Splices

Splices are used to permanently form a stopper at the end of a line, or an eye in a rope, or to join two ropes together.

**Eye Splice with Three-Strand Rope**

The Eye Splice is used to form a permanent eye or loop in the end of a line which has a strength of 90 to 95% of the rope.

1. From one end of the line, count back 16 crowns, and put the tape around the rope, as shown;

2. Unlay the rope end up to the tape into 3 separate strands, and put the tape around the end of the strands, as shown in figure (a);

3. Bring the taped section together with the standing part to form the eye, visualize the size the eye should be, and put the tape on that section of the standing part. This is also to avoid a twist in the eye section after the finished splice;

4. Twist the standing part in reverse direction to the lay to raise the middle strand, which will be for the first tuck. Tuck the middle strand (strand one) of the tail under middle strand of standing part, as shown in the figure (b);

7. Twist the standing part again to raise the next strand on the right of last tuck, right under strand one. Bring strand two which next and under strand one, over and tuck through under strand of the standing part just raised, as shown in figure (c);
8. Turn the eye over, then bring the last strand (strand three) across the standing part and tuck under the last strand of the standing part, as shown in figure (d). The strand three will start where strand two came out, and come out where the strand one went in;

9. The first round is completed; now pull the three strands to tighten the splice, as shown in figure (e);

10. The first round is the most important round to make the foundation for the other rounds. The next round can be started from any strand; simply bring over one lay and tuck under next lay until you get to the end of the strand, as shown in figure (f).
**Short Splice with Three-Strand Rope**

This splice is used to join permanently two ends of same size rope together and is as strong as the rope, but the joining part is slightly enlarged. Make a short splice as follows:

1. Untwist the end of each line 4 to 5 turns;
2. Whip or tape the end of each strand;
3. Place end to end with the strands spread out;
4. Start from any strand of one line, just as for the second round of an eye splice, by putting it over one lay and under the next lay of the other line;
5. After finishing one round, pull the strands to tighten the splice;
6. Do similarly for the strands of the other line;

7. After completing three rounds on each side, lay the splice on deck or any flat surface and roll to smooth out and tighten it;

8. Cut off any excess length on the strands and whip all ends of strands together with the rope.
Back Splice with Three-Strand Rope

The Back Splice is used to lock a loose end of rope just like whipping, but more bulky. Make a short splice as follows:

1. Untwist the rope end about 4 to 5 turns;
2. Whip or tape the end of each strand;
3. Make a Crown Knot and pull down tight;
4. Start with any strand, just as for the Short Splice, and cross it over one lay and under the next lay of the other line;
5. After completing three rounds on each side, lay the splice on the deck or any flat surface and roll to smooth and tighten it;
6. Cut off any excess length on strands and whip all ends of strands, together with the line.
Long Splice with Three-Strand Rope

The Long Splice is also used to join two ends of rope together, such as two broken lines. The big advantage of the Long Splice is that the thickness of the join is about the same as the joining ropes, so it is used to join ropes that run through a tight place, such as the sheaves in a block. Make a Long Splice as follows:

1. Unlay the end of each rope; for natural fibre such as Manila, make it about 30 turns, and for synthetic fibre such as Nylon, make it about 40 turns (due to the greater slipperiness of synthetic fibre). The greater the amount unlaid (within reason), the stronger the splice will be. Twine or tape can be used to hold the unlaid parts in order to prevent the ropes from coming further apart, and also to lash the ends of the strands to prevent them from coming apart;

2. Place the ropes end-to-end together, alternating the strands, as for the short splice. The strands will work as a pair in their relative positions throughout the process;

3. Pick a pair such as (4) and (1), one from each rope. Remove the twine holding the unlaid part, unlay one strand (4) another minimum of 25 turns, and insert the strand from the other side (1) into the groove of strand (4). Lay strand (1) along the groove until it meets strand (4), then use the two strands to make an overhand knot to secure it. Be sure the knot is tied in the direction of the strand twist;
4. Repeat step 3 with another pair, such as (6) and (3), but in the opposite way; this means unlay strand (3) and replace it with strand (6). The remaining pair, (2) and (5), will stay where they are. Make an overhand knot with strands (2) and (5);

5. A few methods can be used to lock the ends of the strands, such as tucking each end of a strand under its adjoining strand. The tucks should be at right angles to the direction of the twist in the rope. Then take the strand around and tuck it under the same strand again three to four times, tapering well for the last two tucks.
The strand can be split into two equal groups. One group is tucked under and around the adjoining strand; another group is brought over the adjoining strand and tucked under and around the next strand.

To reduce the thickness of the join to almost the same as the rope, take the following steps. Untwist each end of the strand up to the point it goes into the knot. If the rope is Manila, use a metal comb to remove all the loose fibres or trim down the yarn as a tail; if it is synthetic rope, then twist the strand back in same direction as the original. First, bring the tail over the strand it was knotted with, then tuck it under the strand next to the knot, over the next, then under the next for 4 to 5 tucks, then cut it off where the remainder can be tucked and hidden under a strand;

6. Put the splice on the floor and roll it under foot until it looks perfectly balanced and as smooth as possible.

Eye Splice with Eight-Strand Plaited Rope

Eight-strand rope can be synthetic or natural hemp. Nowadays, most mooring line used on board is made from eight-strand. This section shows how to make an eye at the end of the mooring line. The eight-strand rope is made up of 4 pairs of two strands, 2 pairs on the left and 2 pairs on the right tucked together. Each pair has two strands so clearly, four strands turn to the right and another four turn to the left, as shown. Some synthetic rope is manufactured with strips of blue or blue and brown in the strand to help identify the pair that turns to the right. In the illustration, layers that turn to the right are coloured gray and those turning to the left remain white.
Procedure for making Eye splice with eight-strand plaited ropes

For making the splice, remember that the right-hand-laid strand pairs will be tucked under the left-hand laid strand pairs, following the right-hand strand pairs of the standing part. Similarly, the left-hand laid strand pairs will be tucked under the right-hand laid strand pairs, following the left-hand strand pairs of the standing part.

1. Firmly lay the rope straight on a flat surface and start from the bitter end of the rope with the layer that either turns to the right (gray), or turn to the left (white), count back 20 crowns, and mark the twenty-first crown with the marker. In this illustration, the layer that turn to the right is counted. Tie a string around the rope between the twentieth and twenty first crowns; the string should pass directly over the middle of the two pairs that turn to the left, and should be tied with a clove hitch and locked firmly;

2. Lay the rope to form the desired eye size, mark on the middle of two pairs that turn to the left where the standing part starts, and let the tail lay parallel with the standing part where the twine is at the mark. This will let all the strands that have the same turn lay side by side, as shown below;

3. Unlay the strands and separate them in pairs of 2 strands; just like their patterns. Tape the ends of each pair together. Two pairs should turn to the right (gray), and two to the left (white);
4. Start with first left-laid strand pair that is closest to the twine. Use the fid or spike to make a tunnel under the nearest diametrically right-laid strand pair, just below the mark on the standing part next to it. Tuck the first left-laid strand pair through the tunnel. The left-laid strand pair of the tail should run parallel with the left-laid strand pair of the standing part;

5. Similarly, tuck the remain left-laid strand pair under the nearest diametrically right-laid strand pair on the standing part. The left-laid strand pair of the tail should also run parallel with the right-laid strand pair of the standing part;

6. Flip the eye over and repeat as in steps 4 and 5, with the right-laid strand pairs tucked under the left-laid strand pairs. After completing, the right-laid strand pairs of the tail should run parallel to the right-laid strand pairs of the standing part;

7. Rotate the eye or standing part 90° so as to split the two pairs that have the same pattern on each side of the standing part, with the standing part on top, as shown in figure below. This will let the strands lay naturally for next tuck;
8. Start with the pair that is closest to the eye, which in this case would be the left-laid strand. Tuck this left-laid strand pair naturally under the nearest diametrically right-laid strand. The left-laid strand pair should be laid parallel to the left-laid strand of the standing part, moving away from the eye;

9. Similarly, the next pair that is closest to the eye would be right-laid strand; tuck this right-laid strand pair naturally under the nearest diametrically left-laid strand.

10. Continue for the remaining left-laid strand pair, then for the right-laid strand pair;

11. After completing one full tuck, flip the eye or standing part 180° for the next full tuck by repeating step 8 and 9;

12. Continue for two additional tucks. This will make four full tucks for each pair as shown in the figure below;
There are a couple of methods of finishing a splice.

**Method 1**
1. From each pair, choose the strand that closes the eye, tape its base and cut it off. Now only four single strands remain;

   ![Image 1](image1.png)

2. With a single strand, repeat Steps 8, 9, 10 and 11 for two more full tucks;

3. Pull all the strands firmly, tape the bases of the strands and cut them off. The eight ends of strands can be heated and fused so they will not fray.

   ![Image 2](image2.png)

**Method 2**
1. Follows Step 1 and 2 of Method 1;

2. Split each strand in half; put the tape around the half portion near the tuck, and cut it off;

3. With the remaining half strands, follow Steps 8, 9, 10 and 11 to make another two full tucks;

4. Pull them firmly, tape them, and cut them off. The splice is completed.

   ![Image 3](image3.png)

Method 2 is used to reduce the thickness to the splice smoothly.
Eye Splices for Wire Rope

The eye splice is used to form a permanent eye at the end of the six strand fibre core or IWRC rope. There are several types of splice, and some popular ones, such as the Liverpool, Lock Splice, Flemish or Hasty eye, will be described.

The strength of the eye will be approximately 95 percent of the strength of the rope, except for the Flemish eye, which is about 70% of the strength of the rope. The strength will be decreased as the diameter of the rope increases. The weakest part of the splice is in vicinity of the last set of tucks; therefore, do not over-hammer this section, which will cause distortion.

Some special tools are needed during splicing, such as a spike, seizing iron, nippers, knife, mallets, some short fibre rope and a piece of pipe. You should wear proper personal protective equipment, such as gloves, google, etc. When using the spike to open up the strand, always insert the spike against the lay and be careful not to damage the strand or the core, nor kink the lifted strand. Insert the spike is well under the strand to be lifted, making sure to leave sufficient room to pass the strand of the tail, which is referred to as the working strand, to be tucked. When tucking the rope against the lay, the working strand is tucked across under the strand of the standing part, and in the case of an eye splice, at nearly a right angle, but when tucking the rope with the lay, the working strand is tucked across underneath the strand of the standing part in the other direction, at a smaller angle.

An eye splice can be made with or without a thimble, depending whether a soft eye or hard eye is preferred. The thimble protects the wire from sharp bends and abrasive action. Before splicing, whether soft eye or hard eye, from the bitter end, measure the length of the tail or the strands that should be unlaid and place a temporary seizing to prevent unlaying further back than desired. The length of the tail depends on the number of tucks needed for the splice. For the Liverpool eye splice, four tucks are preferred, so just follow a single strand up and around the wire from the bitter end five times, and at the fifth turn, place the seize around the wire. For the Lock-Tuck eye splice, five tucks are preferred, so follow the single strand for six turns and place the seize around the wire at the sixth turn. Bend the rope as a bight to form the eye, and put on another seize if necessary to mark where the first tuck is to be made. Two parts of the eye can be held by temporary seizing, or the eye can be put in a rigger's vise for holding while splicing. If the splice is for a hard eye, then a thimble is inserted inside the bight. The thimble is secured to the bight by seizing about the crown and the shoulders of the thimble. Unlay the strands all the way to the seizing, and whip the ends of each strand tightly by the twine or tape. Cut out the core and place the unlaid strands on the left, with the standing part stretched out away as shown in the next figures. Three strands will naturally fall on the front and the other three will fall on the back side. Starting with the strand on the front next to the standing part, call it "Strand
One". The next from strand one in a clockwise direction is "Strand Two". Continue the same pattern to name all the working strands from three to six. Strand six should be the last one, which is next to strand one.

The Liverpool Eye Splice

The Liverpool is one of the most popular splices, and is the most simple splice to make. It is used widely, but do not use it in a rope that is free to spin when loaded. The following describes the procedures to make the Liverpool eye splice:

1. Insert a spike against the lay, under three strands of the standing part. Tuck the working strand one under three strands with the lay, as shown in figure (a) below;

2. Tuck working strand two through the same opening as working strand one, but under two strands, as shown in figure (b) below;

3. Tuck working strand three through the same opening as the first two working strands, but under only one strand, so all three working strands go in at the same point, but come out at different places (c);

4. Turn the eye over, then put the spike under the strand of the standing part to the left of the last three tucks. Turn the spike counterclockwise around the standing part, and tuck the working strand four with the lay. Pull the strand down tight with the spike. Tuck strand four around the same strand four times. Each tuck must be locked in place by holding the strand down and running the spike up (d);
5. Similarly, put the spike under the next higher strand on the standing part and tuck the 5th strand with the lay around it four times (e).

6. Strand six is also tucked with the lay around the next higher strand on the standing part (f);

7. Tuck strand one, two and three. Each is tucked three times in a row, ending up with four tucks for each strand.

There is a way to avoid kinking strands when pulling them into the place. Insert the spike and run it up the wire of the standing part. As the spike runs up with the strand, shove the working strand under the spike and pull it taut. Keeping the strain on the working strand, work the spike down to push the working strand back around and down. Hold the working strand where it is, and work the spike back up the wire. Follow up with the strand, and take the last tuck. Work that strand back down and hold it there. Pull out the spike, and run it back up until the strands of the standing wire bind the working strand in place. Make the second and third tucks with the remaining strands in the same way.

8. Remove the wire from the vise, use a rubber hammer to pound the splice into shape, and cut off the ends of the tucking strands close to complete the splice.
A locking tuck may be taken after completing the third round of tucks to decrease the possibility of the splice working out. For this tuck, take every other strand and pass each of these over two strands, then tuck under the next strand. Each of these strands goes over the next working strand as well as the two strands of the standing part and locks the splice in place.

**The Lock-Tuck Eye Splice**

The Lock-Tuck eye splice is another basic splice, more complex than the Liverpool splice but more secure. As mentioned above, the Liverpool splice should not be used in a rope that is free to spin when loaded, because it can "spin out" when used for a suspended load that is free to rotate. The design of the Lock-Tuck splice has two tucks initially spliced against the lay while others are spliced with the lay, which is considered as a lock to prevent the possibility of the wire opening when the load spins.

1. Insert the spike into the rope under two strands of the standing part, directly facing the splicer, leaving the core and other four strands below the spike. Take strand one through and under the two open strands, over the core, against the lay of the standing part;

2. Put strand two in the same opening as strand one, but tuck it under three strands, over the core, against the lay of the standing part. Strand two should come out of the standing part just below where strand one comes out;

3. Put strand three in the same opening as the last two strands but with the lay, under two strands and also under the core. Strand three should come out just below where strand two comes out. So the first three strands go in the same opening, but come out separately;

4. Tuck strand four through the same opening, with the lay like strand three, but only under one strand;

5. Strand five goes in just above the opening where the last four strands did, and with the lay. So strand five will come out where the last four strands went in;

6. Tuck strand six where strand one comes out, under one strand with the lay, and come out where strand five went in. All six strands come out in separate places of the standing part;

7. Pull all strands tight. Tuck each strand for four more tucks by bringing over the strand of the standing part and back underneath it again. You can start with any strand you like, such as strand six, since the spike is already holding the strand for the last tuck. Every tuck, you should pull the working strand
taut while running the spike down toward the eye, pushing the working strand down tight into the splice. After the standing strand binds the working strand in place, run the spike up and insert the working strand again for the next tuck, then follow the same process to force the working strand down with spike again.

8. After all the strands have 5 tucks, remove the eye from the vise, use a rubber hammer or mallet to pound the splice into shape, and cut off the ends of the tucking strands close to the splice to complete the splice.

Construction of Lock Tuck Wire Eye Splice
The Flemish Eye splice, sometimes known as the Hasty Eye or Molly Hogan splice, is a method of forming a temporary soft eye in the end of the wire rope without permanent splicing. It can be easily and quickly made, but is limited to about 70 percent of the strength of the rope; therefore, it should not be used to hoist loads. This splice can be used only when working with preformed wire rope. When choosing wire rope to make a Flemish Eye, the rope with an even number of strands should be used because the number of strands will be divided equally into two portions. The steps for making a Flemish Eye follow:

1. Use the spike to separate the wire rope into two equal portions with the number of strands and unlay them until they are about four times the diameter of the desired eye. The core can be cut out or laid in one portion of the wire;

2. Bend two portions to make a simple Overhand knot, and let the strands re-lay into position together to form the eye with desired diameter;

3. Continue laying strands back around each other until the eye is completed

4. Secure the bitter end of the strands to the ropes by seizing or a wire clip to prevent unlaying of the rope to complete the splice.