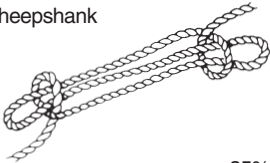



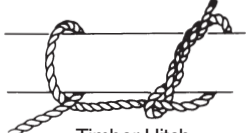






- (d) Good practices when using synthetic rope:
  - (1) Keep rope dry and clean and away from chemicals
  - (2) Never overload a rope
  - (3) Never use a frozen rope
  - (4) Don't drag a rope on the ground. This will damage the outside surface of the rope.
  - (5) Never allow the rope to bend over sharp edges
  - (6) Don't permit the rope to drag against itself
  - (7) Observe proper picking angles
  - (8) Pad all corners when lifting materials
  - (9) When coupling ropes, use thimbles
  - (10) Inspect rope often by twisting to expose the inside yarns
- (e) Synthetic rope shall be removed from service if it shows signs of:
  - (1) Abnormal wear
  - (2) Powder between strands
  - (3) Broken or cut fibers
  - (4) Variations in the size or roundness of strands
  - (5) Discoloration or rotting
  - (6) Distortion of hardware
- (f) When rope is damaged and taken out of service, it shall be completely destroyed to prevent others from using it.

## **12.12 Knots Are Weak**

If a knot or hitch of any kind is tied in a rope, its failure under stress is sure to occur at that place. Each fiber in the straight part of the rope takes proper share of the load. In all knots, the rope is cramped or has a short bend, which throws an overload on those fibers that are on the outside of the bend, and one fiber after another breaks until the rope is torn apart. The shorter the bend in the standing rope, the weaker the knot. The results given in Figure 12ag are approximate, but are sufficient to cause caution in all rope fastenings employed in important work.

**Figure 12ag      Approximate Efficiency – Comparison  
of Rope Knots and Connections to Safe Load**

<p>Sheepshank</p>  <p>35%</p>	<p>Square or Reef Knot</p>  <p>43%</p>
<div> <div>  <p>50%</p> </div> <div>  <p>53%</p> </div> </div> <p>Bowline (outside)      (inside)</p>	<p>72%</p>  <p>Timber Hitch &amp; Half Hitch</p>
 <p>Long Splice      68%</p>	 <p>Clove Hitch      75%</p>
 <p>Short Splice      85%</p>	 <p>Eye Splice      85%</p>

*Source: Handbook for Riggers, 1977 Revised Edition*

Note: Variations in test equipment, procedures, rope age, condition and construction, etc. may impact test results. The efficiencies shown above are for point of reference only. **Rigging methods, rope capacity, etc. shall well exceed the weight of the load to be hoisted. Knot efficiencies shall not be factored into the lift too closely; err on the side of caution.**

## Figure Eight Knot

Used in the end of a rope to temporarily prevent the strands from unraveling. Useful to prevent the end of a rope from slipping through a block or an eye, and does not jam as easily as the overhand knot.

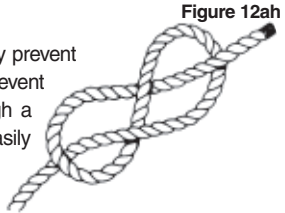
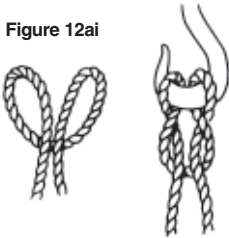


Figure 12ah

Figure 12ai



## Catspaw

Used to secure the middle of a rope to a hook. Take two bights (loops) in the rope, twist in opposite directions and then bring the loops together and pass over hook.

## Timber Hitch

(A) Used for hoisting planks, timbers and pipe. Holds without slipping and does not jam. A half-hitch is added in (B) This is done to keep a plank or length of pipe on end, while lifting.

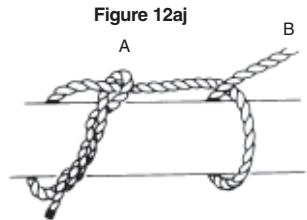
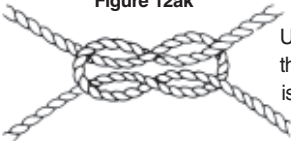


Figure 12aj

Figure 12ak



## Reef Knot or Square Knot

Used to join two ropes or lines of the same size - holds firmly and is easily untied.



Figure 12al

## Bowline on the Bight

Used in emergencies to lift an injured person off a building or out of a hole.

This is accomplished by sitting in one loop, and putting the other loop around the back and under the arms. Also used to tie bowline in middle of line.

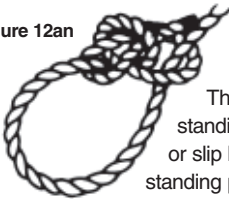
Figure 12am

## Clove Hitch or Builder's Hitch

Because of its wide use by construction workers in fastening rope to upright posts on staging to act as a rail or warning line, it is also known as a builder's hitch. Making a line fast is another common use.



Figure 12an

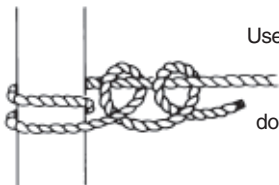


## Running Bowline

This is merely a bowline knot made round the standing part of a rope to form a running noose or slip knot and is very reliable. Runs freely on the standing part and is easily untied. **This knot shall not be used for securing lifelines.**

Figure 12ao

## Round Turn and Two Half Hitches



Used to secure a rope to a column or post, and will stand heavy strain without slipping. Easily tied and does not jam.

## Figure Eight on a Bight

Provides a secure loop in the end of a rope. Made by doubling a line back on itself and then tying a Figure Eight knot in the double line. This knot may reduce the strength of a rope by 20%. **This knot shall not be used for securing a lifeline.**

CAUTION: Be certain you tie a Figure Eight, not an Overhand on a Bight.

Figure 12ap

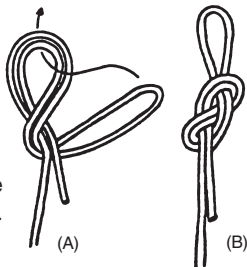


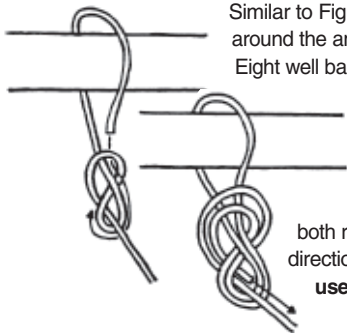
Figure 12aq

## Figure Eight Follow Through

Similar to Figure Eight on a Bight, but is tied around the anchor point. Tie a simple Figure Eight well back from the end of the rope.

Pass the end of the rope around the anchor point then follow back through parallel to the first knot. Follow every contour of the first knot with

both rope ends going in the same direction. **This knot shall not be used for securing a lifeline.**



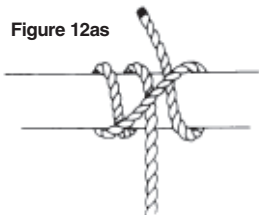
## Bowline

One of the best-known and most-widely used of all knots. A favorite knot with riggers, it is easily constructed and used wherever a hitch is required that will not slip, jam or fail. (Hint: Leave a long tail and secure the tail with two half-hitches.) **This knot shall not be used for securing a lifeline.**



Figure 12ar

Figure 12as



## Rolling Hitch

This knot is used for lifting round loads, such as pipe or bar steel. For a more efficient knot, add half-hitch, short end around long end.

## Carrick Bend

Used for joining large ropes together, and easier to untie than most knots after being subjected to strain.



Figure 12at

Figure 12au



## Sheepshank

This knot is used for shortening a rope. The method shown is especially useful where the ends of the rope are not free, as it can be employed in the center of a tied rope. Taking the strain off a damaged piece of rope when there is not time to immediately replace with sound rope is another use. When seized, as shown, it is more secure.