Simple Anchors Made From Rope

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Introduction:

There are many "right" ways to rig an anchor, and for most applications many different anchors will be more than adequate. Unfortunately, when we learn anchor construction, we often learn anchors by rote memory, rather than learning how to rig based on math, physics, and a mastery of knot craft. As such, most of us are not familiar with some incredibly useful modifications to common anchors that could be helpful, depending on the situation a rigger faces.

This guide is designed to teach rope users, at all levels, some simple single point anchors, and how they can be modified for different uses (as in, modify them to have some helpful properties in a pinch). As such, this guide is not designed to show ALL the ways of building simple rope anchors, but many useful ways of building some simple anchors. Many of these anchors have some great properties that may be needed depending on the geometry and conditions you experience while rigging.

Only single point anchors built from rope are discussed here due to their simplicity, common use, and to limit the amount of information covered. I assume that a rigger will chose to make a single point anchor if there is a single strong enough anchor point available (natural or human made), and will not bother building a multipoint anchor when unnecessary. Obviously, in many circumstances these single point anchors would not be appropriate. Use them when they are a good solution for the problem you face.

Additionally, all examples will demonstrate how to apply these rigging methods to effect simple rescues or training exercises. This was done so readers could learn to tie these anchors and develop some teaching and rescue skills as well.

Knot Families Used:

All anchors presented here are based on four simple knots; the High Strength Tie-Off (HST), Bowline, Figure 8, and Sheet Bend, though occasionally pictures will show rigging modifications for overhand and Figure 9 knots as well. Each knot has its strengths and weaknesses, so the rigger should pick the knot they wish to tie with the properties needed. Similarly, modifications to one knot can be applied to most of the others, and each modification gives the new modified knots unique properties. Riggers are encouraged to pick the properties needed and use the appropriate modification on the knot they chose to rig with. The variations explored include modifications to knot tails, tying knots with an extra loop, finishing knots with bights to form rigging loops, finishing knots with two half hitches to form rigging loops, modifying double loop knots, and tying the knots with doubled rope in a bight.

Organization:

First the basic rope anchors are shown and their strengths and weaknesses are discussed. Then there is a description of ways to modify anchors. After each section a summary table is provided to facilitate comparisons between knots and modifications. Use the knot and modification that is useful for you given the rigging situation.

Unmodified Anchors:

Anchors are discussed in the following order: High Strength Tie-Offs, Bowlines, Figure 8's, and Sheet Bends. This pattern is followed throughout the text.

High Strength Tie-Off (HST):

How to Tie - Wrap a rope around an object (e.g., tree, big in place rock etc.) as many times as needed to prevent the rope tail from experiencing force when the rope is loaded (as in the tail should be slightly slack, and the rope should not slip around the object when weighted). Secure the tail of the rope with a knot or knot and carabiner (Figure 1). Often you will only need 2 or 3 wraps, while 4 wraps works for nearly everything. For some exceptionally slick objects and stiff rope, more wraps may be necessary. Objects used as an anchor should not have sharp edges, or alternatively pad sharp edges so the rope is not harmed or abraded.

Style Points - When wrapping the rope around the object, keep the rope tight against itself with all strands parallel and not crossing, so it looks clean and well dressed. This also makes it easier to check if it is rigged correctly. Wrapping the tail above the standing line and removing extra slack makes a final product where the wraps and tail are held in place by gravity, so the HST looks nicer even after extensive use (Figure 2a, b). If rigging to a tree, it is nice to pad the tree to protect it from abrasion, and the rope from damage (e.g., tree sap, bark abrasion, Figures 1, 2, and 4).

Figure 1: A simple HST

Figure 2: A) An HST wrapped upward, looks clean and dressed, **B)** An HST wrapped downward, sags and can slowly slip down the anchor, **C)** HST around a padded tree; this HST required just over 7.6 m (25 ft) of rope for a ~0.6m (~2 ft) diameter tree.

Pros - If tied correctly, this anchor maintains the full strength of the rope, making the high strength tie off preferable for high potential force applications (e.g., highline rigging, etc.). In addition, if you need to lower a load, releasing the rope and slowly lowering with the remaining tail is possible. If additional rope length is needed, tying ropes together works well because knots will slowly move around the anchor object during the lower.

Cons - HSTs can require a large amount of rope (e.g., when tying around a large tree), which can be a serious problem when rope economy is paramount (Figure 2c). HSTs also induce a rotational motion to the objects they are tied to (Figure 3). So HSTs are not a good choice for anchors that can unscrew (e.g., some metal railings, ice screws, etc.), or that may roll out of place (e.g., big brothers, stemples). It is also difficult to use the extra rope in the tail of the HST for rigging. This means that if you have extra rope not used in the rigging or if you want to alter the rigging for any reason, it is difficult to do so. This is rarely an issue, but can be a problem during a complex rescue, when rope economy is paramount, or during a small party rescue.

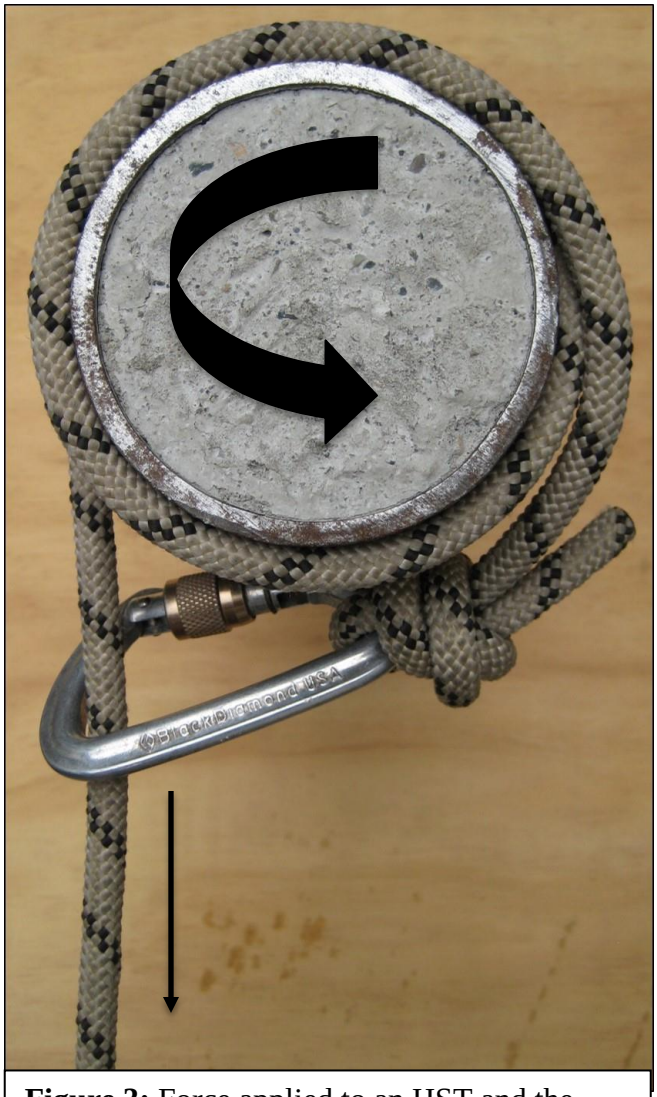
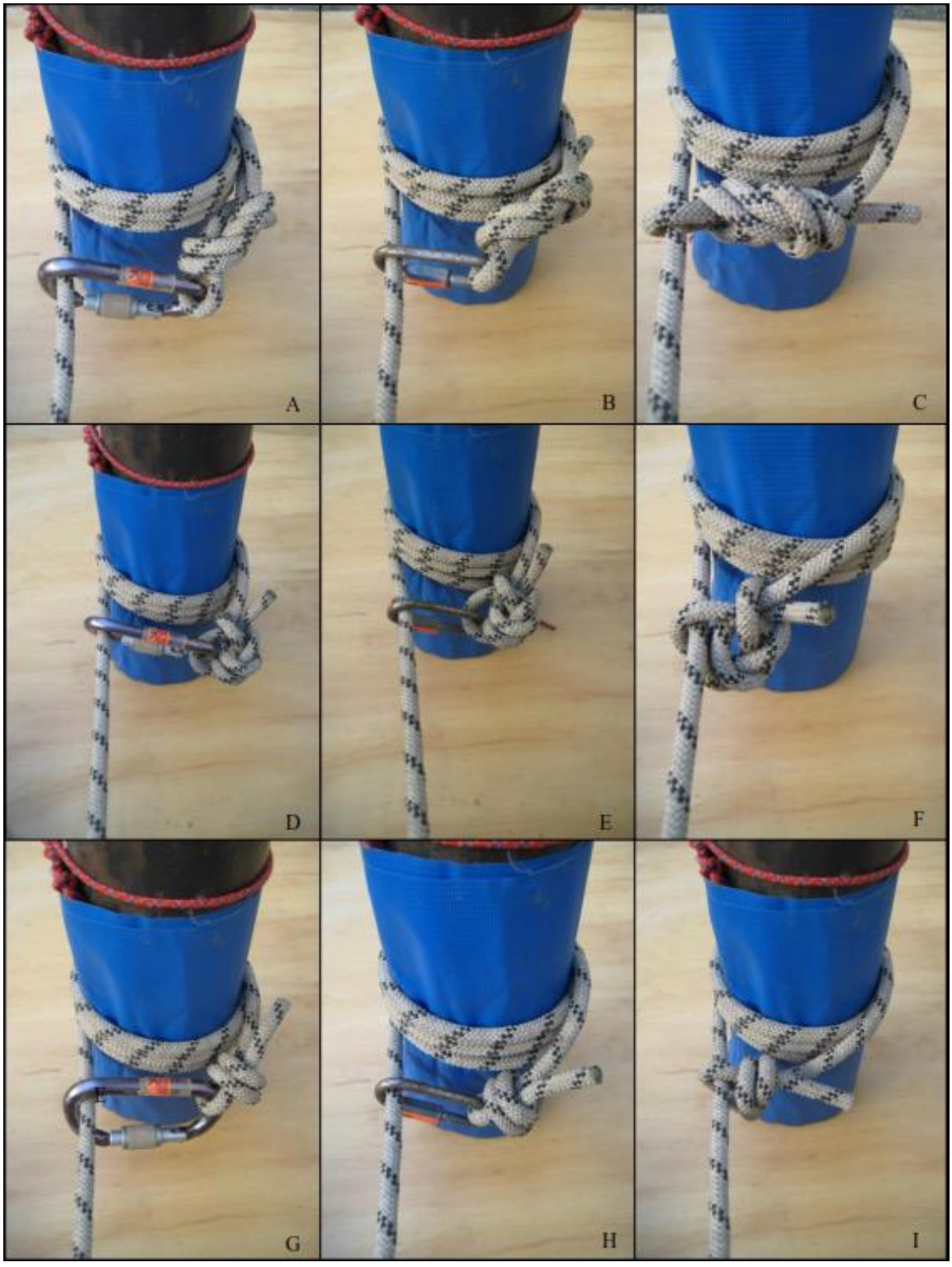


Figure 3: Force applied to an HST and the resulting force on the anchor.

When to Use - HSTs are primarily used when a simple anchor is needed and the rigging is not expected to change, or when the full strength of the rope is needed. For example, when practicing ascending or jugging or when high stresses on the rope could occur, as with the construction and use of some highlines.

Variations - Figure 4 shows a variety of methods to secure the tail of an HST, including a figure 8 follow-through, bowline, slip barrel knot (scaffold knot), and all three of these knots with a carabiner or screw link. Obviously there are other variants (e.g., clove hitches, overhand knots, etc.); these knots were shown as common examples of knot and connector options and are not meant to show all possible variations.

Figure 4: Representative varieties of HST tie off methods. Top row depicts variations of the figure 8 knot tie off with a carabiner (**A**), screw link (**B**), and tied off with a figure 8 follow through (**C**). The middle row shows variations of the bowline tie off with a carabiner (**D**), screw link (**E**), and tied off with a bowline around the standing line (**F**). The bottom row shows variations of the barrel/scaffold knot tie off with a carabiner (**G**), a screw link (**H**), and tied off directly to the mainline (**I**). There are many permutations varying the knot, the kind of connector (carabiner, screw link, or tied directly to the rope), only some of which are depicted.


A
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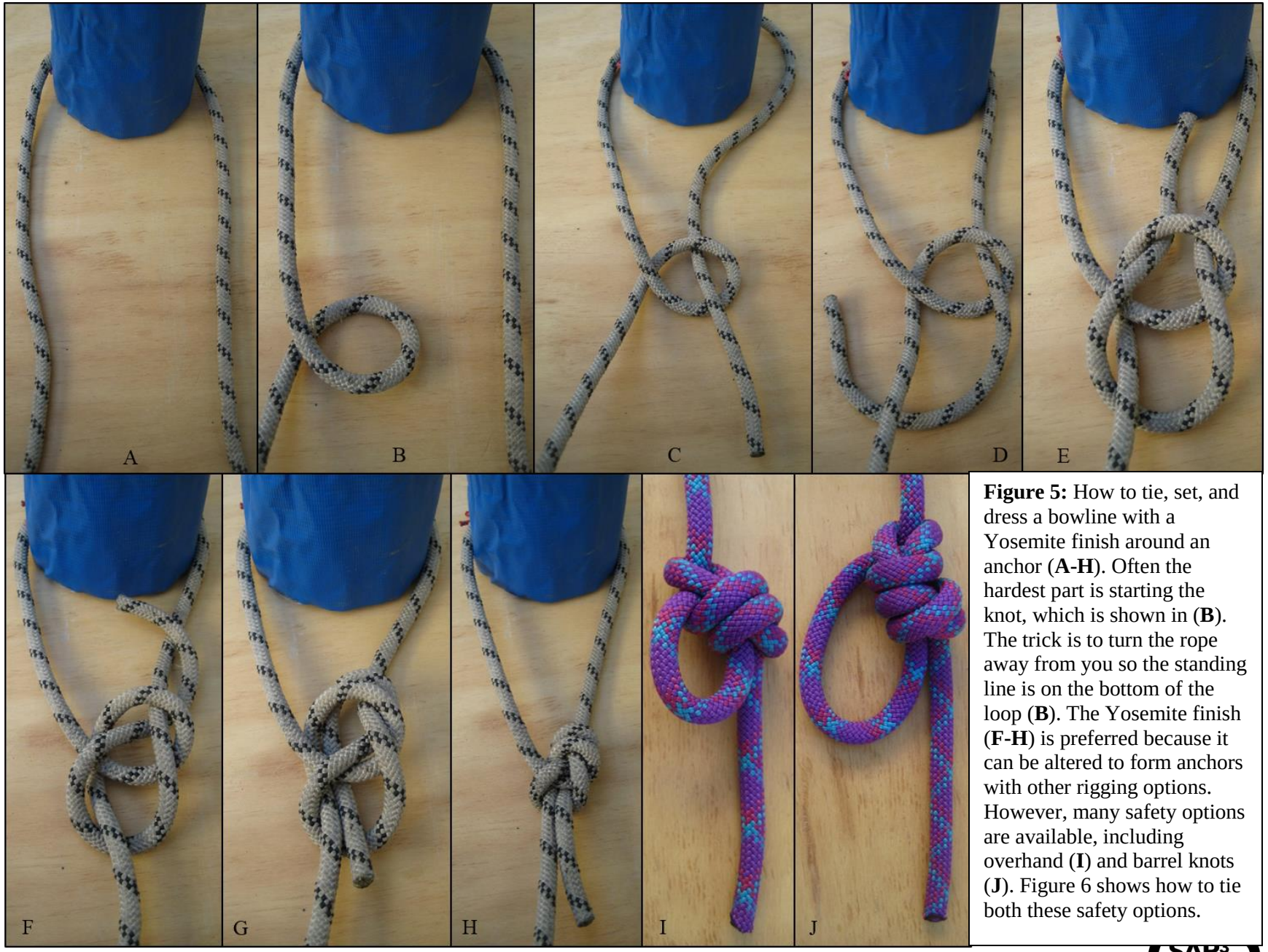


Figure 5: How to tie, set, and dress a bowline with a Yosemite finish around an anchor (**A-H**). Often the hardest part is starting the knot, which is shown in (**B**). The trick is to turn the rope away from you so the standing line is on the bottom of the loop (**B**). The Yosemite finish (**F-H**) is preferred because it can be altered to form anchors with other rigging options. However, many safety options are available, including overhand (**I**) and barrel knots (**J**). Figure 6 shows how to tie both these safety options.

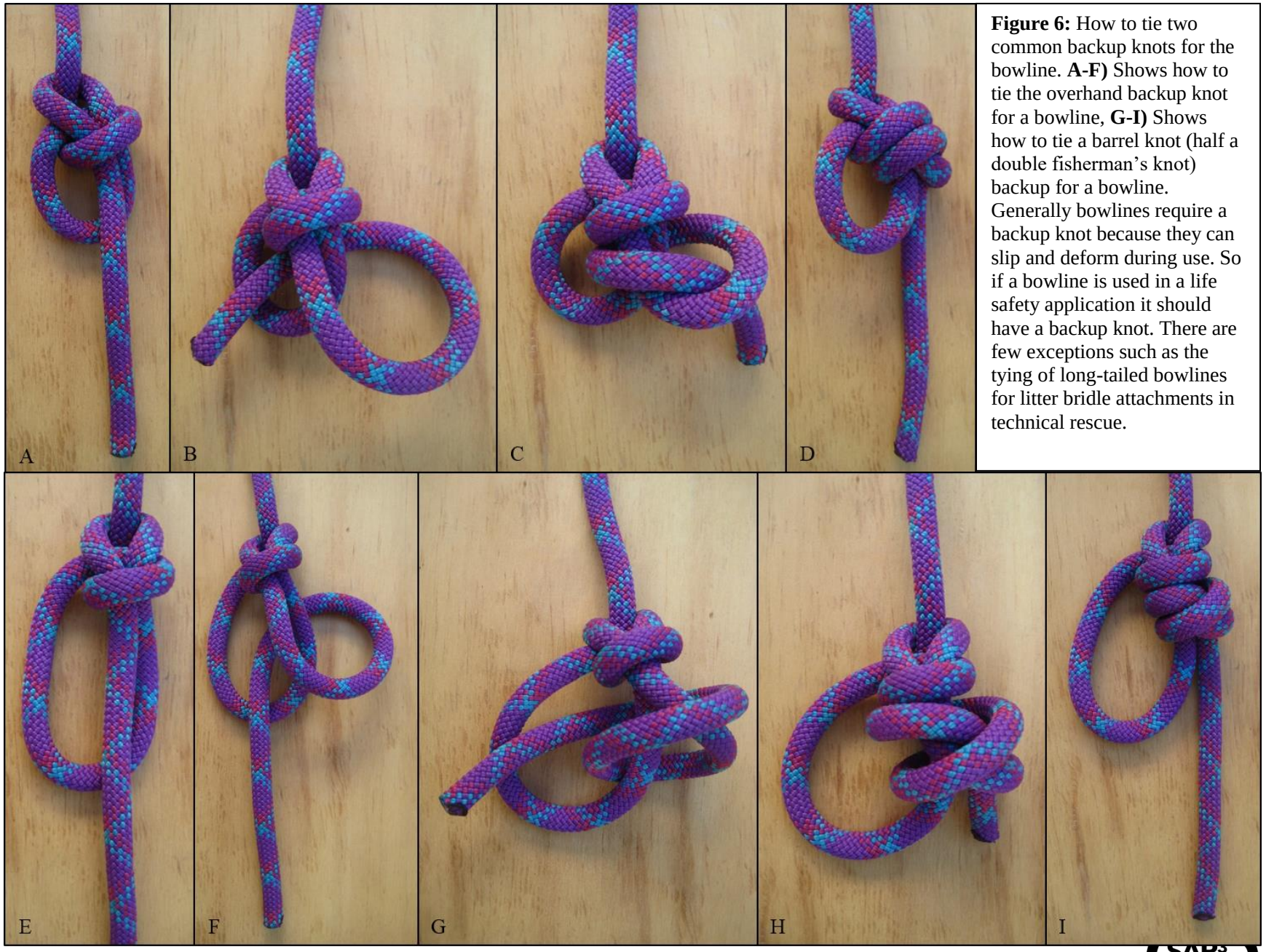


Figure 6: How to tie two common backup knots for the bowline. **A-F)** Shows how to tie the overhand backup knot for a bowline, **G-I)** Shows how to tie a barrel knot (half a double fisherman's knot) backup for a bowline. Generally bowlines require a backup knot because they can slip and deform during use. So if a bowline is used in a life safety application it should have a backup knot. There are few exceptions such as the tying of long-tailed bowlines for litter bridle attachments in technical rescue.

Bowline:
How to Tie - Figure 5 shows how to tie, dress, and set a bowline with a Yosemite finish, and Figure 6 shows two other common varieties of backup to prevent the bowline from slipping out during use (overhand and barrel knots). For the rest of this document we will use the Yosemite finish because it can be modified more readily for other uses.
Pros - This anchor is exceptionally fast to tie and does not use much rope compared to the other knot types (Evans 2015). The speed with which this anchor can be tied is its chief benefit, though bowlines are also simple and easy to tie and inspect.
Cons - All knots reduce the strength of the rope, and bowlines are no exception (on average they are slightly weaker than Figure 8's [Evans and Truebe 2016, McKently, 2014; Richards, 2004; Vines and Hudson, 2004]). However, life safety ropes, even when tied with bowlines, have more than enough strength for the vast majority of applications. Additionally, the rope may be damaged if the object around which the knot is tied is sharp, abrasive, dirty, etc. So this anchor is harder on rope than when using an anchor interface like webbing. Bowlines are less secure than figure 8 knots, so this is one knot that does require a backup. Fortunately, the Yosemite backup can be used for other rigging purposes. Lastly, the rope cannot be rerigged for other purposes during use. This is a large drawback, because it is sometimes necessary, or at least useful, to modify rigging during use. Tying the rope directly to the anchor prevents this flexibility.
When to Use - This anchor is amazing when a fast anchor is needed for a single fixed line and the object it is tied around will not damage the rope. An excellent example is if you need to access a patient quickly via a rappel or set up an additional edge attendant line. This anchor would be an excellent choice for installing a patient access line when responding to a rescue (the anchor needs to be fast so you can access a patient quickly and provide medical care).
Variations - Bowlines can be tied off with overhand knots, barrel knots, or a Yosemite finish (Figures 5 & 6). The Yosemite finish can be modified more readily than other variations.

Figure 8 Follow Through:
How to Tie - Tie a figure 8 knot in a rope, then wrap the tail around the object to be anchored to. Using the rope tail, follow through the original figure 8, starting where the tail left the knot. Dress, set, and inspect, ensuring the knot internal angle is as small as desired (Figure 7).
Pros - This anchor is relatively quick, simple, easy to tie and inspect, and uses little rope. It is also slightly stronger than a bowline (Evans and Truebe 2016, McKently, 2014; Richards, 2004; Vines and Hudson, 2004), though this strength advantage is rarely practically useful.
Cons - Slower than a bowline. Knots reduce rope strength; however, life safety ropes are sufficiently strong that this is usually not an issue. Additionally, the rope may be damaged if the object around which the knot is tied is sharp, abrasive, dirty, etc. So this anchor is harder on rope than when using an anchor interface like webbing. Lastly, the rope cannot be rerigged for other purposes during use. This is a large drawback, because it is sometimes necessary, or at least useful, to modify rigging during use. Tying the rope to the anchor prevents this flexibility.
When to Use - A single fixed standing line is needed, no rigging loop is needed, and the object it is tied around will not damage the rope.
Variations - If the Figure 8 Follow Through is tied in the middle of the rope, then the two tails of the rope can both be used as standing lines. While this knot would be slow to tie, and there are faster rigging alternatives (see discussion below), this is a variation that will work.

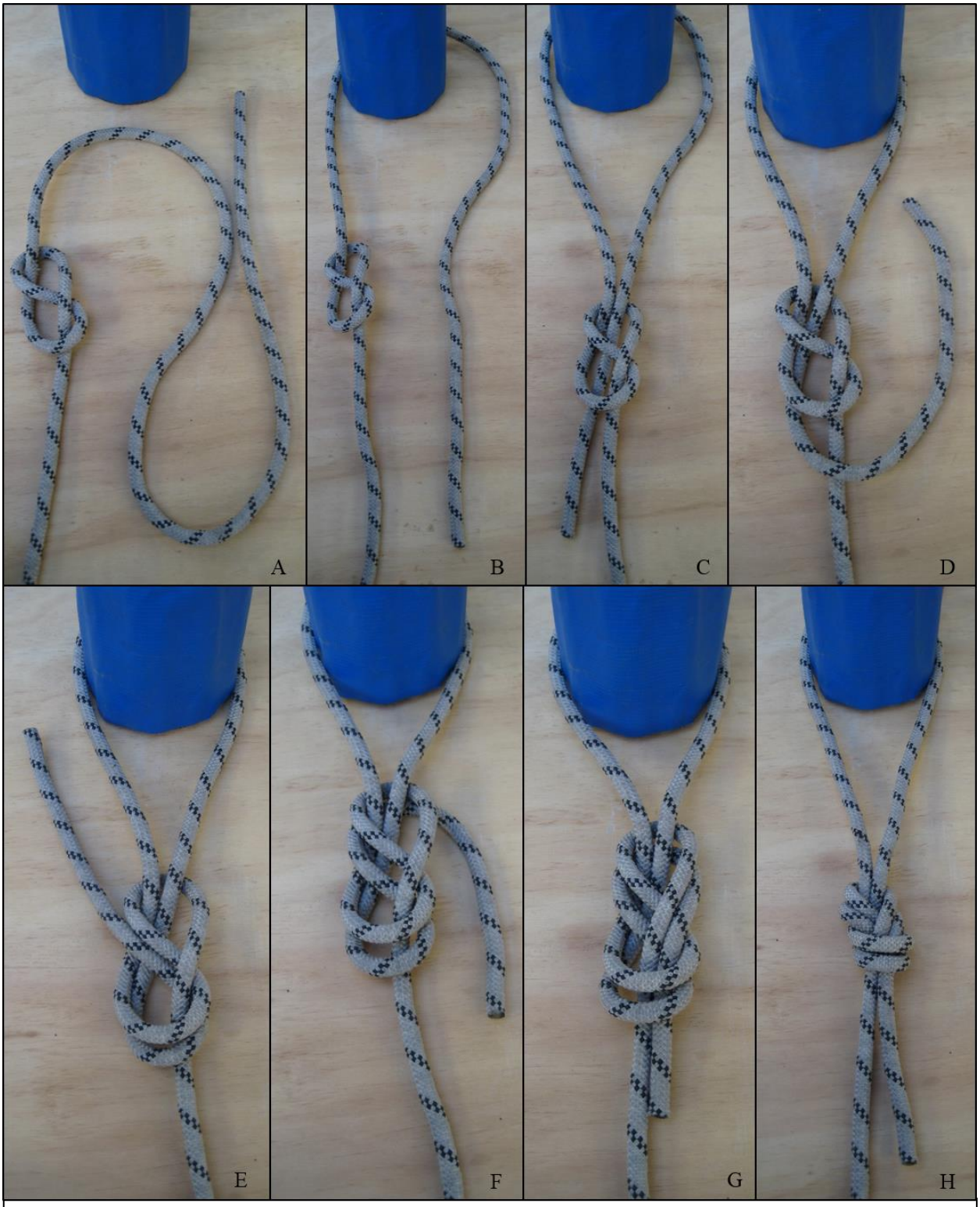


Figure 7: Tying the Figure 8 Follow Through anchor. Tie a figure 8 in the rope (**A**) and wrap the rope around the anchor (**B**). Tie a figure 8 follow through starting where the rope left the figure 8 toward the anchor (**C-G**). Adjust the rope so the remaining tail is not too long, the anchor internal angle is narrow enough, then dress, set, and safety check.

Sheet Bend:

Note: Some riggers are concerned with using the sheet bend. It should be noted that the sheet bend and double sheet bend are identical to the bowline and double bowline (Figure 8). So if the bowline is an acceptable rigging knot, then so are sheet bends. However, like the bowline, sheet bends also require safety knots to ensure security of the bend.

Figure 8: Comparison of bowlines and sheet bends; they are the same series of rope turns.

Figure 9: How to tie a sheet bend anchor. Wrap the rope around the anchor (**A, B**), form a bight in the rope (**C**), then tie a sheet bend with the tail (**D-F**). If desired, add a second wrap to form a double sheet bend (**G**). Dress and set (**H**), then tie a safety knot using the sheet bend tail (**I**, an overhand knot tied around the rope is shown, any backup knot will do-barrel, overhand). Use the anchor for rigging (**J**). Note: This anchor is multidirectional.

How to Tie- Wrap the rope around the object to be anchored to. Make a bight and tie a double sheet bend with a safety knot. Ensure the remaining standing line comes off the bend parallel to the rope strand entering the knot with it, which will prevent the bend from collapsing (Figure 9).
Pros - This anchor is multidirectional, which can be useful if the load may move in different directions. The amount of rope used is minimal (same amount as a bowline, less than a figure 8 knot), and the tail can be used for a variety of rigging functions (Ryan Stallings 2015a, b).

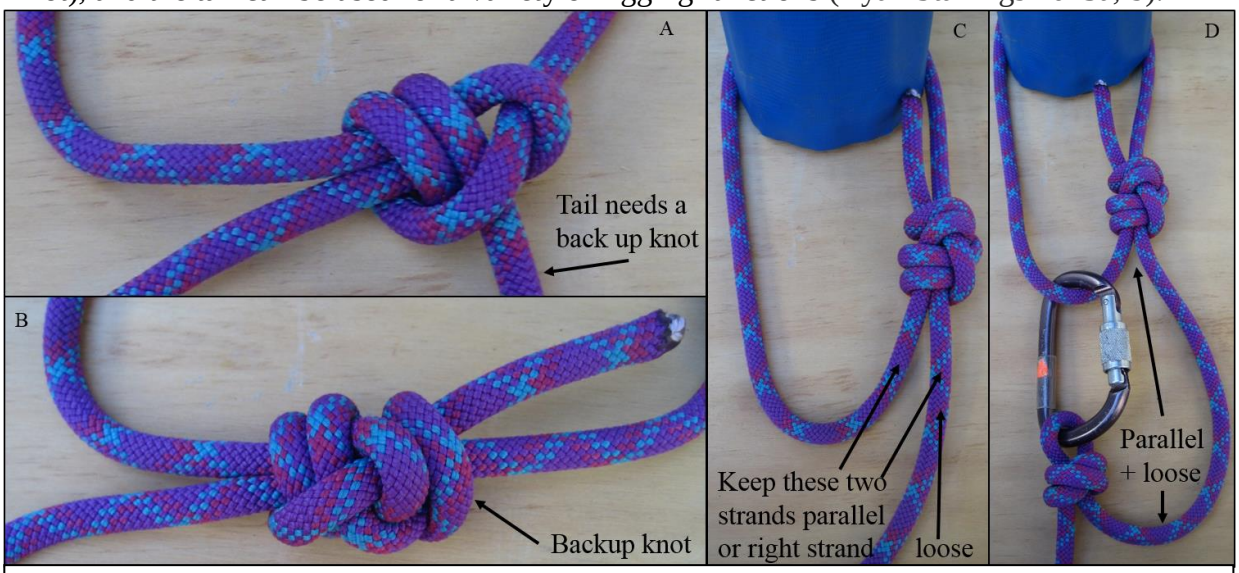


Figure 10: A) The sheet bend tail that needs a back up knot, **B)** Sheet bend with an overhand backup knot, **C)** The two strands that should be parallel and the strand that should be loose, **D)** A rigging example that keeps the two strands parallel and one strand loose, keeping the sheet bend intact.

Cons - Unfortunately one side of the sheet bend is not secure and requires a safety knot (Figure 10) or a Yosemite tie off (Ryan Stallings 2015a, b, sarisentropy 2014), so this end must be kept either slack or parallel to the rope strand it lays parallel to in the knot. This is also a knot that many riggers do not know, or cannot safety check quickly, which may cause problems during safety inspections. The tail having restrictions on what it can and cannot do, is a problem, but this can be overcome by someone who understands the weaknesses and strengths of this anchor.
When to Use - This is an effective anchor when a multidirectional anchor is needed, or an anchor that multiple things will be connected to, and equipment is at a minimum. This is a great anchor for making fixed break lowers when rope is limited for small party rescues (Figure 11), or for rigging a multidirectional standing line with minimal equipment (Figure 10d). This anchor is similar to the rigging bowline or rigging figure 8 (discussed below), except that it produces a multidirectional anchor. So consider this a better option for when loads can move side to side easily, or you forget how to tie a loop bowline, rigging bowline or rigging figure 8.
Variations - The same anchor can be built with the figure 8 bend (Figure 12a), however it does require feeding a lot of rope through the anchor knot, so it is considerably slower

Figure 11: Multidirectional anchor and fixed brake

Figure 12: Anchors similar to the sheet bend anchor tied with a follow through figure 8 (**A**) and a double fisherman's knot (**B**). These two variations are less user friendly.

Figure 13: Sheet bend anchors modified with two butterfly knots (**A**) and a Spanish Bowline (**B**). These knots create two rigging points.

than the sheet bend variety, though easier to safety check. Similarly, the anchor can be tied with a double fisherman's bend (Figure 12b), but this requires pulling quite a bit of rope through half the double fisherman's knot, and the hitch could be tied incorrectly. So both the figure 8 and double fisherman's variations are difficult for most rigging scenarios. This anchor can be modified by putting butterfly knots in the anchor to form the knot version of a rigging plate (Figure 13a). Similarly, a Spanish Bowline could be used as well, but this is a more difficult knot to remember and the two loops are no longer independent (Figure 13b). Having rigging loops can make rigging easier, but could contribute to overloading the anchor if too many things are clipped into one anchor. Lastly, the bend can be formed using a figure eight becket bend (Rhodes 2014:44-45). This variation is not shown because it combines knots (figure 8 and becket bend), which makes the bend no longer simple, but it is mentioned for those interested in learning an additional rigging tool. Please see the original source to learn this variation.

Table 1: Strengths and weaknesses of each anchor knot/hitch family.

Knot Family	Pros	Cons
High Strength Tie Off	Anchor provides full rope strength Can lower through the anchor Tying ropes together is easy while loaded Passing a knot through the anchor is easy	Often requires a lot of rope Often slow to rig Induces rotational motion in anchor Any extra rope is hard to rig with
Bowline (Yosemite Finish)	Exceptionally fast to tie Consumes little rope for construction Easy to inspect Strong enough for most applications The Yosemite backup is convenient for other rigging	Reduces rope strength Requires a backup knot Extra rope at the bottom of pitch Hard to rig with extra rope if needed Slightly weaker than the Figure 8
Figure 8 Follow Through	Fast to tie but slower than the bowline Uses little rope but more than a bowline or sheet bend Easy to inspect Strong enough for most applications Slightly stronger than a bowline	Reduces rope strength (stronger than a bowline) Much slower to rig than a bowline or sheet bend Extra rope at bottom of pitch and hard to rig with if needed
Sheet Bend	Exceptionally fast to tie Uses as much rope as the bowline (less than figure 8) Makes a multidirectional anchor Multiple things can be clipped in to the anchor Excellent for loads that move side to side	Reduces rope strength Requires a backup knot One tail must be kept parallel to itself to prevent knot collapse Many riggers have a hard time inspecting sheet bends Requires a more advanced rigger to use safely

Figure 14: Knot tail modifications, **A)** Bowline, **B)** Figure 8, and **C)** Scaffold knot.

Modifications:

Here we explore only a few knot modifications, those that have unique rigging properties. The modifications explored include changes to knot tails, tying knots with an extra loop, finishing knots with bights to form rigging loops, modifying knots using two half hitches, modifying double loop knots, and tying the knots with doubled rope on a bight. Each is discussed in turn.

Knot Tail Modifications:

Knots with tails, like the Bowline, Figure 8 Follow Through, and Sheet Bend, afford the rigger an opportunity: the tails can be used to tie additional knots. If a rigging point is needed, another loop knot can be tied, for example, another figure 8, bowline, or a slip barrel (scaffold knot). Figure 14 shows the bowline, figure 8 follow through, and sheet bend anchors tied with knots in their tails.

These tail modifications are not as rope efficient or as elegant as finishing knots with bights to form rigging loops (see next sub heading), however this modification is easy to remember. So if you forget how to tie rigging bowlines or figure 8's, tying knots in the tails is an adequate solution. This extra loop can be used as an anchor for personal tethers, hauls systems, lower systems, or any other rigging function.

It should be noted that the tail of a HST is used to secure the hitch, so are unavailable for rigging purposes (Figures 1-4). So this modification cannot be easily applied to HST anchors.

Tying Knots with an Extra Loop

Note: Knots tied with this modification are called "Eye _____". For example, an "Eye Bowline" or a "Eye Sheet Bend" facilitates rigging to the anchor and using the standing line simultaneously.

How to Tie - In effect this variation amounts to tying a loop knot with a long tail, then rethreading the tail through to form a second knot. There are variations for the bowline and sheet bends that are exceptionally useful. This same strategy used on knots likes the overhand, figure 8, and figure 9 knots yields "rigging" knots, so they are discussed in the next section. Two methods of tying both the eye bowline (Figures 15 and 16) and the eye sheet bend (Figures 17 and 18) are described. One method is useful for tying anchors around an object (Figures 15, 17, and 18), and the other for tying a double loop knot quickly (Figures 16 and 18). It should be noted that the rigging sheet bend (Figure 21) looks very similar to the Eye Sheet Bend, but they are different knots. Compare Figures 17 and 18 to Figures 21 to determine the differences.

Pros - Of all the knots that create two loops, this variation uses the least rope, is the fastest to tie (once you get the hang of it), and is significantly easier to set, dress, and safety than the others.

Cons - This method can be difficult to learn if you are not fond of the bowline or sheet bend, and this variation does require a backup knot. Fortunately the backup knot can sometimes be tied in advance, making this a smaller drawback.

When to Use - Exceptionally versatile, these loop knots can be used whenever a simple anchor is needed and an additional rigging loop is desirable. The bowline variety is probably more user friendly, while the sheet bend variety is faster to tie.

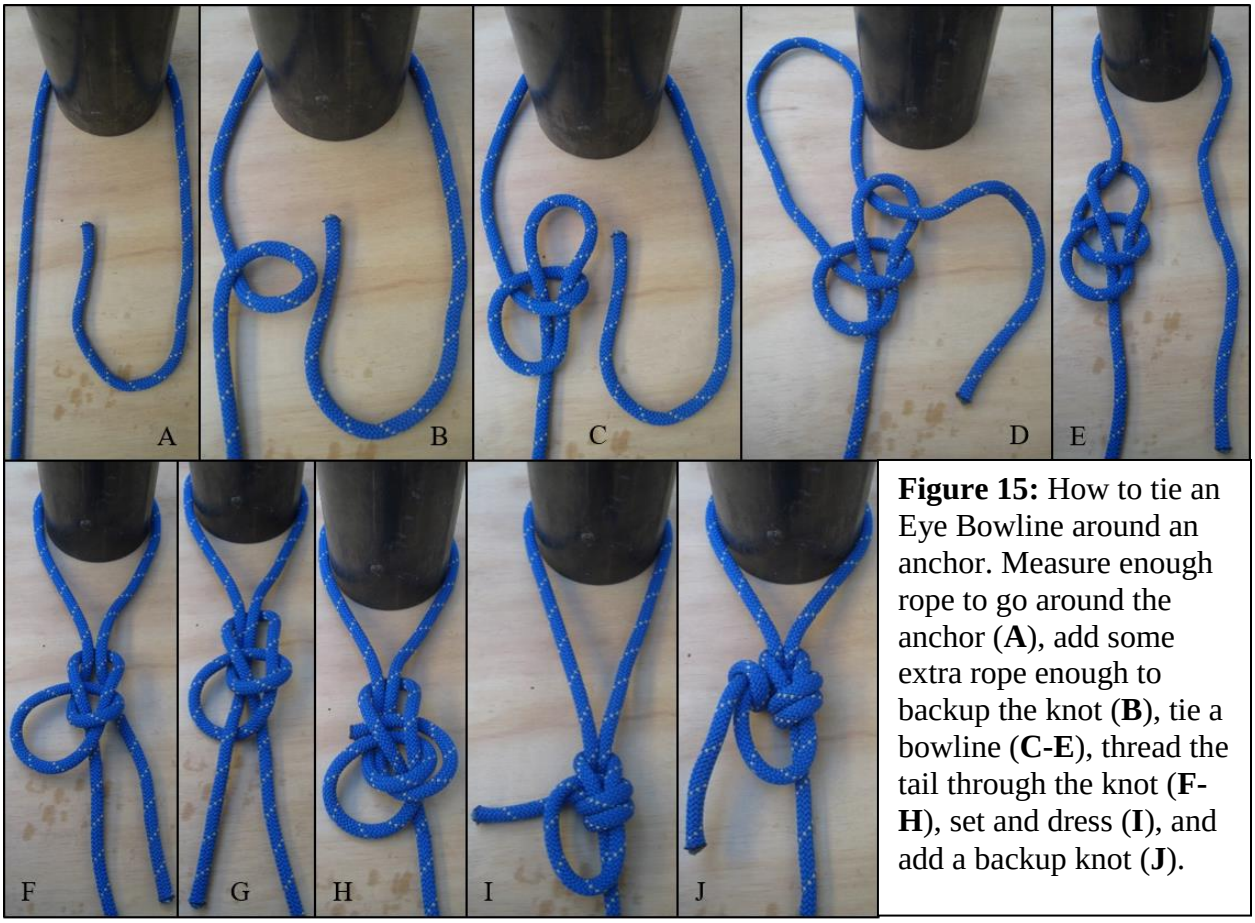


Figure 15: How to tie an Eye Bowline around an anchor. Measure enough rope to go around the anchor (**A**), add some extra rope enough to backup the knot (**B**), tie a bowline (**C-E**), thread the tail through the knot (**F-H**), set and dress (**I**), and add a backup knot (**J**).

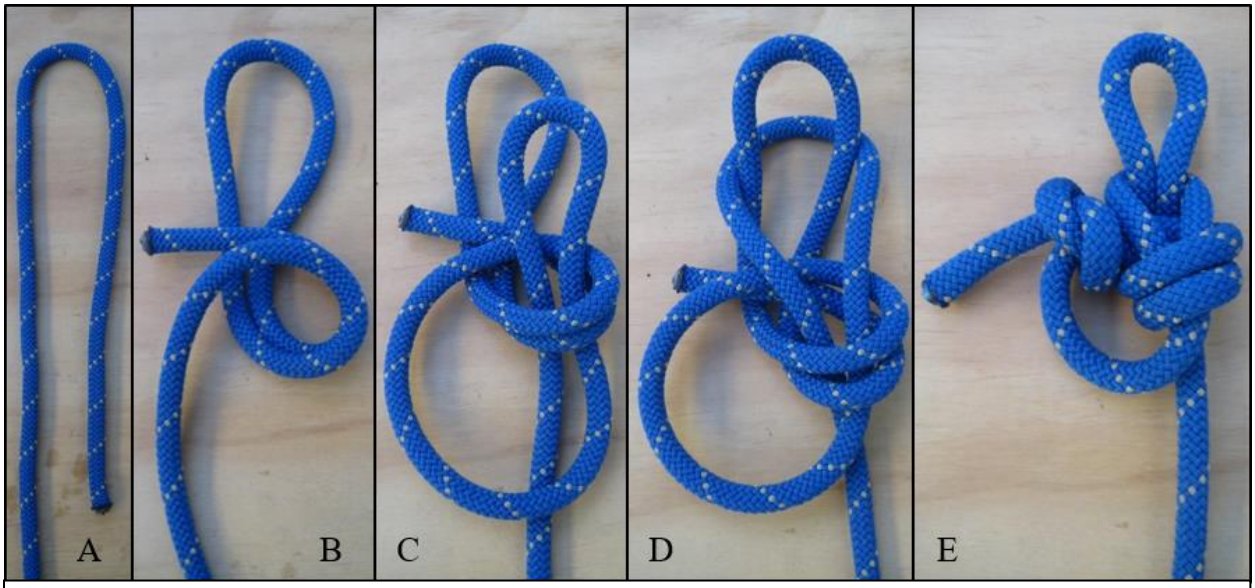


Figure 16: How to tie an Eye Bowline quickly for clipping in to a carabiner or other small connector. Make a bight of rope (**A**), put a loop in the bight-leave enough tail to tie a backup knot, (**B**), with the long tail pass a bight up through the loop (**C**), push the bight up and over the first bight created (**D**), set, dress, and tie a safety check the knot (**E**).

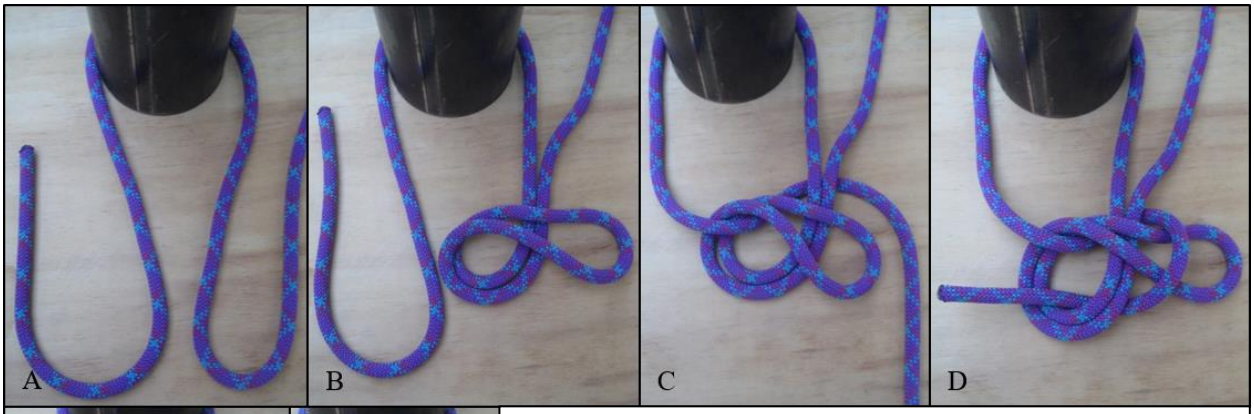


Figure 17: How to tie an Eye Sheet Bend around an anchor quickly. Pass the rope tail around the anchor with enough tail to tie a backup knot (**A**). Form a bight in the long end of the rope and make a loop in it (**B**). Pass the rope tail through the loop (**C**), around the bight, and back through the loop (**D**). Set and dress (**E**), and tie a backup knot (**F**). With a little practice this is fast and no rope is wasted.

Figure 18: How to tie an Eye Sheet Bend really quickly. With the tail of the rope, tie your chosen backup knot (e.g., overhand or barrel knots) as a slip knot (**A**). Wrap the rope around the anchor forming a bight (**A**). Wrap the bight over and under the slip knot loop (**B**). Finish the knot by passing the bight through the slip knot loop (**C**). Set and dress the knot (**D**). Setting will be rapid because the backup knot slips down to the sheet bend when the slip loop is pulled shut. This variation is exceptionally fast, creates a rigging loop pointing down the pitch, and makes it very difficult to incorrectly load the sheet bend pulling the knot apart.

Finishing Knots with Bights to Form Rigging Loops:

Note: Knots tied with this modification are called "Rigging _____". For example, a "Rigging Bowline" or a "Rigging Figure 8" facilitates rigging to the anchor and using the standing line simultaneously.

How to Tie - The bowline (Figure 19, Element Rescue 2015a,b, Rhodes 2014:35), figure 8 (Figure 20), and sheet bend (Figure 21) can be finished using bights of rope, rather than one end (see Figures 19-21 for visual directions). This modification creates anchors with two loops, one around the anchor, and a rigging loop that can be used for any function desired (personal tether attachment, haul or lower systems, etc.).

Pros - This modification is particularly versatile because it requires little extra rope (more than Eye knots), is fast to tie, set, dress, and inspect, and provides a rigging loop for a variety of uses.

Cons - Unfortunately some users find this modification hard to remember, and it does take up more rope, so cannot be used when rope is at a premium. Similarly, it takes longer to set and dress than simpler bowline/figure 8/sheet bend anchors.

When to Use - This anchor modification is amazing when a fast anchor is needed for a single fixed line and a rigging point is needed for further rigging options. This anchor is great for self and partner rescue scenarios where equipment is limited, and a raise or lower operation is taking place. A great use would be to make this anchor, and install a fixed break lower on the rigging loop, like a Münter or Remy Hitch or other equivalent device, and use the standing line to lower the patient (Figure 22a). Building a haul system using the rig point is also a possibility (Figure 22b), including techniques like the Spanish Pendulum (Figure 22c, d; Marbach and Tourte, 2002:288-291, 297; Petzl, Unknown Date; Unknown Author, Unknown Date).

Figure 22: Some uses of the rigging bowline**, A)** A Münter Hitch fixed brake lower, **B)** A 2:1 haul system with progress capture at the anchor with a redirect pulley (makes hauling easier), **C)** Installing the Spanish Pendulum, **D)** Spanish Pendulum with load on the prusik.

Figure 19: How to tie the rigging bowline. Start tying a bowline (**A, B**), then finish tying a bowline with a bight rather than the rope tail (**C-F**). Safety the knot with a Yosemite finish (**G-J**).The loop formed by the end of the Yosemite finish can be used for rigging (**K**). (See also Element Rescue 2015a,b)

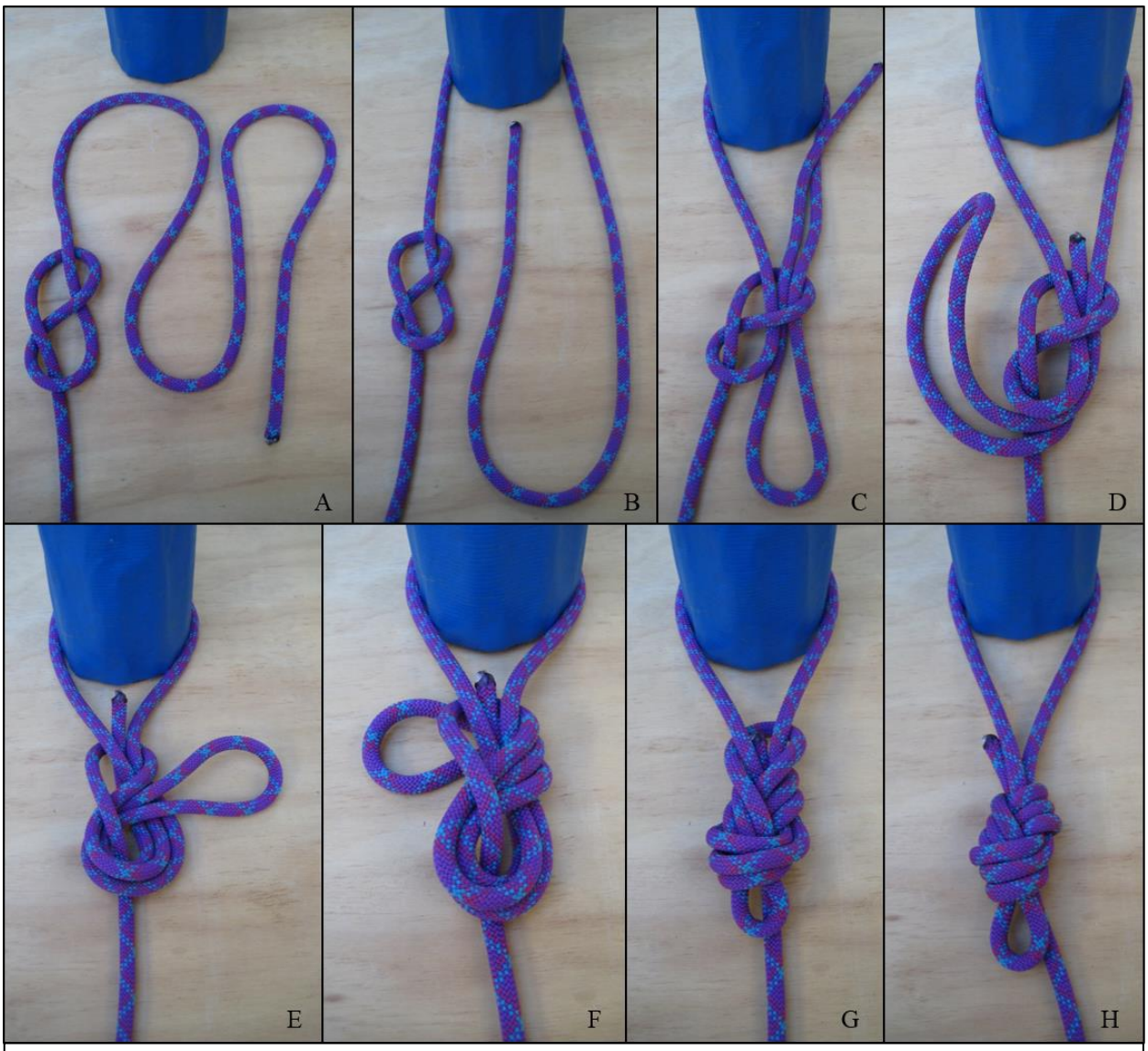


Figure 20: How to tie the rigging figure 8. Start tying a figure 8 in the rope (**A**), then wrap the rope around the anchor (**B**). Tie a figure 8 follow through using a bight of rope (**C**-**G**). The loop formed by the bight can be used for rigging.

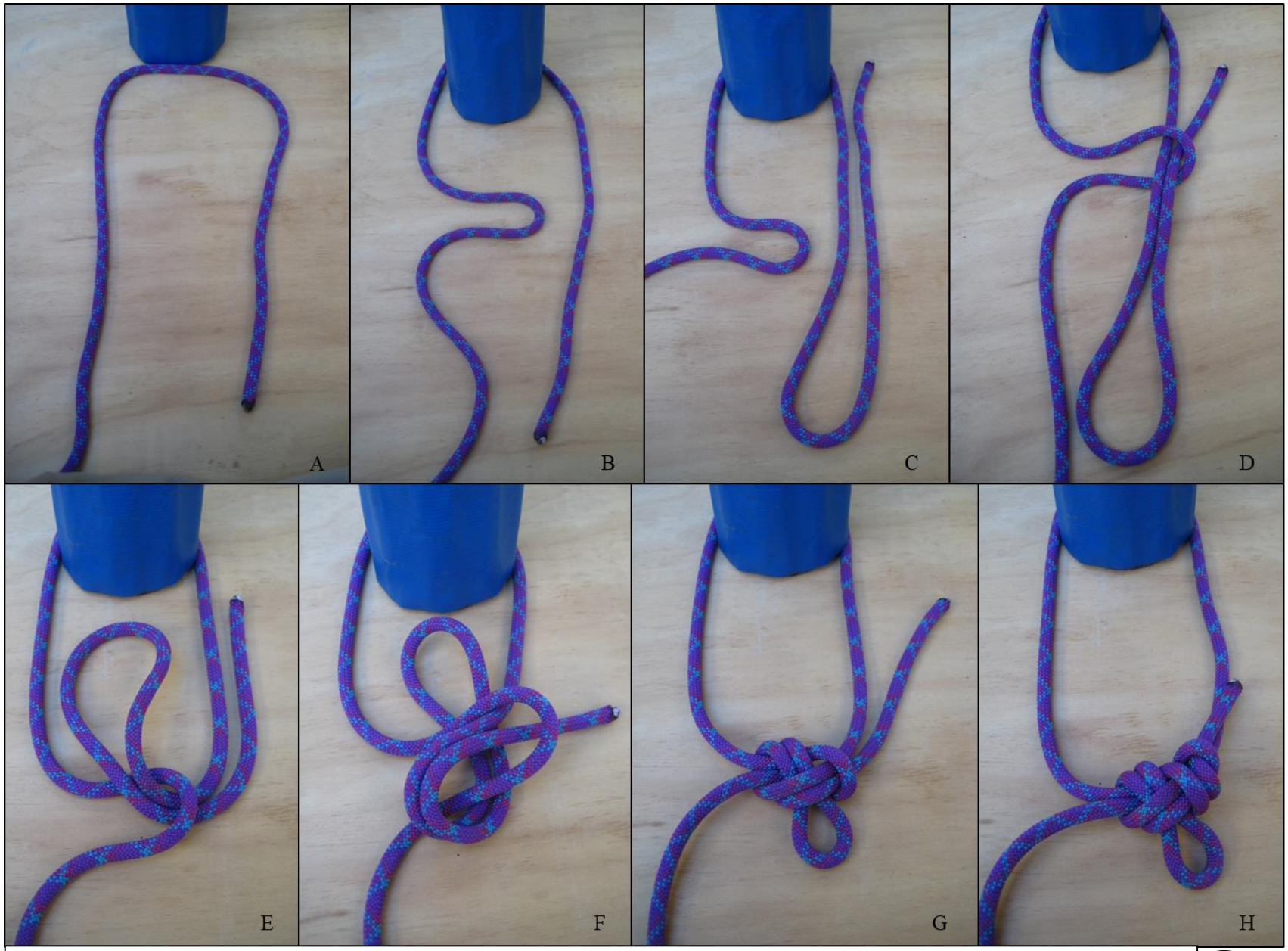


Figure 21: How to tie the rigging sheet bend. Wrap the rope around the anchor (**A**), form a bight in the rope (**B**) then tie a sheet bend with a second bight of rope (**C-G**). Add a safety knot in the free tail (**H**). The loop formed by the end of the sheet bend can be used for rigging (**G, H**). This knot can also be started tying the safety knot first, like Figure 18.

Variations - Many bowline varieties can be modified into a rigging bowline. For example, a Portuguese Bowline can be tied and finished with a bight, making a multipoint anchor, and a rigging point (Figure 23, Eric Campbell 2011). It is harder to modify the Sheet Bend and Figure 8 in a similar manner.

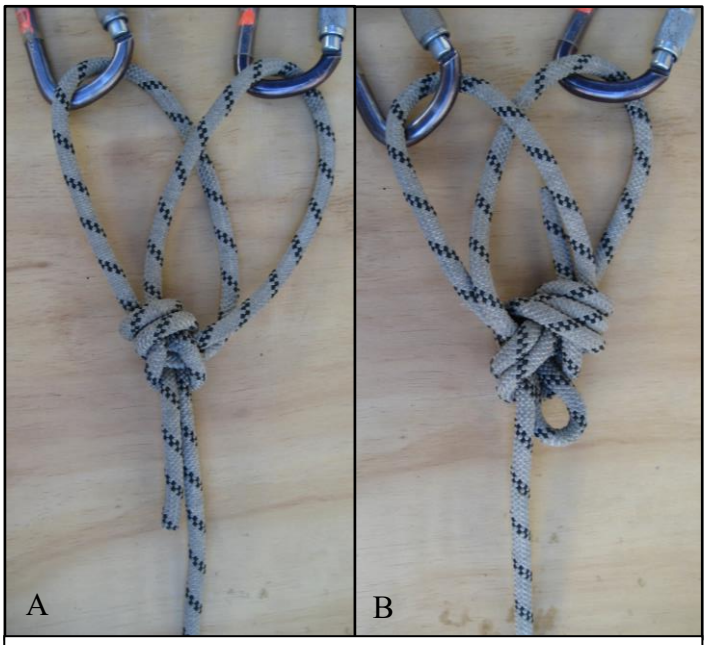


Figure 23: Modifying the Portuguese Bowline into a Rigging Portuguese Bowline. **A)** A Portuguese Bowline without modification, **B)** A Rigging Portuguese Bowline.

Knots Finished with Two Half Hitches:

Note: Knots tied with this modification are called "Gandalf _____". For example, a "Gandalf Bowline" or a "Gandalf Figure 8" facilitates rigging to the anchor and using the standing line simultaneously.

How to Tie - Start by tying whatever knot you wish to tie (e.g., bowline, figure 8, etc.). Loosen the knot, then take a bight of the standing line and pull it through the knot bridge and tie two half hitches over the original loop. Now you have a secure knot with two loops that is easy to adjust. Figure 24 shows examples of the Gandalf Bowline (Figure 24a-f), Gandalf Figure 8 (Figure 24g-m), and Gandalf Overhand (Figure 24n-r). (For additional tying instructions see: Corpo Nazionale Soccorso Alpino E Speleologico 2013:42)

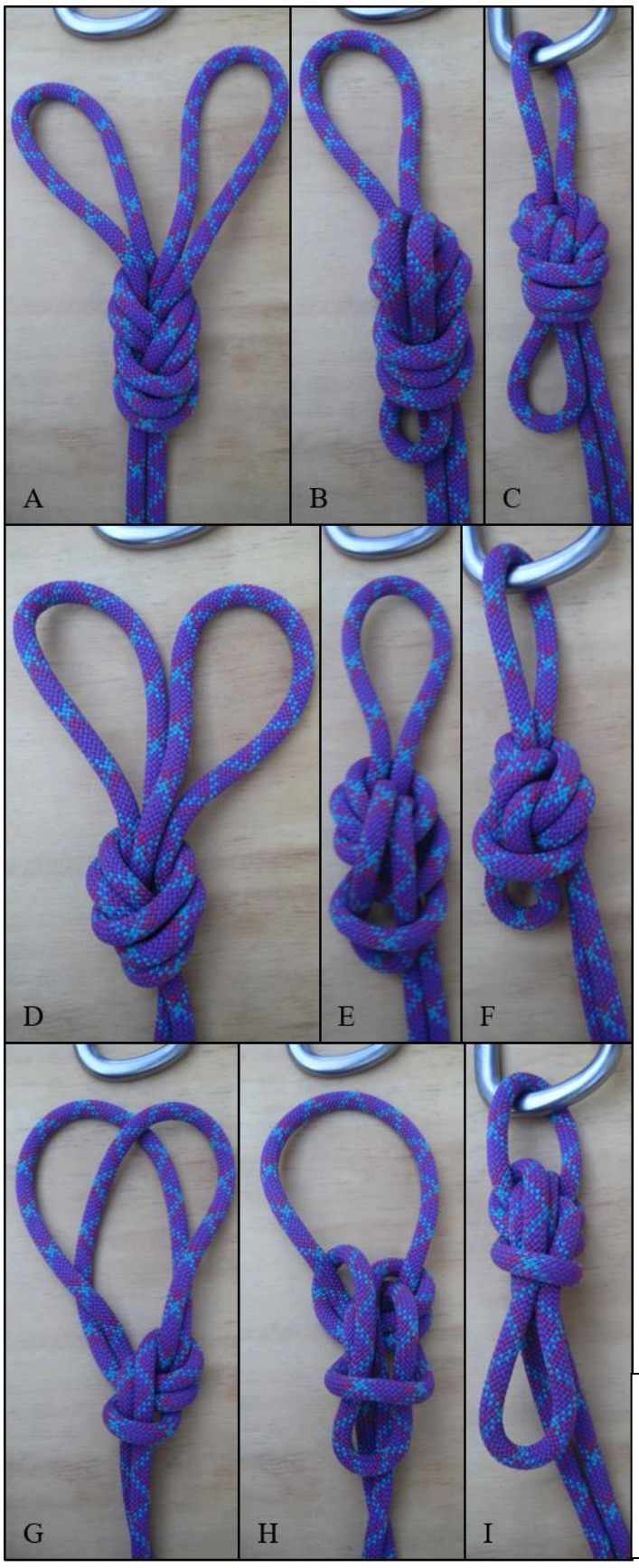
Pros - This variation works exceptionally well when converting existing rigging. Rather than untie a knot that already exists, loosen the existing knot, add two half hitches, and move on. As such, this is an excellent way to convert simple static rigging into more dynamic rigging with a rigging loop. Because it is so simple, it is an incredibly easy variation to remember.

Cons - These knots are impossible to dress nicely and make look clean and pretty. As a result, they look really weird, and hard to tie at first glance. Others who do not know the knot will have a hard time safety checking it because the parent knot is difficult to identify. This knot variation takes far more rope to tie than other variations that create two loops, so it is not a first choice knot when initially rigging.

When to Use - This modification works well when there is existing rigging, and you want to quickly convert the static rigging to more dynamic rigging. Because it takes quite a bit of rope, this knot variation should not be used when rope is at a minimum.

Variations - This variation can be applied to any loop knot, so is readily applied to the overhand, figure 8, figure 9, bowline, etc.

Figure 24: How to tie the Gandalf variation for a Bowline (**A-F**), Figure 8 (**G-M**), and Overhand (**N-R**). Start by tying the original rigging knot (**A,G,N**). Form a bight in the standing line (**B,H,N**), loosen the knot, and slip the bight of rope under the knot bridge (**C,I, O**). Form a half hitch around the original knot loop (**D,J/K,P**), then add a second half hitch (**E,L,Q**). Set, and dress the knot as best you can (**F,M,R**). The final knot will look ugly.



Modified Double Loop Knots:

How to Tie - Start by tying any double loop knot you desire, like a double Figure 8, Double Overhand on a Bight, or Bowline on a Bight. Pick one of the loops and fold it down toward the standing line. Slide this downward facing loop under the knot bridge, then dress and set the knot. Figure 25 shows this process for the figure 8, overhand, and bowline knots.

Pros - This variation is incredibly simple to learn and tie consistently, so is a good variation if you have a hard time remembering Eye or Rigging knots.

Cons - There is nothing pretty about this variation because it takes the normal knots we know well, and modifies them to look like a chimera. As such, this knot is hard to dress, set, and safety check because other people simply do not know it that well. Moreover, it takes quite a bit of rope to tie a knot with the same function as an Eye knot.

When to Use - This knot variation works well when other variations are forgotten, or a double loop knot has already been tied. However, some rigging schools advocate this knot in common rigging (Federation Francaise De Speleologie 2014:6).

Variations - This knot variation looks decently beautiful when tied on a Figure 8 because the lower loop slips under all four strands of the knot bridge. The Overhand variation must slip under just the lowest strand of the bridge because if it slips under all of them, the knot falls apart. So when tying the overhand version, make sure it is tied correctly!

Figure 25: How to modify double loop knots. Tie the knot of interest (**A,D,G**), fold a loop down and under the knot bridge (**B,E,H**), then dress and set the knot (**C,F,I**).

Tying Knots with Doubled Rope on a Bight:

How to Tie - Simply tie the HST, Bowline with Yosemite finish, Figure 8, and sheet bends with a bight formed by the middle of the rope (see Figures 26, 27, and 28 for visual directions). This modification creates two standing lines, and rigging loops at the anchor for the bowline, figure 8, and sheet bend.

Pros - These knots form anchors with two standing lines, and a rigging loop, and do so without considerable planning, as long as the center of a rope is marked or known. This configuration makes them incredibly versatile, with two standing lines for rigging and a rigging loop. In addition, they are relatively fast to tie and safety check if the center of the rope is known or marked. This geometry enables riggers to perform many rigging functions with one knot.

Figure 26: Tying the HST with a bight to form two standing lines. Form a bight of rope (**A**), wrap it around the anchor two or three times or as much as needed (**B, C**), and clip a carabiner between the bight and the two standing lines (**D**). The HST can also be finished using a screw link (**E**) or by pulling all the rope through the bight in the middle of the rope (**F**), though this takes a lot of time, unless the rope is coiled.

Cons - These anchors consume quite a bit of rope, which is a problem when rope economy is paramount. It is also possible to overload this system because there are three interfaces (two standing lines, and a rigging loop). The rigger needs to think through the forces on the system and make sure it is not overloaded, because it may be tempting with so many rigging options. In addition, any extra rope is difficult to rig with. Because the tails of the rope are obligated into rigging functions, it is difficult to perform other rigging tasks with the rope once this anchor is tied. As such, think of this knot as being the solution to some unique rigging problems, but is definitely not the only solution for all rigging situations.

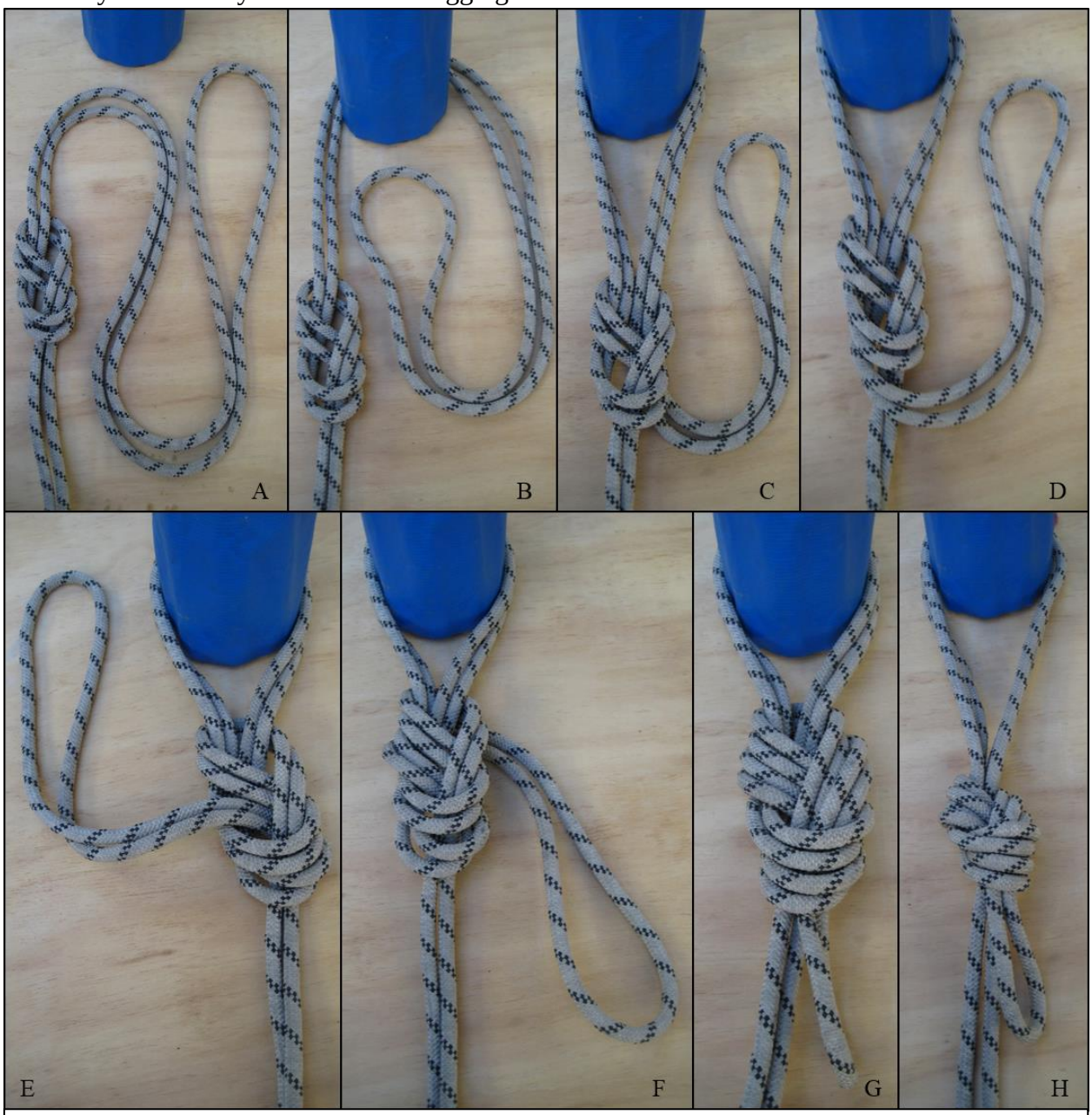


Figure 27: Tying the Figure 8 Follow Through anchor using a bight of rope. Tie a figure 8 in the doubled rope (**A**) and wrap a long bight of rope around the anchor (**B**). Tie a figure 8 follow through using the bight by starting where the bight left the figure 8 toward the anchor (**C**-**G**). Adjust the rope so that the remaining tail loop is not too long, the anchor internal angle is narrow enough, then dress, set, and safety check.

Figure 28: Tying the Sheet Bend anchor using a bight of rope. Form a bight of rope (**A**) and wrap it around the anchor (**B**). Form a bight in the standing end (**C**), then tie a sheet bend (**D-F**) or double sheet bend. Dress, set, and inspect. This knot requires some rigging connected to the rigging loop to act as a knot safety preventing the loop from sliding out of the knot.

When to Use- These anchors should be used when two standing lines are needed. This variation produces two standing lines and rigging loops consuming a bit more rope, but produce anchors substantively the same. As such, these varieties are preferred. This is a spectacular knot for use while teaching rappelling. Students can clip in to the rigging loop, rig their rappel devices, and the instructor can do the same and follow them down side by side (Figure 29a). Or the instructor can belay the rappeler using a fixed brake lower off the rigging loop (Figure 29b). This is also an effective anchor during rescues. One standing line can be a patient access line, or edge attendant line, and the rigging loop and other standing line can be used to construct a haul system (Figure 29c). Similarly, during a small party rescue, one line could be a belay line and the other used to build a haul system (Figure 29d,e).

Figure 29: Using a doubled rope anchors - **A)** A system where two people can rappel side by side, with another instructor or onlooker clipped in at the top. **B)** A rappeller belayed with the other rope with a Münter Hitch. **C)** A rescue system with a patient access line or edge attendant line and a haul system (compound 6:1 system shown). **D)** A small party rescue system with a Münter Hitch belay and a 2:1 haul system with a redirect pulley. Using a rigging sheet bend - **E)** A similar small party rescue system to (**D**), with a Münter Hitch belay and an inline 3:1 haul system. Note how little equipment is needed to perform some rescues.


A
B
C
D
E

Note: The Bowline created in this way is affectionately called the “Chubby Bunny” (Figure 30). While the author is not aware of any nickname for the figure 8 tied in this way, an appropriate nickname could be the “Slimy Slug” (Figure 30). Similarly, the sheet bend tied with a bight could be called the “Coiled Snake” (Figure 30). These nicknames are proposed to give riggers a fun way to ask for or delegate anchor building quickly, or to further obfuscate the names used for these rigging configurations. ☺

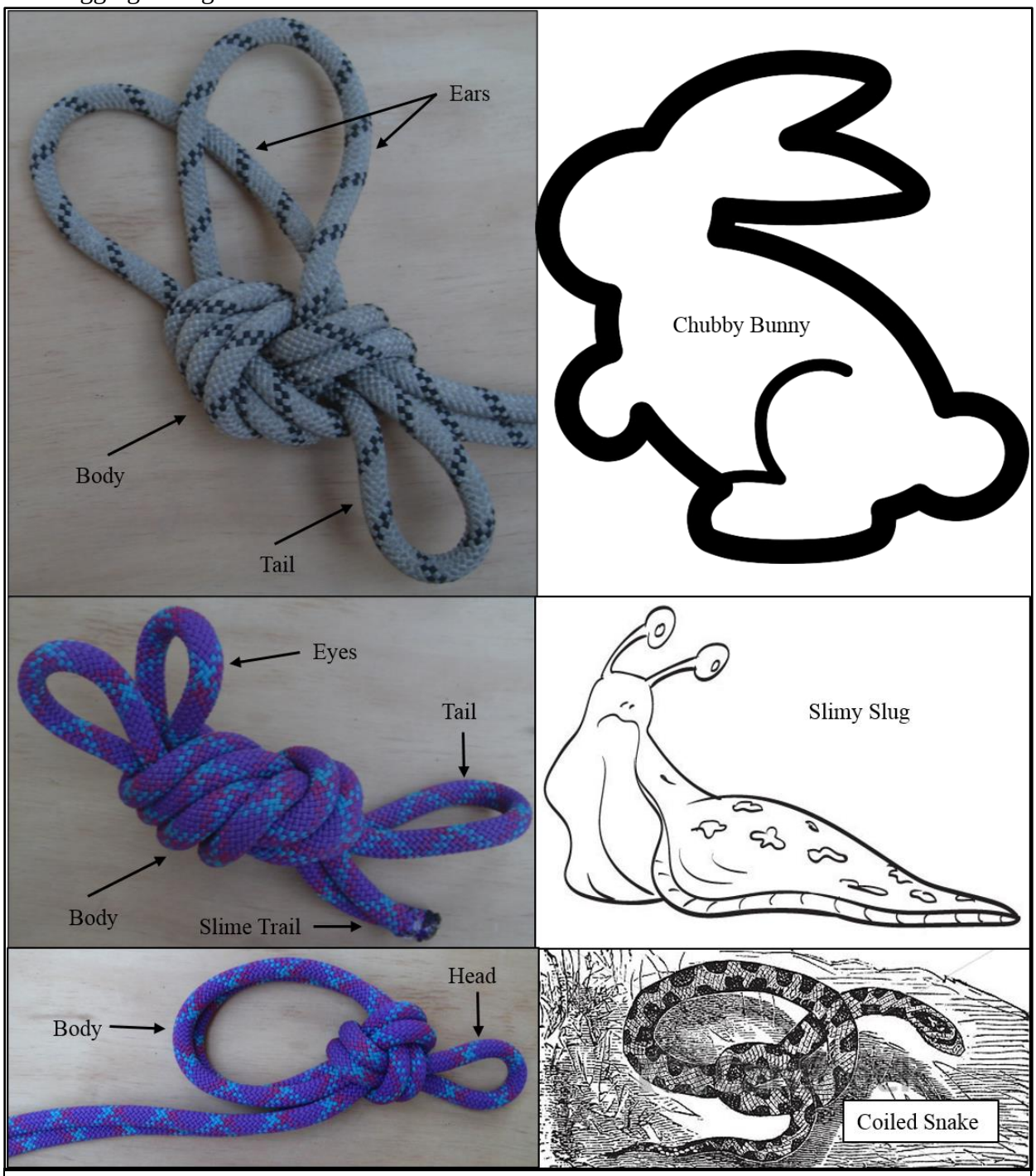


Figure 30: Comparison of the bowline, figure 8, and sheet bend tied in the middle of the rope with drawings that look similar. The names are proposed for convenience, and fun.

Table 2: Strengths and weaknesses of each anchor modification.

Tail Modifications		
Use	Pros	Cons
Bowline Knot	Fast to tie, dress, set, and inspect, uses little rope	Weaker than the figure 8, less elegant than rigging version, cannot be used on an HST
Figure 8 Follow Through Knot	Easy to inspect	Slower and uses more rope than bowline, not as elegant as rigging version, cannot be used on an HST
Barrel Knot	Most rope efficient, fast to tie, dress, set, and inspect	Slips/elongates more than other knots, cannot be used on an HST
Knot + Carabiner	Fast way to finish a HST	Requires an extra piece of hardware
Knot + Screw Link	Fast way to finish a HST, lighter than a carabiner	Requires an extra piece of hardware, slower than a carabiner

Tying Knots With An Extra Loop (Eye Bowline and Sheet Bend)	
Pros	Cons
Requires the least rope for two loop knot Fast to tie and inspect Provides a rigging loop for any rigging desired For Figure 8 knots it is the "rigging" version	Can be hard to remember how to tie Uses more rope than a normal knot Cannot be used on an HST Takes longer to tie, set, and dress than an unmodified knot

Knots Finished Using a Bight (Rigging Version)	
Pros	Cons
Requires little exra rope Fast to tie and inspect Provides a rigging loop for any rigging desired	Can be hard to remember how to tie Uses more rope than a normal knot Cannot be used on an HST Takes longer to tie, set, and dress than an unmodified knot

Knots Finished With Two Half Hitches (Gandalf Knots)	
Pros	Cons
Can easily modify a knot already rigged Easy to remember how to tie Provides a rigging loop for any rigging desired	Difficult to inspect because it is a hybrid of three knots Can be difficult to dress Uses more rope than a normal knot Cannot be used on an HST Takes longer to tie, set, and dress than an unmodified knot

Modified Double Loop Knots	
Pros	Cons
Easy to remember how to tie Simple modification of a knot already tied	Can be difficult to dress, and looks disjointed Hard to safety check Uses far more rope than a normal knot Cannot be used on an HST

Tied Using a Bight	
Pros	Cons
Forms two standing lines Can be tied with an HST easily Fast if the middle of the rope is marked Incredibly versatile rigging Provides a rigging loop for any rigging desired	Consumes a large quantity of rope Can be slow if the middle of the rope is not marked Can overload anchor because there are three rigging interfaces Requires a more vigilant rigger Hard to use any extra rope for rigging at the top of the pitch

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