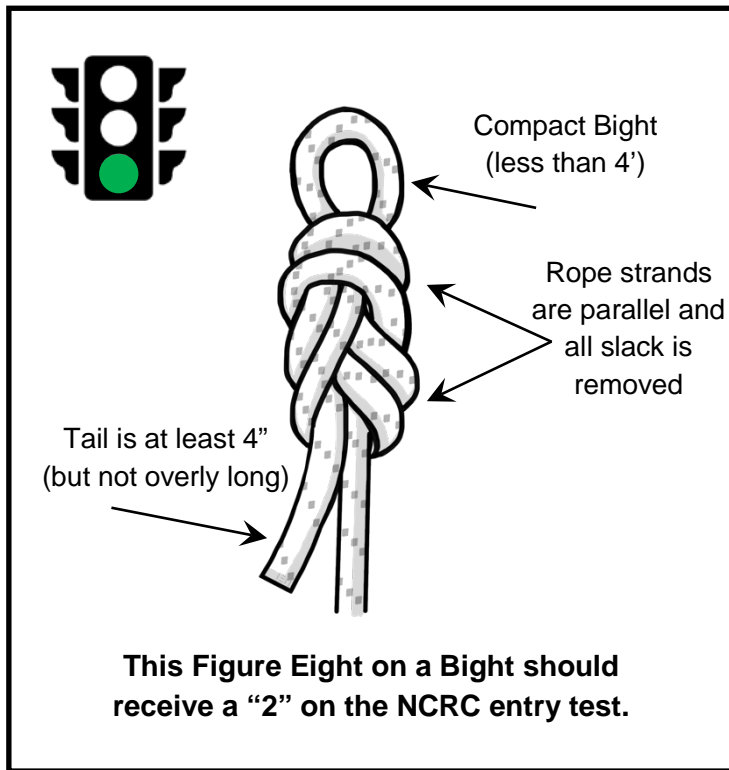
## **NCRC Level 3 Entrance Skill Prep: Tie Knots**

**Knots:** *There is no time limit for this skill. Efficiency is beneficial, but tying correctly should outweigh speed.* Each knot, bend, and hitch is evaluated for safety, effectiveness, and efficiency, then scored 2, 1 or 0. Below are guidelines for practice but you may refer to [Knots for Cave Rescue Training](#) for specific testing criteria.

	Score	Description	Details
	2	Safe & Efficient	A photo-quality example. Bights are small, tails are minimal, knots are dressed, cinched, and ready for use. (For 11mm rope, bights less than 4"; tails about 4".)
	1	Safe & Functional	Safe, but undressed or sloppy. Examples could include oversized bights, long tails, poorly dressed.
	0	Unsafe or Not Functional	Has an overly short tail, not what was requested by the evaluator, or a general critical safety problem.

Tie the following with 11mm rescue rope unless otherwise noted:

- ☐ Figure Eight on a Bight
- ☐ Figure Eight Follow Through
- ☐ Double Figure Eight Knot
- ☐ Bowline with safety (Yosemite acceptable)
- ☐ Münter Hitch
- ☐ Tie-off (for any adjusting knot/hitch, such as the Münter): Half Hitch with an overhand safety
- ☐ Butterfly Knot
- ☐ Clove Hitch with safety
- ☐ Trucker's Hitch
- ☐ Ring Bend (Water Knot) in webbing
- ☐ Double Overhand Bend (Double Fisherman's Knot, Barrel) in 8mm cord
- ☐ Prusik Hitch (3 wrap) in 8 mm cord on rescue rope
- ☐ Square Knot



## Figure Eight on a Bight:

*Uses include:*

- Terminal end knot.

*Additional Notes:*

- Can be difficult to dress if you've not practiced,
- Proper dressing includes parallel strands throughout the knot.



## Figure Eight Follow Through:

*Uses include:*

- Tying directly to an object without the use of a carabiner.

*Additional Notes:*

- Completed knot is identical to the Figure Eight on a Bight,
- Typically tied around an object,
- Can be difficult to dress if you've not practiced,
- Proper dressing includes parallel strands throughout the knot.



*Retrace a single figure eight  
using the tail. Continue to  
completion.*

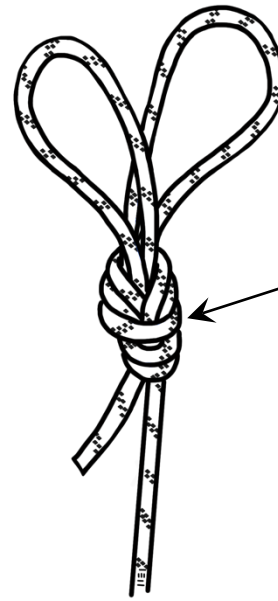
## Double Figure Eight Knot:

*Uses include:*

- Multipoint anchors,
- Tagline on litter.

*Additional Notes:*

- No bight length minimum,
- Proper dressing includes parallel strands throughout the knot,
- Each bight can be different lengths and longer than 4",
- The strand that connects and adjusts the two bights, should be located on the body of the knot closest to the bights.



*This strand can adjust the bight lengths without having to re-tie the entire knot.*

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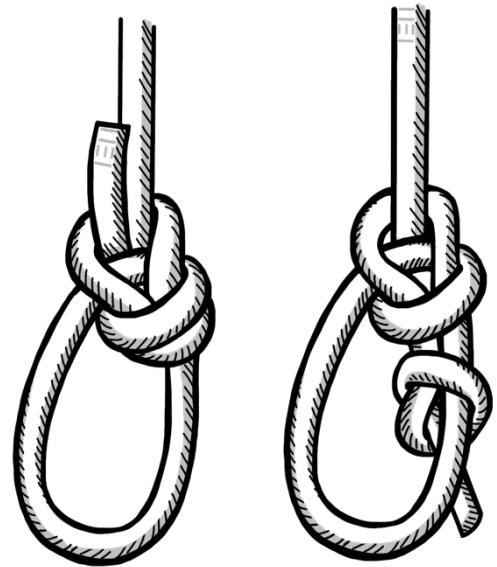
## Bowline (with safety):

*Uses include:*

- Terminal end knot,
- Tying directly to an object without the use of a carabiner.

*Additional Notes:*

- No bight length requirement when tied around an object,
- Proper dressing includes safety (e.g., Yosemite or overhand.)



*Bowline  
with Yosemite*

*Bowline  
with Overhand*

*Bowlines and clove hitches, which could slip or capsize, require safeties.*

*Acceptable safety knots include: overhand, two half hitches, half a double fisherman's (barrel knot) or Yosemite tie-off for the bowline.*

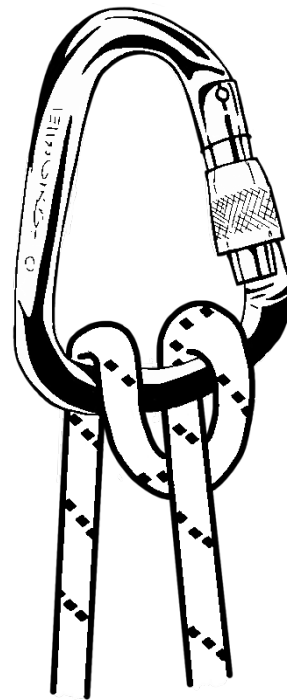
## Münter Hitch:

*Uses include:*

- Rappelling,
- Fixed brake lower device.

*Additional Notes:*

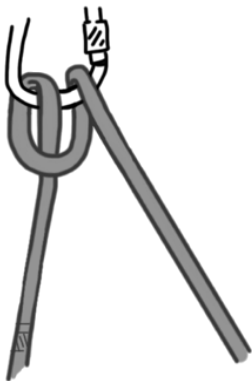
- Proper dressing includes proper selection of carabiner (HMS/ pear shape),
- Ensure carabiner is locked before use,
- Hitch should be able to flip and change directions without removing from the attachment.



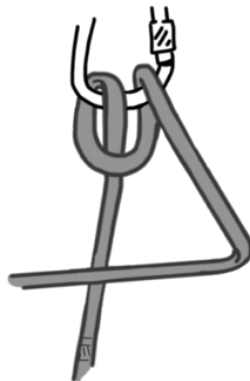
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### Tie-off (for any adjusting knot/hitch): Half Hitch with an overhand safety

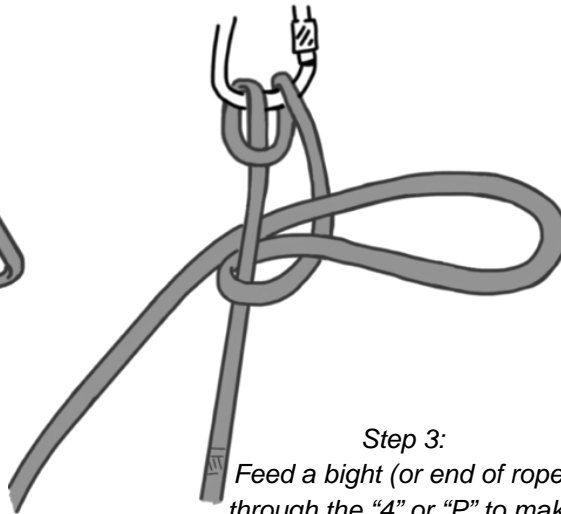
We recommend using a half hitch and overhand to tie-off / safety the Münter and a few other hitches that can be adjusted under tension. In this illustration the half hitch and overhand are tied using the bight.



Step 1:  
Tie Münter



Step 2:  
Use tail to make a  
"4" or "P"



Step 3:  
Feed a bight (or end of rope)  
through the "4" or "P" to make  
a half hitch and cinch toward  
the Münter



Step 4:  
Tie an  
overhand  
behind the half  
hitch

## Butterfly Knot:

*Uses include:*

- Midline attachment,
- isolate a bad place in a rope.

*Additional Notes:*

- No tail length requirement since it is a midline knot,
- Can be loaded in multiple directions,
- As with many knots, there are multiple ways to tie this knot. It does not matter if your technique is over-the-hand or twist-in-the-air, it is the final result that matters most.



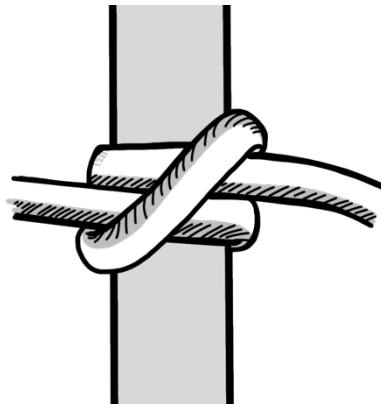
## Clove Hitch (with safety):

*Uses include:*

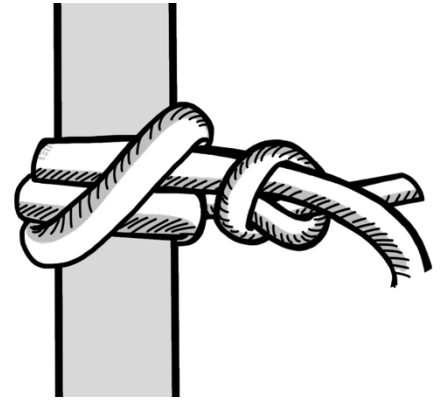
- Tying around an object.

*Additional Notes:*

- Should be tied around an object,
- Safety required,
- Acceptable safety knots include: overhand, two half hitches, half a double fisherman's.



Clove  
without safety  
(incomplete)



Clove  
with overhand  
safety

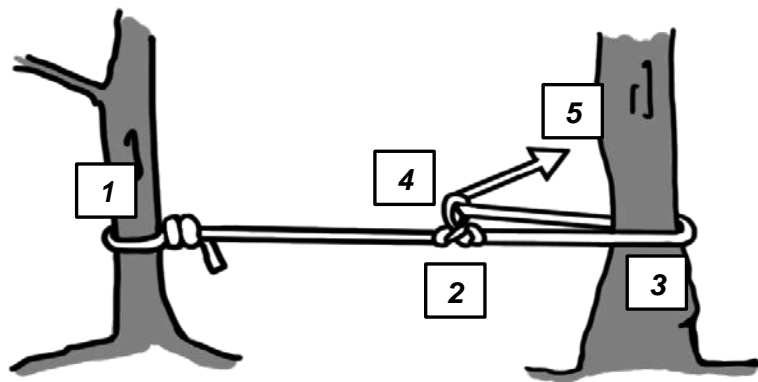
## Trucker's Hitch:

*Uses include:*

- Tying down objects,
- Providing tension between objects.

*Additional Notes:*

- A system that combines several knots to complete,
- Must be anchored,
- Should hold tension when tied-off.



**1) Anchor end of rope**  
(i.e., bowline, figure eight follow through, clove hitch, etc.)

**2) Tie midline knot**  
(i.e., butterfly, in-line eight, etc.)

**3) Wrap around object**

**4) Pass rope through midline knot to cinch**

**5) Tie off tensioned rope**  
(Recommend a half hitch and overhand)



*FYI: Trucker's Hitches are great to tie down canoes or other items during travel.*



## Water Knot or (Ring Bend) in webbing:

*Uses include:*

- Joins each end of webbing to form a loop,
- Joins two separate lengths of webbing.

*Additional Notes:*

- Proper dressing includes parallel strands throughout the knot with no twists.



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## Double Fisherman's Knot (Double Overhand Bend) in 8mm cord

*Uses include:*

- Joins each end of cordage to form a loop,
- Joins two separate lengths of cordage,
- Can be used in full sized rope.

*Additional Notes:*

- 1" tail allowed after knot is tensioned,
- Tails should be offset (diagonal) from each other.



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## Prusik Hitch (3 wrap) in 8 mm cord on rescue rope

*Uses include:*

- Progress capture device,
- Adjustable rope attachment.

*Additional Notes:*

- Begin with a pre-tied loop of cordage,
- Check the tail length on the double fisherman's as they can shorten over time with use,
- Double fisherman's knot should be on the side of the bight of the finished Prusik hitch,
- Proper dressing includes snug, parallel coils throughout the hitch.



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## Square Knot

*Uses include:*

- Joins each ends of rope to form a loop,
- Joins two separate lengths of rope or cordage.

*Additional Notes:*

- Proper dressing includes tails coming out on the same side (top or bottom),
- Safety is required for life-safety applications.





# **NCRC Level 3 Entrance Skill Prep: Personal Vertical System and SRT**

## **Demonstrate SRT vertical competencies**

*There is a 25-minute time limit.* Ascend 10 meters passing a knot in that distance, downclimb, change-over to rappel, descend passing knot, change to ascend, down-climb. Begin with gear in pack. Must demonstrate a hard lock-off of descent device during changeover. Three attempts allowed. Steps below are guidelines for practice.

**System Evaluation** - A climbing system must have at least these components:

- 1) A commercially manufactured seat harness,
- 2) Two primary gripping points of attachment to the seat harness, one of which should be fully operable with one hand,
- 3) A tether (or cowstail) attached to the seat harness ready for use but separate from the primary two gripping points. It may have a locking or non-locking carabiner on the free end,
- 4) An approved DCD.

## **Ascending**

- Be sure to maintain 2 points of gripping attachment throughout your ascent.
- Be proficient at ascending. Demonstrate that your system functions properly and efficiently allowing for a smooth climb.

## **Knot pass on ascent**

- Work to pass knot on first attempt and avoid clipping INTO the knot.

## **Down-Climb**

- Down-climb smoothly without weighting the safety tether
- Adjust gripping points of attachment without fully opening cams (preferably by pressing the cam from the top)
- Maintain 2 gripping points of attachment throughout the maneuver

## **Change-Over – Ascent to Rappel**

- Perform change-over correctly and efficiently on 1<sup>st</sup> attempt without assistance.
  - Off-weight ascender on 1<sup>st</sup> attempt
  - Do not weight secondary attachment during maneuver
- Lock-off of descent device with little to no slippage (<4").
- Demonstrate control of unlocked descent device before committing to single point of contact.

## **Rappel and pass knot on descent**

- Rappel in a controlled manner.
- Lock and unlock descender in a controlled manner with little to no slippage (<4").
- Demonstrate at least one hard lock off during DCD use.

## **Change from Rappel to Ascent**

- Perform change-over correctly and efficiently on 1<sup>st</sup> attempt without assistance.
  - Off-weight descender on 1<sup>st</sup> attempt
  - Keep 2 gripping points of attachment during weight transfer to ascending system

## **Personal Protective Equipment (PPE)**

- Wear helmet at all times in the fall zone and on rope
- Wear gloves while handling moving rope

## **Safety**

- Leave the fall zone when possible.
- Enter and exit designated fall zone efficiently.
- Call "On Rope" and "Off Rope" from outside the designated fall zone.
- Never commit to a single gripping point of contact during ascent.
- Ideally, do not drop anything while on rope, but call "**ROCK!**" if you do.

## Concerning Change-Overs

As defined by NCRC, you must maintain at least two points of attachment between your seat harness and the rope or rigging UNTIL you demonstrate control of your unlocked descender. When changing over, this means that you must weight and unlock your descender BEFORE removing your safety connection.

If you are weighting your safety strap rather than your descender when changing from ascent to descent, there are several possible solutions including downclimbing to your descender.

- Rig the descender as high as possible.
- Lock off the descender with no slack.
- Be certain the lock off is secure.
- Lower your upper ascender as far as possible before standing up.
- Shorten your frog foot loop (but long enough to lock your knees when standing).
- Once your weight is on the descender, lower your ascender before unlocking.
- Do not allow rope to slip through the descender when unlocking.
- Lengthen the safety strap to your upper ascender.
- Shorten the connection between your seat harness and descender.

## A note about Vertical Systems

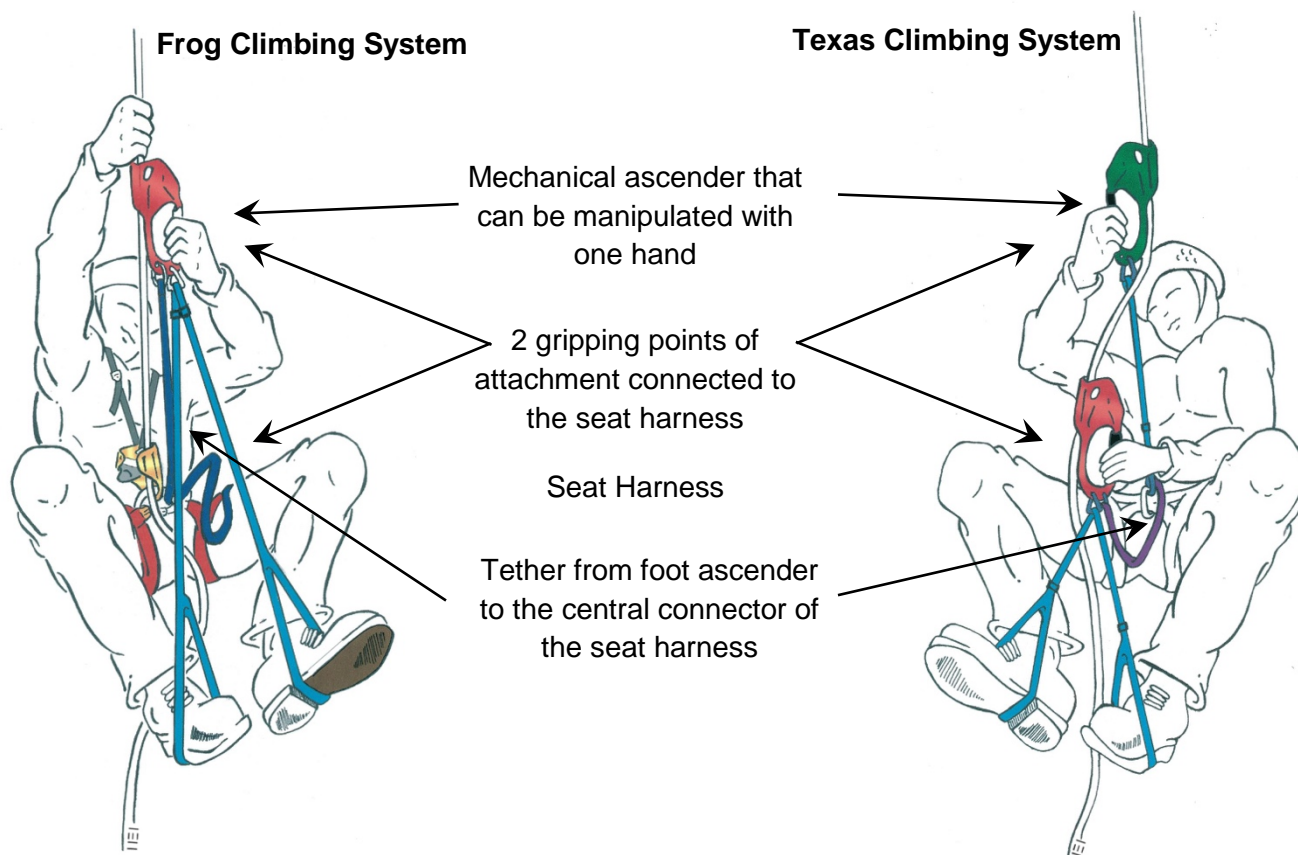
You will need to come prepared with a working ascending system. You will be asked to demonstrate your ability to use it. There are many ascending systems that work, there are far more that do not work.

Unless you have a specific reason to do things differently, it is beneficial to use a standard vertical system. Some good examples are: Frog, Texas, Ropewalker or Mitchell.

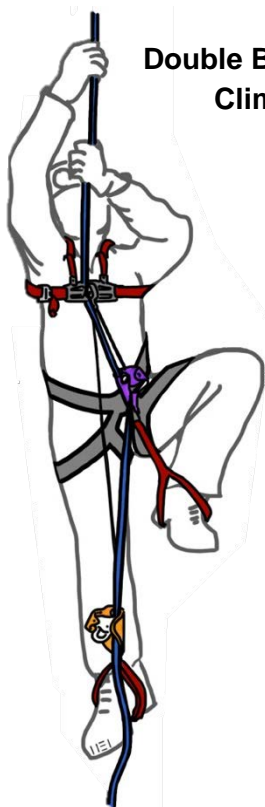
Practice – good technique and familiarity are essential for your overall efficiency and for your ability to safely and effectively help others. Even very experienced cavers benefit from regular practice of skills such as changeovers that they don't frequently use during "normal" cave trips.

If you need help with your vertical system, we recommend that you take a basic vertical course through your grotto, agency, or VTC. *If you have any questions about your system or your preparation for your NCRC seminar, please contact an instructor or regional coordinator.*

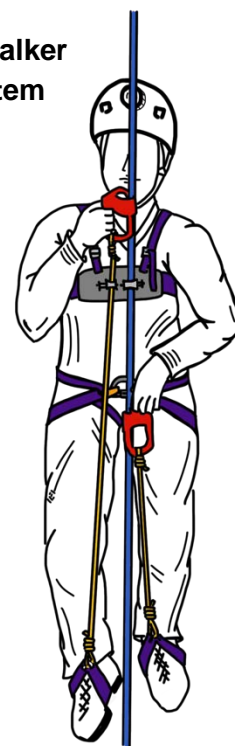
<b>System</b>	<b>Strengths</b>	<b>Weaknesses</b>
<b>Frog</b>	Versatile Efficient for passing knots and rebelay Quick to get on/off rope Quick to don/doff	Comparatively slow on long pitches Requires some upper body endurance Difficult for some body types
<b>Texas</b>	Versatile Simple, compact, lightweight Great on slopes and work positioning Efficient for passing knots Quick to get on/off rope Quick to don/doff	Climber could invert since there is no chest ascender Less efficient than Frog Strong upper body endurance if it's a free hanging drop
<b>Ropewalker/ Mitchell</b>	Faster for ascending deep pits	Heavy and bulky Slow to don/doff Takes time to get on/off rope Difficult to pass knots, rebelay, etc. Difficult for people with a weaker knee



The Frog and the Texas are common sit-stand systems. In the context of expedition caving and alpine rigging, the optimal system is a Frog. It is versatile, familiar to many expedition cavers, and it is relatively compact and simple. It can also be efficient for passing obstacles such as knots and rebelay. The Texas system is similar to the Frog but uses shorter leg loops and requires a bit more upper-body strength. Both **MUST** have a tether from the ascender attached to the foot loop to the central connector of the seat harness. Many froggers use one footloop and employ a Pantin or similar foot ascender.



**Mitchell Ropewalker Climbing System**



The ropewalker and the Mitchell both use a motion like climbing stairs. The double-bungee ropewalker is commonly used on very deep pits and can be quick and efficient for covering a lot of distance. Both systems **MUST** have a tether from the lower foot ascender to the central connector of the seat harness, although this is not shown in these diagrams.

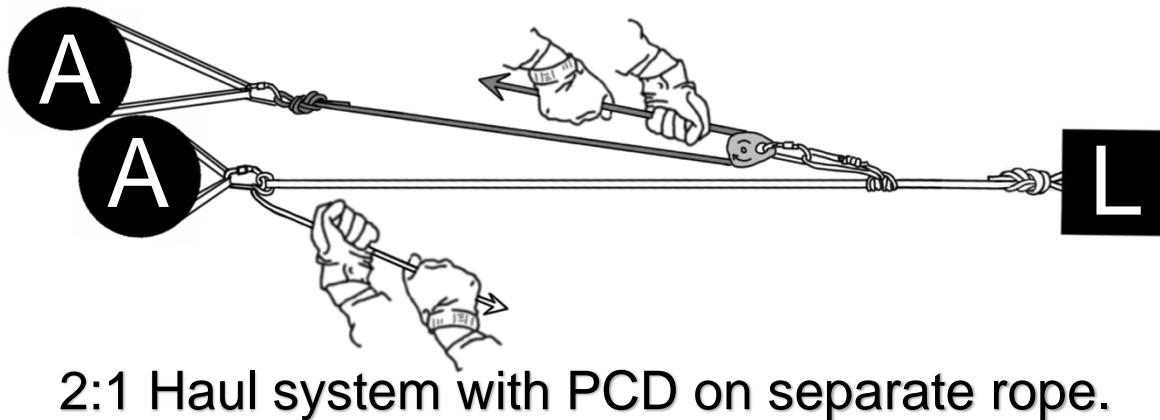
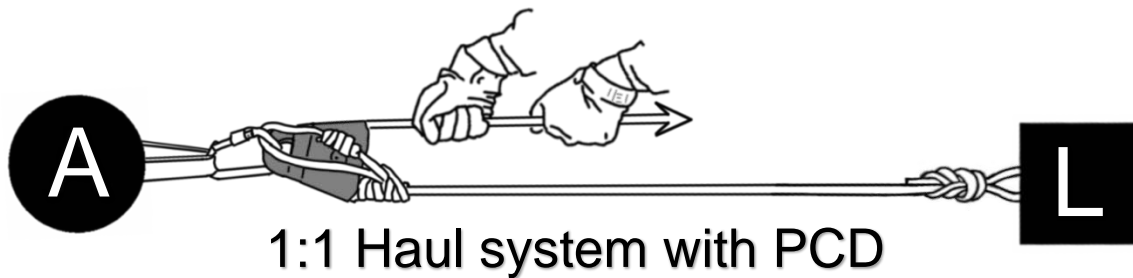
## NCRC Level 3 Entrance Skill Prep: Rigging Skills

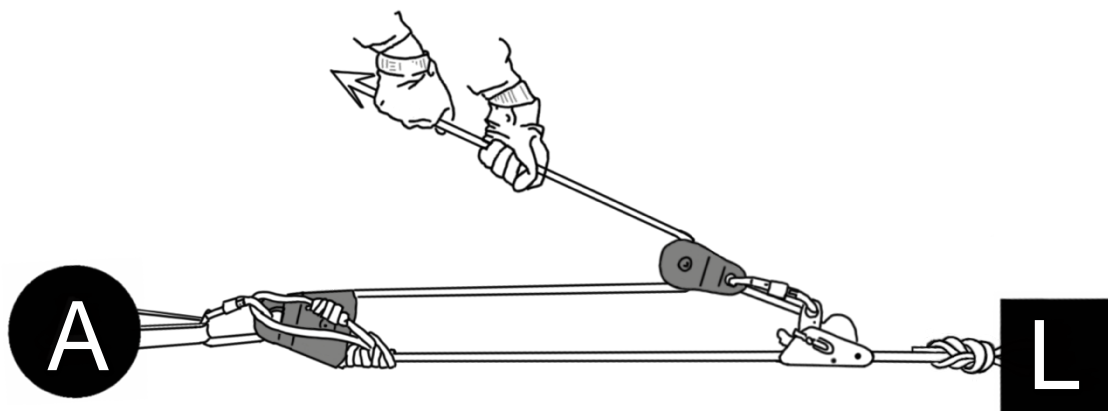
Each item will be evaluated with its specific criteria and with the general criteria for equipment, anchoring, knots and operation. Each component is evaluated for safety, effectiveness and efficiency, then scored.

**2-** Safe & Efficient. (If there are multiple criteria, all must be met to earn a 2)

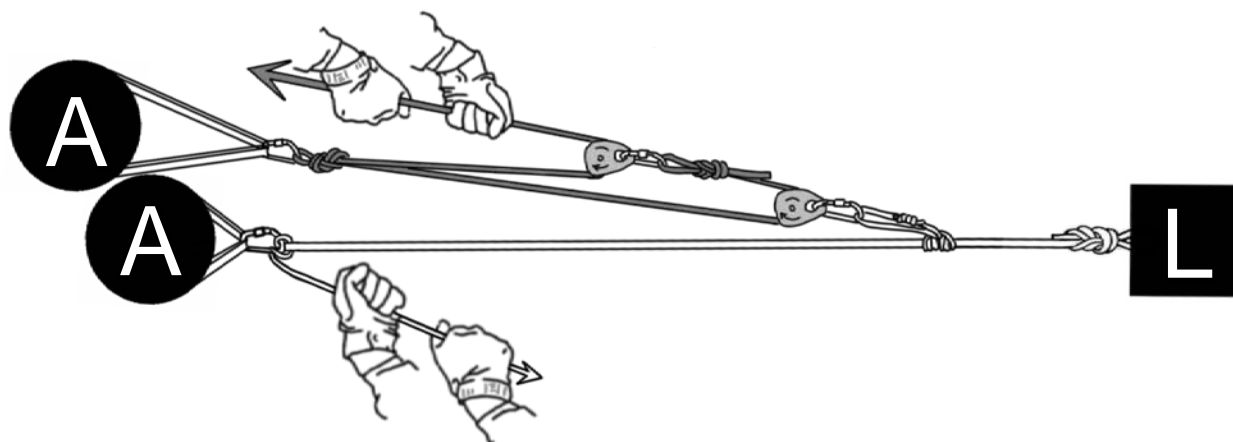
**1-** Safe & Functional. (some examples of inefficiency are listed, others may apply)

**0-** Unsafe or Not Functional – any zero represents a critical failure or safety problem. (If there are multiple criteria, any scores zero)





3:1 Z-Rig Haul system with PCD.



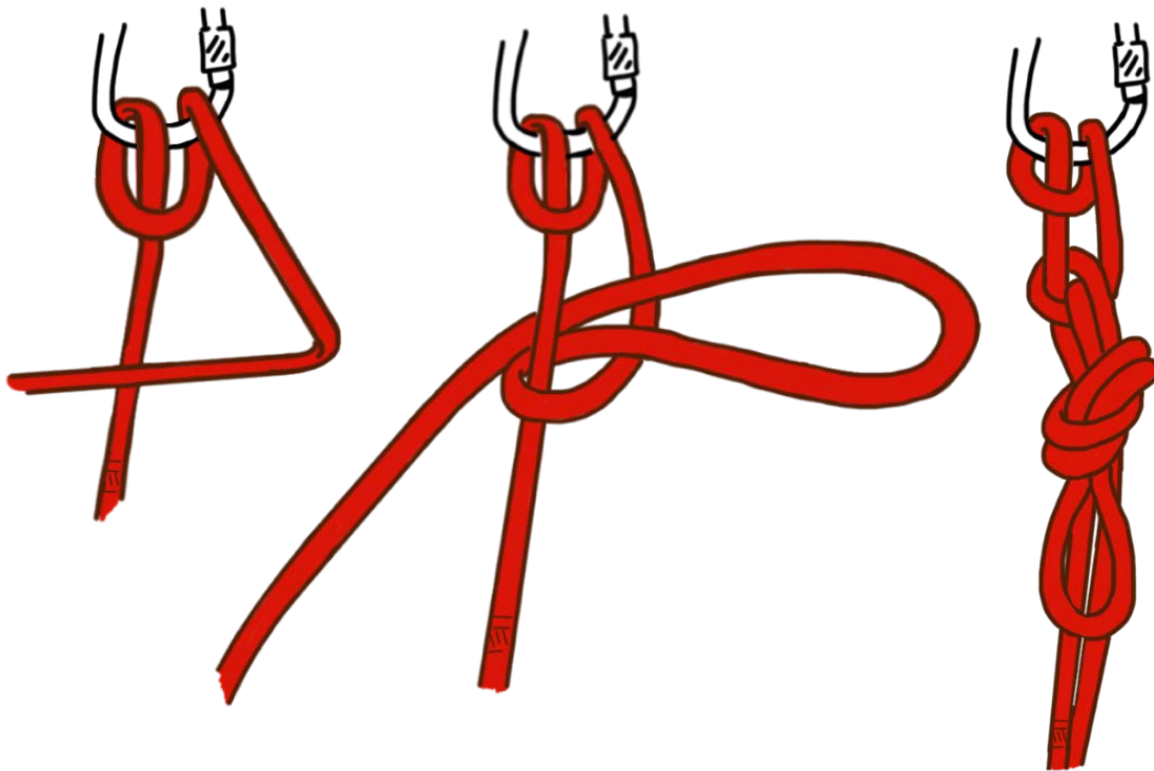
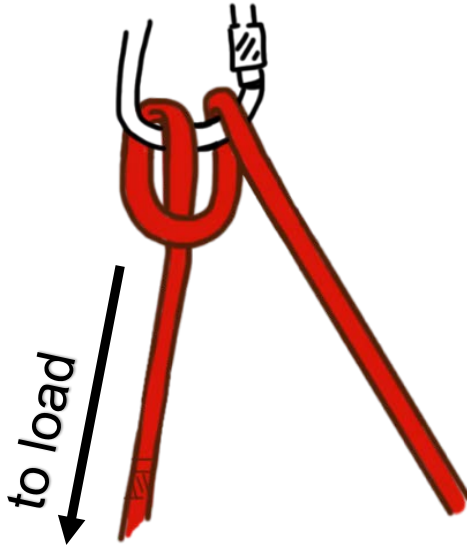
Compound 4:1 Haul system  
with PCD on separate rope

## Münter Operation-

Students may be asked to rig and operate a Münter to an anchor as well as demonstrate the ability to control a single person load while lowering or as a progress capture device (PCD).

Student should be able to:

- rig Münter to an anchor,
- demonstrate the ability to maintain control of the load,
- tie off the Münter while holding the load,
- untie and resume movement with control,
- use NCRC commands.



Tie off with  
a half hitch  
and an  
overhand.

Make as  
compact  
as  
possible.