

Retire the Rope when it's Time **Rope Inspection & Retirement**

One frequently asked question is, "When should I retire my rope?" The most obvious answer is, "Before it breaks." But, without a thorough understanding of how to inspect it and knowing the load history, you are left making an educated guess. Unfortunately, there are no definitive rules nor are there industry guidelines to establish when a rope should be retired because there are so many variables that affect rope strength. Factors like load history, bending radius, abrasion, chemical exposure or some combination of those factors, make retirement decisions difficult. Inspecting your rope should be a continuous process of observation before, during, and after each use. In synthetic fiber ropes, the amount of strength loss due to abrasion and/or flexing is directly related to the amount of broken fiber in the rope's cross section. After each use, look and feel along every inch of the rope length inspecting for abrasion, glossy or glazed areas, inconsistent diameter, discoloration, and inconsistencies in texture and stiffness.

VISUAL INSPECTION

The load-bearing capacity of double braid ropes, such as Stable Braid, is divided equally between the inner core and the outer cover. If upon inspection, there are cut strands or significant abrasion damage the rope must be retired because the strength of the entire rope is decreased.

Core-dependent double braids such as Ultra-Tech have 100% of their load-bearing capacity handled by the core alone. For these ropes, the jacket can sustain damage without compromising the strength of the load-bearing core. Inspection of core-dependent double braids can be misleading because it is difficult to see the core. In the case of 12-strand single braids such as AmSteel® and AmSteel®-Blue, each of the 12-strands carries approximately 8.33%, or 1/12th, of the load. If upon inspection, there are cut strands or significant abrasion damage to the rope, the rope must be retired or the areas of damage removed and the rope repaired with the appropriate splice.

ABRASION

When a 12-strand single braid rope, such as AmSteel®-Blue, is first put into service, the outer filaments of the rope will quickly fuzz up. This is the result of these filaments breaking, which actually forms a protective cushion and shield for the fibers underneath. This condition should stabilize, not progress. If the surface roughness increases, excessive abrasion is taking place and strength is being lost. When inspecting the rope, look closely at both the inner and outer fibers. When either is worn, the rope is obviously weakened.

Open the strands and look for powdered fiber, which is one sign of internal wear. Estimate the internal wear to estimate total fiber abrasion. If total fiber loss is 20%, then it is safe to assume that the rope has lost 20% of its strength as a result of abrasion.

As a general rule for braided ropes, when there is 25% or more wear from abrasion, or the fiber is broken or worn away, the rope should be retired from service. For double braid ropes, 50% wear on the cover is the retirement point, and with 3-strand ropes, 10% or more wear is accepted as the retirement point.

GLOSSY OR GLAZED AREAS

Glossy or glazed areas are signs of heat damage with more strength loss than the amount of melted fiber indicates. Fibers adjacent to the melted areas are probably damaged from excessive heat even though they appear normal. It is reasonable to assume that the melted fiber has damaged an equal amount of adjacent unmelted fiber.

DISCOLORATION

With use, all ropes get dirty. Be on the lookout for areas of discoloration that could be caused by chemical contamination. Determine the cause of the discoloration and replace the rope if it is brittle or stiff.

INCONSISTENT DIAMETER

Inspect for flat areas, bumps, or lumps. This can indicate core or internal damage from overloading or shock loads and is usually sufficient reason to replace the rope.

INCONSISTENT TEXTURE

Inconsistent texture or stiff areas can indicate excessive dirt or grit embedded in the rope or shock load damage and is usually reason to replace the rope.

RESIDUAL STRENGTH

Samson offers customers residual strength testing of our ropes. Periodic testing of samples taken from ropes currently in service ensures that retirement criteria are updated to reflect the actual conditions of service.



New rope.



Used rope.



Severely abraded rope.



Inspect for pulled strands.



Inspect for internal abrasion.



Compare surface yarns with internal yarns.



Compressed areas.

SINGLE BRAID Rope Inspection & Retirement Checklist

Single Braids

Inspection and Retirement Checklist*

Any rope that has been in use for any period of time will show normal wear and tear. Some characteristics of a used rope will not reduce strength while others will. Below we have defined normal conditions that should be inspected on a regular basis.

If upon inspection you find any of these conditions, you must consider the following before deciding to repair or retire it:

- > the length of the rope,
- > the time it has been in service,
- > the type of work it does,
- > where the damage is, and
- > the extent of the damage.

In general, it is recommended to:

- > Repair the rope if the observed damage is in localized areas.
- > Retire the rope if the damage is over extended areas.

*REFERENCES Cordage Institute International, *International Guideline CI2001-04, Fiber-Rope Inspection and Retirement Criteria: Guidelines to Enhance Durability and the Safer Use of Rope*, 2004.

COMPRESSION *Not a permanent characteristic*



- WHAT**
- > Visible sheen
 - > Stiffness reduced by flexing the rope
 - > Not to be confused with melting
 - > Often seen on winch drums
- CAUSE**
- > Fiber molding itself to the contact surface under a radial load
- CORRECTIVE ACTION**
- Flex the rope to remove compression.

PULLED STRAND *Not a permanent characteristic*



- WHAT**
- > Strand pulled away from the rest of the rope
 - > Is not cut or otherwise damaged
- CAUSE**
- > Snagging on equipment or surfaces
- CORRECTIVE ACTION**
- Work back into the rope.

ABRASION *Repair or retire*



- WHAT**
- > 25% reduction
- CAUSE**
- > Abrasion
 - > Sharp edges and surfaces
 - > Cyclic tension wear
- CORRECTIVE ACTION**
- If possible, remove affected section and resplice with a standard end-for-end splice. If resplicing is not possible, retire the rope.

MELTED OR GLAZED FIBER *Repair or retire*



- WHAT**
- > Fused fibers
 - > Visibly charred and melted fibers, yarns, and/or strands
 - > Extreme stiffness
 - > Unchanged by flexing
- CAUSE**
- > Exposure to excessive heat, shock load, or a sustained high load
- CORRECTIVE ACTION**
- If possible, remove affected section and resplice with a standard end-for-end splice.

DISCOLORATION/DEGRADATION *Repair or retire*



- WHAT**
- > Fused fibers
 - > Brittle fibers
 - > Stiffness
- CAUSE**
- > Chemical contamination
- CORRECTIVE ACTION**
- If possible, remove affected section and resplice with a standard end-for-end splice. If resplicing is not possible, retire the rope.

INCONSISTENT DIAMETER *Repair or retire*



- WHAT**
- > Flat areas
 - > Lumps and bumps
- CAUSE**
- > Shock loading
 - > Broken internal strands
- CORRECTIVE ACTION**
- If possible, remove affected section and resplice with a standard end-for-end splice. If resplicing is not possible, retire the rope.

ABRASION INSPECTION PROCEDURES



To determine the extent of outer fiber damage from abrasion, a single yarn in all abraded areas should be examined. The diameter of the abraded yarn should then be compared to a portion of the same yarn or an adjacent yarn of the same type that has been protected by the strand crossover area and is free from abrasion damage. (LEFT)

Internal abrasion can be determined by pulling one strand away from the others and looking for powdered or broken fiber filaments. (ABOVE)