

I. INTRODUCTION

- A. Purpose: To provide Department personnel with information and instruction for properly tying knots, hitches, and specialized assemblies.
- B. Scope: This instruction applies to all sworn personnel.
- C. Author: The Deputy Chief of the Special Operations Bureau is responsible for the content, revision, and periodic review of this instruction.
- D. Objectives: To assist Department personnel in utilizing proper techniques when tying knots, hitches, and specialized assemblies while maintaining uniformity Departmentwide.
- E. Definitions: See Glossary.

II. RESPONSIBILITY

- A. All sworn personnel are responsible for the information contained in this subject and shall be able to tie the listed knots, hitches, and specialized assemblies.
- B. Company officers/training captains are responsible for training personnel and ensuring proficiency with the information contained in this subject.
- C. Knots and hitches
 - 1. Slip Knot
 - 2. Round Turn and Two Half Hitches
 - 3. Clove Hitch
 - 4. Larks Foot
 - 5. Overhand Knot
 - 6. Double Overhand Bend
 - 7. Prusik Hitch

8. Overhand Follow Through
 9. Bowline Knot
 10. Long Tail Bowline Knot
 11. Figure Eight Knot
 12. Figure 8 on a bight knot
 13. Inline figure 8 knot
 14. Figure 8 bend
- D. Specialized assemblies
1. Modified Trucker's Hitch
 2. Webbing Load Releasing Hitch
 3. Radium Release Hitch, Load Releasing Hitch (These require advanced skill not required of all personnel.)

III. POLICY

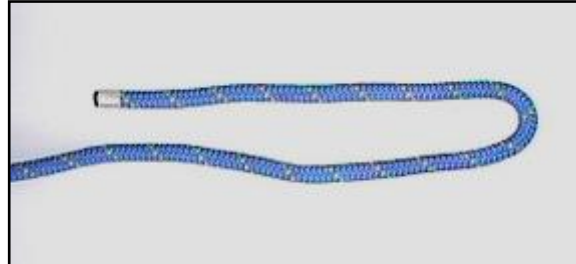
- A. The bowline, figure 8 on a bight, figure 8 bend, and the figure 8 follow through shall be finished with a safety tie-off.
1. The safety tie-off shall be as close as possible to the completed knot.
- B. All knots and hitches shall be properly dressed and set to be completed.
- C. In general, all knots and bends will decrease the overall breaking strength of the rope in which they are tied by about 50% when shock loaded.

IV. PROCEDURES

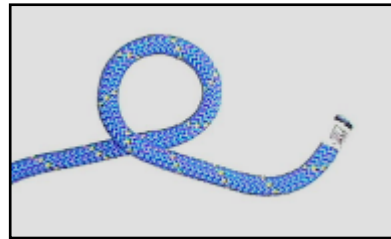
- A. The following examples are provided to clarify the procedures on tying Department knots and hitches.

1. Running End: The end of the rope that you are working with.
2. Standing Part: The inactive part of the rope not being used to form the knot.

3. Bight: A U-shaped bend in the rope that does not cross itself.



4. Overhand Loop: Formed by crossing the end of the rope over the standing part.



5. Underhand Loop: Formed by crossing the end of the rope under the standing part.



6. Half Hitch: Formed by placing an overhand or underhand loop in the rope and placing it over an object. It can also be formed by laying the rope over an object and forming a loop around the standing part.



7. Round Turn: Formed by looping the rope around an object two times.



8. Running Loop: This loop is formed by connecting the hook of the drop bag over the standing part in a manner that causes a bight or eye to be formed.

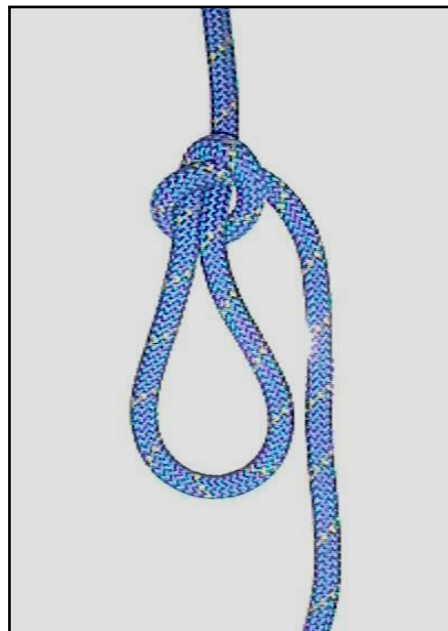


- B. The following procedures are provided to instruct personnel how to tie Department knots, hitches, and specialized assemblies.

1. Slip Knot:

- a. Form an overhand loop with the running end on top.
- b. With the running end, form a bight and pass it up through the overhand loop.
- c. Tighten by pulling the bight.

Application: Hoisting tools and equipment.

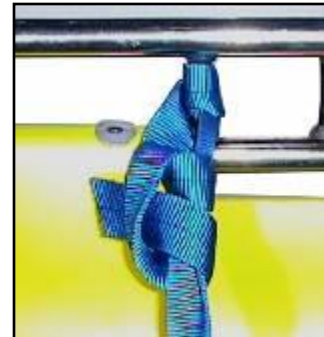


2. Round turn and two half hitches:

- a. With the end of the rope or webbing, make two turns around the object.



- b. Form an overhand loop around the standing part, then dress and tighten against the object.



- c. Form a second overhand loop around the standing part, then dress and tighten around the object.

Application: Stokes stretcher lashing.

3. Clove Hitch

- a. Form an underhand loop around the object.
- b. Form a second underhand loop above the first underhand loop and pass the end between both loops where the "X" is formed.
- c. Tighten by drawing on the standing part and the end.



Application: Tying off equipment.

4. Girth Hitch (Lark's Foot)

- a. Make a one-foot bight.
- b. Place hand through the bight and grasp the standing part and running end of the rope.
- c. Then pull rope through the bight.

Application: Taut prusik release (from rappel) and tying off equipment.



5. Overhand Knot

- a. Form an overhand loop around the standing part of the rope.
- b. Place the end through the loop, parallel to the standing part and tighten.



Application: Used as a safety tie-off.

6. Double Overhand Bend (For Prusik Loops)

- a. Bring the two ends of the rope together and overlap them approximately eighteen inches.
- b. Holding the rope in the middle of the overlap, take one end and form an underhand loop around the standing part of the rope (the part parallel to it).
- c. Form another loop around the standing part toward your hand holding the middle of the overlap.
- d. Place the end through the two loops just formed, (parallel to the standing part) tighten the knot leaving a $\frac{3}{4}$ - to 1-inch tail.
- e. Turn the half completed prusik loop around and, using the other end, duplicate steps b, c, and d above.
- f. Grasp the now formed prusik loop and pull the two knots together to dress and set the prusik.

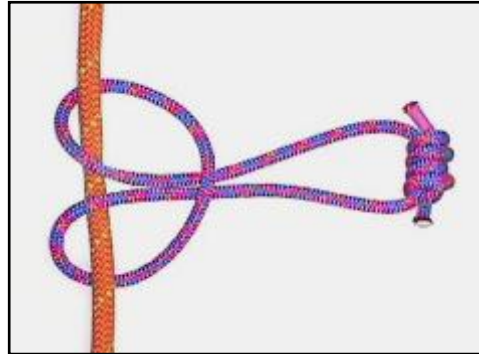
Application: To make a prusik loop.



7. Prusik Hitch

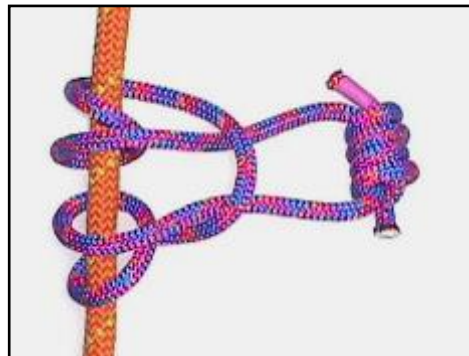
NOTE: All prusik hitches used in rescue systems shall be wrapped three times around the lifeline. The only exception shall be for rappelling, in which a two-wrap prusik hitch is allowed.

- a. Place the portion of the prusik loop without the knot over the standing part of the lifeline, letting it hang to form two bights.



- b. Reach through the front bight, under the lifeline, and grasp the rear bight with the knot.

- c. Pull the rear bight through the front bight and continue wrapping it around the lifeline and back through the front bight twice, forming three wraps around the lifeline.



- d. Dress the prusik loop on the lifeline to allow the double overhand bend to move from the end of the bight to the side of the bight. Insure that the three wraps do not overlap.



Applications: Prusik hitches are used for tandem prusik belays, self-minding ratchets, haul prusiks, self-belay for rappel, and for pre-rig adjustments.

8. Overhand Follow Through (Water Knot)

- a. Tie an overhand knot in one end of the webbing leaving a two-inch tail.



- b. After removing any twists in the webbing, take the other end of the webbing and insert it into the overhand knot on the opposite end.



- c. Continue to follow through the overhand knot forming another overhand knot on top of, and parallel to the first overhand knot, leaving a two-inch tail.



- d. Dress and set the knot by pulling on all four legs of the knot one at a time.



Application: Used to connect the ends of webbing together and form webbing loops or slings.

9. Bowline

The Bowline is a very useful knot for rescue applications. It is easy to tie and easily untied after loading. The bowline must always be properly dressed and set as it can distort and fall apart. A safety tie-off shall be used.

- a. Make an overhand loop with the standing part.
- b. Pass the end up through the loop, then behind the standing part and back down through the loop again, completing with the end on the inside of the loop.
- c. Insure that the knot is dressed and set.
- d. Finish with a safety tie-off.



Application: Rescuer attachment and equipment tie-off

Bowline



Bowline with safety tie-off



10. Long Tail Bowline

This knot can be tied anywhere in the rope, it is easily adjustable up and down the rope and because of the long tail it does not require a safety tie-off.

Follow steps a through c on tying the bowline.



Long Tailed Bowline

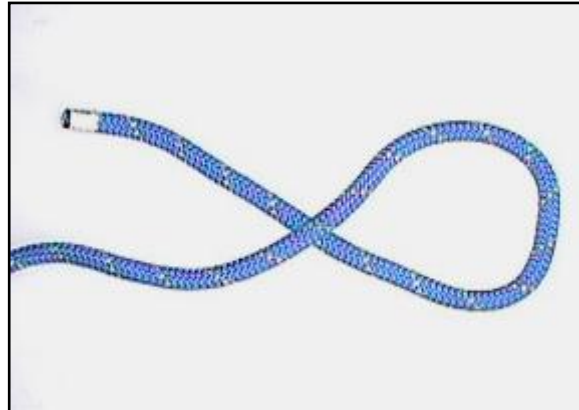


Interlocking Bowlines

Long Tailed interlocking bowlines are used to connect main and belay lifelines together for attachment to a rescuer or the stokes pre-rig. The loops are interlocked and both loops are then attached to a carabiner.

11. Figure 8

- a. Form an overhand loop with a three-foot tail.
- b. Place end under and partially around the standing part.
- c. Place end through the loop formed by the original overhand loop.
- d. To tighten, pull end and standing part in opposing directions.



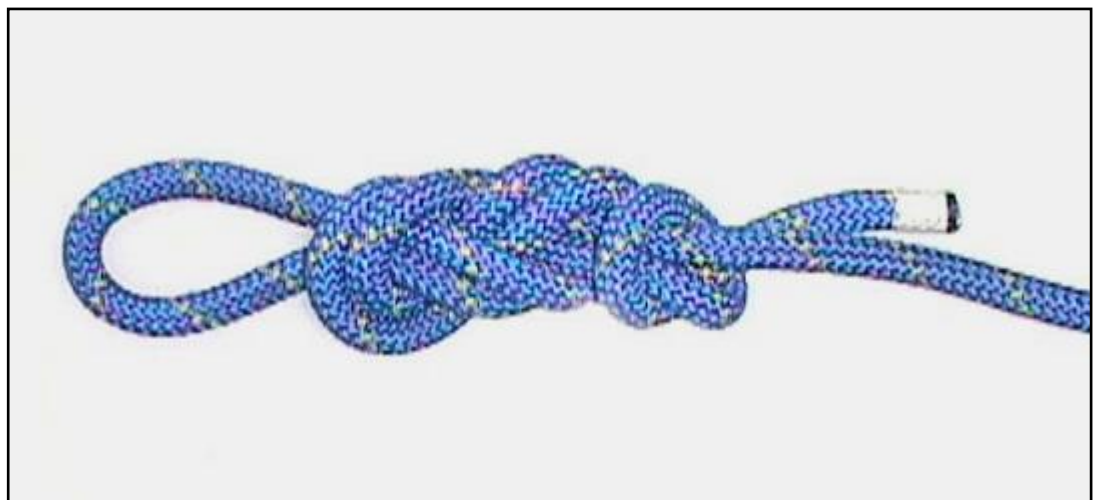
Application: Stopper knot at the end of a lifeline.

12. Figure 8 on a bight

- a. Form a four-foot bight in the lifeline.
- b. Form an overhand loop with the bight.
- c. Place the end of the bight underhand partially around the standing part.



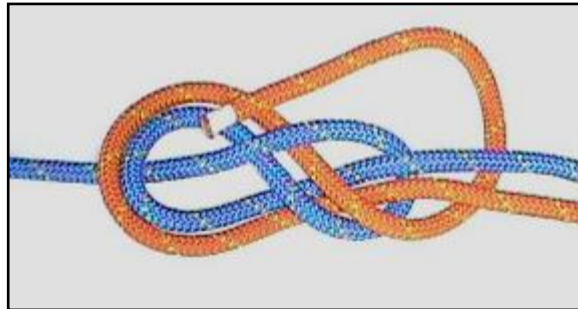
- d. Place end of the bight down through the loop formed by the original overhand loop.
- e. Dress and set the knot by pulling the bight and standing part in opposite directions and finish with a safety tie-off.



Application: Used to attach lifelines to anchor systems and rescuers.

13. Figure 8 bend

- a. Tie a figure 8 knot with a two-foot tail in the end of one line.



- b. Starting at the tail of the first line, take the end of the second line and follow the knot through tying another figure 8 within and parallel to the first.



- c. Dress the knot to eliminate any crossovers.
- d. Set the knot by pulling tightly on all four strands of the lifelines.
- e. Finish with a safety tie-off.

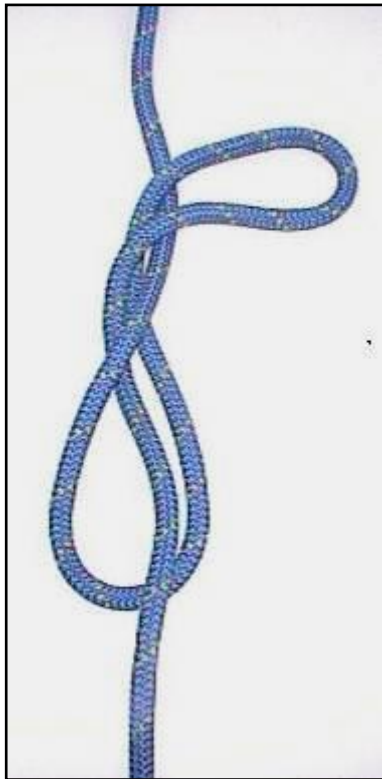
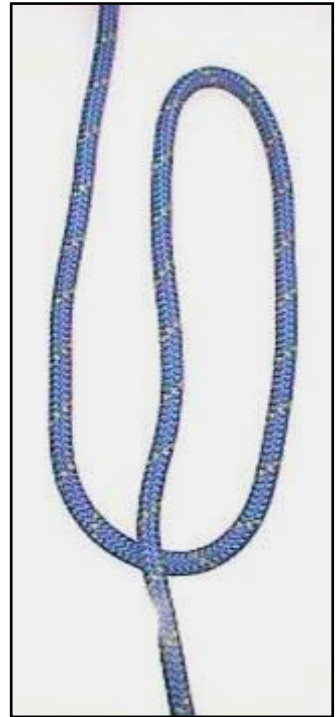


Application: The knot of choice for joining two lifelines together.

14. In-line figure 8

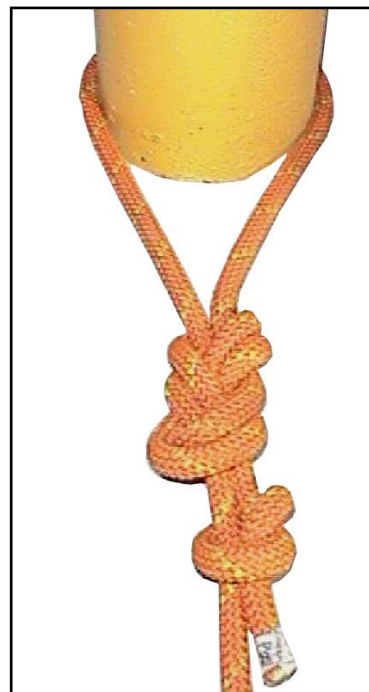
- a. Form a bight two feet long.
- b. Pass the bight behind and then around the standing part of the rope.
- c. Bring the bight down through the loop that was formed in step b.
- d. Dress and set the knot by pulling the bight and standing part in opposite directions.

Application: Used in the formation of the modified trucker's hitch and as a directional in-line knot.



15. Figure 8 follow through

- a. Tie a loose figure 8 with a tail long enough to go around the desired anchor plus three feet.
- b. Place the rope around the anchor.
- c. Feed the end of the rope into the figure 8, and follow the knot through, tying another figure 8 within and parallel to the first.
- d. Dress the knot to eliminate any crossovers.
- e. Set the knot by pulling the bight and standing part in opposite directions.
- f. Finish with a safety tie-off.

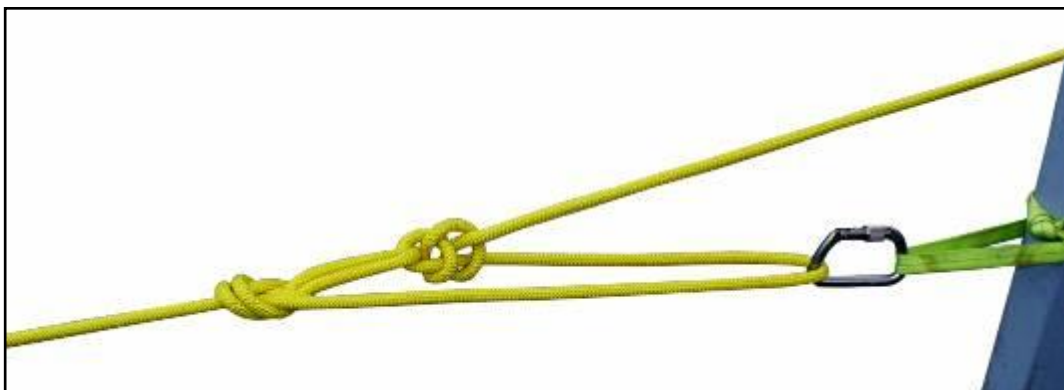
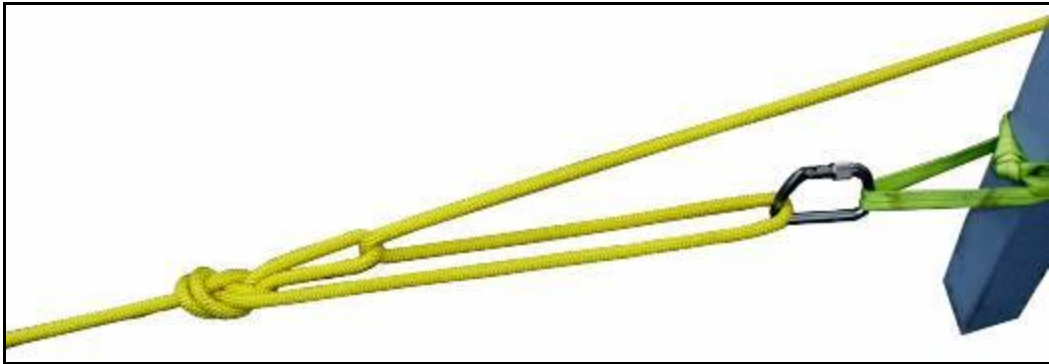


Application: Attaching rope to anchor points.

C. Specialized Assemblies

1. Modified trucker's hitch

- a. Secure one end of the rope to the hose/edge roller, ladder gin, etc., with a figure 8 or bowline.
- b. While keeping the slack out of the rope, wrap the other end of the rope around an anchor or anchor assembly.
- c. Tie an in-line figure 8 in the standing part of the rope.
- d. Place the running end of the rope through the in-line figure 8, and pull back towards the anchor to tighten the rope.
- e. Secure by tying two half hitches against the bight of the in-line figure 8.



2. Webbing Load Releasing Hitch

The Webbing Load Releasing Hitch (WLRH) is a system that is designed to be released under a load or when tensioned. Specifically used on the belay lifeline, it is attached to the belay anchor on one end and the tandem prusik belay on the other end.

In the case of a failure of the main lifeline or if the tandem prusiks set up and can't be released, the WLRH allows the prusiks to be reset and the belay system to be rebuilt without taking anyone off of the belay line.

Another feature of the WLRH is the ability to act as a shock absorber in the case of a shock load to the belay system.

- a. Tie an overhand follow through knot with a single blue webbing.
- b. Attach a steel carabiner, into the web sling.
- c. Pass the other end of the web sling through another steel carabiner.



- d. Ensure that the overhand follow through knot is just off center and pass the webbing up and through the carabiner.
- e. Wrap the webbing in a circular motion around both straps towards the anchor carabiner. A minimum of four full wraps is necessary.
- f. After the last wrap, pass the webbing through the loop and attach a third carabiner (aluminum, if available).



3. Radium Release Hitch (3:1 variation, Advanced Skill Level)

The Radium Release Hitch is another release device and also is used in knot passing operations. A 30-foot length of 8mm cord is used to tie the hitch.

- a. Tie a figure 8 on a bight and clip it into the load side carabiner on the spine side.
- b. Clip the standing part of the cord up through the anchor carabiner, back down through the load carabiner; bring back up to the anchor and tie a Munter Hitch onto that anchor carabiner on its gate side.
- c. Ensure that the munter hitch is in the release position with the in-feed rope towards the gate side of the carabiner. A reasonable length for the hitch is about 12 inches.





- d. Secure the radium release hitch using a bight to tie a half-hitch around the entire stem below the munter hitch, and then back it up with an Overhand on a bight knot, again around the entire stem.
- e. Tie a figure 8 on a bight at the other end and clip it to a secure anchor if desired.



NOTE: For illustrative purposes, the half-hitch and overhand tie-offs are not shown tied tight up against the munter hitch. In actual use, ensure that this is done.

