Storage conditions

Store the ropes in a clean environment under mild and dry environmental conditions (avoid storage in high temperatures) and away from direct sunlight. Store the ropes away from heat generating sources and acid (especially sulfuric acid) and alkaline environment. Good ventilation of the storage place is also preferable. Under these specified conditions, the ropes can be stored without loss of properties for 8-10 years (shelf-life), but the user should keep in mind that once the rope is unpacked and subjected to operation the shelf-life management stops and the service life begins.

Estimated service life of rope under good storage and usage conditions as described in this manual is 5 years or 7500 hours under tension.

Inspection practices and retirement criteria

⚠ The rope should be inspected in all of the length used after each usage. An experienced person from the crew, assigned by the master or by the company, must be charged with the visual inspections. A diary log must be kept where as much information as possible must be recorded (rope life history/mooring line history). Also keep in mind that in order to have an indication of the remaining/current breaking strength of a line, the originally received coil, should have an extra length of about 10 to 12 meters. This way, a breaking test in a specimen could be performed without limiting/affecting the line's length. For this extra length, the purchaser should make this notification during the order placement. The visual inspection must check the following.

Synthetic mooring lines should be replaced when its residual strength has fallen to 75% of the ship design MBL (equivalent to about 75% LDBF).

One strand of the rope is pulled out. If it is possible, try and work it back to the rope, if it is in good condition (no significant wear), and look out for the cause (possibly some snagging on deck equipment). **RETIRE THE ROPE? NO**

The rope has suffered extreme compression but there are no fused/melted fibers. Try to flex the rope to remove compression. **RETIRE THE ROPE? NO**

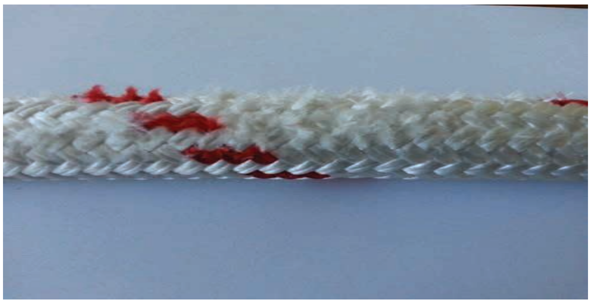
The rope's diameter is inconsistent. Possibly due to shock loading there are broken internal strands/rope yarns. **REPAIR THE ROPE (CUT AND RESPLICE, IF ALLOWED and if remaining length is sufficient for mooring operations) OR RETIRE**

The rope has extensive wear and/or reduced volume. The percent of the volume decreased means greater decrease in line's strength. **REPAIR THE ROPE (CUT AND RESPLICE IF ALLOWED and if remaining length is sufficient for mooring operations) OR RETIRE**

The rope's surface is discolored. Most probable cause is chemical contamination. There may also be some fiber fusion or some fibers may be brittle. **REPAIR THE ROPE (CUT AND RESPLICE IF ALLOWED and if remaining length is sufficient for mooring operations) OR RETIRE**

For covered ropes (in case of a worn jacket or a pulled strand for example) there could be a **local repair** in the jacket (as long as it is verified that the load bearing core is in good condition and hasn't suffered any damage).

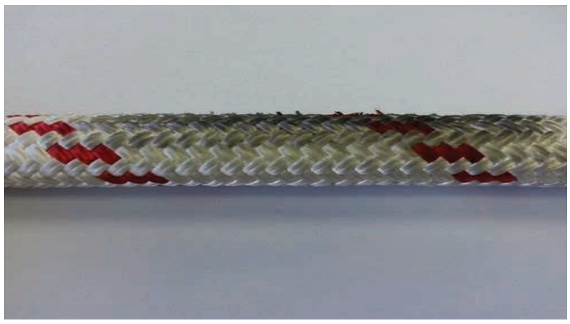
Abraded cover



Cut cover-jacket strands

Glazed (fused) strands on the jacket

Discoloration



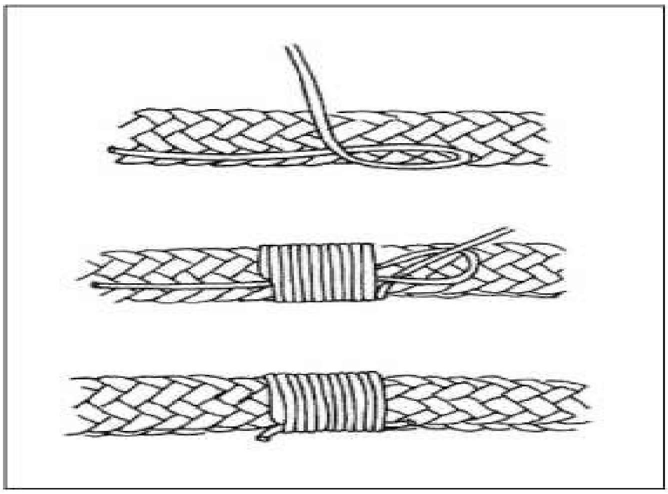
When the cover is damaged, we recommend inspection of the inner strength member. If the inner strength member is damaged then it may be necessary to downgrade the rope. The cause of the damage should be determined and if possible removed. Depending on the extent of the damage either a small repair or an extensive repair is recommended.

Small repairs

The most durable method to make small repairs on the jacket braid requires the use of Nylon whipping twine and polyurethane glue.

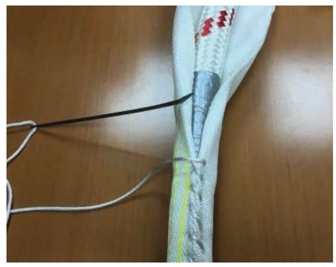
Remove all the damaged yarns and coat the free yarn ends with the glue, in order to prevent further unraveling of the cover. Start whipping at least three centimeters away from the damage, as shown in the drawing. Lay a loop of twine across the rope, leaving a free tail after the damage zone of about ten centimeters. This tail has to be grasped later, so avoid covering it completely with whipping. With the working end of the twine, make multiple wraps around the rope from the tail end toward the apex of the loop, covering the loop until the whipping is at least three centimeters beyond the damage.

To finish the whipping, insert the working end of the small twine through the loop. Pull on the very end or tail of the small twine until the loop slides completely out of sight. Clip the ends close to the whipping. If necessary, a temporary cover repair can be made using high quality adhesive tapes such as vinyl electrical tape, etc. A more permanent repair,as described above, should replace the tape as soon as possible.

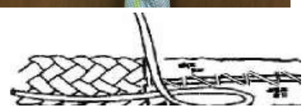


Extensive repairs

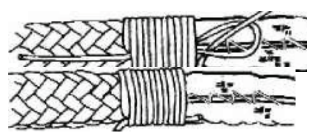
For extensive repairs the following tools are needed: replacement cover, some sewing twine and a large sewing needle. Optionally additional protection can be obtained by a two-component polyurethane. Remove all the damaged yarns and inspect the rope. After inspection coat the free yarn ends with the glue, in order to prevent further unraveling of the cover. Wrap the damaged part in the replacement cover. Stitch the web together, with a special knot that will prevent the stitching yarn from loosening when it is torn.



Protect the beginning and the end of the replacement cover with whipping. Start whipping at least three centimeters away from the edge, as shown in the drawing. Lay a loop of twine across the rope, leaving a free tail after the damage zone of about 10cm. This tail has to be grasped later, so avoid covering it completely. With the working end of the twine, make multiple wraps around the rope from the tail end toward the apex of the loop, covering the loop until the whipping is at least three centimeters beyond the damage.

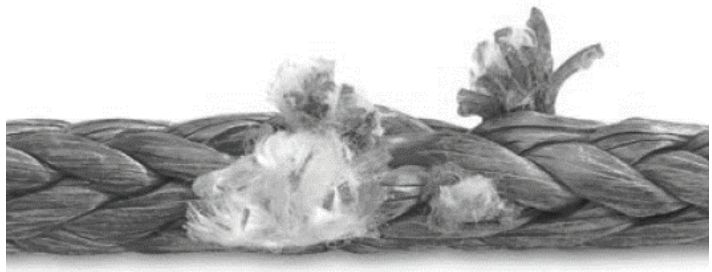
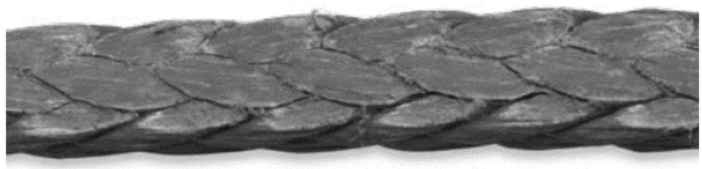


To finish the whipping, insert the working end of the twine through the loop. Pull on the very end or tail of the twine until the loop slides completely out of sight. Clip the ends close to the whipping.



Inspection practices and retirement criteria

⚠ Ropes must be operated under normal working load conditions. This means that the load must be handled slowly and steadily in order to minimize the dynamic effects. Loads bigger than the maximum working load limit must be considered as shock loads, which can stress and destroy the yarns and to result in the premature damage of the rope, even when handling loads below the maximum working load limit. In the below pictures you will find some of the reasons for which the condition of the rope will have to be re-evaluated before using it again. In such cases, you must either cut the part that shows the large localized wear (internally or externally) or the pulled-out strand or the melting due to increased temperature caused from friction against a metal surface under load and spliced (if permitted by the regulations) or to retire and withdraw the rope from further use and destroy / recycle it according to the local legislation or the corporate or other regulations on handling end of life products.

Cut Strands: Repair or Retire	
WHAT: 8-strand if one or more cut strands **CAUSE:** Abrasion, Sharp edges and surfaces **CORRECTIVE ACTION:** If possible, remove affected section and re-splice with a standard end-for-end splice. If re-splicing is not possible, retire the rope	
Compression: Repair	
WHAT: Visible sheen Stiffness reduced by flexing the rope Not to be confused with melting Often sees on winch drums **CAUSE:** Fiber molding itself to the contact surface under a radial load **CORRECTIVE ACTION:** Flex the rope to remove compression	

<table>
<tr><td colspan="2">Discoloration: Repair or Retire</td></tr>
<tr><td>WHAT: Fused fibers
Brittle fibers
Stiffness

CAUSE: Chemical contamination

CORRECTIVE ACTION: If possible, remove affected section and re-splice with a strand and-for-end splice. If re-splicing is not possible, retire the rope</td><td></td></tr>
<tr><td colspan="2">Inconsistent Diameter: Repair or Retire</td></tr>
<tr><td>WHAT: Broken filaments and yarns
Abrasion
Sharp edges and surfaces
Broken internal strands

CAUSE: Broken internal strands
Shock loading

CORRECTIVE ACTION: If 10% loss of fiber cross-section in whole rope or in an individual strand cross-section. Crowns of strands badly worn reducing strand diameter by more than 10% No repair is possible for that rope. Best action is downgrade or retirement. In other cases, affected section should be removed, rope re-spliced with a strand and-for-end splice</td><td></td></tr>
</table>