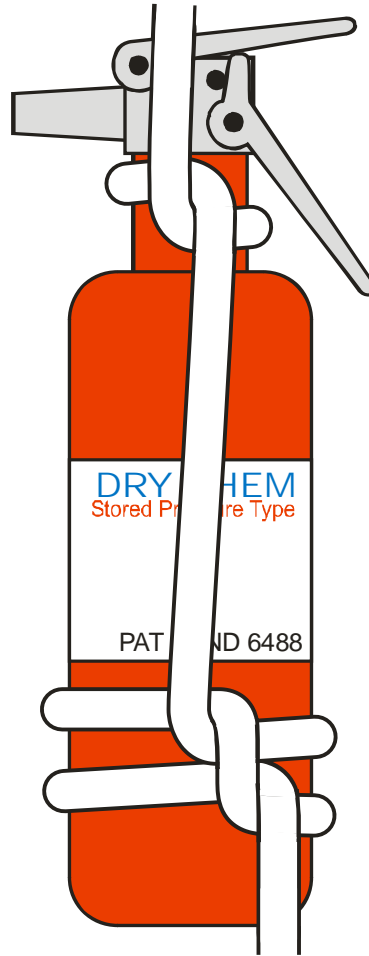


Knots, Bends & Hitches



For Emergency Service Personnel

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Introduction

I started my firefighting career as a volunteer or retained staff working in the NSW town of Lake Cargelligo. It was there that I became interested in firefighting so I applied to join the NSW Fire Brigades as a permanent employee. I worked as NSWFB firefighter for 22 years then I joined the NSW Rural Fire Service to work as Learning and Development Officer.

I have always been passionate about rope work. This passion has been the driving force behind interests that included climbing, caving, rigging and the development of training material like this document.

I created the original content and artwork for this document whilst I was employed as a Senior Rescue Instructor with the NSW Fire Brigades. This document was written as a chapter of the Rescue Operators Training Manual and it was hoped that it would become more widely used as a training tool not limited to firefighting and rescue.

This version has been modified to suit a wider audience and is shared in the interests of public safety.

This document remains the intellectual property of the State Government of NSW because I created it as an employee of the State Government of NSW in two different capacities those being the NSW Fire Brigades and the NSW Rural Fire Service.

Mick Holton

Friction

Knots are made up of tucks and turns that are held together with the friction that exists between the rope itself or the rope and other objects. Because friction plays such an important role in the security of a knot it stands to reason that different rope types will perform differently. Many knots are more suited to specific rope materials and construction methods as outlined in this manual. Firefighters need to be aware that external conditions such as a wet or muddy rope will have an impact upon the available friction therefore will impact upon the performance of knots and other friction devices.

Warnings, Cautions, Notes and Points of Interest

Throughout this document, the reader will find statements titled Warning, Caution, Note or Point of Interest with a short piece of information following, generally no more than one sentence, highlighting a hazard or providing additional clarification, or both. Each of these statements has a particular meaning, as follows:



WARNING

A warning indicates that personal injury may result if procedures or practices are not carefully followed and tells what to do to avoid such injury. Equipment may also become damaged.



CAUTION

A caution indicates that equipment may be damaged if procedures or practices are not carefully followed and tells what to do to avoid such damage. Potential for personal injury is not expected.



NOTE

A note provides clarification of an operational procedure, practice or is used to highlight information that may assist the reader. Neither personal injury nor equipment damage is expected.



POINT OF INTEREST

A point of interest statement indicates that the information that follows is provided to increase the readers' knowledge of the subject but it is not information that needs to be committed to memory.

Definitions

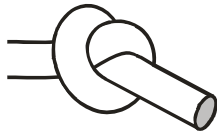


Fig 1. Overhand Knot

Knot

A knot when tied in a rope will maintain its own form.

Examples include the Overhand knot, Figure of Eight knot, Figure of Eight Loop and an Alpine Butterfly.

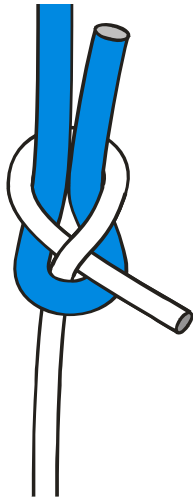


Fig 2. Sheet Bend

Bend

A bend is used to:

- (a) join two ends of a rope to form a loop
- (b) join two ropes together
- (c) join sheeting or tarp to a rope

Examples include the Double Fisherman's bend, Reef knot (Reef bend), Sheet bend and Tape knot (overhand bend tied with tape).

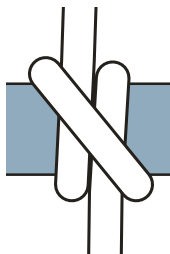
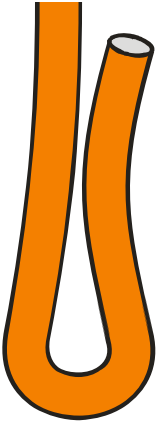


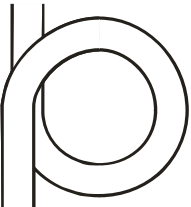
Fig 3. Clove Hitch

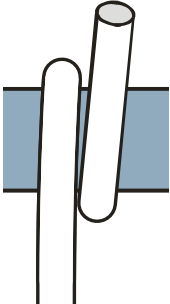
Hitch

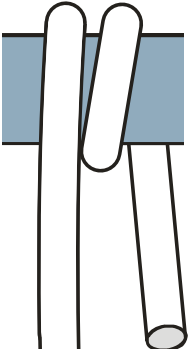
A hitch is a knot tied around an object that when the object is removed the knot falls apart.

Examples include the Girth hitch, Clove hitch, Rolling hitch and Prusik hitch.

 <p data-bbox="300 618 478 645">Fig 4. Bight of rope</p>	<p data-bbox="579 208 667 248">Bight</p> <p data-bbox="579 282 1406 389">A bight is a part of a rope between each end in which a knot can be formed (the line does not cross itself otherwise it would be a loop).</p> <p data-bbox="579 432 1422 539">Note: A bight of rope does not have to be close to an end (as pictured) it may be positioned at any point along the length of the rope.</p>
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 <p data-bbox="288 947 493 974">Fig 5. A Loop of rope</p>	<p data-bbox="579 748 663 788">Loop</p> <p data-bbox="579 822 991 862">A closed curve or circle of rope.</p>
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 <p data-bbox="292 1377 486 1404">Fig 6. A Turn of rope</p>	<p data-bbox="579 1075 659 1115">Turn</p> <p data-bbox="579 1149 1050 1189">Same as a loop but around an object.</p>
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 <p data-bbox="292 1854 486 1881">Fig 7. A Round Turn</p>	<p data-bbox="579 1505 778 1545">Round Turn</p> <p data-bbox="579 1579 1417 1686">A round turn seems like two wraps of rope around an object, it is titled a “round turn” because it is one complete encirclement of the object.</p>
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Strength Reduction at Knots

A knot in a line reduces the strength of the line. This strength reduction has been taken into account when calculating the working load limit of the line. During destruction testing of ropes with knots applied, failure usually occurs at the knot. Correct knot application, dressing and packing will help to improve the performance of all knots.

Characteristics of Knots

The knots outlined in this manual are described and drawn considering the following characteristics:

- Correct and safe application with other equipment and / or techniques
- Will not cause damage to the line
- Ease of tying and untying
- Appropriate to the task applied
- Sufficient security depending upon the application and task
- Correct dressing and packing of the knot
- Acceptable strength reduction limits

Tail Length Rule

When tying knots a certain amount of rope tail must protrude beyond the knot to ensure the security of the knot. As a general rule a tail length of approx 150mm will be required for all knots with the following exceptions:

- An overhand knot has no tail length rule because there are many applications where the tail would become an obstruction.
- When making Prusik loops with kernmantle cord, a tail length of 75mm will be applied at the time that the Prusik loop is created. With use the tails will reduce in length until sufficient tension remains in the double fisherman's bend. A Prusik loop tail length is to be considered to be serviceable provided it is not less than 40mm.



WARNING

The images in this manual may not always illustrate the correct tail length, it is the responsibility of the person tying the knot to ensure that sufficient tail remains after the knot is properly dressed and packed. Please refer to the "tail length rule" as outlined in this manual.

Dressing & Packing Knots

After a knot has been tied, it must be dressed and packed before a load is placed on it.

Dressing the knot

Firm the knot and arrange each part of the knot so that it lays correctly to maximise knot strength and efficiency. This manual includes instructions on how to dress and pack specific knots.

Packing the knot

Hold the knot firmly and tighten each part of it in turn until no more slack can be pulled through the knot.



NOTE

Many of the knots in this manual have been deliberately drawn without being packed firmly. This is to help the reader see how the knot is to be dressed. Once the knots have been packed tightly they may appear slightly different than the images.

Ropes, Lines and Tape

In this manual the term “rope” refers to any commercially available cordage product with no reference to specific length, diameter or purpose.

In this manual the term “line” refers to a cordage product that has been selected, cut to length and prepared for a specific purpose.

Examples of a line may include:

- GP or general purpose line
- Pocket line
- Life rescue line
- Guide line
- Guy line
- Lashing lines

In this manual the term “tape” refers to either flat or tubular webbing.

Items that are made from flat or tube tape include:

- Harnesses
- Sewn slings
- Stokes litter restraint straps
- Four point lifting slings

Tube tape may also be available to some emergency service units for sling and anchor system construction.

Tips for Knot Tying Practice

Knot tying is a skill that requires considerable practice in varying conditions, application and orientation.

The following tips will assist emergency service personnel to become proficient at tying knots:

- Learn how to tie new knots on a table top or flat surface, lay the knot flat and work step by step following the instructions in this manual
- Keep your pocket line handy and practice regularly
- Put your knot tying skills to good use. There are many day to day tasks that can be made safer with the application of some knots to improve stability

What Knots, Bends or Hitches should I learn?

The following knot categories are provided as a guide only.

Category 1. General Applications.

- Overhand Knot
- Reef Knot
- Half Hitch
- Girth Hitch
- Clove Hitch
- Rolling Hitch
- Round Turn & Two Half Hitches
- Sheet Bend
- Double Sheet Bend
- Half Sheepshank
- Bowline
- Round Lashing
- Square Lashing

Category 2. Rescue and Height Safety Applications.

- All of the previous knots
- Double Fisherman's Bend
- Figure of Eight
- Figure of Eight Loop
- Follow Thru Figure of Eight Loop
- Alpine Butterfly
- Double Wrap Prusik Hitch
- Triple Wrap Prusik Hitch

Category 3. Vertical Rescue and USAR (Urban Search and Rescue)

- All of the previous knots
- Figure of Eight Lashing
- Tape Knot (Overhand Bend)
- Italian Hitch
- Tensionless Hitch

Life Support Application Rules

This manual makes reference to the suitability of certain knots, bends and hitches for life support applications. It is important that all emergency service personnel use the correct knots to secure a life rescue line to an anchor before loading the line in a scenario that supports human life.

The following knots are identified as being suitable to support human life:

- Figure of Eight Loop
- Follow Thru Figure of Eight Loop
- Alpine Butterfly
- Tape knot (overhand bend tied with tube tape)
- Tensionless hitch (round turns & figure of eight loop)

The following knots may be used in life support rigging but must be backed up with a knot that is suitable for life support:

- Triple Wrap Prusik Hitch
- Clove hitch
- Rolling hitch

Exceptions to the life support application rules:

- A triple wrap Prusik hitch may be used without a backup in safety line applications. A stopper knot should be used to limit travel, please refer to your service or organisations guidelines
- Two, triple wrap Prusik hitches can be used without an additional backup for ascending a life rescue line
- A reef knot can be used in the rigging of a SKED stretcher, the reef knot is backed up by a double fisherman's bend in this application
- An overhand knot tied with a bight can be used as part of the "locked off securely" technique to secure any friction device
- Lashing techniques can be used to construct ground anchors, tripods and "A" frames. These devices can all be used as part of a life support system
- An Italian hitch may be used for a life support application in an emergency

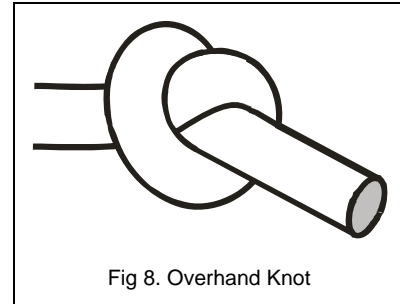
Types of Knots, Bends & Hitches

The remainder of this chapter provides descriptions, applications and instructions on how to tie a range of knots that are in common use by emergency service organisations.

This manual includes descriptions, examples of applications and step by step instructions for tying each knot, bend or hitch.

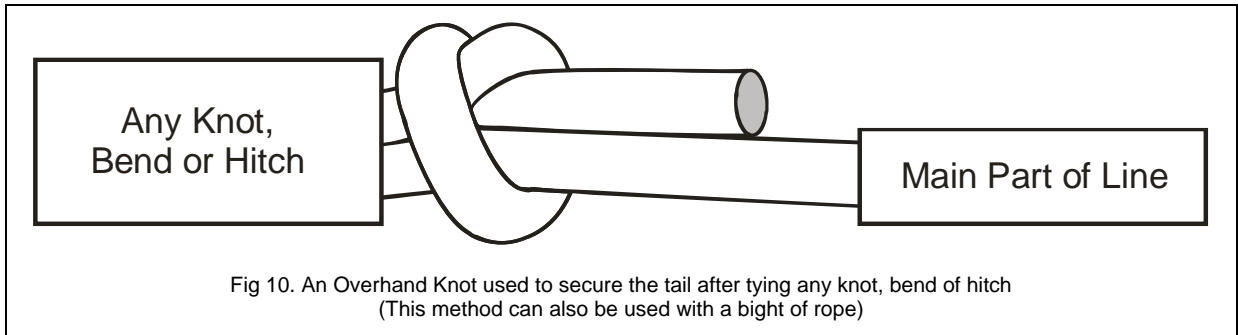
Overhand Knot

The overhand knot is also known as a Thumb Knot, it is the most basic of all knots.



Applications for the Overhand Knot

- Not to be used in life support applications other than as an additional knot for rope tail management.
- Can be used to secure the tail of any line after tying a knot, bend or hitch. (*fig 10*)
- Can be tied independently to or around the main part of the line. (*fig 10*)
- Can be used to terminate a damaged end of any rope or line to prevent the end of a line unwinding.
- Can be used as a stopper knot to prevent the end of a line passing through an eye or pulley block.
- Forms the first step in tying a tape knot
- Can be used to secure the tail of a knot in applications such as a Clove Hitch.
- Can be used in conjunction with the snap hook on a GP Line to form a fixed loop. (*fig 9*)
- Can be tied with a bight of rope around the main line to form a backup when securely locking off any friction device.
- Is often used as a guide when determining how much tail should protrude through a knot bend or hitch. A rope tail is considered to be long enough if it is possible to tie an overhand knot into it. Please refer to the section in this manual titled “Tail Length Rule”



NOTE

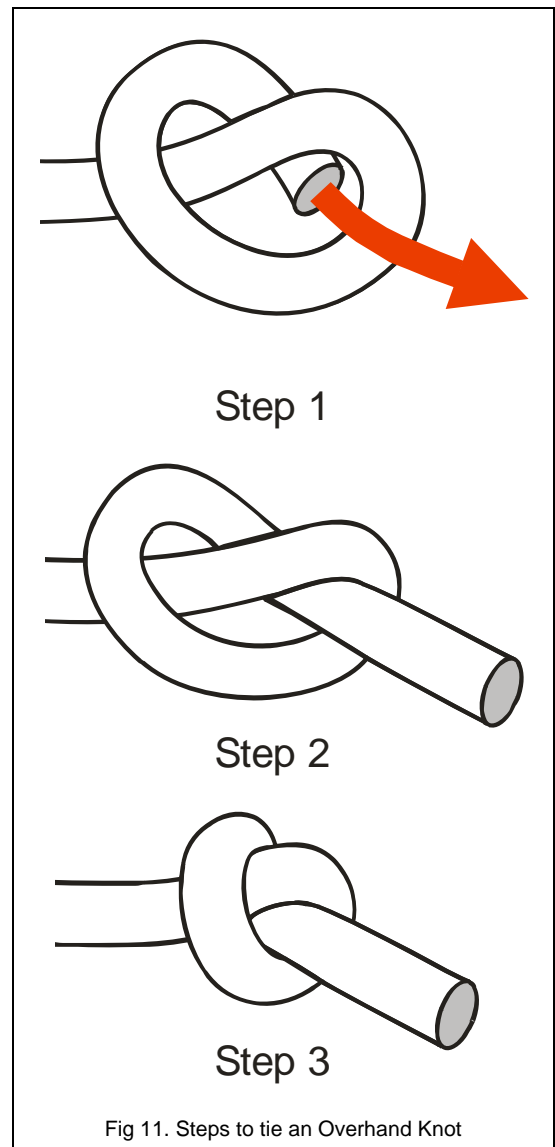
The use of an overhand knot to secure the tail of another knot, bend or hitch is not normally required and can often create unnecessary bulk.

Method of tying an Overhand Knot

1. Form a loop. (*fig 11*)
2. Pull the end of the line through the loop.
3. Dress and pack the knot with enough tail to suit task.

If tying to secure a tail onto the main part of a line:

1. Form a loop around the main part of the line.
2. Pull the end of the line through the loop.
3. Dress and pack the knot with enough tail to suit task. (*fig 10*)



Reef Knot

The reef knot is often used to join the ends of a rope, cord or string when securing a bag or parcel.

The reef knot is also called a square knot, flat knot and first aiders knot. It is well suited to first aid applications because of its flat profile when used to tie a bandage or sling.

A properly tied reef knot will have the rope tails exiting the finished knot as shown *in figure 12*.

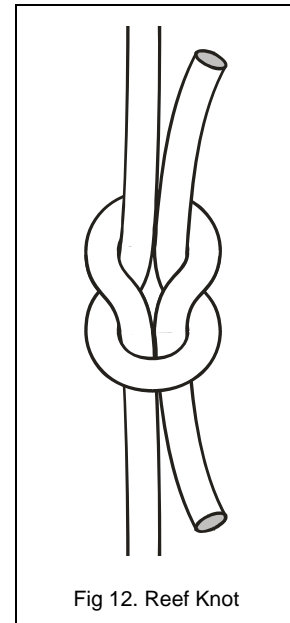


Fig 12. Reef Knot

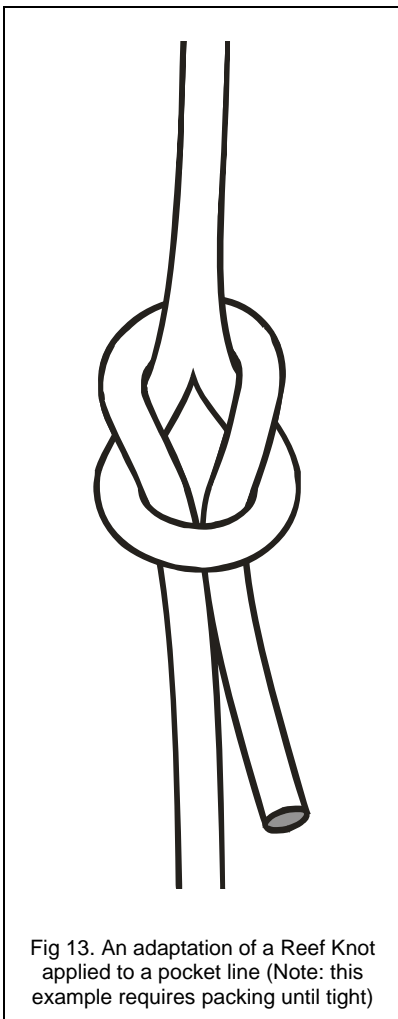


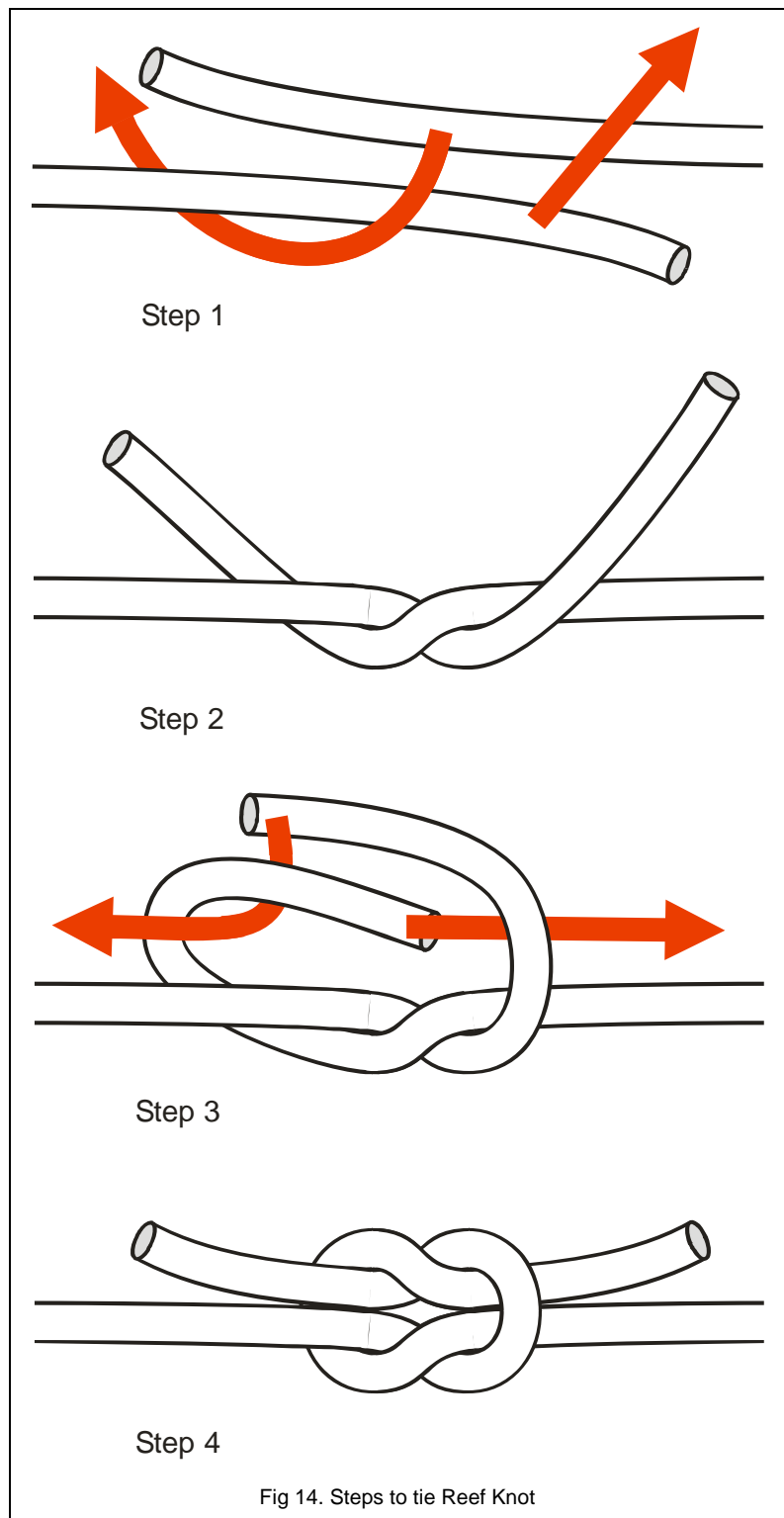
Fig 13. An adaptation of a Reef Knot applied to a pocket line (Note: this example requires packing until tight)

Applications for a Reef Knot

- Not for life support applications.
- An excellent first aid knot for tying bandages and slings.
- An adaptation can be used to join pocket lines when a flat profile is required as shown *in figure 13*. (requires packing until tight) A sheet bend or double sheet bend would be more secure.
- Used to secure parcels and packaging with string.
- Used as part of a patient packaging technique when packaging a patient into a SKED stretcher in preparation for a hauling operation. Although this knot is unsuitable for life support applications, it is used with the SKED stretcher to form a cross over below the feet. The line is terminated across the knees with a double fisherman's bend. The double fisherman's bend provides the security in the SKED stretcher application.

Method of tying a Reef Knot

1. Lay the ends of the rope beside each other. Twist them over and under each other as shown.
2. Curve the rope ends back so that they lay beside each other.
3. Twist them over and under each other a second time as shown.
4. Dress and pack the knot tightly.



Half Hitch

A half hitch forms part of other knots and hitches, it relies upon an object or some other rigging to make it useful and it cannot be used on its own.

If the object to which a half hitch is applied to is removed the hitch will fall apart. (fig 15)

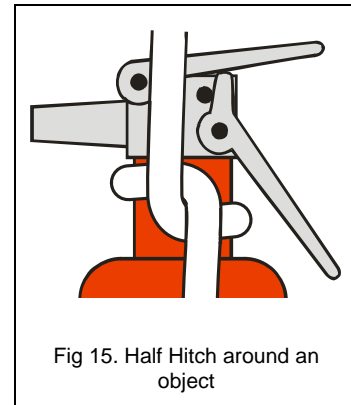


Fig 15. Half Hitch around an object

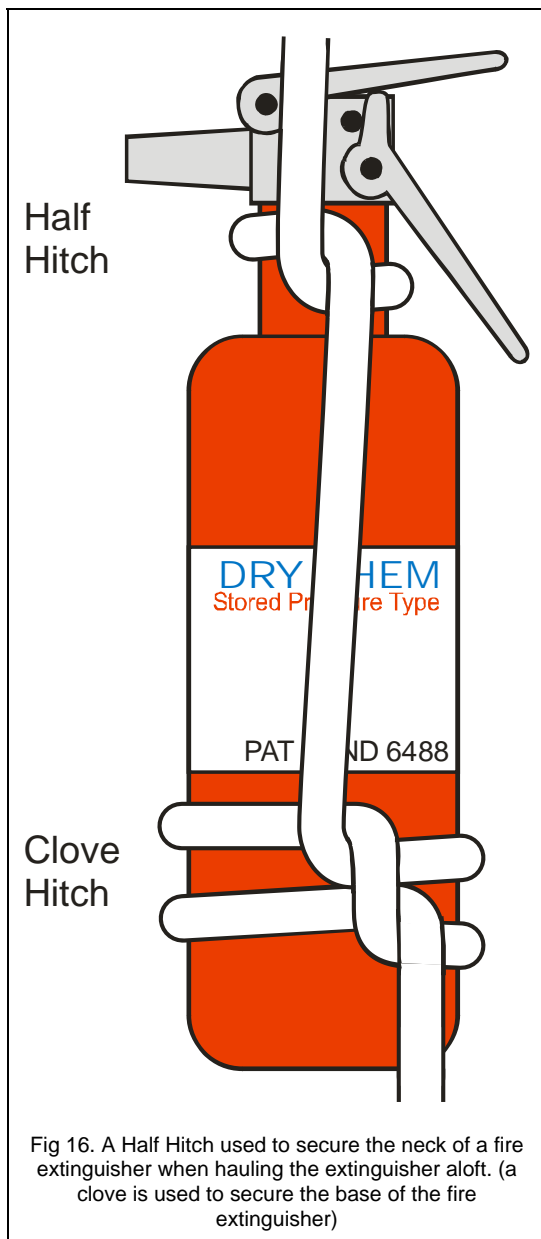


Fig 16. A Half Hitch used to secure the neck of a fire extinguisher when hauling the extinguisher aloft. (a clove is used to secure the base of the fire extinguisher)

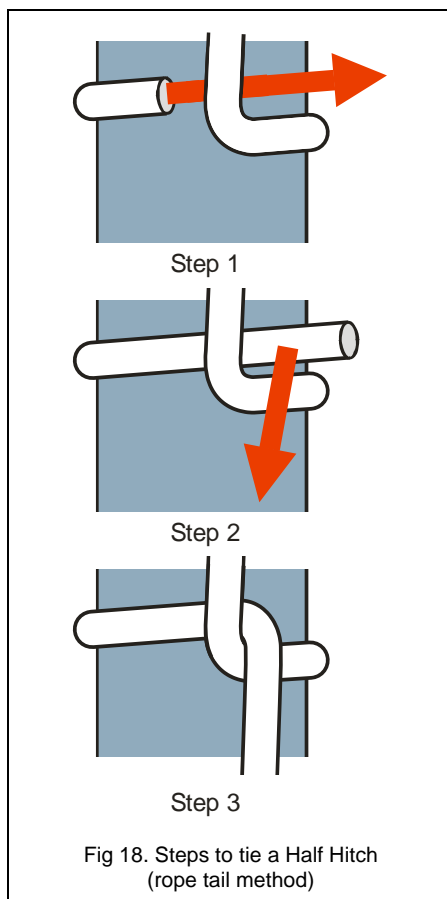
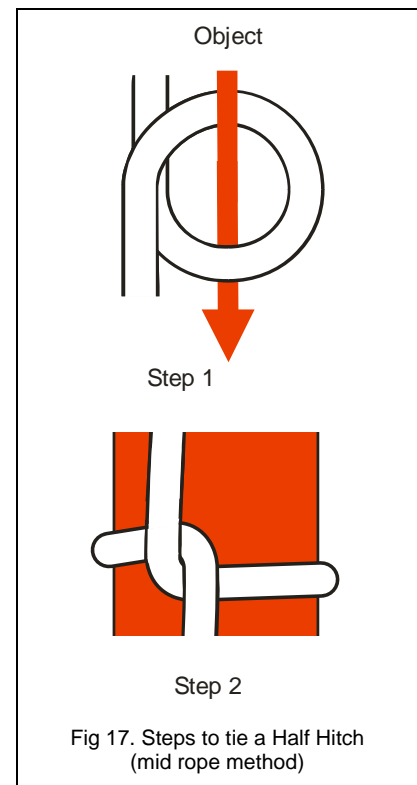
Applications for the Half Hitch

- Not to be used in life support applications other than as an additional knot for rope tail management.
- Forms parts of other knots.
- Can be used in conjunction with other knots, bends and hitches to secure parts of an object.
- When used in conjunction with other knots, bends and hitches the half hitch is useful to secure various parts of objects being hauled aloft. Some examples include: fire extinguishers, axes, ladders and ceiling hooks.
- Two half hitches are used to form a clove hitch.

Method of tying a Half Hitch

Mid rope method

1. Twist the line to form a loop then place the loop over the object so that the line tension maintains the loop around the object.
2. Dress and pack to suit the task.



Method using rope tail

1. Place a turn of line around the object. Pass the tail under the main part of the line and pull the tail through so that it forms a loop.
2. Tension the line to maintain the loop around the object.
3. Dress and pack to suit the task.

Girth Hitch

Also known as a Lark's foot, Lark's head or a choke. A girth hitch is a simple hitch that can be made with a bight of rope or with a formed loop such as a spliced loop in a pocket line. A girth hitch can also be tied with tube tape or flat tape.

The strength of a girth hitch is dependent upon a number of factors including:

- The type and size of the rope, tube tape or flat tape.
- The size or diameter of the object that the girth hitch is tied onto.
- The amount of friction between the girth hitch and the object.
- The orientation of the line that exits the hitch.

Figure 19 shows two orientation examples.



NOTE

When friction is low the orientation will automatically settle into a position between the two examples.

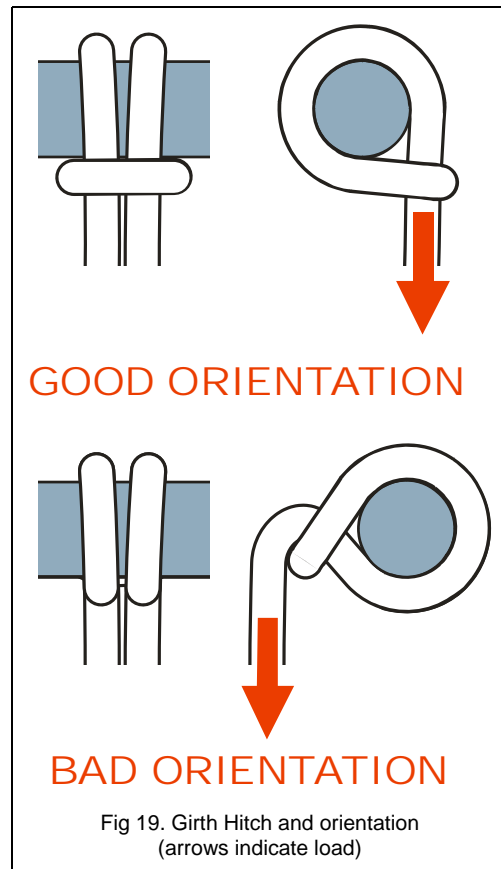


Fig 19. Girth Hitch and orientation
(arrows indicate load)

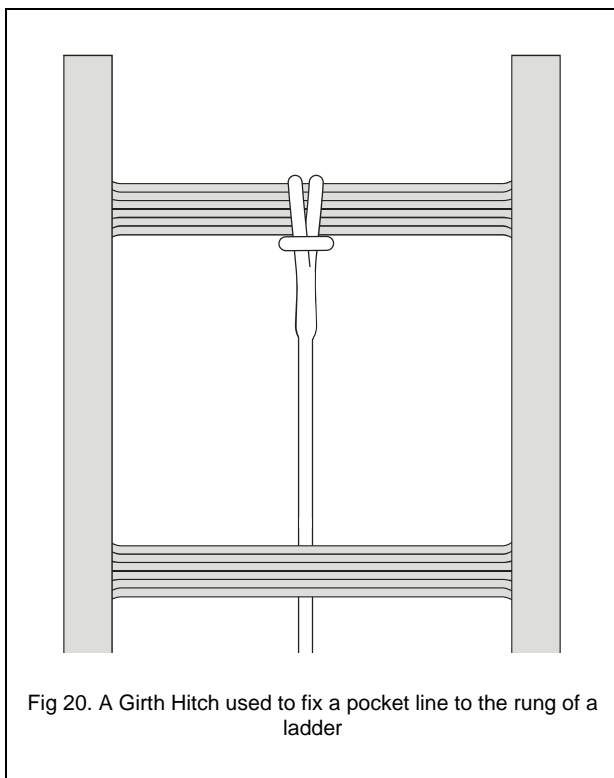


Fig 20. A Girth Hitch used to fix a pocket line to the rung of a ladder

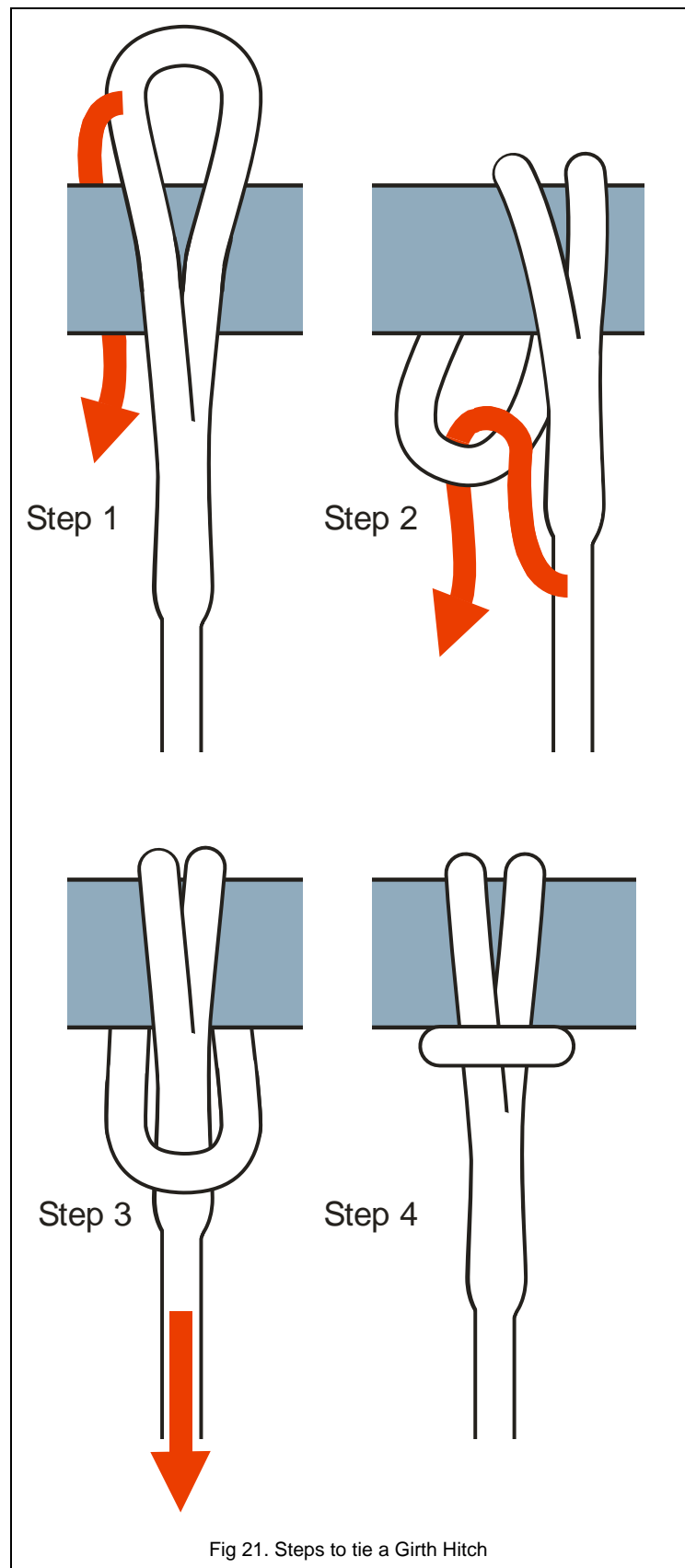
Applications for the Girth Hitch

- Not for life support, but may form part of a life support operation. Examples include: picket applications, lashing and securing ladders and other edge management devices.
- Can be used to fix the spliced eye in a pocket line to an object. Example: starting a ladder lashing operation. (*fig 20*)
- Can be applied to a tape sling when a constrictive force is required to keep the sling in place.
- Is used to attach a bight in the middle of a GP line to a stokes litter thus providing two guide lines. (example – the ladder slide technique)

Method of tying a Girth Hitch

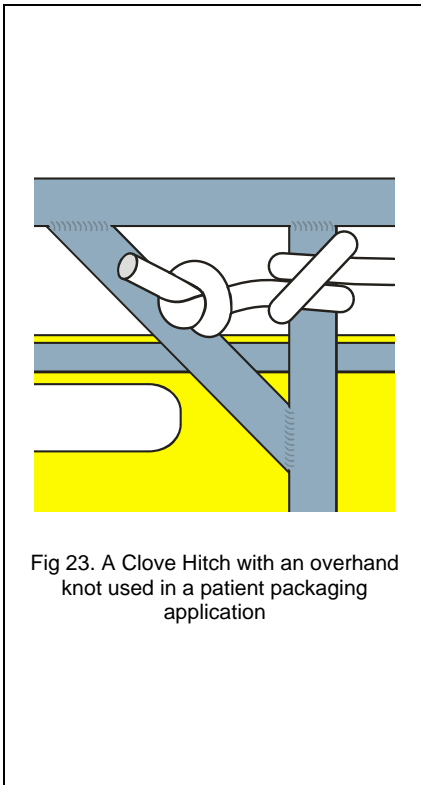
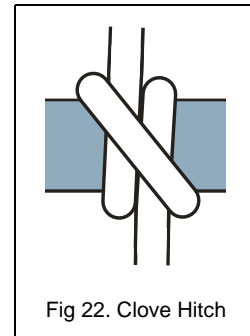
This example shows a girth hitch being applied to the spliced eye of a pocket line.

1. Wrap the eye or bight of rope around the object.
2. Feed the entire length of rope or line through the eye or bight.
3. Dress and pack to suit the application.
4. Adjust the orientation as shown *in figure 19* to maximize the strength of the hitch.



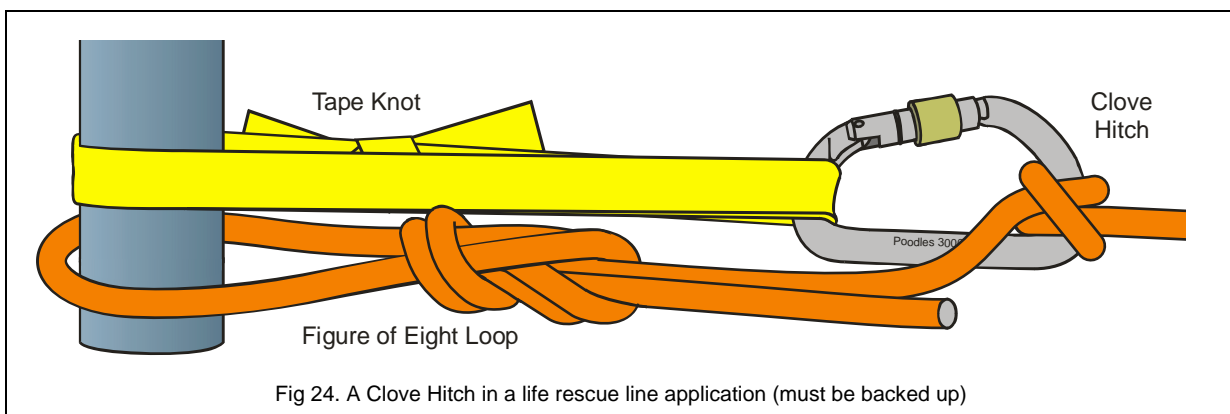
Clove Hitch

The clove hitch is a simple hitch that is widely used in domestic, commercial and recreational activities. The clove hitch is often used to secure the end of a line to a rail or beam in many applications. A clove hitch is quick to tie and very easy to adjust.



Applications for the Clove Hitch

- Can be used in life support applications provided that the life rescue line is backed up in an approved manner. The use of a clove hitch in this application allows for rapid adjustment of line tension and is ideal for sling leg applications.
- Attachment of a line to a rail or beam.
- Attachment of a ladder hauling line to a ladder rung.
- Securing a line for general lashing techniques.
- Termination of the end of a line after frapping.
- Attachment of a GP line to the strainer when rigging suction hoses and a strainer.
- Can be used to attach a line to tools and other equipment when hauling aloft.
- Can be used to attach a lashing line or pocket line to the rail of a Stokes litter when using the lashing technique for patient packaging. The use of an overhand knot for added security is recommended for this application.



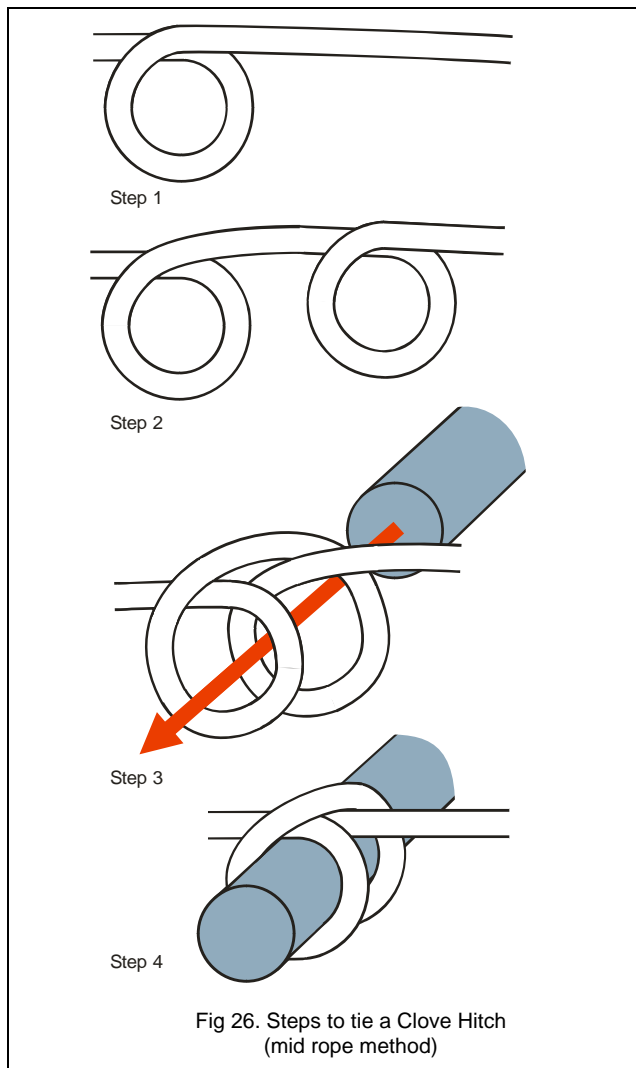
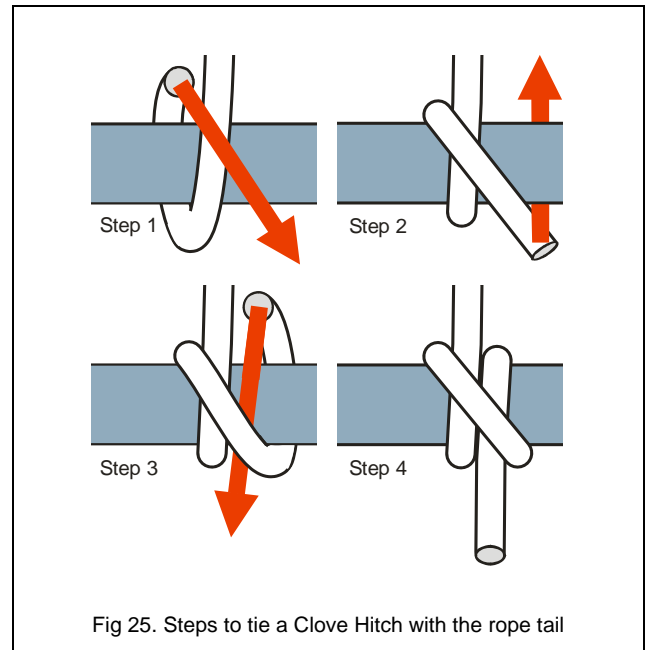
WARNING

A clove hitch must not be used to support live loads unless backup rigging is used.

Method of tying a Clove Hitch

Method using rope tail

1. Form a loop or turn around the object passing the tail over the main part of the line.
2. After crossing the main part of the line with the tail, continue wrapping the tail around the object in the same direction.
3. Form a second loop or turn on the opposite side of the first loop passing the tail under the section of line that links the two loops.
4. Dress and pack to suit the task.



Mid rope method

1. Form a loop in the line.
2. Form a second loop.
3. Pass the second loop behind the first and slip the two loops over the object.
4. Dress and pack to suit the task.

Rolling Hitch

The rolling hitch is similar to a clove hitch with an extra loop or turn.

The extra turn adds additional friction to help the hitch resist sideways movement in a certain direction as shown by the arrows in *figure 27*.

The principles that make the rolling hitch function are similar to that of the Prusik hitch. Firefighters are encouraged to compare the two knots side by side during training.

The rolling hitch appears in knot books with two different methods of dressing as shown in *figure 27*. The dressing can be modified without untying the hitch, emergency service personnel may choose to dress a rolling hitch using either method.

Both methods of dressing a rolling hitch are acceptable.

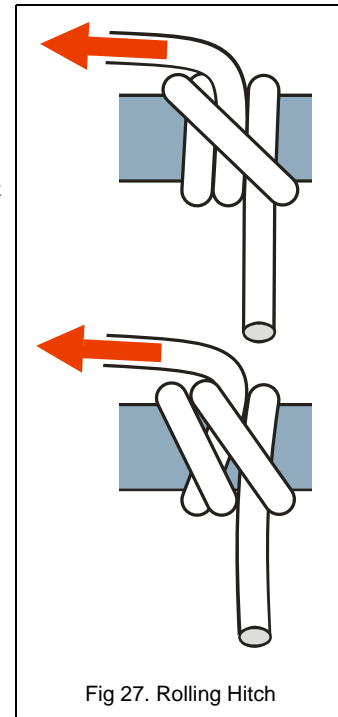


Fig 27. Rolling Hitch

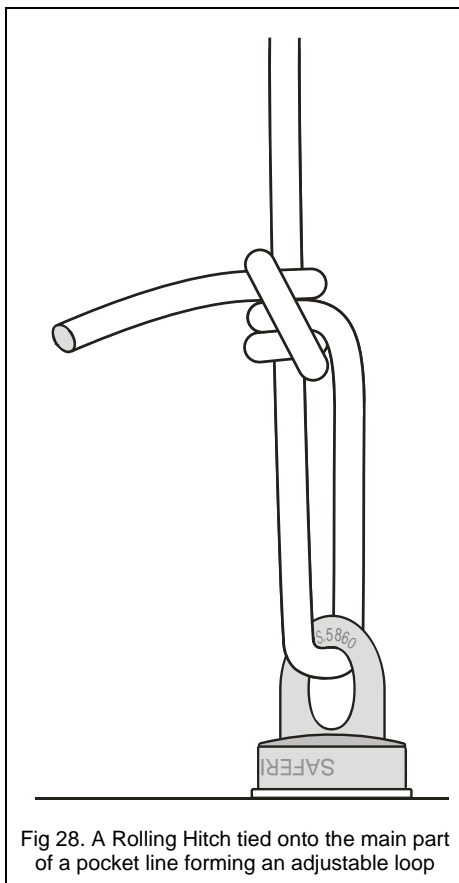


Fig 28. A Rolling Hitch tied onto the main part of a pocket line forming an adjustable loop

Applications for the Rolling Hitch

- An upgrade to a clove hitch application where some sideways force may be expected.
- An excellent hitch that can be applied to pickets using a pocket line to assist with picket removal.
- Can be tied onto the main part of a line forming an adjustable loop as shown in *figure 28*.
- The rolling hitch as applied in *figure 28* can be positioned up or down the main part of the line to adjust as desired. The hitch will automatically lock provided it is dressed and packed correctly.
- Applications where the rolling hitch is formed into an adjustable loop can be used as follows:
 - As an adjustable tent rope.
 - As an adjustable line to secure parts of motor vehicles or other objects that have been displaced during rescue operations.
 - As an emergency adjustable loop to tilt and secure a stretcher during vertical rescue operations.

Method of tying a Rolling Hitch

Dressing Method One

1. Form two loops or turns around the line or object. The side of the hitch that these turns are against will determine which side of the hitch resists sideways movement.
2. Pass the tail over the turns and main part of the line and continue wrapping the tail around the object in the same direction.
3. Form a third turn on the opposite side of the main part of the line passing the tail under the section of line that links the outer two loops.
4. Dress and pack the hitch.

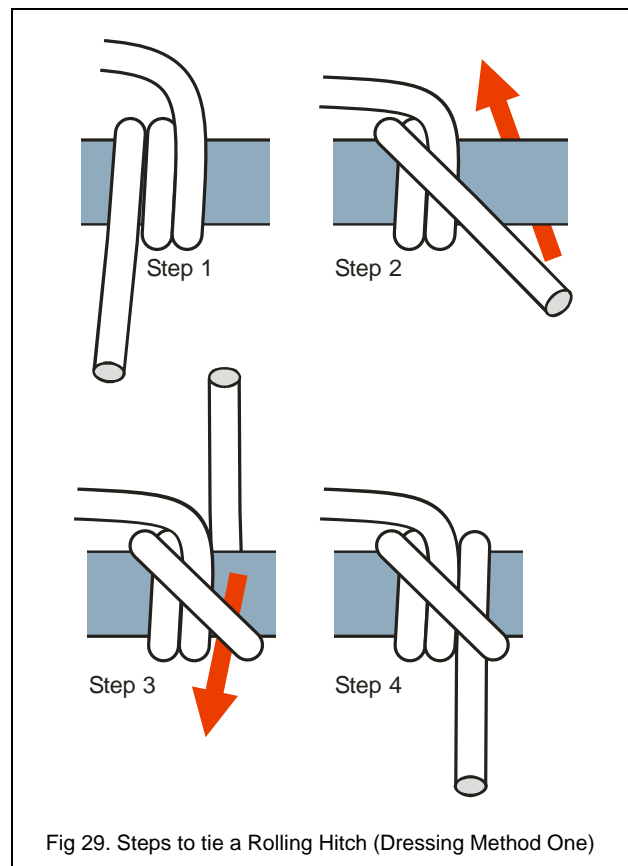


Fig 29. Steps to tie a Rolling Hitch (Dressing Method One)

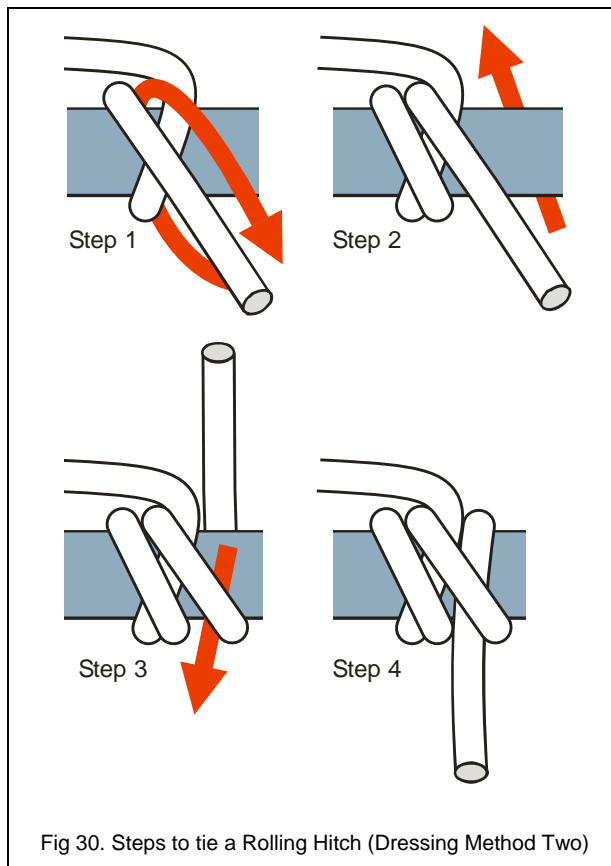


Fig 30. Steps to tie a Rolling Hitch (Dressing Method Two)

Dressing Method Two

1. Form a loop or turn around the line or object. The side of the hitch that this turn is against will determine which side of the hitch resists sideways movement. Cross the tail over the main part of the line.
2. Whilst crossing the tail over the main part of the line, form a second turn in the same manner as the first. Cross the tail over the main part of the line and continue wrapping the tail around the object in the same direction.
3. Form a third turn on the opposite side of the main part of the line passing the tail under the section of line that last crossed the main part of the line.
4. Dress and pack the hitch.

Round Turn & Two Half Hitches

The round turn & two half hitches is a hitch used to secure the end of a rope to a fixed object.

The strength of a round turn & two half hitches is dependent upon the diameter of the object that it is being applied to and the amount of friction that exists between the rope and the object.

A round turn & two half hitches uses the available friction between the turns of rope around an object in much the same way as a tensionless anchor. The friction that exists between the rope and the object helps make this an easy hitch to tie and untie under load.

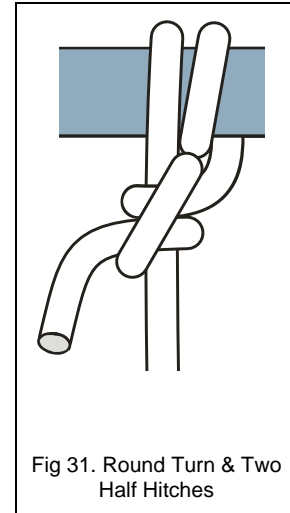


Fig 31. Round Turn & Two Half Hitches

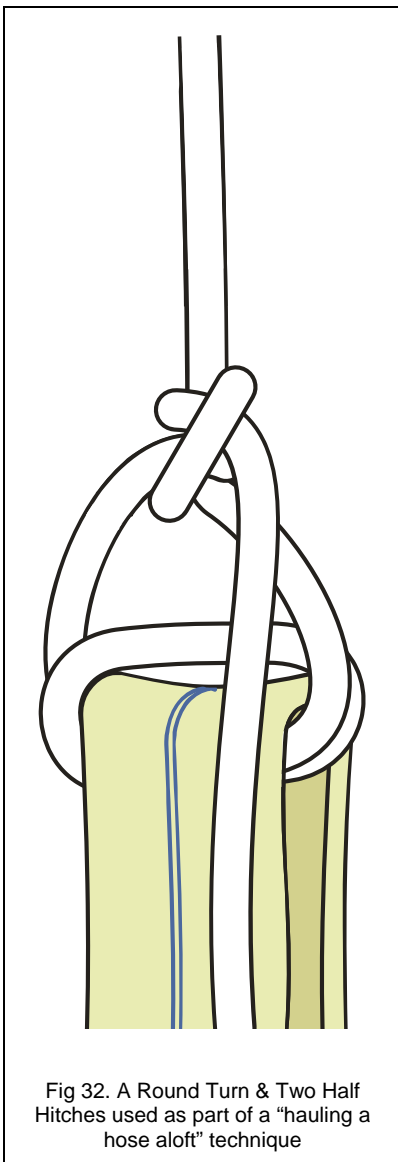


Fig 32. A Round Turn & Two Half Hitches used as part of a "hauling a hose aloft" technique

Applications for a Round Turn & Two Half Hitches

- Used to attach a general purpose line to a bight of lay flat firefighting hose when hauling a hose aloft. (see figure 32) A long tail is left hanging during hose hauling operations. The tail can then be utilised to secure the hose after hauling. The firefighting branch is attached to the same general purpose line via a clove hitch and half hitch.
- Attaching the end of a line to an object.
- Easier to tension than a Bowline.
- The "round turn" part of the knot can be tied loosely as pictured in figure 32 with the "two half hitches" (clove hitch) dressed and packed tightly. This technique is used if the object requires clearance such as in a lay flat firefighting hose application.
- The turns of rope around the object could easily be increased to add friction as required to suit the application. The finished hitch may end up as two round turns & two half hitches.

Method of tying a Round Turn & Two Half Hitches

1. Form a loop or turn around the object.
2. Continue to form what seems like two wraps of rope around the object, it is titled a “round turn” because it is one complete encirclement of the object. Pass the tail over the main part of the line.
3. Tie the first half hitch.
4. Continue tying the half hitches without changing the direction that the tail is being passed around the main part of the line. (This is the same as tying a clove hitch)
5. Finish the second half hitch (now forming a clove hitch) by passing the tail under the section of rope that links the two half hitches.
6. Dress and pack to suit the application.

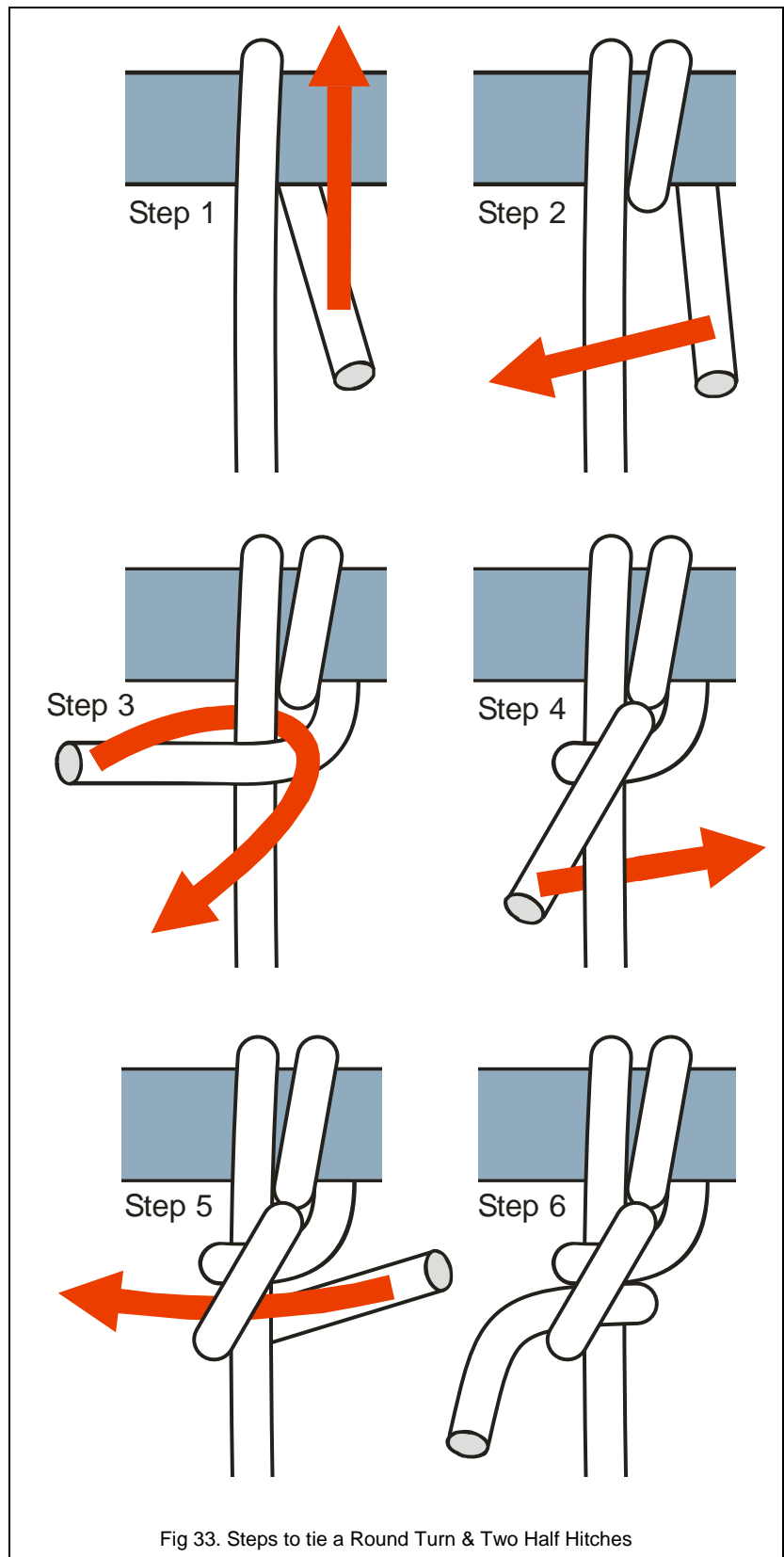


Fig 33. Steps to tie a Round Turn & Two Half Hitches

Sheet Bend

The sheet bend was originally used to attach a rope to the corner of a sheet or sail, hence the name “sheet bend”.

A sheet bend is ideal for joining two ropes of unequal diameter or a rope to an object such as a tarp or plastic sheeting.

The security of a sheet bend is dependent upon the available friction between the two objects being attached. If insufficient friction is available then a double sheet bend may be more suitable.

A properly tied sheet bend will have the rope tails exiting the finished knot on the same side as shown *in figure 34*.

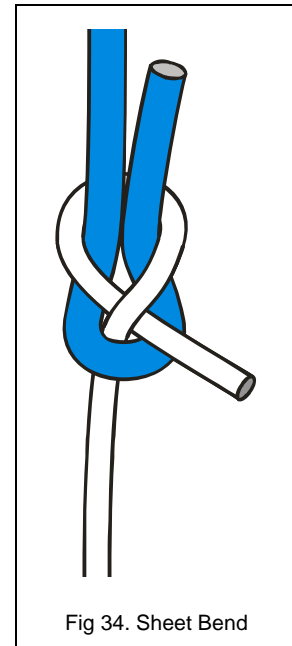


Fig 34. Sheet Bend

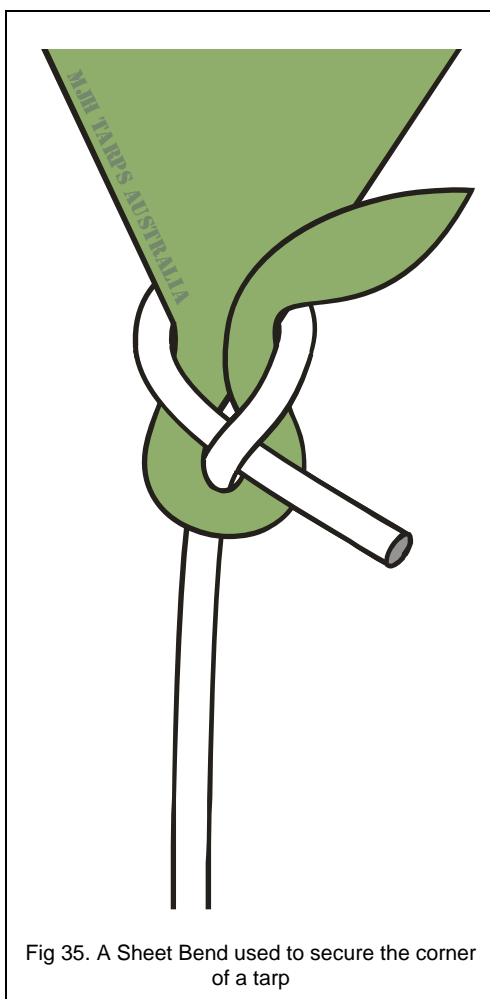


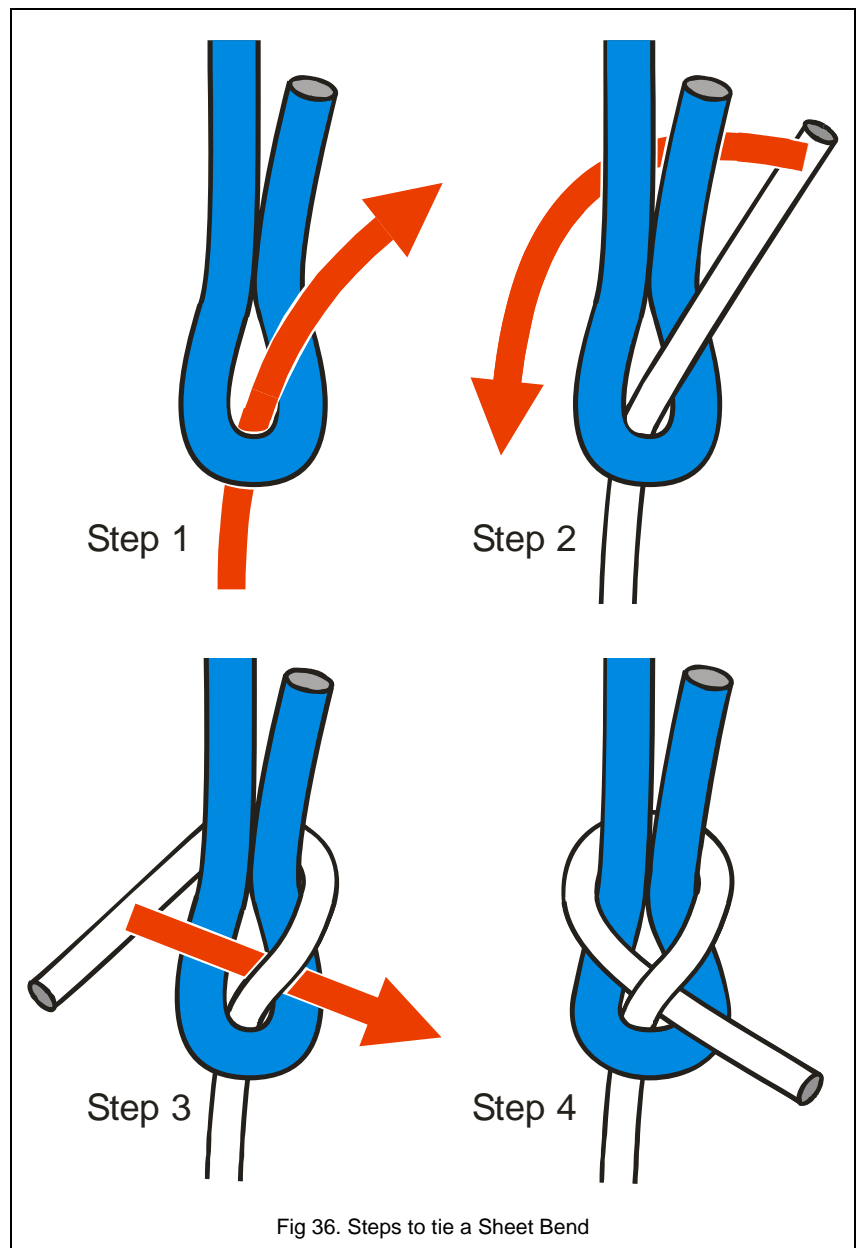
Fig 35. A Sheet Bend used to secure the corner of a tarp

Applications for a Sheet Bend

- Join two ropes of unequal diameter.
- Attaching a rope or line to a tarp or plastic sheet as shown *in figure 35*.
- Salvage operations with tarps, plastic sheet, pocket lines and lashing lines.
- Storm damage operations when eyelets have failed on roofing sheets.
- A rapid method of joining pocket lines together using the spliced eye of one pocket line and the whipped end of the other pocket line.

Method of tying a Sheet Bend

1. Form a bight with the larger rope, tarp or plastic sheeting. Pass the smaller rope through the eye that is formed by the bight.
2. Lay the rope so that both tails are on the same side as shown. Pass the rope around the entire bight.
3. Pass the smaller rope back under itself as shown.
4. Dress and pack the knot.

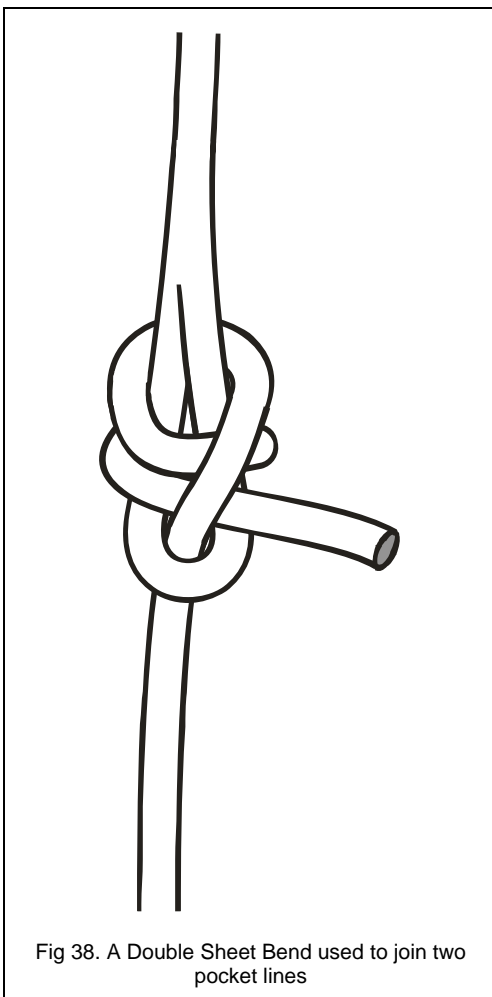
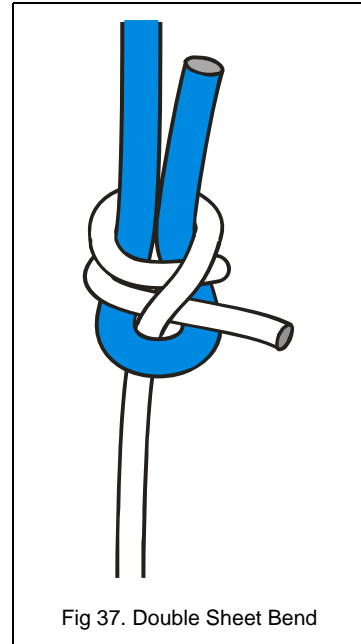


Double Sheet Bend

The double sheet bend is a modification to the single sheet bend to add friction.

A double sheet bend is ideal for sheet bend applications that require a stronger grip.

A properly tied double sheet bend will have the rope tails exiting the finished knot on the same side as shown *in figure 37*.

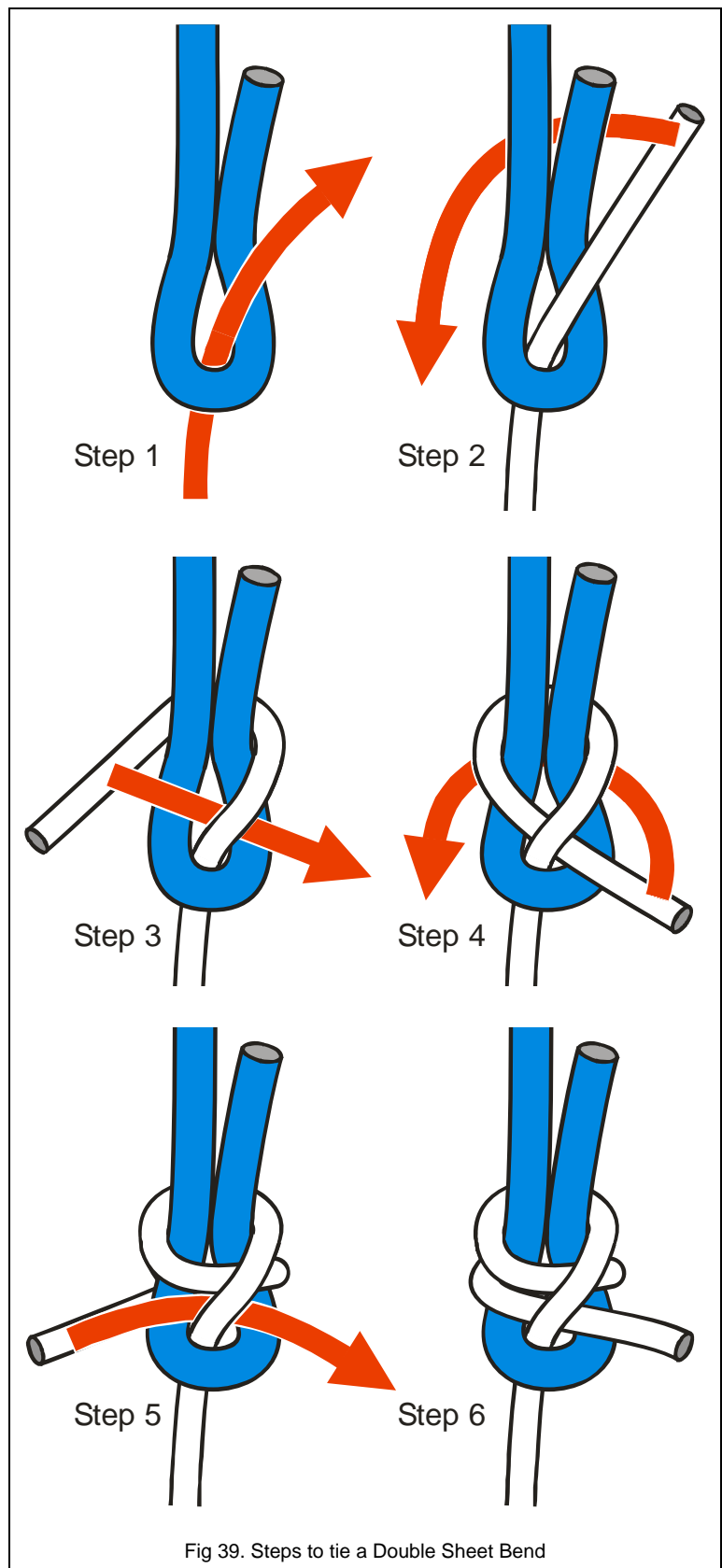


Applications for a Double Sheet Bend

- Provides additional friction than that of a sheet bend.
- Join two ropes of unequal diameter.
- Attaching a rope or line to a tarp or plastic sheet.
- Salvage operations with tarps, plastic sheet, pocket lines and lashing lines.
- Storm damage operations when eyelets have failed on roofing sheets.
- Joining pocket lines together using the spliced eye of one pocket line and the whipped end of the other pocket line as shown *in figure 38*.

Method of tying a Double Sheet Bend

1. Form a bight with the larger rope, tarp or plastic sheeting. Pass the smaller rope through the eye that is formed by the bight.
2. Lay the rope so that both tails are on the same side as shown. Pass the rope around the entire bight.
3. Pass the smaller rope back under itself as shown.
4. Pass the rope a second time around the entire bight.
5. Pass the smaller rope back under itself a second time.
6. Dress and pack the knot.



Double Fisherman's Bend

The double fisherman's bend consists of two ropes or a loop of rope and two double overhand knots that are tied to encircle the main lines of each other. Once tied the double overhand knots slide together when the ropes are pulled. The double overhand knots function as stopper knots preventing the ropes from pulling apart.

The double fisherman's bend is used to join ropes and lines. It is very secure and is the preferred method of joining two life rescue lines together if required.

Figure 40 shows correct dressing of a double fisherman's bend. Take notice of the crosses on one side and the parallel sections of rope on the other.

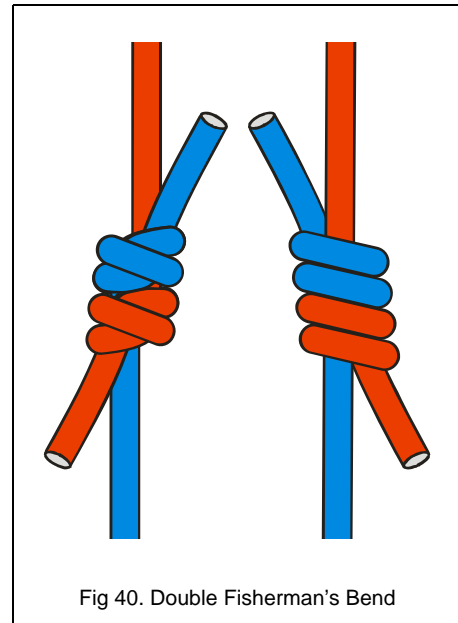


Fig 40. Double Fisherman's Bend

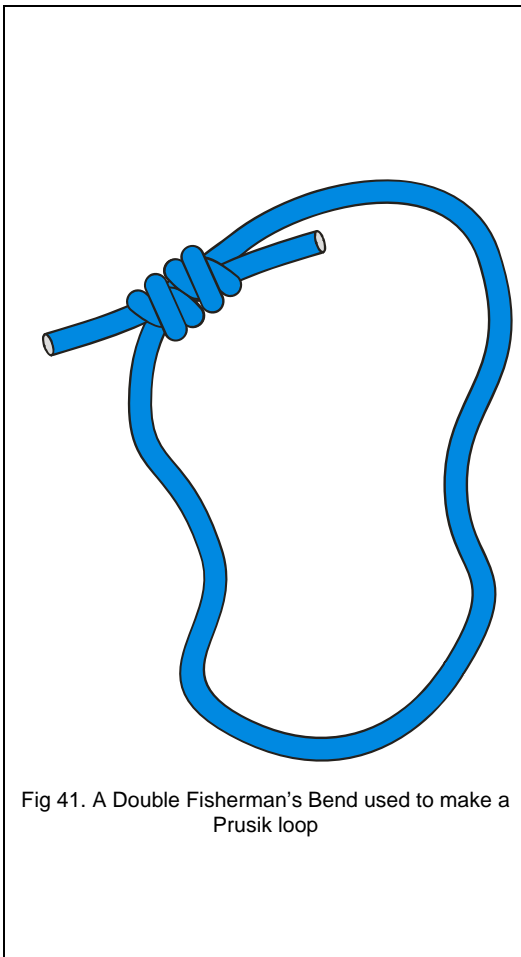


Fig 41. A Double Fisherman's Bend used to make a Prusik loop

Applications for a Double Fisherman's Bend

- Suitable for life support applications.
- Used to join ropes and lines.
- Used to create Prusik loops.
- Attachment of a throw line to a line throwing device can be achieved by passing the line through the ring on the line throwing device then by tying an adaptation of a double fisherman's knot as shown in *figure 42*. Although this has changed the classification of the knot, the principle and function of the double overhand component remains the same.

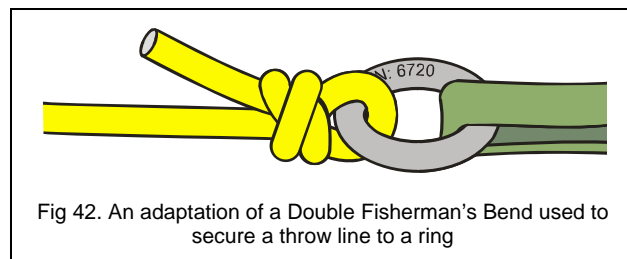


Fig 42. An adaptation of a Double Fisherman's Bend used to secure a throw line to a ring

Method of tying a Double Fisherman's Bend

The tie and flip method

1. Lay the rope ends beside each other. Working with the right hand rope end, wrap it around the left hand rope to form a loop of rope. (the loop of rope will be evident depending upon how you are holding the ropes)
2. Continue wrapping the right hand rope end in the same direction a second time, wrapping it over itself.
3. Continue wrapping the right hand rope end in the same manner to form two loops.
4. Feed the right hand rope end through the two loops that were formed by the two wraps.
5. Dress and pack the first half then flip the rope ends and half completed knot over so that the incomplete left hand side is now on the right hand side.
6. Repeat step 1.
7. Repeat step 2.
8. Repeat step 3.
9. Repeat step 4.
10. Dress and pack the double overhands then pull the ropes. The double overhands will travel towards each other until they stop against each other.
11. Dress and pack the finished knot. Check the dressing of the finished double fisherman's bend by ensuring that it has crosses on one side and parallel sections of rope on the other as shown in *figure 40*.

Once this technique has been mastered you can then practice tying the knot without using the tie and flip method.

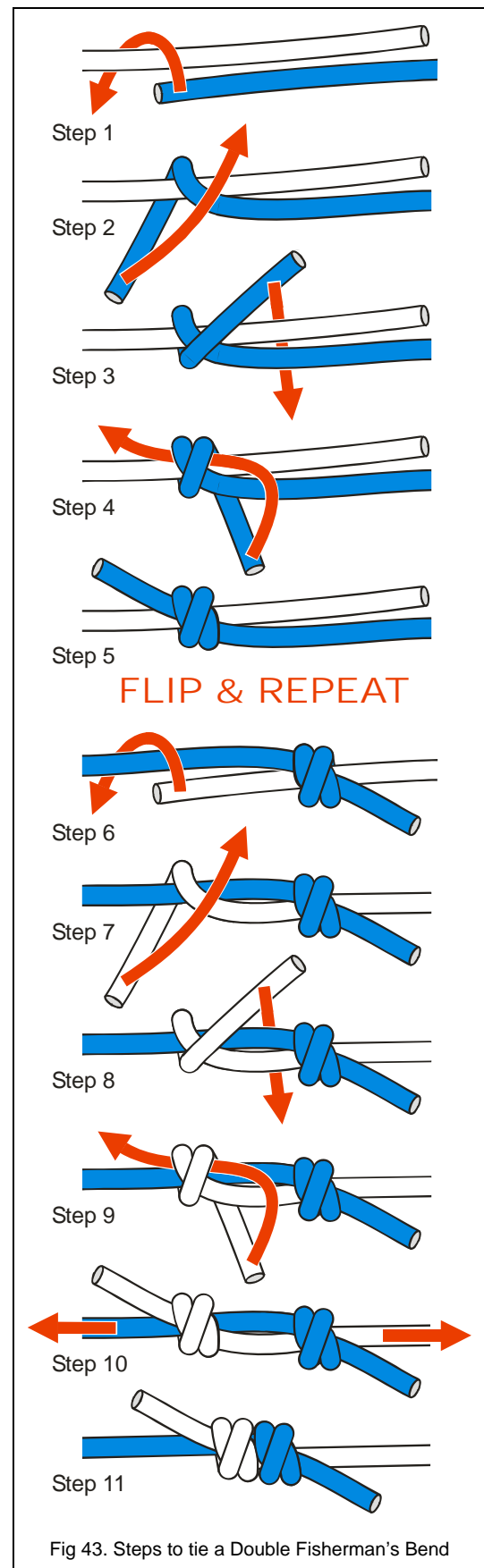


Fig 43. Steps to tie a Double Fisherman's Bend

Half Sheepshank

The half sheepshank is used to provide mechanical advantage to a hawser laid rope as part of a tensioning system to secure objects. It is often referred to as a “truckies hitch” because it is widely used by truck drivers for securing loads.

The security of half sheepshank is dependent upon the available friction between the parts of the rope as they bind against each other thus making the half sheepshank a suitable knot for use with hawser laid rope.

The rope on rope friction that is created when using this knot can damage ropes and lines.



NOTE

There are many variations to this hitch that will perform in a similar manner and may offer additional advantages.

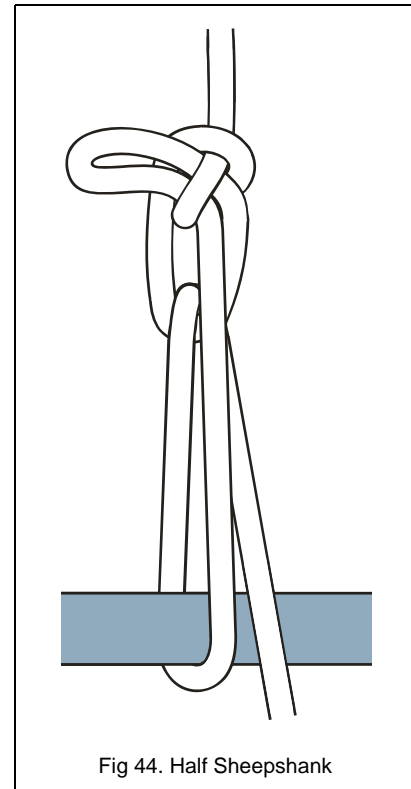


Fig 44. Half Sheepshank

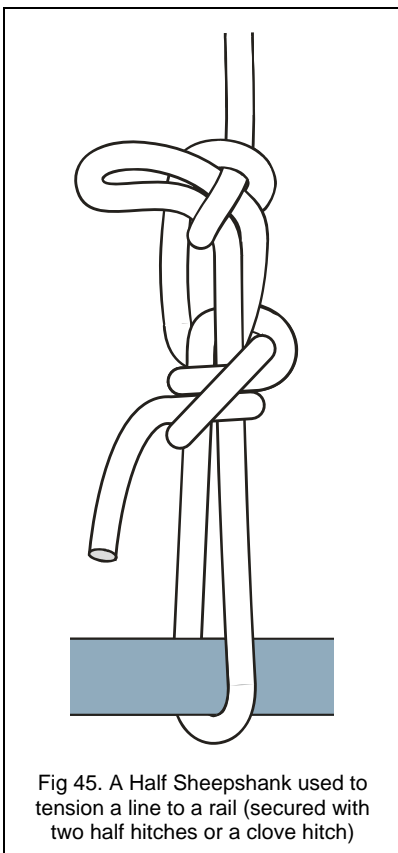


Fig 45. A Half Sheepshank used to tension a line to a rail (secured with two half hitches or a clove hitch)

Applications for a Half Sheepshank

- Not for life support.
- Not to be used with life rescue lines.
- Used to tension loads in road transport applications.
- Can be used in any rope tensioning system with hawser laid ropes and lines.
- The example as shown *in figure 45* has been secured with two half hitches or a clove hitch. An alternate finishing method is to tie a clove hitch directly to the rail.

Method of tying a Half Sheepshank

 **NOTE**

The images have been drawn in an attempt to make the steps easy to understand. This example is presented as a half sheepshank tensioned against a hook. When learning this knot you may decide to follow these steps exactly but to tie this knot quickly you may experience some twisting depending upon the orientation of the rail or hook.

1. Loop the rope over an anchor such as a rail, bollard or hook. Reach under the section of the loop or turn of rope and pull a bight of rope.
2. Hold the bight of rope in one hand then grab another bight of rope and twist it twice to form a loop as shown in the upper section with the other hand.
3. Feed the bight of rope into the loop in such a way that tension on the loop will grab the bight of rope.
4. Whilst holding the knot to prevent it falling apart, apply light tension to the tail. Check the dressing of the knot and when satisfied that the loop and bight are securely dressed haul the tail to provide tension as required.

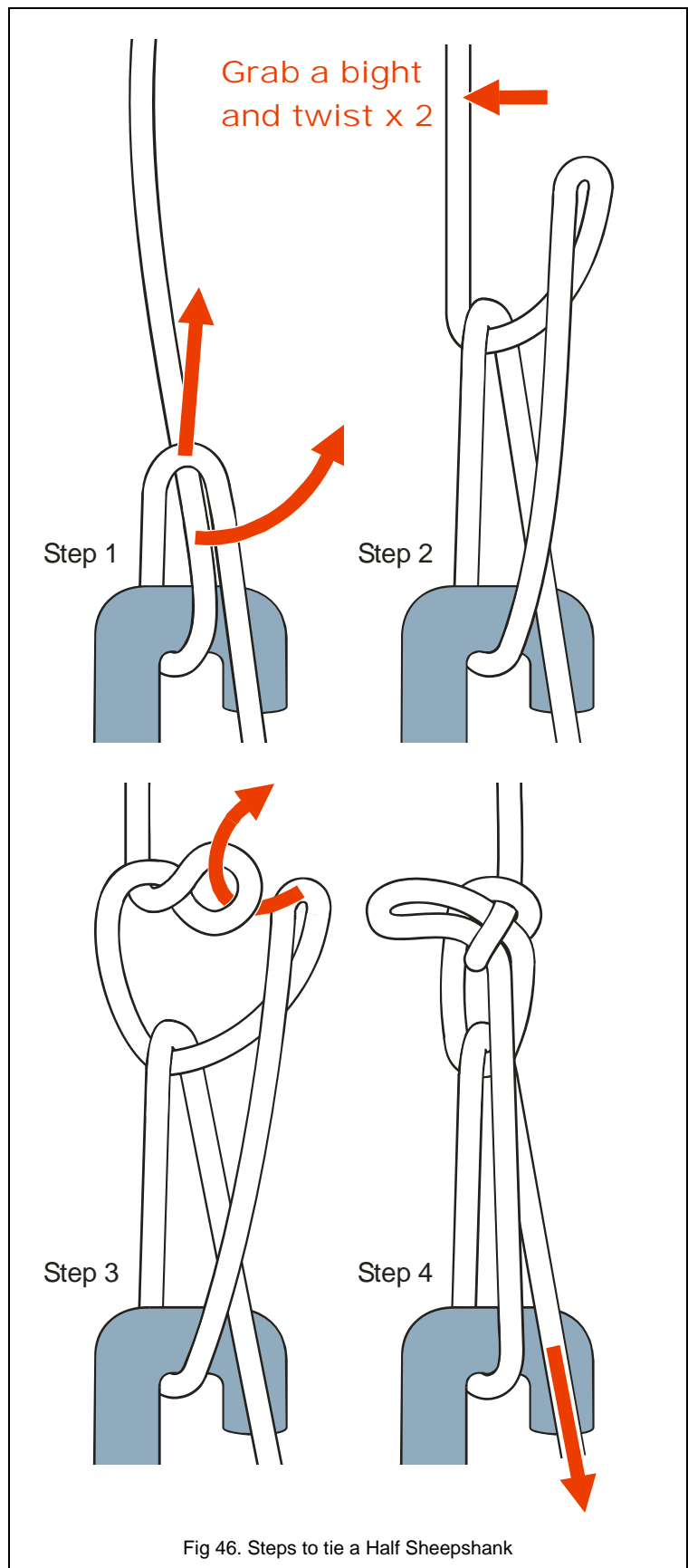


Fig 46. Steps to tie a Half Sheepshank

Bowline

A bowline is a knot that is used to provide an attachment loop into a hawser laid rope.



WARNING

The bowline as described in this manual is not for life support applications. There are many other knot options described in this manual that are more suitable than the bowline for life support.



POINT OF INTEREST

Many knot users make use of knots from the bowline family with modifications to improve the performance of the knot for live loads. Modifications include:

- A bowline with a Yosemite lock-off.
- Double long tail bowline.
- Bowline tied with a bight.
- Double bowline.
- Bowlines with a re-thread backup.

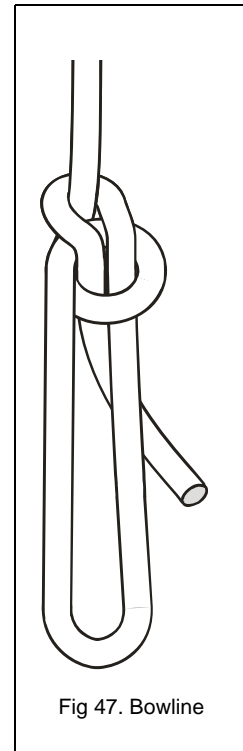


Fig 47. Bowline

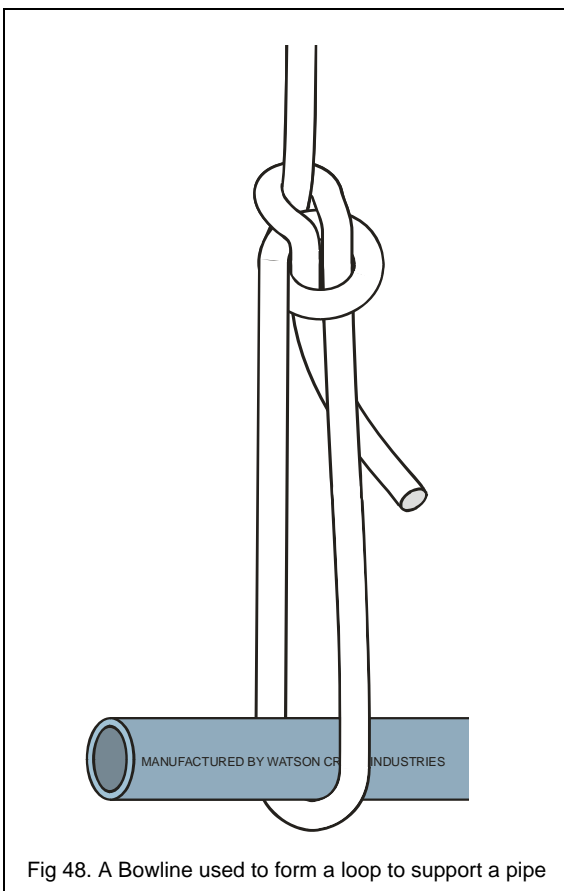


Fig 48. A Bowline used to form a loop to support a pipe

Applications for a Bowline

- Forms a fixed loop in a hawser laid rope.
- Provides a rapid attachment of a rope to an object.
- Used to attach a hawser laid line to an anchor point.

Method of tying a Bowline

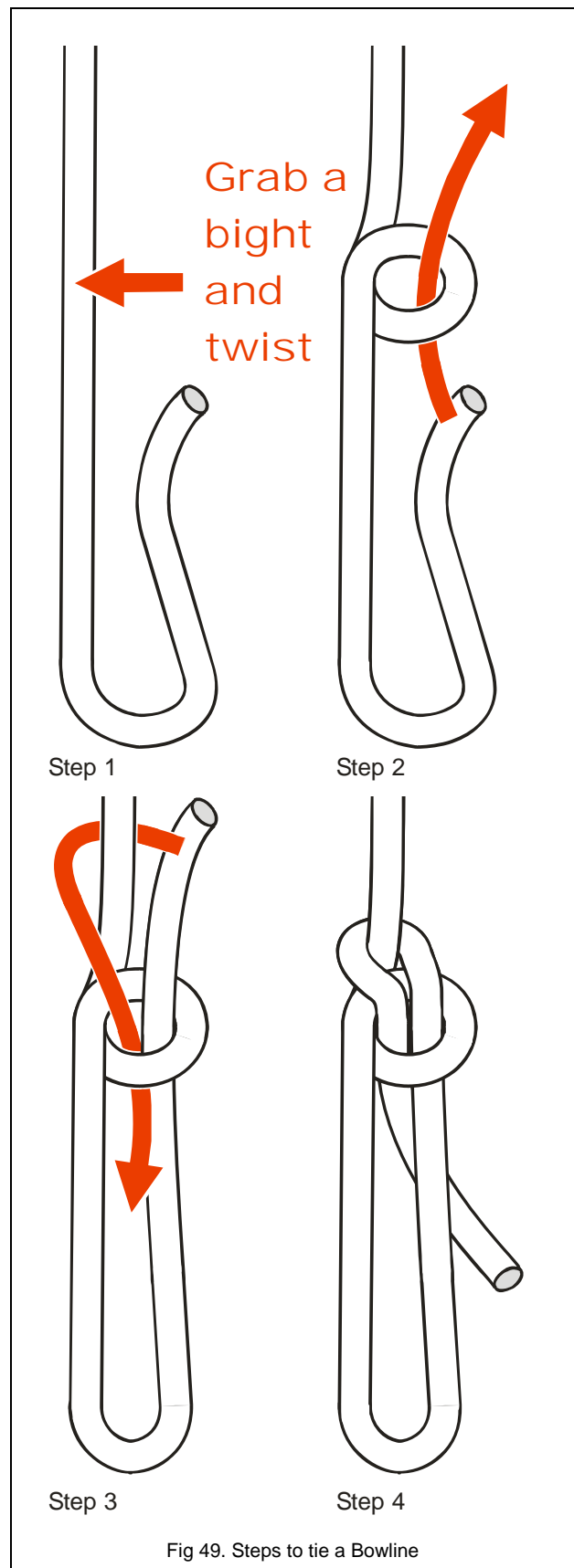
There are many different ways to tie a bowline. The following is one simple example.

1. Form a bight or pass the end of the rope around an object. Grab the section of rope above the bight or object and twist to form a loop.
2. Pass the tail through the loop.
3. Pass the tail around the main section of the rope then back through the loop. A quick study of the lay of the loop will determine which direction to feed the tail. If the direction is incorrect the knot will fall apart.
4. Dress and pack the knot.



CAUTION

For security reasons the tail of the bowline must finish on the inside of the knot as shown *in figure 49*.



Round Lashing

Round lashing is a quick, simple and secure method of applying tension between two parallel objects.

The principles of round lashing are as follows:

1. Fix the lashing line.
2. Wrap the objects together with tension.
3. Apply frapping turns to further tension the lashing.
4. Fix or secure the lashing line tail.

The strength of a lashing depends upon the size and type of lashing line used and the number of wraps.

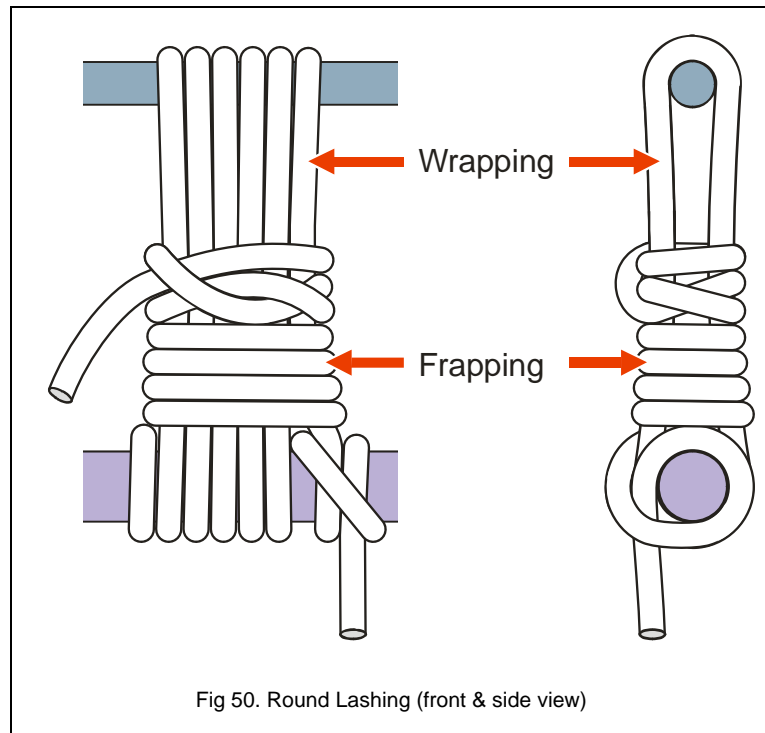


Fig 50. Round Lashing (front & side view)

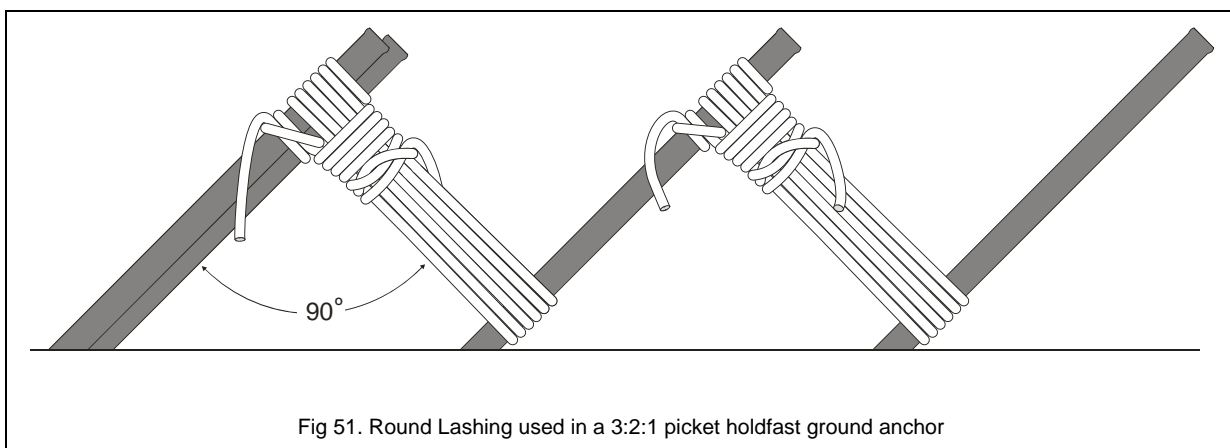


Fig 51. Round Lashing used in a 3:2:1 picket holdfast ground anchor

Applications for a Round Lashing

- Not for life support, but may form part of a life support operation. Examples include: back tying an anchor, picket applications, securing ladders and other edge management devices.
- Used to apply tension and bind parallel objects.
- Used to tension and secure pickets in picket holdfast ground anchor systems as shown in figure 51.
- A quick and secure method of stabilising a ladder against a rail or beam.
- A secure method of locking the sliding lengths of an extension ladder together. This is particularly useful when performing ladder slides and ladder bridging operations.

Method of tying a Round Lashing

1. Fix the end of the lashing line to one of the objects. Although a clove hitch is shown, a round turn & two half hitches, a girth hitch with the spliced eye or even the spliced eye on its own will do.
2. Wrap and tension the lashing line around the objects. The strength of the lashing is determined by the size and type of lashing line used and the number of wraps. A second clove hitch can be added prior to the frapping if desired.
3. The frapping turns apply additional tension and friction that further secures the objects.
4. Fix the finished end either directly to the lashing as shown or if that space has been consumed by the frapping, a clove hitch can be tied directly to the object.

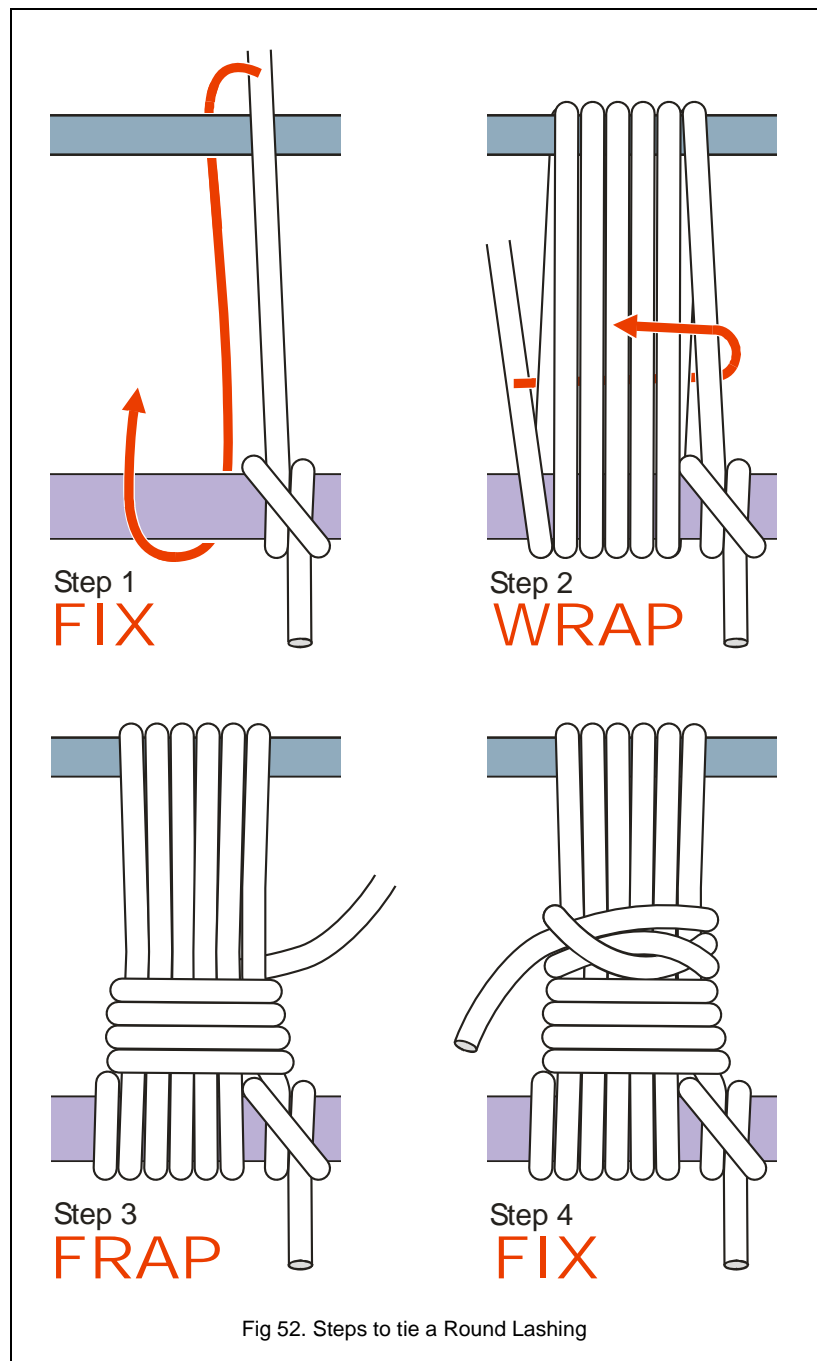


Fig 52. Steps to tie a Round Lashing

POINT OF INTEREST

The frapping turns increase the tension by applying a vector force onto the side of the wrapping turns. The example *in figure 52* depicts two different sizes of objects and the frapping is placed against the larger of the two. Doing so will enhance the amount of tension that can be applied.

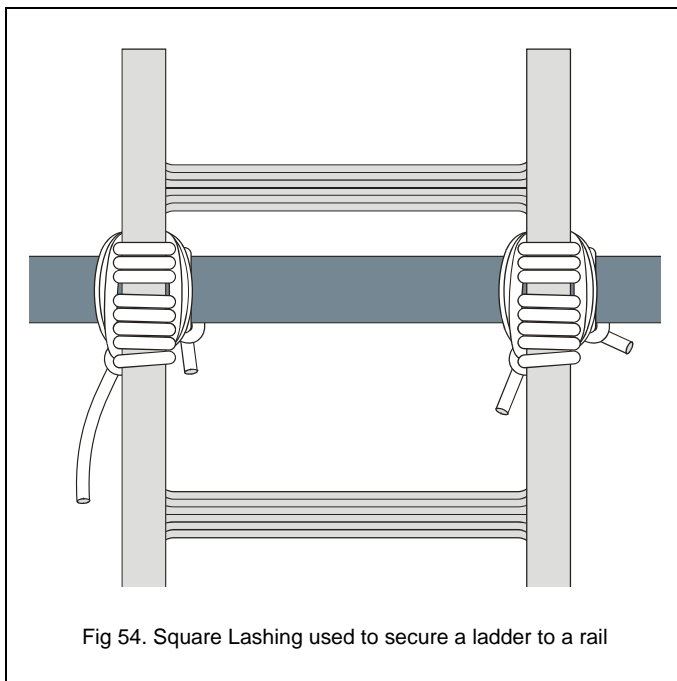
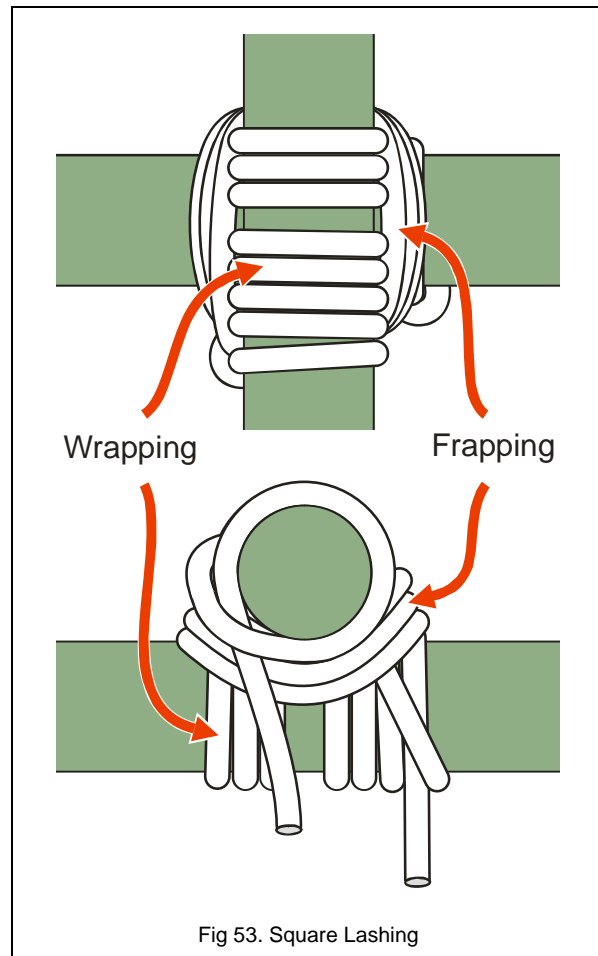
Square Lashing

Square lashing is a quick, simple and secure method of applying tension between two perpendicular objects.

The principles of square lashing are as follows:

1. Fix the lashing line.
2. Wrap the objects together with tension.
3. Apply frapping turns to further tension the lashing.
4. Fix or secure the lashing line tail.

The strength of a lashing depends upon the size and type of lashing line used and the number of wraps.



Applications for Square Lashing

- Not for life support, but may form part of a life support operation. Examples include: construction and security of edge management devices including ladders and “A” frames.
- Used to apply tension and bind perpendicular objects.
- A quick and secure method of stabilising a ladder against a rail or beam. (*fig 54*)
- Used to attach timber rounds when constructing “A” frames.

Method of tying a Square Lashing

1. Fix the end of the lashing line to one of the objects. Although a clove hitch is shown a round turn & two half hitches, a girth hitch with the spliced eye or even the spliced eye on its own will do.
2. Wrap and tension the lashing line around the objects. Lay or dress the lashing line so that each wrap sits alongside the previous wrap without any crossovers. Wraps will move outwards on one of the objects and inwards on the other object.
3. The frapping turns apply additional tension and friction that further secures the objects.
4. Fix the finished end with a clove hitch directly to the object.

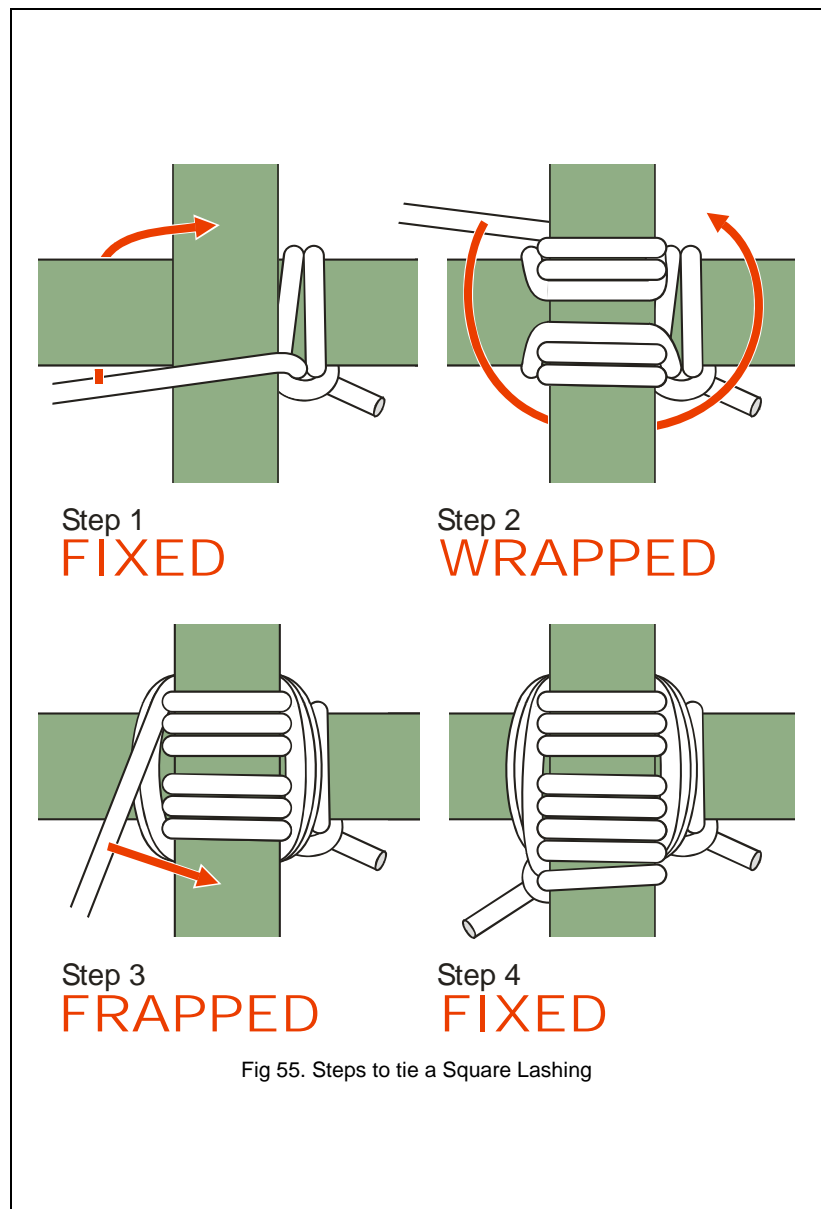


Fig 55. Steps to tie a Square Lashing

NOTE

If building an “A” frame or other similar structure where the perpendicular objects will be forced into an angle other than 90°, correct placement of the finishing knot will ensure that the movement of the objects adds tension.

The strength of the lashing is determined by the size and type of lashing line used and the number of wraps. A second clove hitch can be added prior to the frapping if desired.

Figure of Eight Lashing

Figure of eight lashing is a secure method of connecting two or more objects. This method of lashing provides a flexible joint that if moved in a certain direction further tightens the lashing.

The principles of figure of eight lashing are as follows:

1. Fix the lashing line.
2. Wrap a figure of eight pattern around the objects.
3. Apply frapping turns to further tension the lashing. These frapping turns also form the hinge for applications such as tripods.
4. Fix or secure the lashing line tail.

The strength of a figure of eight lashing depends upon the size and type of lashing line used, the number of wraps and the amount of additional twisting that is applied to the joint given the application.

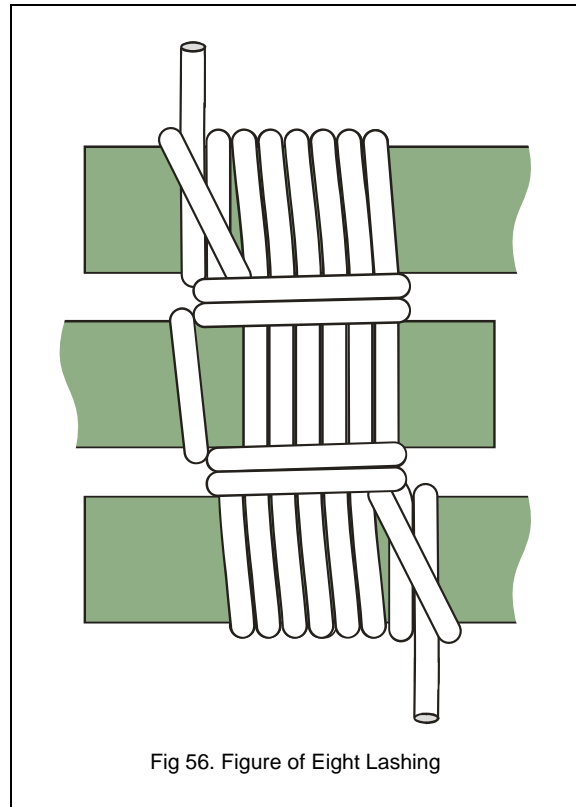


Fig 56. Figure of Eight Lashing

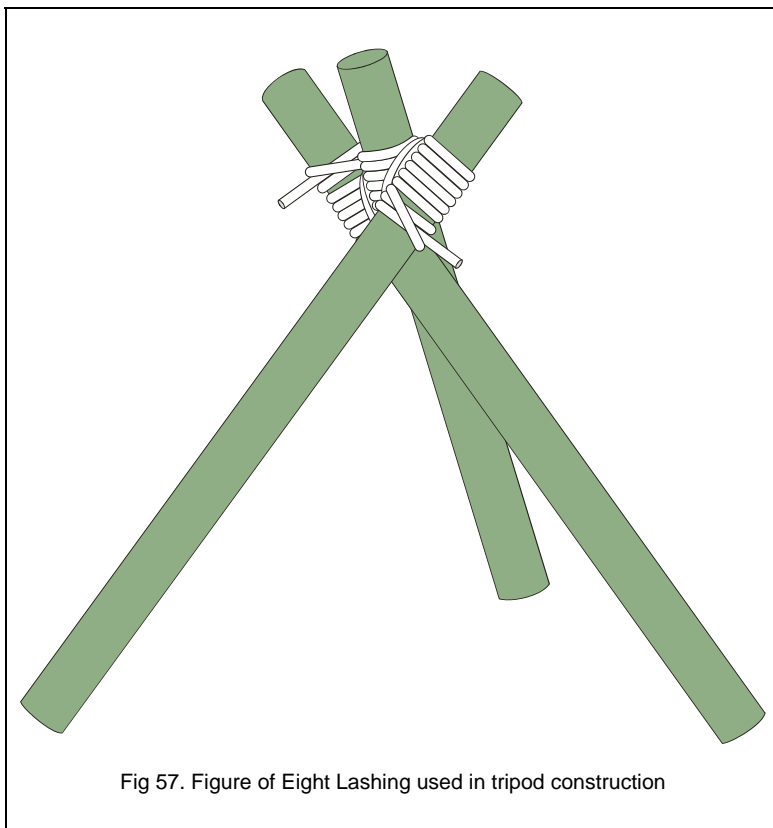


Fig 57. Figure of Eight Lashing used in tripod construction

Applications for a Figure of Eight Lashing

- Not for life support, but may form part of a life support operation. Examples include: construction and security of edge management devices including tripods.
- Used to apply tension and bind two or more objects.
- Used to bind object with a flexible connection.
- Used to attach timber rounds when constructing tripods as shown in *figure 57*.

Method of tying a Figure of Eight Lashing

1. Lay the objects down on a flat surface and fix the end of the lashing line to one of the objects that lays on the outside as shown.
2. Begin wrapping the lashing line around the objects in a figure of eight pattern. Lay or dress the lashing line so that each wrap sits alongside the previous wrap. Tension the wrapping as you progress with each half wrap in turn.
3. Continue wrapping until you have sufficient wraps for the task then begin frapping on the side that you first fixed the lashing line. Tension the frapping and maintain the tension as you progress.
4. Once you have finished frapping one side, cross the line over the middle object and frap the other side in the reverse direction.
5. Pass the tail under itself as shown to form the first part of a clove hitch.
6. Complete the clove hitch as shown tied directly to the object.

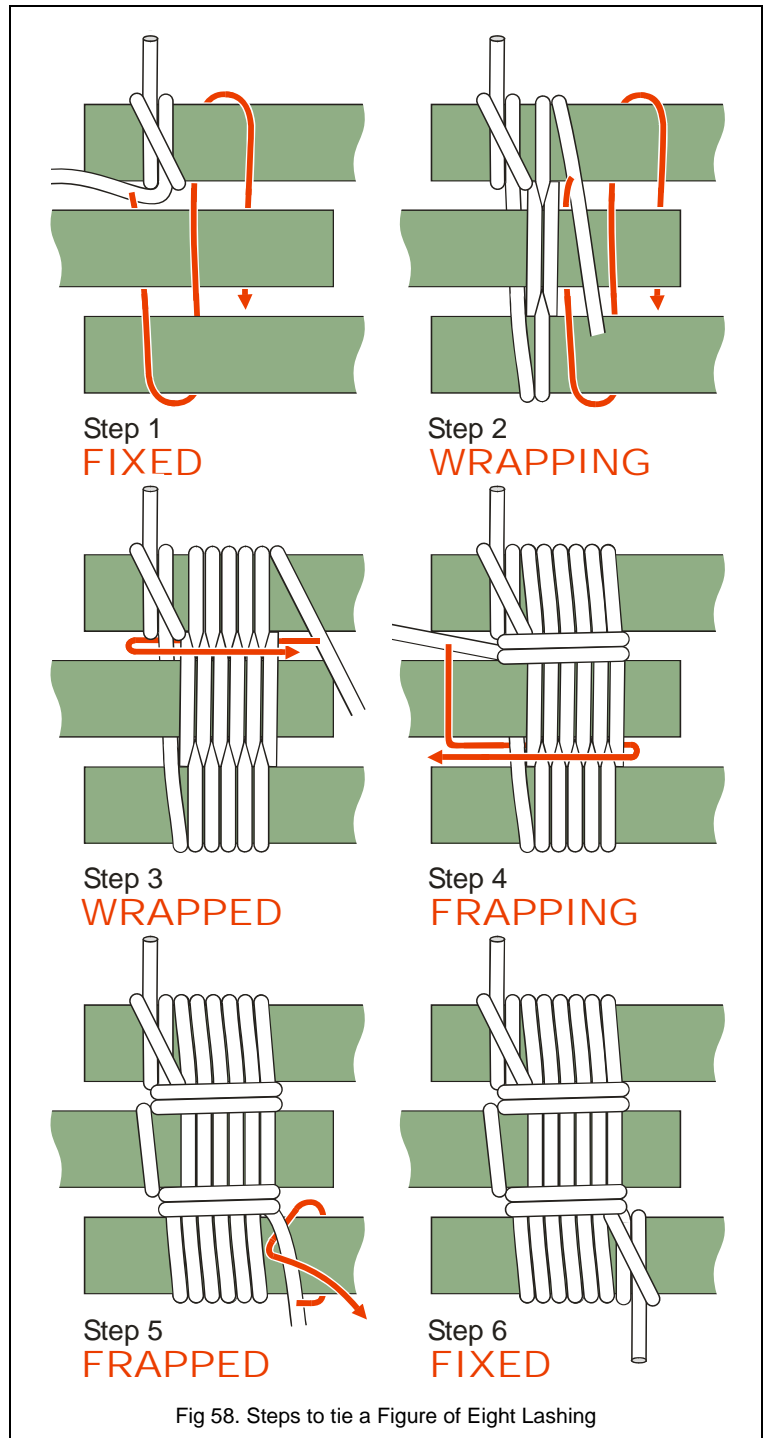


Fig 58. Steps to tie a Figure of Eight Lashing

NOTE

For tripod construction with 100 to 125mm timbers rounds and using 8 to 10mm lashing line a minimum of 6x wraps and 4x fraps is recommended.

The strength of the figure of eight lashing is determined by the size and type of lashing line used and the number of wraps. If too many wraps and fraps are used the joint becomes stiff and difficult to manage.

Tape Knot (Overhand Bend)

The tape knot is also known as an overhand bend but referred to as a tape knot because it is tied with either flat or tube tape.

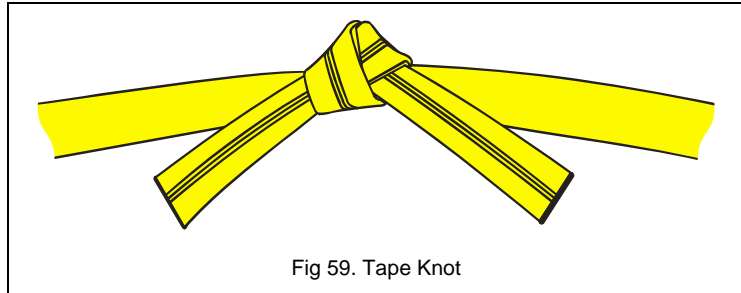


Fig 59. Tape Knot

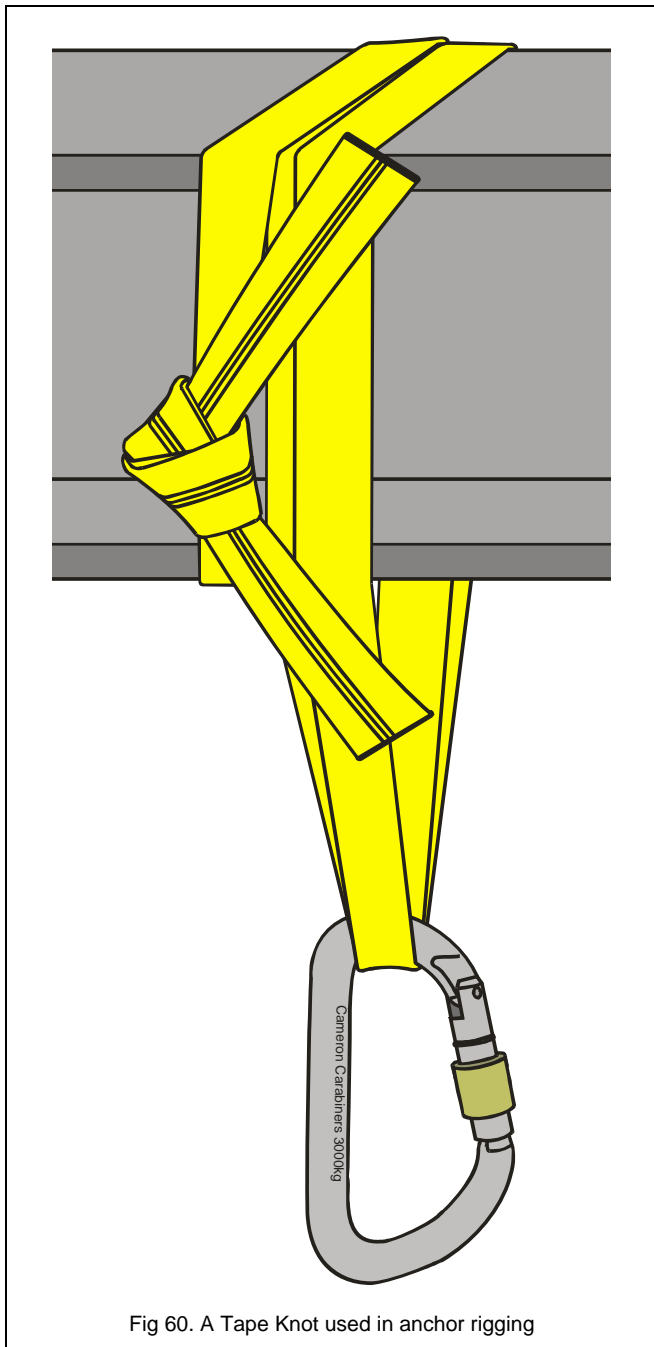


Fig 60. A Tape Knot used in anchor rigging

Applications for a Tape Knot

- Suitable for life support applications provided that approved tube tape or flat tape is used.
- Used to join tube tape and flat tape.
- Can be used to construct tape slings for rigging applications as shown in figure 60.

Method of tying a Tape Knot

1. Start with one end of tube tape or flat tape.
2. Tie an overhand knot into the end of the tape. Dress the tape so that a flat version of the overhand is formed. Adjust the tail length before continuing.
3. Feed the other end of tape behind the tail and into the loop of the overhand knot. Pull sufficient tape through to complete the knot.
4. Follow the path of the first tape end in reverse.
5. Continue following the first tape end.
6. Feed the tape through the last loop. In this step the tape actually passes under itself and the loop of the first tape end.
7. Check the dressing. When dressed and flat the knot will resemble a pentagon shape.
8. Finish by packing the knot. Pull all parts of the knot until slack is removed.

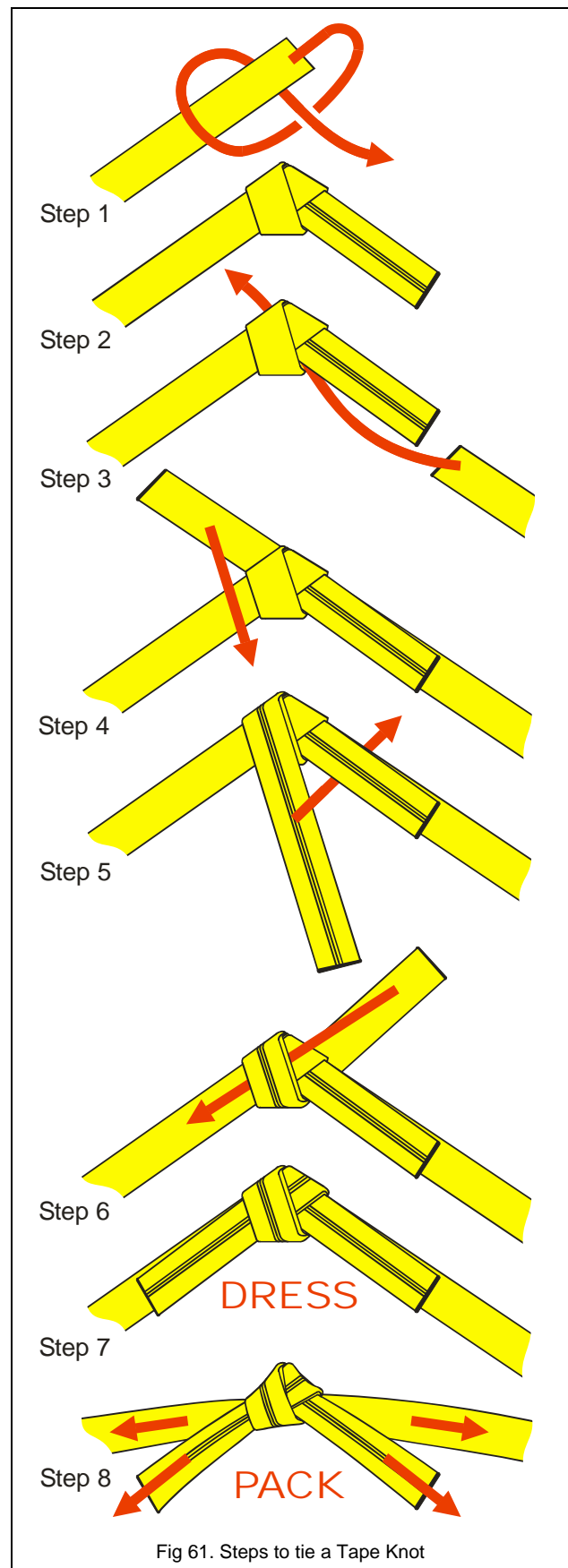


Fig 61. Steps to tie a Tape Knot

Figure of Eight

The figure of eight is a simple stopper knot. The principles of tying the figure of eight knot should be learned before moving on to other figure of eight class knots such as the figure of eight loop and the follow thru figure of eight loop.

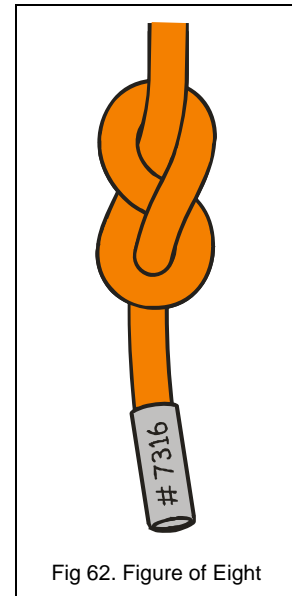


Fig 62. Figure of Eight

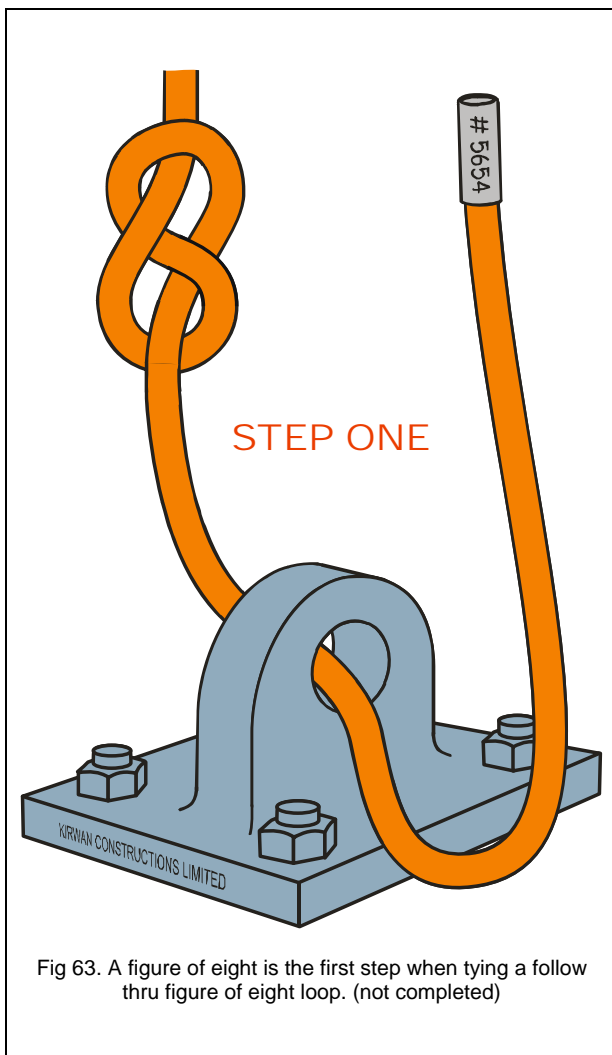


Fig 63. A figure of eight is the first step when tying a follow thru figure of eight loop. (not completed)

Applications for a Figure of Eight

- Suitable for life support applications when used in figure of eight class knots. Not normally used on its own.
- Can be used as a stopper knot to prevent a loose end of rope from running through a pulley or similar device.
- Can be used to prevent the end of a line from unraveling if line termination becomes damaged or is cut to length during field operations.
- Forms parts of other knots.
- Forms the first step when tying a follow thru figure of eight loop as shown *in figure 63*.



WARNING

The example *in figure 63* shows the first step of tying a follow thru figure of eight loop. A figure of eight is tied prior to the line being threaded into position. The follow thru figure of eight loop must then be completed, dressed and packed before use.

Method of tying a Figure of Eight

Tip: Remember when tying this knot that the rope crosses itself in an alternating pattern.
(example: under then over then under and over)

1. Form a half loop of rope. Pass the tail under itself to form a loop.
2. Pass the tail over itself to form a second loop next to the first. This is when the two loops resemble a figure of eight shape.
3. Pass the tail through the first loop. Notice that the tail passed under then over itself to complete this step.
4. Dress the knot.
5. Pack the knot.

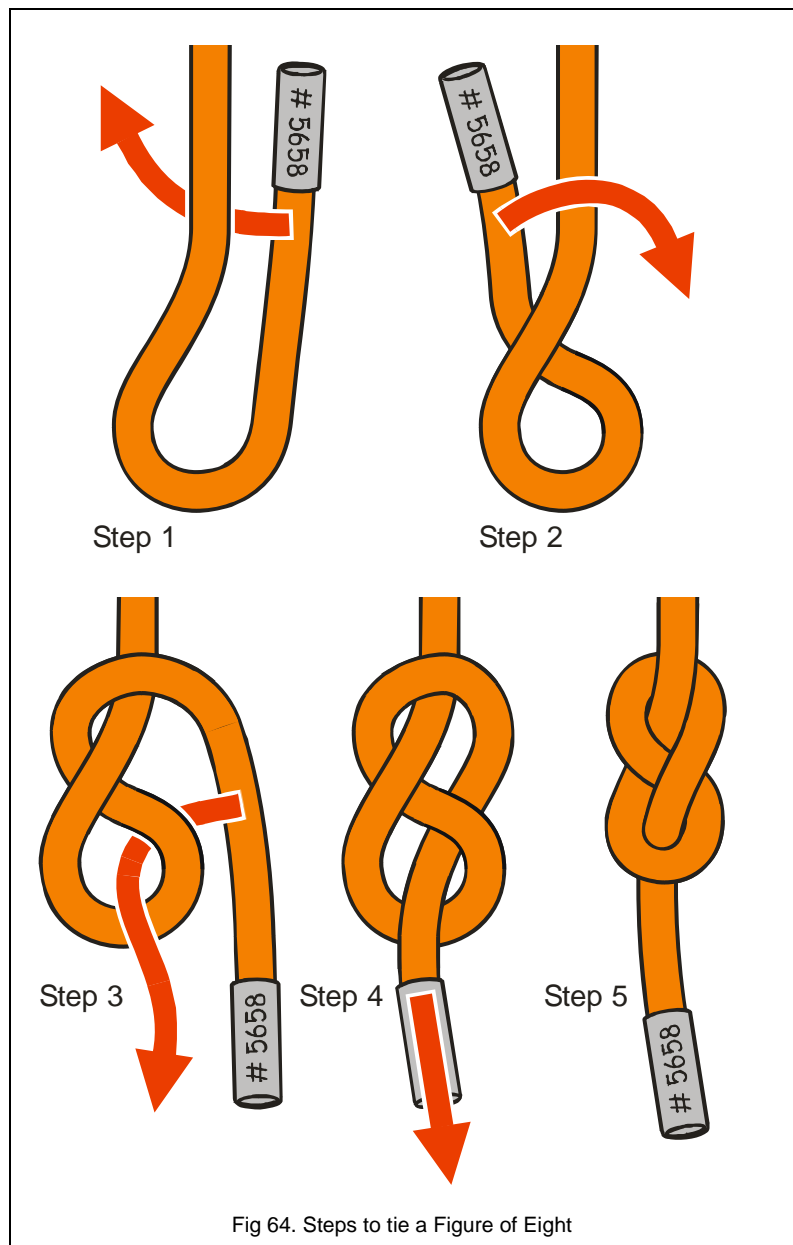


Figure of Eight Loop

The figure of eight loop is a knot that provides a strong loop suitable for life support operations. It is widely accepted as being the preferred knot for the attachment of a kernmantle rope to a harness and to terminate rigging systems.

When tying the figure of eight loop a long tail can be used as subsequent rigging provided that the forces being applied to the main part of the line and to the tail are in a similar direction. If your rigging requires that forces be applied in a multi-directional sense then the alpine butterfly should be used.

The follow thru figure of eight loop as described in this manual is exactly the same knot but it is tied differently so that the user can thread the loop into a closed object without the use of other rigging materials.

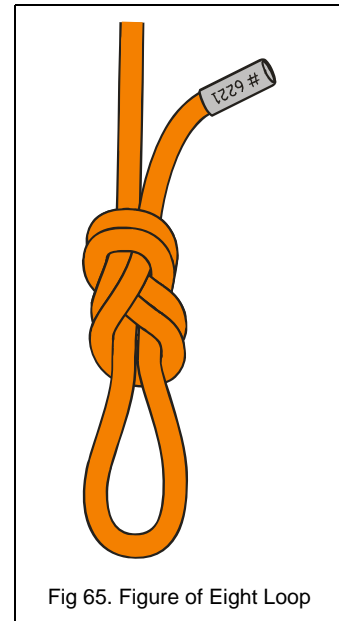


Fig 65. Figure of Eight Loop

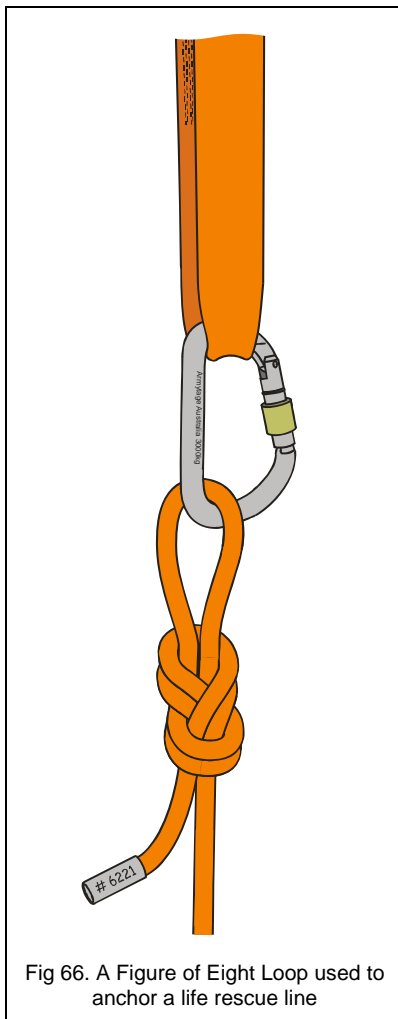


Fig 66. A Figure of Eight Loop used to anchor a life rescue line

Applications for a Figure of Eight Loop

- Used for life support applications.
- Can be tied as a follow Thru figure of eight loop.
- Used to provide a secure loop of rope in the end of life support rigging.
- Used to terminate rigging and isolate unwanted life rescue line.

Method of tying a Figure of Eight Loop

Tip: Tying this knot is similar to tying the figure of eight. Instead of tying the knot with the tail you tie it with a bight of rope.

1. Working with a bight of rope, form a half loop. Pass the bight under itself to form a loop.
2. Pass the bight over itself to form a second loop next to the first. This is when the two loops resemble a figure of eight shape.
3. Pass the bight through the first loop. Notice that the bight passed under then over itself to complete this step. Lay the knot flat with the ropes running parallel through the knot (this helps to get the dressing sorted)
4. With the knot laid flat, dress the first loop by moving the outer section of rope away from the knot then pack as shown.
5. Dress the second loop by moving the outer section of rope away from the knot then pack as shown.
6. Pull all parts of the knot to complete the packing.

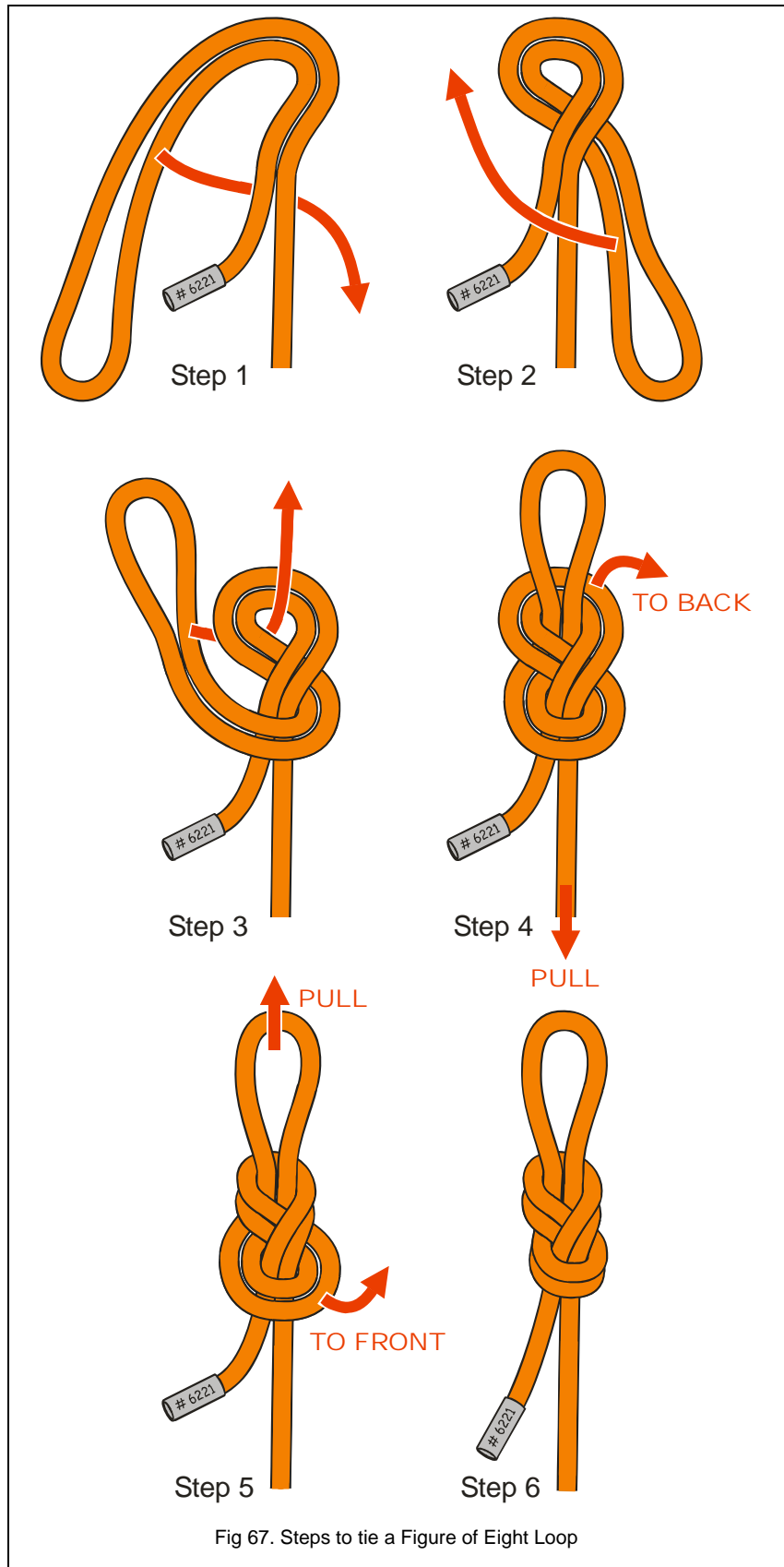


Fig 67. Steps to tie a Figure of Eight Loop

Follow Thru Figure of Eight Loop

A completed follow thru figure of eight loop is exactly the same as a figure of eight loop. The difference between the two knots is the method of tying and applying the knots. As the name suggests, a follow thru figure of eight loop can be tied or threaded into position making it an excellent option where other attachment equipment is not available or inappropriate.

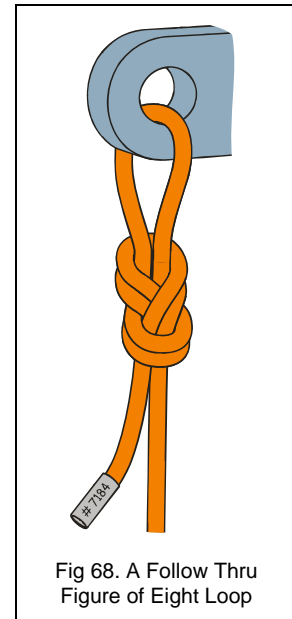


Fig 68. A Follow Thru Figure of Eight Loop

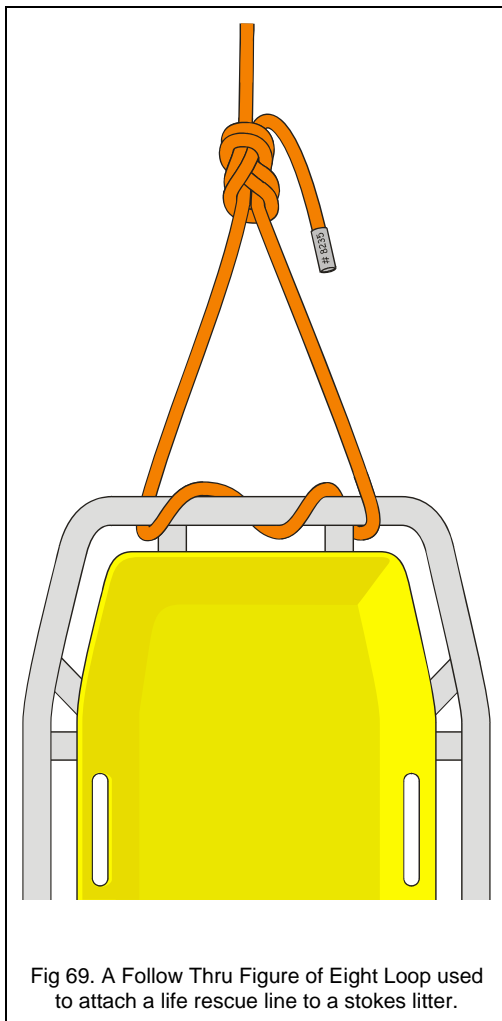


Fig 69. A Follow Thru Figure of Eight Loop used to attach a life rescue line to a stokes litter.

Applications for a Follow Thru Figure of Eight Loop

- Used for life support applications.
- Used to provide a secure loop of rope in the end of life support rigging.
- Can be threaded into place when other equipment is not available or unsuitable.
- Is the preferred tie in option for attachment of a life rescue to a harness because it eliminates the chance of cross loading a carabiner.
- Widely used by recreational climbers for dynamic rope to harness attachment.
- Is an excellent method of attaching a life rescue line to the head of a stokes litter as shown *in figure 69*.

Method of tying a Follow Thru Figure of Eight Loop

1. Start by tying a figure of eight with a long tail.
Form a half loop of rope. Pass the tail under itself to form a loop.
2. Pass the tail over itself to form a second loop next to the first. This is when the two loops resemble a figure of eight shape.
3. Pass the tail through the first loop. Notice that the tail passed under then over itself to complete this step.
4. Thread the tail around or through the object then back into the knot to re-trace the path of the rope through the knot.
5. Continue to re-trace the path of the rope.
6. Continue to re-trace until the tail exits the knot alongside the point at which the main part of the rope entered the knot.
7. Lay the knot flat to assist with correct dressing.
8. With the knot laid flat, dress the first loop by moving the outer section of rope away from the knot then pack as shown.
9. Dress the second loop by moving the outer section of rope away from the knot then pack as shown.
10. Pull all parts of the knot to complete the packing.

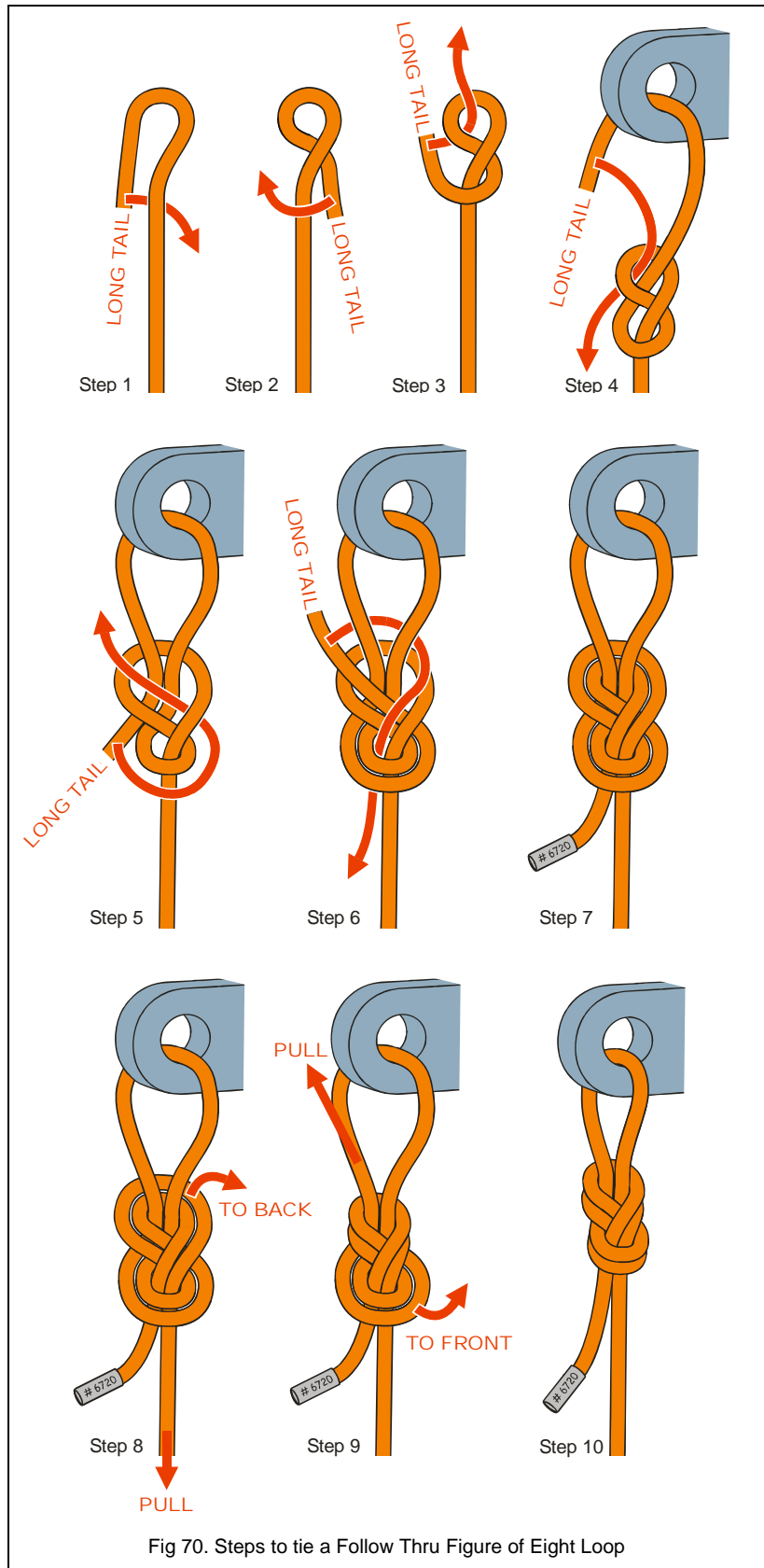


Fig 70. Steps to tie a Follow Thru Figure of Eight Loop

Alpine Butterfly

The alpine butterfly provides a loop in a line that can be loaded in multiple directions.

Also known as a middleman's knot or a D & B knot.

The alpine butterfly is a versatile knot with many vertical rescue applications.

A correctly dressed and packed alpine butterfly will look like the images in *figure 71*. The front will present as a crossed over line and the back will present as lines that does not cross.

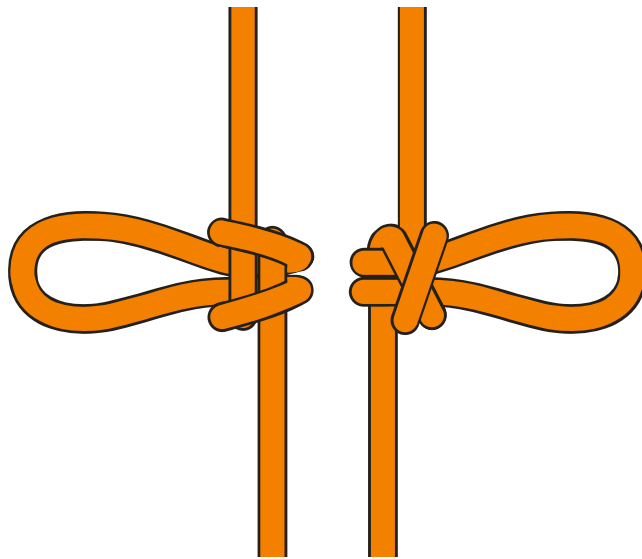


Fig 71. Alpine Butterfly

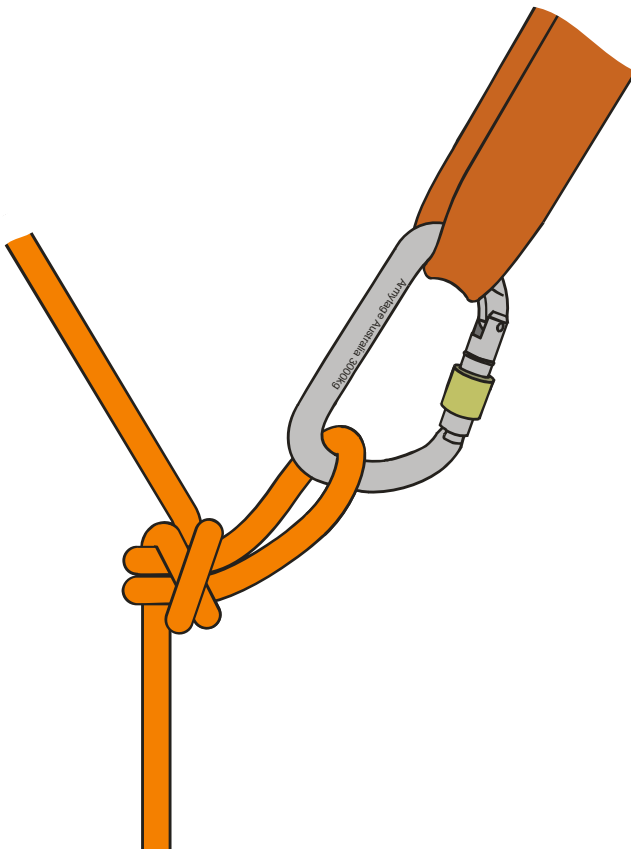


Fig 72. Alpine Butterfly used in vertical rescue rigging

Applications for an Alpine Butterfly

- Used for life support applications.
- Used to provide a secure loop of rope in the middle of a life rescue line.
- A midline loop designed to take multi directional loads.
- An excellent vertical rescue rigging knot as shown in *figure 72*.
- The loop size can be increased to extend sling legs when rigging.
- Used as a rescue load attachment point.
- Used as part of a stokes litter to life rescue line attachment with a carabiner.

Method of tying an Alpine Butterfly

1. Pull out a bight of rope. Adjust the size of this bight to suit the application. Twist the bight two half turns to form two circles of rope.
2. Keep the inner circle small and the outer circle can be as large as required. Bending at the cross over between the two circles, pass the large outer circle behind the small inner circle and behind the main part of the rope.
3. Keep a hand on the small circle to maintain its form. Pass the larger circle of rope over the main part of the line and thread it through the small circle as shown.
4. Dress the knot and pull all parts of the knot to pack as shown in figure 73.

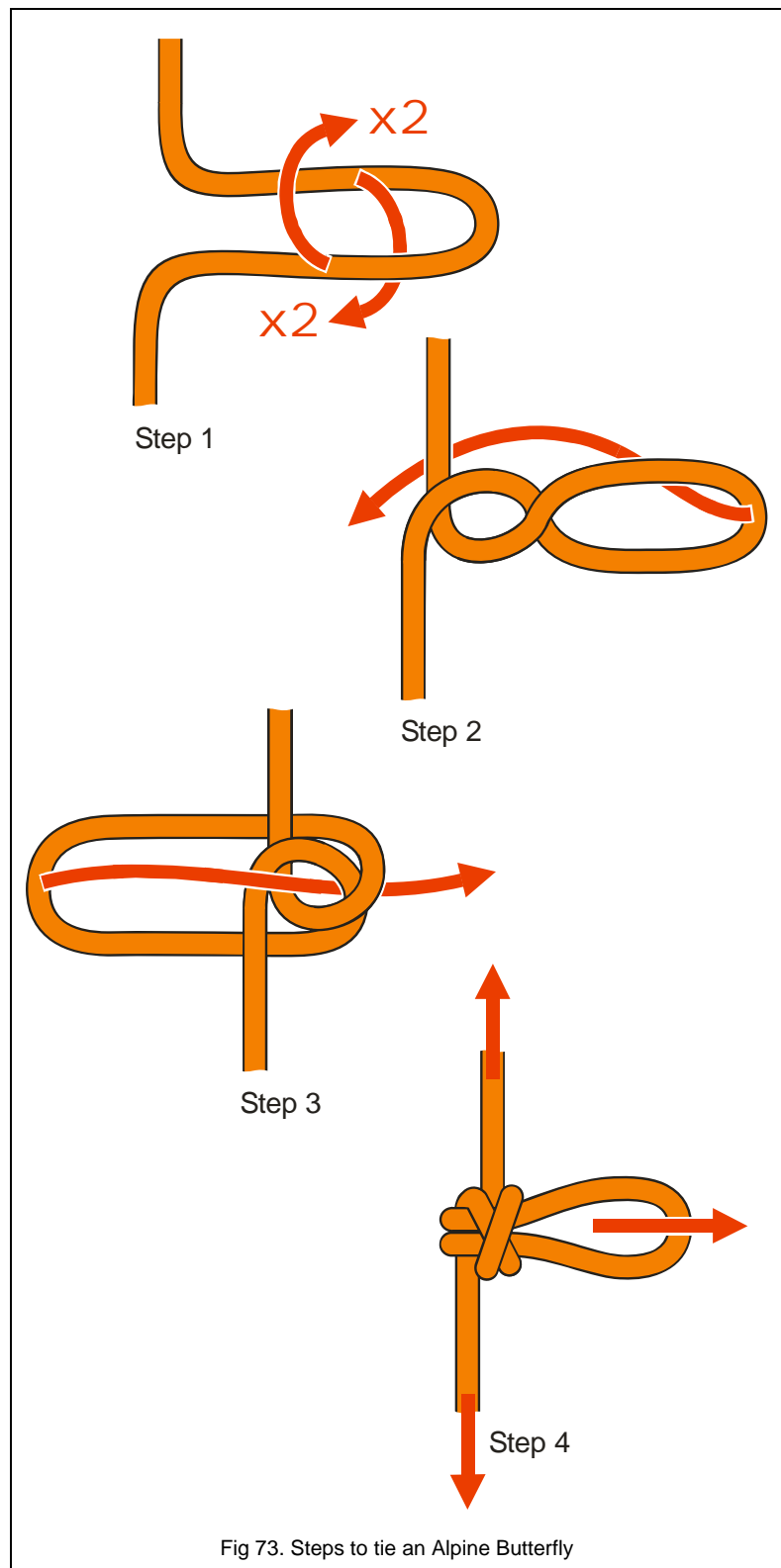


Fig 73. Steps to tie an Alpine Butterfly

Double Wrap Prusik Hitch

The double wrap Prusik hitch is used with a loop of kernmantle cord known as a Prusik loop.

The double wrap Prusik hitch is a two way friction hitch that locks against a larger diameter rope or other object when a load is applied to the Prusik loop.

The double wrap Prusik hitch will lock against the larger rope if sufficient friction is available between the hitch and the rope.

The hitch can be loosened when the load is removed. Once loosened, the hitch can be repositioned along the rope or object.

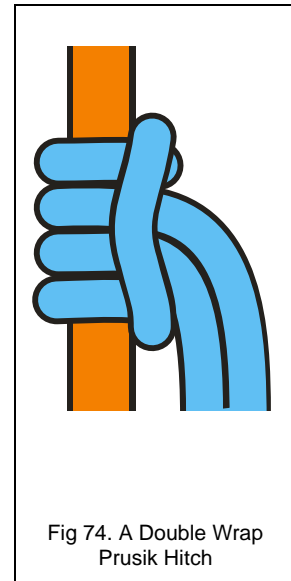


Fig 74. A Double Wrap Prusik Hitch

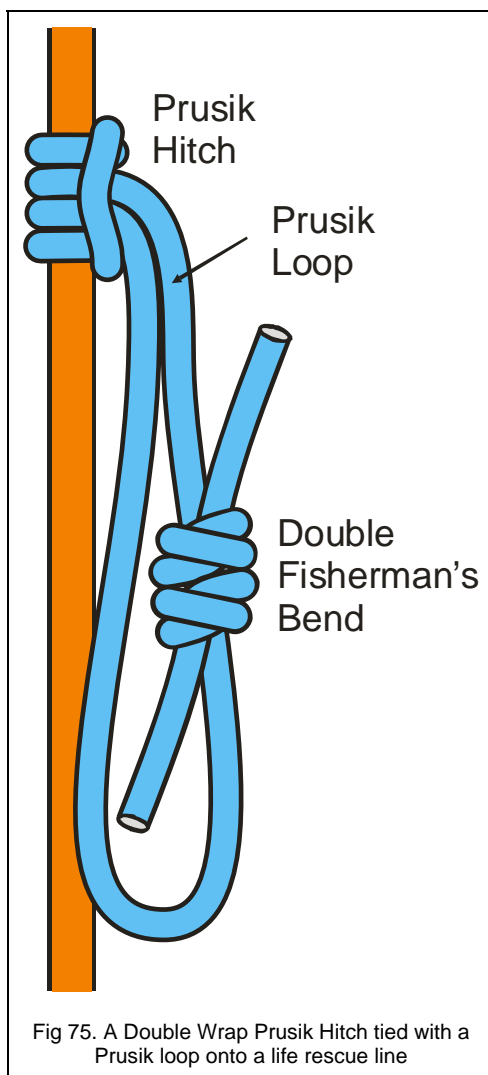


Fig 75. A Double Wrap Prusik Hitch tied with a Prusik loop onto a life rescue line

Applications for a Double Wrap Prusik Hitch

- Suitable for life support rigging but requires back up rigging.
- Provides a two way friction hitch that will lock onto a larger diameter line.
- Used as a rope grab device when attaching hauling systems to a life rescue line as shown *in figure 75*.
- Can be used with two or three Prusik loops to ascend a life rescue line.
- Can be used as a rope grab device in span line rigging applications. The life rescue line must be backed.



WARNING

A double wrap Prusik hitch must be dressed correctly and packed so that it is rubbing against the life rescue line.

Method of tying a Double Wrap Prusik Hitch

Using a previously constructed Prusik loop.

1. Lay the Prusik loop perpendicular to the life rescue line with the double fisherman's bend and the Prusik loop offset as shown. Wrap the bulk of the Prusik loop around the life rescue line and thread it back through itself. (this is now a girth hitch)
2. Wrap the bulk of the Prusik loop around the life rescue line a second time and thread it back through itself. You now have two wraps or a double wrap.
3. Dress and pack the double wrap Prusik hitch as shown. A correctly packed Prusik hitch will make a rubbing sound as it slides along a life rescue line.

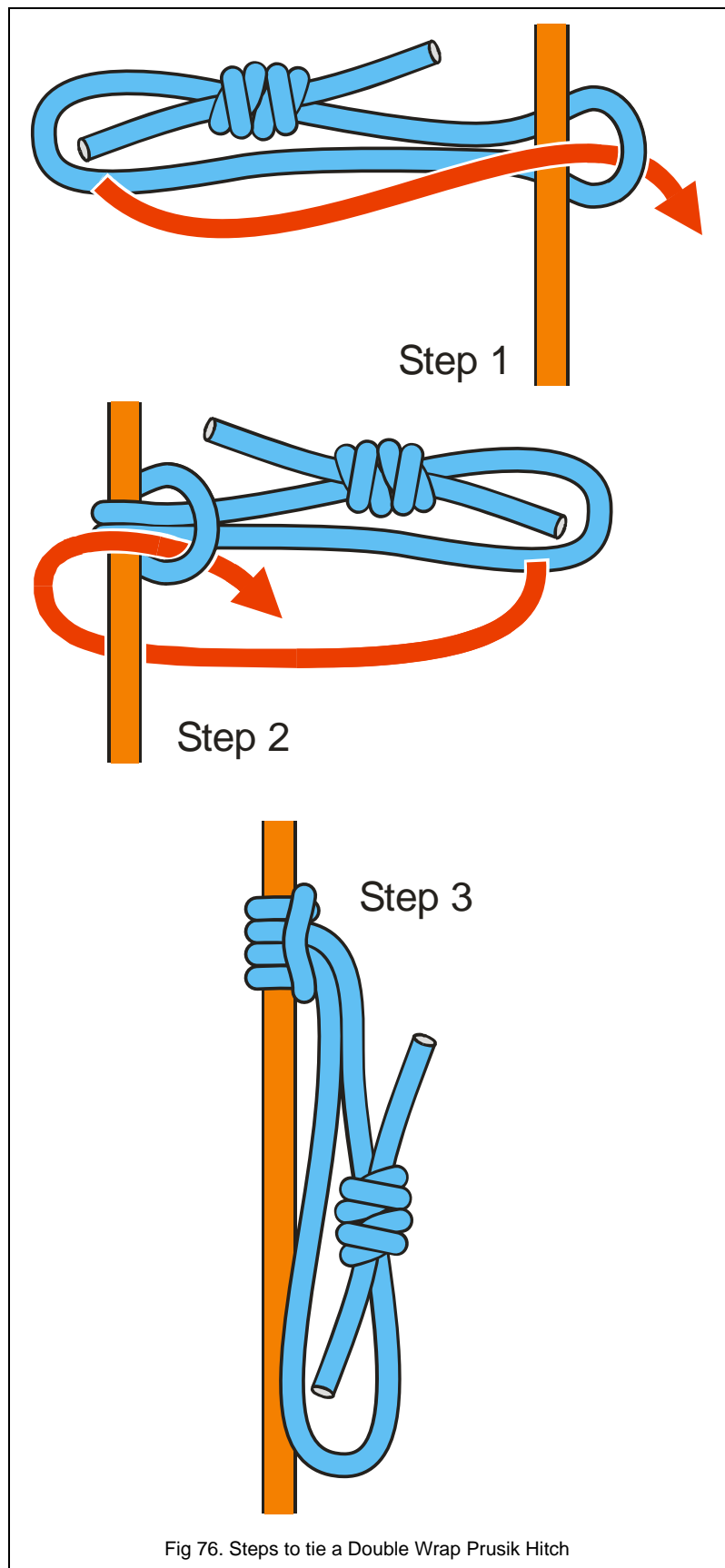


Fig 76. Steps to tie a Double Wrap Prusik Hitch

Triple Wrap Prusik Hitch

The triple wrap Prusik hitch is used with a loop of kernmantle cord known as a Prusik loop.

The triple wrap Prusik hitch is a two way friction hitch that locks against a larger diameter rope or other object when a load is applied to the Prusik loop.

The triple wrap Prusik hitch will lock against the larger rope if sufficient friction is available between the hitch and the rope.

The hitch can be loosened when the load is removed. Once loosened, the hitch can be repositioned along the rope or object.

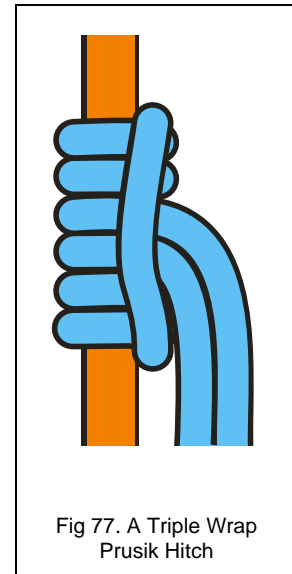


Fig 77. A Triple Wrap Prusik Hitch

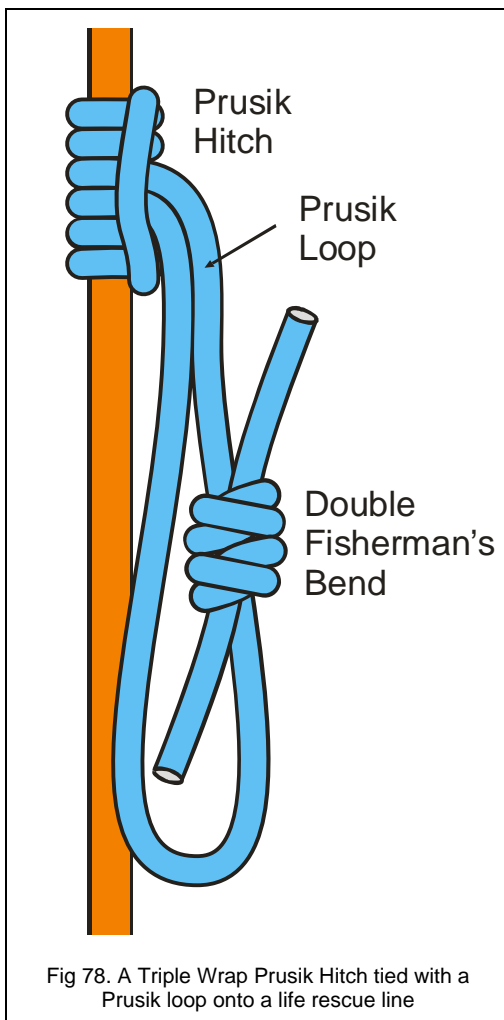


Fig 78. A Triple Wrap Prusik Hitch tied with a Prusik loop onto a life rescue line

Applications for a Triple Wrap Prusik Hitch

- Suitable for life support when working on roofs or for providing edge limiting functions.
- Suitable for life support rigging but requires back up rigging.
- Provides a two way friction hitch that will lock onto a larger diameter line.
- Used with a Prusik loop to form a movable attachment of a rescuer to a life rescue line as shown in figure 78.
- Can be used with two or three Prusik loops to ascend a life rescue line.
- Used to improve the safety of personnel when working on roofs.
- Used to improve the safety of personnel when performing stretcher operations on sloping ground.



WARNING

A triple wrap Prusik hitch must be dressed correctly and packed so that it is rubbing against the life rescue line.

Method of tying a Triple Wrap Prusik Hitch

Using a previously constructed Prusik loop.

1. Lay the Prusik loop perpendicular to the life rescue line with the double fisherman's bend and the Prusik loop offset as shown. Wrap the bulk of the Prusik loop around the life rescue line and thread it back through itself. (this is now a girth hitch)
2. Wrap the bulk of the Prusik loop around the life rescue line a second time and thread it back through itself. You now have two wraps or a double wrap.
3. Wrap the bulk of the Prusik loop around the life rescue line a third time and thread it back through itself. You now have three wraps or a triple wrap.
4. Dress and pack the double wrap Prusik hitch as shown. A correctly packed Prusik hitch will make a rubbing sound as it slides along a life rescue line.

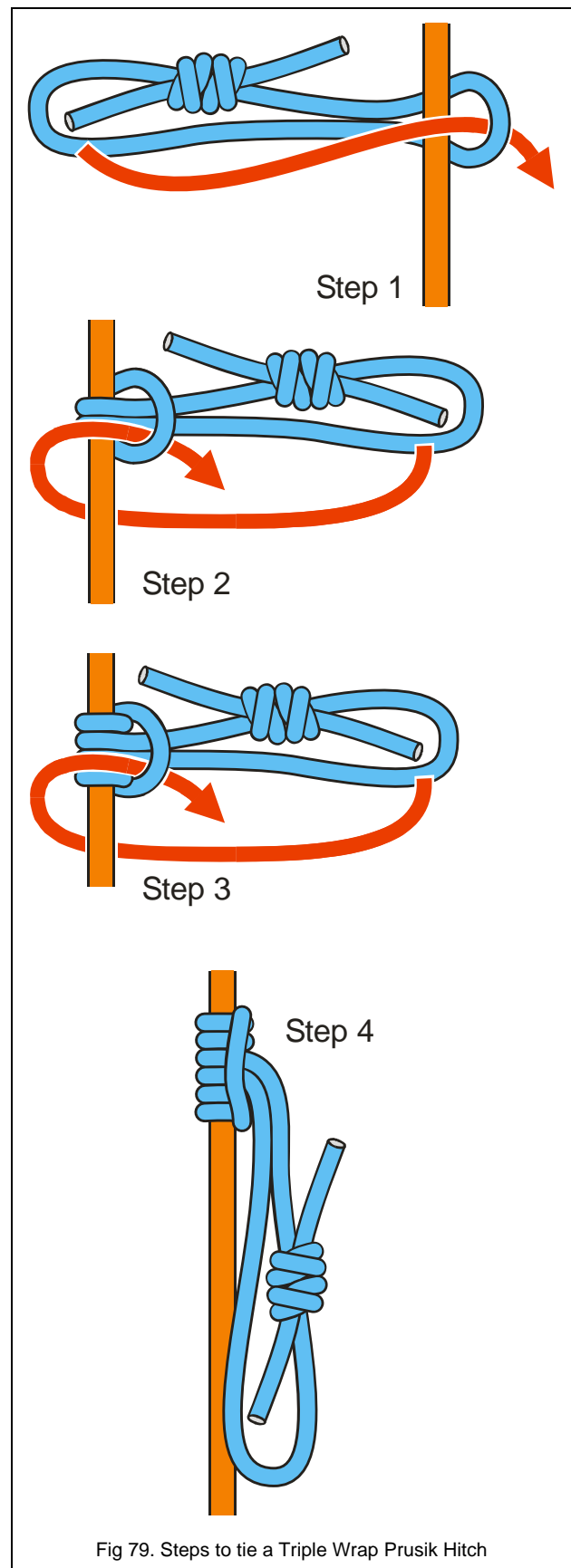


Fig 79. Steps to tie a Triple Wrap Prusik Hitch

Italian Hitch

The Italian hitch is a dynamic friction hitch. It is also known as a Munter hitch.

Unlike the other knots in this manual, the Italian hitch cannot hold a load on its own. The Italian hitch is actually a type of belay device and therefore requires the attention of a brake operator.

The Italian hitch can be applied to any smooth round object.

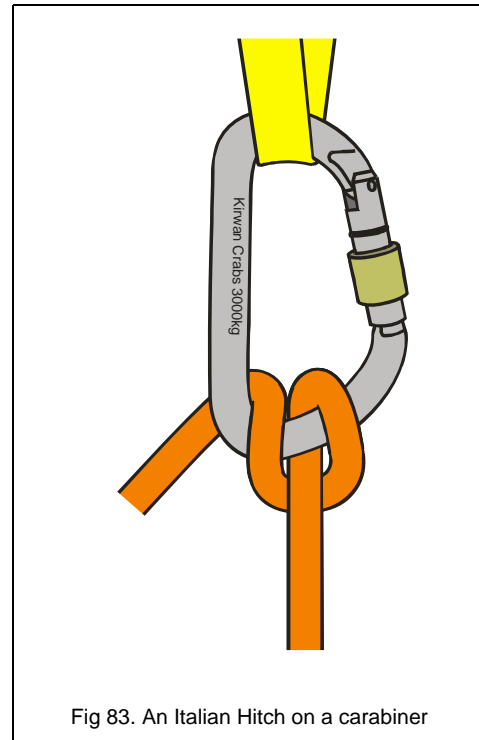


Fig 83. An Italian Hitch on a carabiner

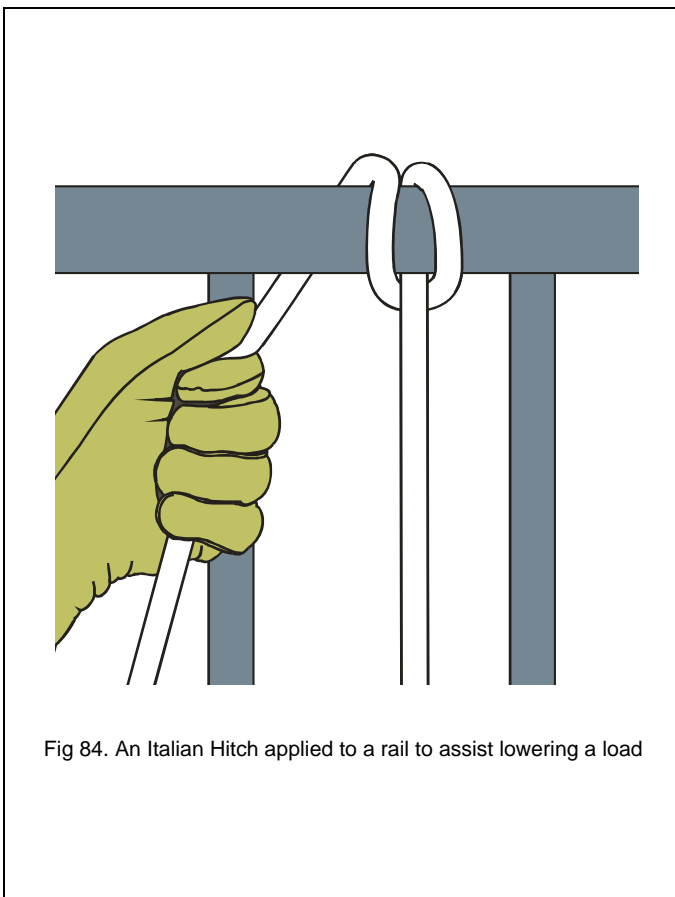


Fig 84. An Italian Hitch applied to a rail to assist lowering a load

Applications for an Italian Hitch

- Suitable for life support with life rescue line and equipment in an emergency.
- To increase friction when lowering an object over a rail.



WARNING

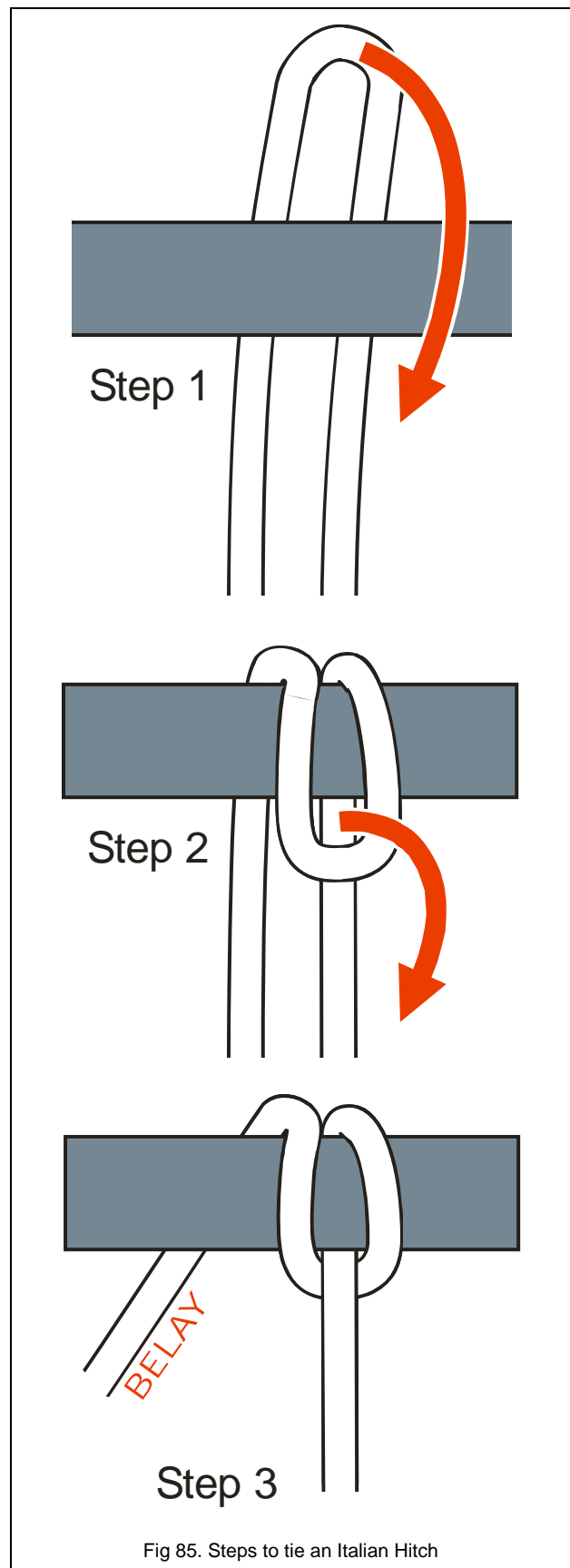
The Italian hitch is a very handy knot to assist personnel lowering objects but must only be used with live loads in emergencies.

During training a two rope system with an approved belay must be used if demonstrating an Italian hitch for life support. The Italian hitch can be used to belay the demonstration line with an approved belay system used on the second line.

Method of tying an Italian Hitch

There are many methods of tying an Italian hitch. The following method is simple and well suited to general lowering of equipment with a GP line applied to a hand rail or similar.

1. Pass a bight of rope up and behind the rail. Wrap it over the top and drape it down at the front.
2. Reach in through the bight and pull one of rope ends completely out through the bight.
3. This knot will dress itself if you feed some rope in the direction that you are going to use it. Belay the rope end as shown.

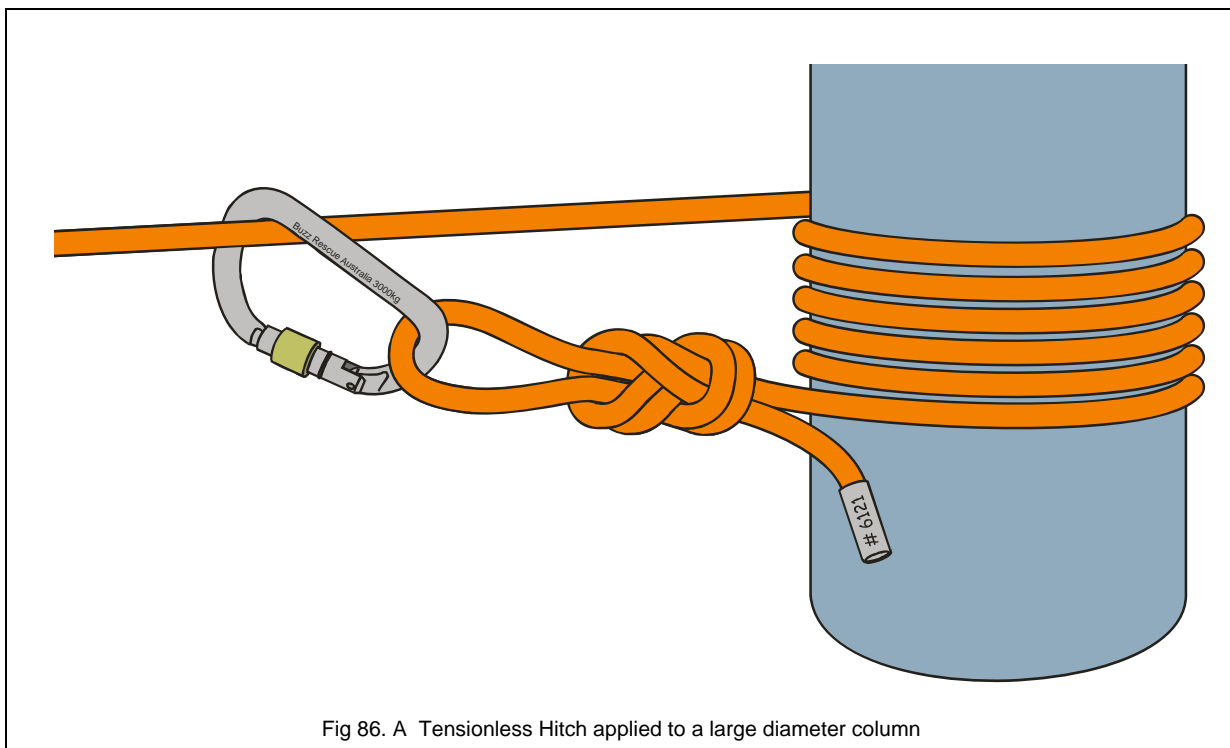


Tensionless Hitch

Depending upon the anchor point, the tensionless hitch is a technique that eliminates the strength reduction of a knot.

The tensionless hitch is simply a series of wraps around an object then a figure of eight loop is used to provide security. If sufficient friction exists the figure of eight loop will not be subjected to any load.

In cases where rescuers are unable to access the anchor point, this type of hitch has the added benefit of being easy for an untrained person to tie. Rescuers would tie the figure of eight loop and send the line to the untrained person with a carabiner attached. The rescuers would then oversee the completion of the tensionless hitch.



Applications for a Tensionless Hitch

- Suitable for life support applications.
- Can be used in high load applications such as span lines.
- Can be used to assist an untrained person establish an anchor point.

Method of tying Tensionless Hitch

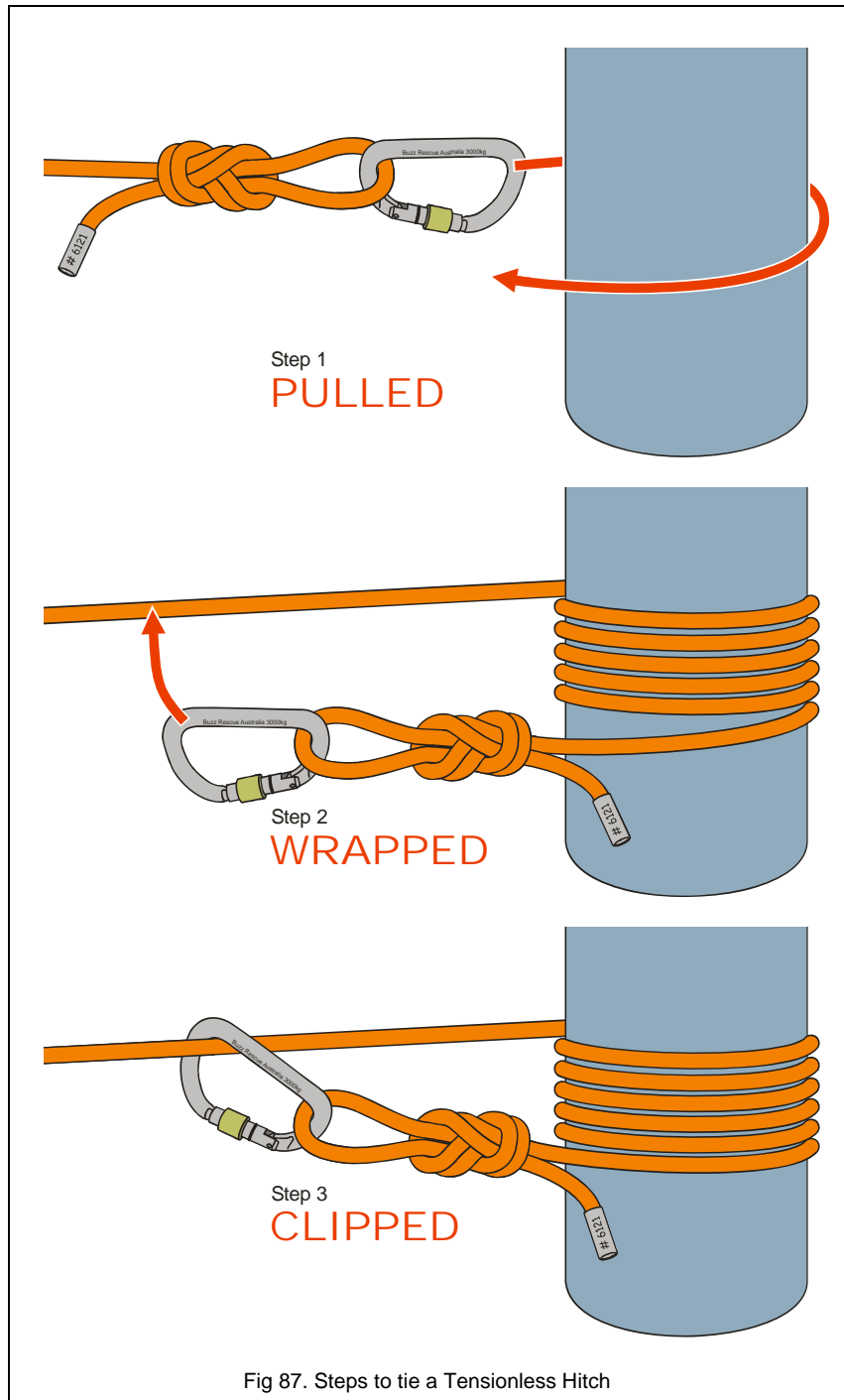
Life Support Applications

Prepare a life rescue line with a figure of eight loop and a carabiner.

General Purpose Applications

This technique could also be used with a GP line and the snap hook.

1. Pull enough line to complete the wraps. A minimum of 6 wraps should be used. Wrap the line around the object.
2. Clip the carabiner to the main part of the line.
3. Check the security of the figure of eight loop and carabiner.



POINT OF INTEREST

Because of the orientation of this rigging, it would not be difficult to inspect the rigging from a distance with binoculars.

Review Questions & Exercises

1. Explain the tail length rule.
2. Explain the term “dressing a knot”.
3. Explain the term “packing a knot”.
4. Detail the knots, bends and hitches that are suitable to support human life.
5. Describe the principles of good and bad orientation when applying a girth hitch to round sling.
6. Detail the most suitable knot, bend or hitch to secure the corner of a plastic sheet to a rope. (with no eyelet present)
7. Demonstrate how to use a rolling hitch to make an adjustable loop.
8. Demonstrate how to lash a ladder to a horizontal beam or pipe.
9. Demonstrate how to lash two rungs of a ladder together.
10. Explain why a tensionless hitch is so strong in some applications.