

# Rope Inspection Guidelines

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Ropes should be inspected on a regular basis. An established inspection procedure allows the operator to assess the overall condition of the rope and determine when maintenance and/or replacement are warranted. A thorough inspection may also assist the operator in identifying the cause of the problem, thereby allowing corrective action to be taken before the rope is severely damaged. Since the rope is just one part of a complex system, any inspection should also include those components that come into contact with, or have a direct influence on, the condition and overall performance of the rope.

### 1. Establish a regular inspection procedure

- Visual inspection prior to each use
- Immediately after any unusual occurrence
- Full documented inspection every 3 months of service

### 2. Inspect all components of system

- Rope
- Terminations and hardware
- Mechanical components
- Contact surfaces

### 3. Maintain a detailed inspection and use-log

- Date rope placed into service
- Results of inspection
- Any unusual occurrences
- Date and type of repairs
- Condition of ancillary equipment

### 4. Determine residual strength of used rope

- Provides hard data on effects of rope usage on strength
- Helps in determining point at which other ropes should be retired
- Information is most useful if the inspection and use-log is faithfully maintained

### Inspection Points

1. Tags
2. Abrasion
3. Cuts
4. Pulls
5. Burns
6. Contaminants
7. Discoloration
8. Uneven diameter or lumps
9. Shock loads – unusual hardness
10. Quality of splices

# Rope Inspection Points

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Ropes should be inspected in accordance with the guidelines below. Of necessity, they are somewhat general in nature. The decision to repair or retire a rope in a particular service should be made on the basis of experience and/or established policy guidelines.

- 1. Tag (ID):** Illegible or missing tagging is a major criteria for retirement. Information to be included on tag: rope type, rope diameter, rope length, published MBL, date of manufacture.
- 2. Abrasion:** Abrasion is the tearing or wearing away of surface filaments. When a new rope is placed in service, contact with various abrasive surfaces will break some of the outer filaments over the entire surface of the rope, giving it a slightly "fuzzy" appearance. This condition is normal and, to a certain extent, beneficial as the broken filaments act as a protective cushion. This condition should stabilize after the rope has been in service for a period of time. If abrasion continues at an accelerated rate then fiber mass is being lost and the performance properties of the rope have been adversely affected.

While uniform surface abrasion is to be expected, isolated areas of extensive abrasion or definite abrasive patterns along the length of the rope indicate a problem somewhere within the system. As an example, a pattern of extensive abrasion running down the body of the rope in a line usually means that the rope has come into contact with some rough surface while it was moving under load. This may be a damaged winch drum, pulley or other contact surface. An attempt should be made to identify the cause(s) of this type of damage.

The effects of abrasion on the strength of the rope may be estimated in the field. Since abrasion results in the loss of fiber mass, the residual strength in any damaged section may be estimated by comparing the remaining bulk of the damaged strands to a section of undamaged rope.

- 3. Cuts:** Although not as common as abrasion in the course of routine applications, cuts represent a greater potential hazard to overall rope performance. Cuts may be identified by the even, squared-off fiber ends at the point of damage. Obviously, rope strength is affected at the location of a cut, with the amount of strength loss dependent upon the depth and extent of the cut. The strength loss at the point of the cut may be estimated in the same manner as that used for abrasion.

While small surface nicks have very little effect, deeper cuts can substantially reduce rope strength. Cuts extending at right angles to the rope's axis can cause the rope to become "unbalanced" since the damaged strands can no longer carry their share of the load. Cuts that extend along the length of the rope for even a few inches have probably damaged a significant portion of the strands making up the rope. Consequently, severe cuts are sufficient cause to remove the rope from service. As with specific patterns of abrasion, cuts also indicate that there is a problem somewhere within the rope system and the cause should be immediately identified and corrected.

If cuts are noticed when performing either visual or periodic inspections the line should be retired and removed from service or alternatively repaired by trained and qualified personnel.

- 4. Pulls:** A pull occurs when a sharp object or edge snags a yarn or strand and pulls it away from the rope's surface, forming a loop. The loop can create a dangerous situation if it should catch on a projection while the rope is under load. Pulls generally occur only when the rope is under little or no load, as even a moderate load will cause the rope to become very hard and compact.

In most cases the pulled yarn or strand can be easily worked back into the body of the rope. If a pulled yarn cannot be worked back in, then the line should be retired and removed from service or alternatively repaired by trained and qualified personnel.

- 5. Burns:** Virtually all synthetic fibers can be melted due to frictional heating. Burns can be identified by a glassy fused area on the rope's surface. Although burned fiber has lost all of its strength, the extent of the damage can vary. A light glazing of the rope surface indicates marginal fusing and only a slight strength loss. Darker, brittle areas have probably been more severely damaged. If any form of fiber glazing due to frictional heat are noticed, the line should be immediately retired. A more thorough inspection should be performed on the interfacing hardware to determine and mediate the cause of the friction.

## Rope Inspection Points cont.

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- 6. Contaminants:** The rope should be checked for the presence of abrasive contaminants and/or chemicals that can work into the interior of the rope structure. Abrasive particles, such as rust or grit, can damage the internal fibers over time. While synthetic fibers are relatively impervious to most common chemical compounds and petroleum products, exposure to these, and other chemicals, should be avoided as a routine precaution. If extensive fiber discoloration occurs and chemical exposure is suspected, the rope should be removed from service.
- 7. Discoloration:** When fibers, or coatings applied to the ropes are exposed to UV light, these tend to discolor. Synthetics have moderate to excellent UV light resistance. However, long periods of exposure will decrease the overall strength. Chemicals will also damage the color, which is the first indicator of damage in the rope. Internal inspection is required at this stage to assess the damage.
- 8. Uneven diameter or lumps:** Any diameter disruption must be taken into consideration for retirement. Distortion, significant diameter change, inconsistency in overall measurements will decrease the performance of the rope. When dealing with small diameter cordage diameter changes will be noticeable by tactile and visual inspections.
- 9. Shock Loads:** There are no readily visible signs that indicate a rope has been overloaded or shock loaded. Usually, a rope that has been worked heavily will tend to become hard as the fibers compact within the rope structure. If the rope feels unusually stiff in a particular area compared to the rest of the length shock loading may be the cause. In such cases the rope should be removed from service as a routine precaution.
- 10. Quality of Splices:** All splices should be performed in accordance with the manufacturers guidelines and procedures set forth.

Inspection and retirement criteria set forth follow regulations of the Cordage Institute: CI-2001 Fiber Inspection and Retirement Criteria. For more information please visit [www.ropecord.com](http://www.ropecord.com).



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