Lanex
You can be sure

REPAIR

LANEX, a. s.
Hlučínská 96/1
Bolatice 747 23
Czech Republic

Traditional manufacturer since 1949

CONTENT

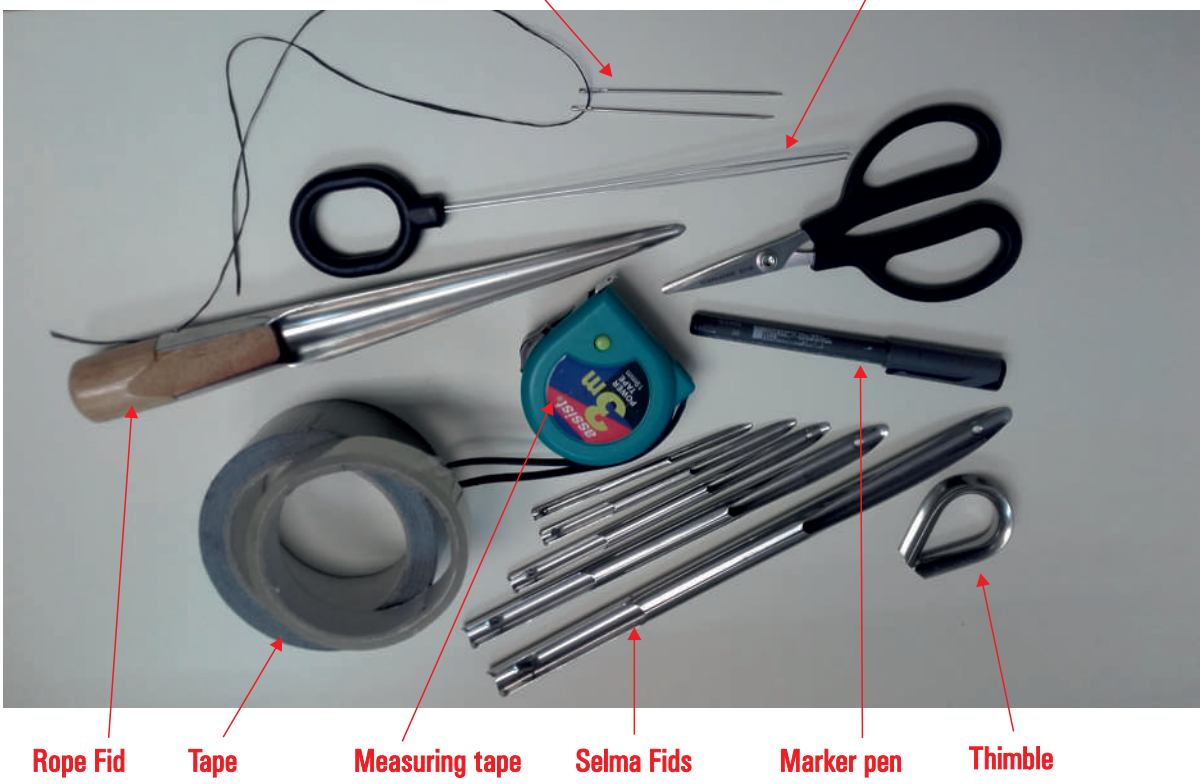
FIGURES

REPAIR

When a rope is considered to be damaged, in accordance with the inspection criteria, a decision must be made to repair, downgrade or retire the rope based on the results of the inspection (see Inspection and Retirement Criteria).
If the rope shows severe damage only in a few concentrated areas, it may be possible to remove the damage sections and resplice the rope. After completion of new eye splices or end-for-end splices, pretension or load cycle to set the splice if possible. For end-for-end splices, assume 100% strength for a short splice and 80% for a long splice.

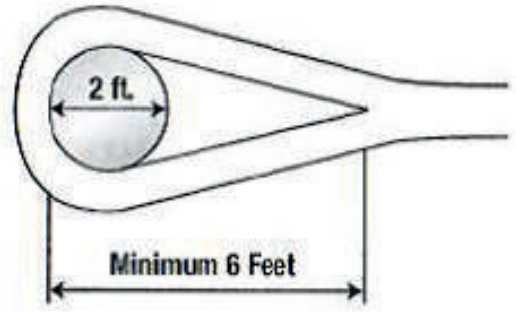
Splicing tools and explanation of terms

Depending on the type of splice and rope, there is a variety of splicing tools available, such as Fids, D-Splicers and traditional rope fids. You will probably also need a hot knife, scissors (both normal ones and ones specifically for HMPE), tape,a marker pen, and so one.



Length of an eye splice

The ratio of the length of an eye splice to the diameter of the object over which the eye is to be placed (for example bollard, bitt, etc.) should be a minimum 3:1 relationship (larger is always preferred to improve durability). By using this ratio the angle of the two legs of the eye at its throat will not be so severe as to cause a parting or tearing action at this point (thimbles are normal designed with a 3:1 ratio).



Eye splice diameter to the diameter of the object it will be placed over should be 3:1 minimum, 5:1 is preferable.

Splice - is a manually made permanent rope joint. It is made by complete splicing of strands into the rope itself, i.e. by making the relevant number of tucks.
Tuck - opening the rope by means of the conical fid and lacing the strand through the hole made in this way.
Complete tuck - gradual tucking of all rope strands.

Splicing methods

Twisted ropes – eye splice

Rope preparation for splicing – For eye splicing (both without and with thimbles), measure the additional length of rope so that the complete tucks can be made, i. e. the point is found by either following one strand up the rope for four complete rotations or counting 12 lays of rope (3 strands x 4 rotation = 12 lays) from the rope end.

Splicing procedure

Mark the additional length of rope (see Figure no.1) and secure it with an adhesive tape to prevent the untwisted ends of the rope from further untwisting. The tape will be removed after making the splice. Then mark the length of the eye.

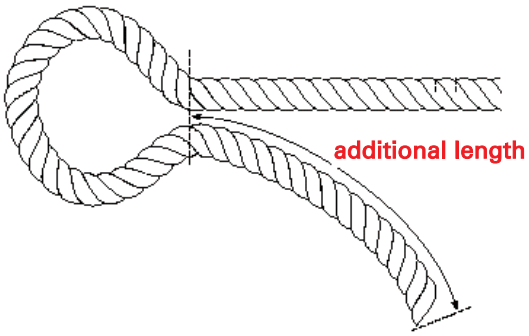


Figure no. 1: **Marking the additional length**

Figure no. 2: **Rope untwisting**

Make the eye either without or with a thimble by gradual tucking of individual strands into the rope (Figures no. 3 and 4).

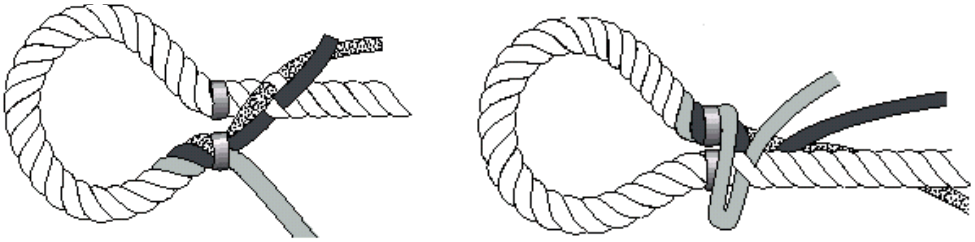


Figure no. 3 and 4: **Gradual tucking of individual strands**

Figure no. 5: **Finishing the splice**

Twisted ropes – end-to-end splice

Rope preparation for splicing – Each rope end needs an additional length which shall be equal to 10 to 14 times the rope diameter.

Splicing procedure – The procedure is identical to that of eye splicing (see twisted ropes – eye splice). Mark the additional length of rope on both rope ends and untwist both ends up to this mark. Now place the rope ends one to another with the strands laid alternately next to one another. If necessary, secure the place of contact with a tape which will be removed after making the splice. Splice the strands of both ropes by means of 5 complete tucks.

8-strand braided ropes – eye splice

Rope preparation for splicing – For eye splicing (both without and with thimbles), measure the additional length of rope so that the necessary number of complete tucks can be made, i.e. 5 + 4 complete tucks (Place a secure layer of tape at the end the 9th rope lay from the end).

Splicing procedure - Mark the spliced rope end at a distance equal to the additional length of rope. If necessary, secure that place with a tape to prevent the strands from the rope construction from further unbraiding (Figure No. 6). The tape will be removed after making the splice.

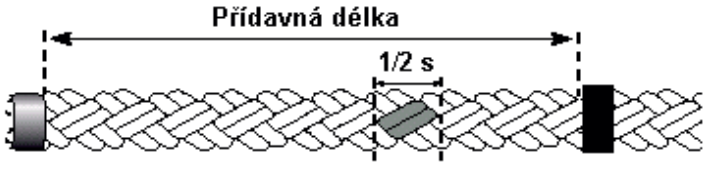


Figure no. 6: **Marking the length of splice**

Unbraid the rope up to this mark (Figure no. 7). Join the strand pairs at the end with a tape

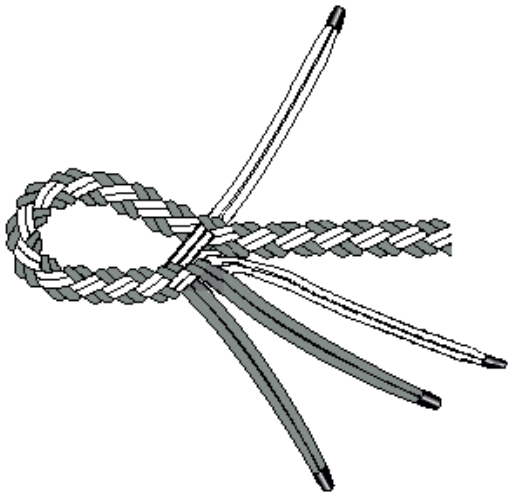


Figure no. 7: **Finishing the splice**

Now make the eye by gradual tucking of individual strand pairs into the rope (Figures no. 8 and 9).

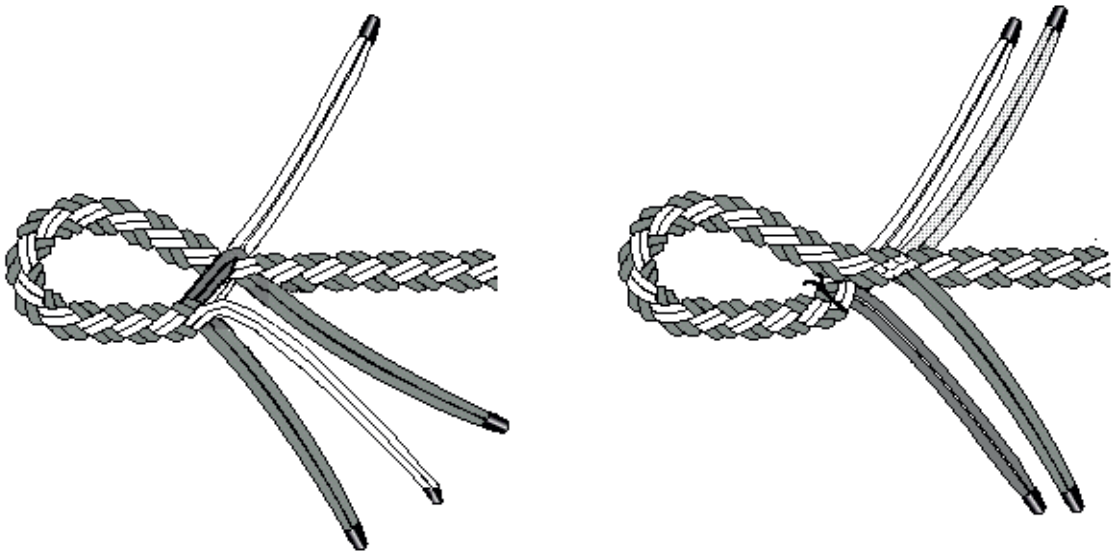


Figure no. 8 snd 9: **Tucking of individual strands**

The last splice will be made with one of the strand pair only (Figure no. 10).

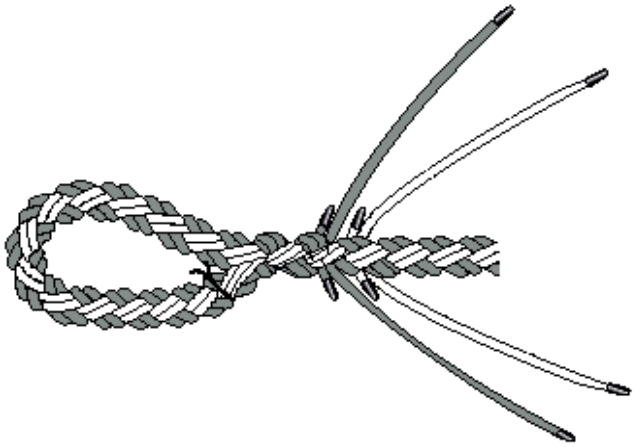


Figure no. 10: **Finishing the splice**

The splice is formed by making the relevant number of complete tucks, i.e. 4, 5 complete tucks (Figure no. 11). Ends of individual strands are melted-off or fixed by an adhesive tape.

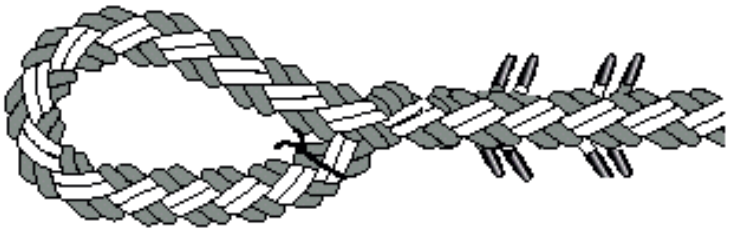


Figure no. 11: **Finished splice**

8-strand braided ropes – end-to-end

Rope preparation for splicing – Prepare the rope in required length on the bench with the right end and the left end pointing to each other. According to the splice description, see section 3, mark the strands in "Z" direction on both ends and fix the places of unbraiding with a tape.

Splicing procedure:

1) Mark 10 tucks on "Z" strands from both right and left side – secure by tying (step 1).
2) Mark additional 6 tucks on "Z" strands from both right and left side (step 2).
3) Secure the ends of strands with a tape – distinguish "S" and "Z" strands in colour (step 3).
4) Join two parallel "S" and "Z" on both sides by taping (step 4).
5) Unbraid the strands up to the place of tying, with "Z" outside and "S" inside (step 5).

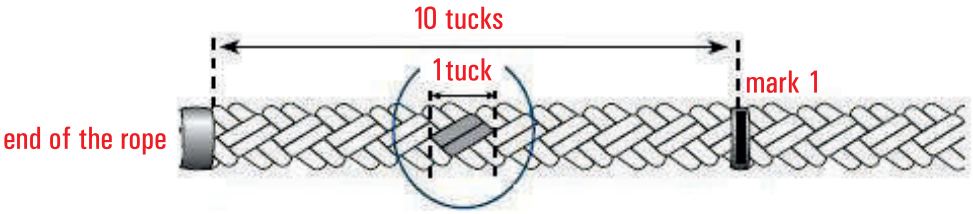


Figure no. 12: **8-strand braided ropes (end-to-end) - step 1**

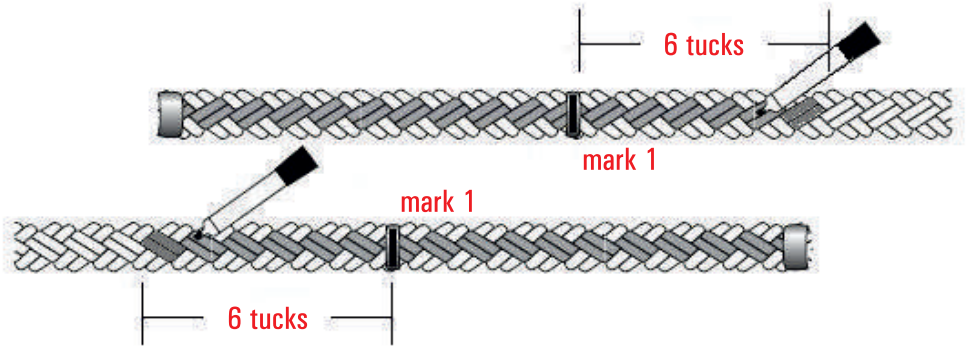


Figure no. 13: **8-strand braided ropes (end-to-end) - step 2**

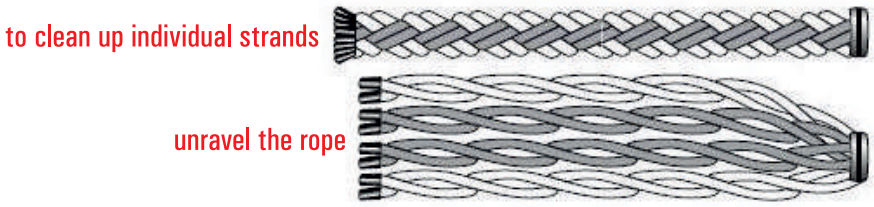


Figure no. 14: **8-strand braided ropes (end-to-end) - step 3**

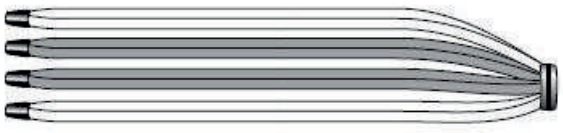


Figure no. 15: **8-strand braided ropes (end-to-end) - step 4**

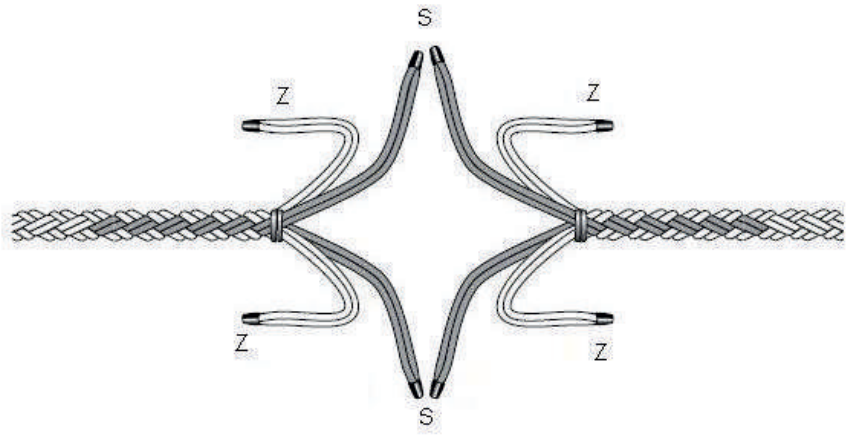


Figure no. 16: **8-strand braided ropes (end-to-end) - step 5**

Tucking of individual strands:

1) Left upper "Z" into right upper "Z" from below.
2) Right upper "S" into left upper "S" from below.
3) Right lower "S" into left lower "S" from below.
4) Left lower "Z" into right lower "Z" from below.

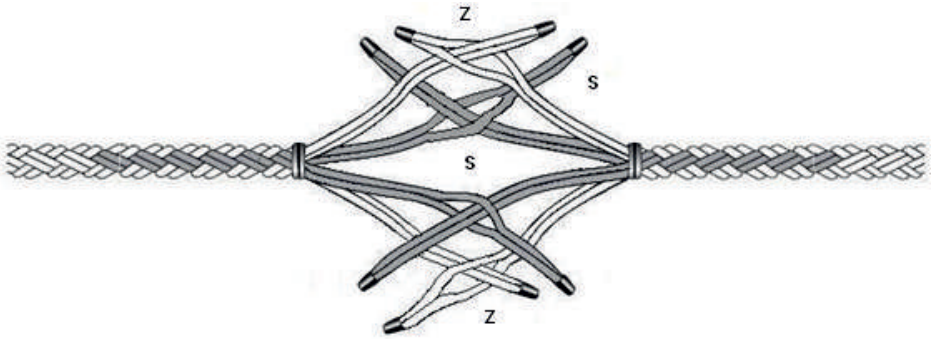


Figure no. 17: **Tucking of individual strands**

Tighten the knot so that the upper "Z" position is up – the lower "Z" position is down, the upper "S" position is down – the lower "S" position is up = alternately

Secure the place of joining with a twine firmly!

Splicing procedure for strands

Left side:
Remove the tying on the rope.

1) Tuck the upper "Z" from above into "S" - from the front - turn it to yourself
2) Tuck the upper "Z" from above into "S" - from the front - turn it back
3) Tuck the lower "S" into "Z" (with tucked "S") - from below - turn it to yourself
4) Tuck the remaining "S" into "Z" - from below

Right side:
Remove the tying on the rope.

1) Tuck the upper "Z" from above into "S" - from the back - turn it to yourself
2) Tuck the upper "Z" from above into "S" - from the back - turn it back
3) Tuck the upper "S" into "Z" from above - from the front - turn it to yourself
4) Tuck the remaining "S" into "Z" from above - from the front

Now continue with the standard eye splicing of LL ropes. Each side shall be tucked 3 times with 2 joined strands, the last fourth tuck shall be done with one strand only. End of operation – secure and cut off the ends of strands. Finished splice – Figure no. 1.

Figure no. 18: **Finished splice**

12-strand braided ropes – eye splicing

Rope preparation for splicing – For eye splicing (both without and with thimbles), measure the additional length of rope so that the necessary number of complete tucks can be made, i.e. 5 + 3 complete tucks (Place a secure layer of tape at the end the 8th rope lay from the end)

Splicing procedure
Mark the spliced rope end at a distance equal to the additional length of rope. If necessary, secure that place with a tape to prevent the strands from the rope construction from further unbraiding (Figure no. 19). The tape will be removed after making the splice.

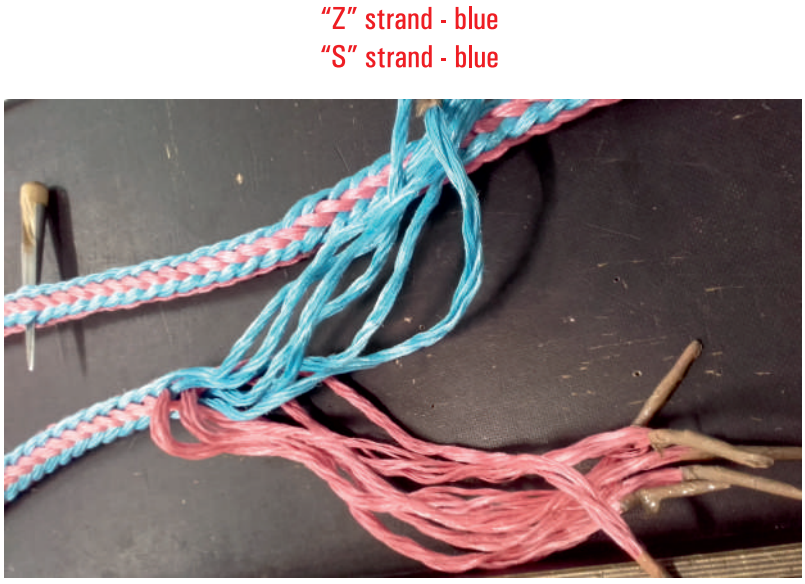


Figure no. 19: **Marking the length of splice and unbraiding of individual strands**

Begin with the pair of strands in "Z" direction – lace one strand of this pair through the middle of the rope (Figure no. 20) and tuck it under the "Z" strand.

Figure no. 20: **Lacing the "Z" strand through the middle of the rope**

Lace the other "Z" strand of that pair through the rope also, tuck the strand over the "Z" strand (Figure no. 20).

Figure no. 21: **Lacing both "Z" strands**

Repeat this splicing procedure, i.e. tucking always under and over the "Z" strand, 5 times with each "Z" strand of the pair being spliced.
After splicing, turn the rope over and splice a pair of strands in "S" direction. Lace the "S" strand under the "Z" and "S" pair (Figure no. 21) and tuck it under and over the "S" strand, as shown in Figure no. 20.

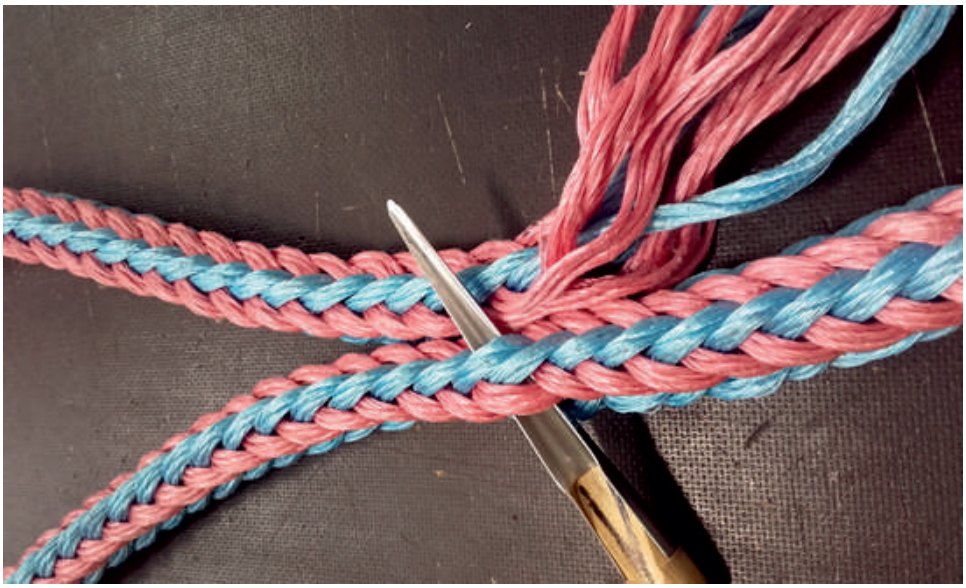


Figure no. 22: **Lacing the "S" strand**

Figure no. 23 a): **Tucking the "S" strands**

Figure no. 23 b): **Tucking the "S" strands**

Figure no. 23 c): **Tucking the "S" strands**

After that, splice "Z" strands and "S" strands alternately. As soon as five lacings (complete tucks) are finished with all pairs of the strands, continue splicing with one strand of the pair only (lower strand) and make additional three lacings (comlete tucks) (Figure no. 17).

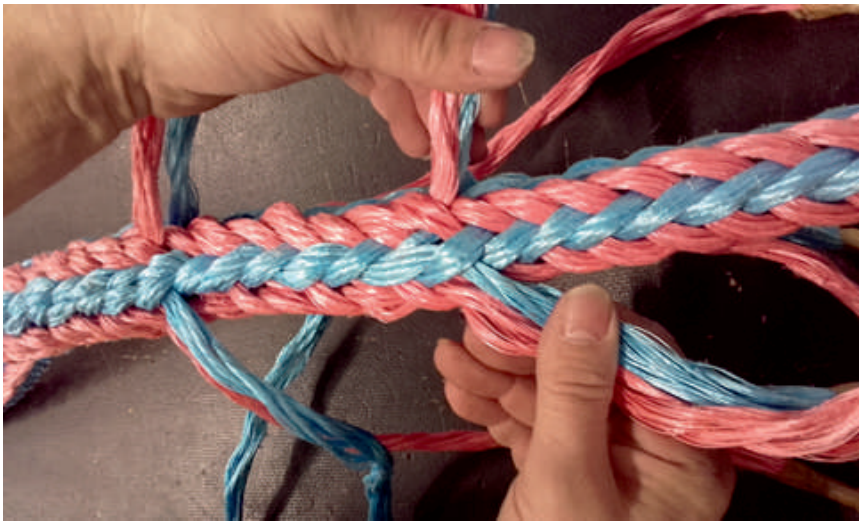


Figure no. 24: **Finishing the splice**

After finishing the splice, join the protruding ends of the strands by means of an adhesive tape and cut them off. The finished splice is shown in Figures no. 24.

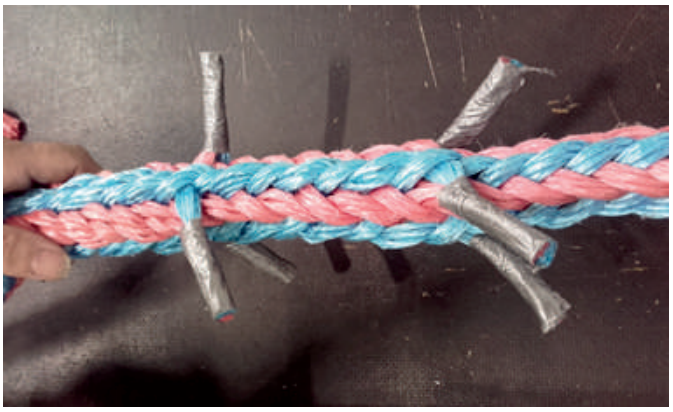


Figure no. 25 a): **Finished splice**

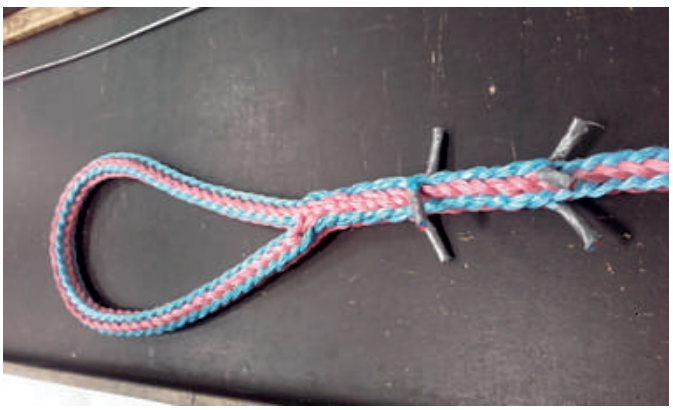


Figure no. 25 b): **Finished splice**

Minimum lengths and circumferences of ropes

Ropes with eyes

The shortest produced lengths for all types of ropes with eyes are determined as follows:

- ropes of nominal diameter 6.0 – 20.0 mm incl., minimum length is 1 m
- ropes of nominal diameter 22.0 – 30.0 mm incl., minimum length is 2 m
- ropes of nominal diameter 32.0 – 48.0 mm incl., minimum length is 3 m
- ropes of nominal diameter over 52.0 mm, minimum length is 4 m

Endless ropes

The shortest produced lengths for all types of endless ropes are determined as follows:

- ropes of nominal diameter 6.0 – 16.0 mm incl., minimum length is 1 m
- ropes of nominal diameter 18.0 – 30.0 mm incl., minimum length is 2 m
- ropes of nominal diameter 32.0 – 48.0 mm incl., minimum length is 3 m
- ropes of nominal diameter over 52.0 mm, minimum length is 4 m

CAUTION: Splicing of a heavily used rope may be impossible, or very difficult. In such cases, there is often a significant strength loss; consultation with a qualified person may be appropriate. For jacketed ropes where the core is the strength member, it may be possible to repair the jacket.

Cover repair methods

Small external damages, such as dirt and minor abrasion, are very common. The objective of the rope cover and filter is to the protect the inner cores (Figure no.26). The cover and filter are not considered for calculations of rope performance regarding, for example breaking strength and stiffness.

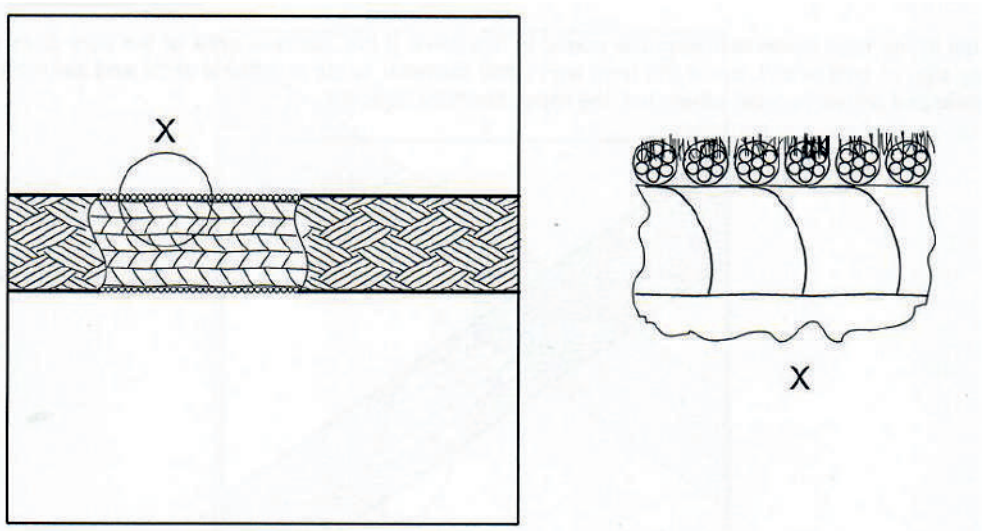


Figure no. 26: **Rope cover and filter**

External damage can be visually identified as the following.

- Excess dirt, which does not represent major damage. The objective of the cover is to protect the rope cores. In this case, wash the area with fresh water.

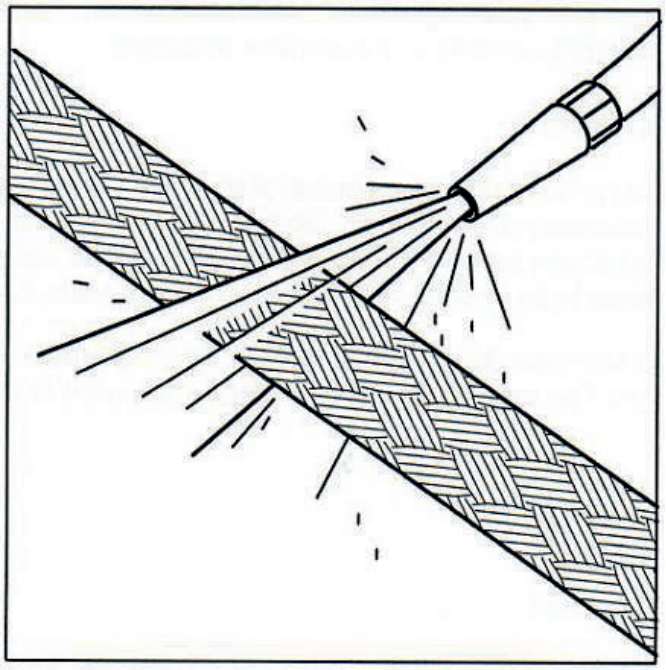


Figure no. 27: **Wash the damage area with water**

- Cuts in the rope cover exposing the cores. In the case, if the exposed area of the core does not show any sign of cuts or dirt, cover the area with small diameter cords in a spiral array and secure them with reinforced adhesive tape; otherwise, the rope should be rejected.

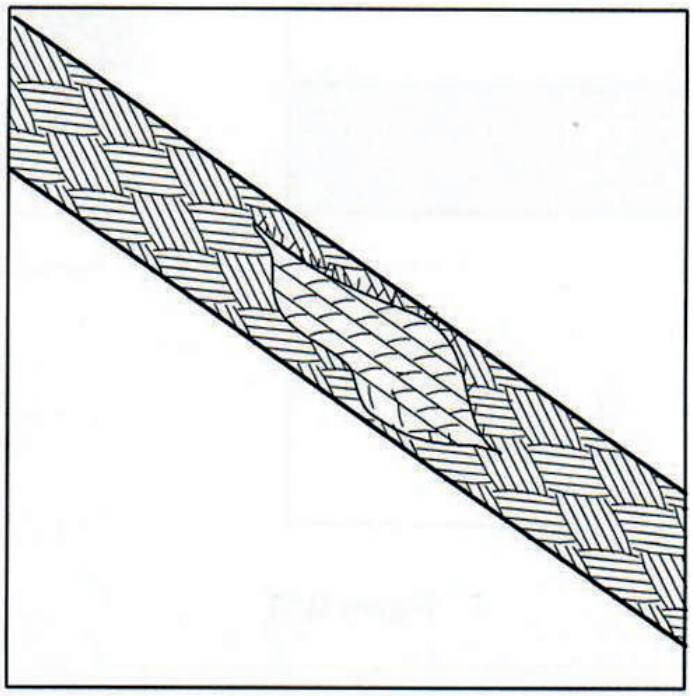


Figure no. 28: **Cutting the rope cover**

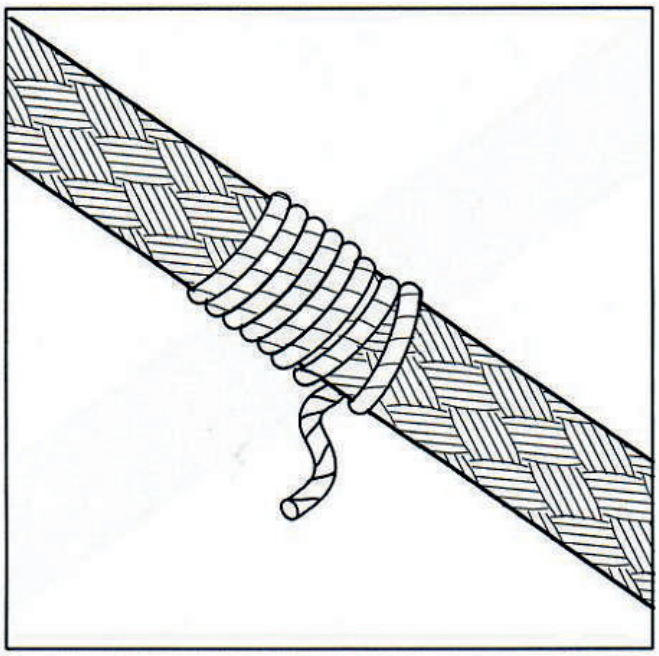


Figure no. 29: **Covering the area with small diameter cords**

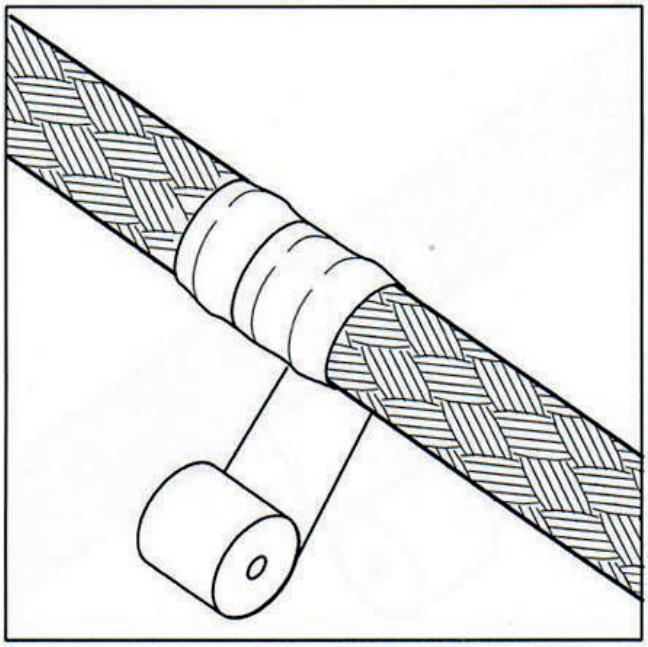


Figure no. 30: **Covering the rope with reinforced adhesive tape**

- Threadbare cover caused by abrasion, without a cut. In this case, cover the area with reinforced adhesives tape.

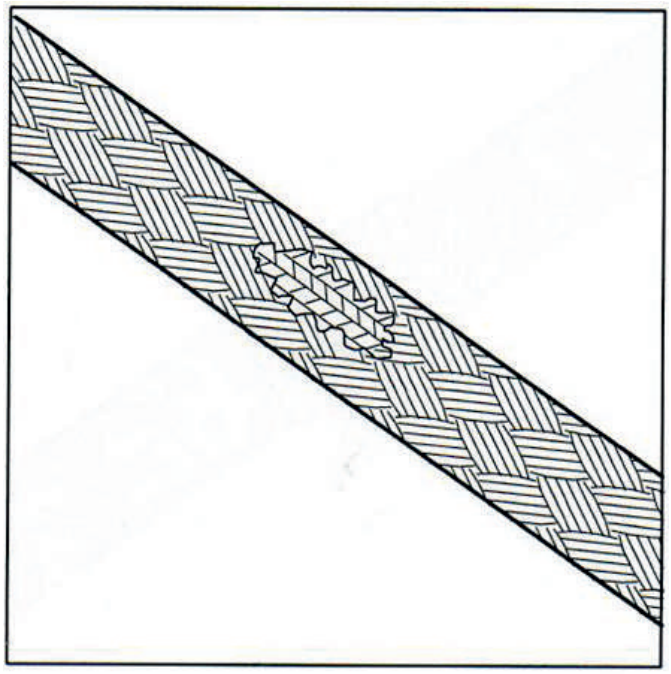


Figure no. 31: **Cover caused by abrasion**

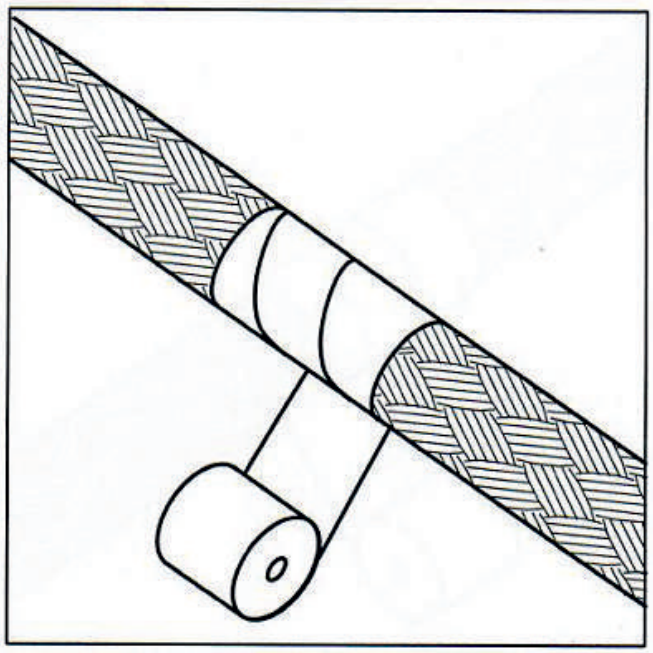


Figure no. 32: **Covering the rope with reinforced adhesive tape**

- Ropes with damaged cores should be rejected.

RESOURCES

1. Cordage Institute - International Guideline. CI 2001-04 Fiber Rope Inspection and Retirement Criteria

2. ISO/TS 14909:2012 Fibre Ropes for Offshore Stationkeeping - High Modulus Polyethylene (HMPE)

LANEX, a. s.
Hlučínská 96/1
Bolatice 747 23
Czech Republic
www.lanex.cz | +420 553 751 111 | lanex@lanex.cz

Traditional manufacturer since 1949