

ROPE INSPECTION AND RETIREMENT

TECHNICAL INFORMATION

<p>Sheave diameters on rotating sheave blocks</p> <p>Twisted Rope = 10 times the rope diameter</p> <p>Braided Rope = 8 times the rope diameter</p>	<p>KNOTS AND HITCHES</p> <p>While it is true that a knot reduces rope strength, it is also true that a knot is a convenient way to attach a rope to tree limbs and other ropes. The strength loss is a result of the tight bends that occur in the knot. With some knots, ropes can lose up to 50% of their strength, which is part of the reason the work load limit should not exceed 20% of the rope strength.</p>	<p>ROPE STORAGE</p> <p>Keep your ropes as clean and dry as possible and store them away from heat sources. Many climbers keep their ropes in special rope bags, which keep them clean and makes them easy to identify at the job site.</p>
<p>Fixed PIN Termination Diameter</p> <p>The diameter on fixed pin termination should be at least 3 times the diameter – i.e., the bending radius for 1/2" rope should be 1-1/2"</p>		

3 RETIREMENT: RETIRE ROPE FROM USE WHEN IT HAS REACHED ITS DISCARD POINT

One of the most frequently asked questions 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 without knowing the load history, you are left making an educated guess. Unfortunately, there are no definitive rules nor 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 damage as listed below.

ABRASION

When the rope is first put into service, the outer filaments of the rope will quickly fuzz up. This is the result of these filaments breaking and this roughened surface 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. As a general rule for braided ropes, when there is 25% or more wear from abrasion the rope should be retired from service. In other words, if 25% or more of the fiber is broken or worn away the rope should be removed from service. With three-strand ropes, 10% or more wear is accepted as the retirement point.

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.

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.

INCONSISTANT 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.

INCONSISTANT TEXTURE/STIFFNESS

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.

TEMPERATURE

When using rope, friction can be your best friend or worst enemy if it is not managed properly. By definition, friction creates heat, the greater the friction, the greater the heat buildup. Heat is an enemy to synthetic fiber and elevated temperatures can drastically reduce the strength and/or cause rope melt-through.

High temperatures can be achieved when surging rope on a capstan, checking ropes on a cable, or running over stuck or non-rolling sheaves or rollers. Each rope's construction and fiber type will yield a different coefficient of friction (reluctance to slip) in a new and used state. It is important to understand the operational demands and ensure the size, rope construction and fiber type be taken into account to minimize heat buildup.

Never let ropes under tension rub together or move relative to one another. Enough heat to melt the fibers can buildup and cause the rope to fail as quickly as if it had been cut with a knife.

Always be aware of areas of heat buildup and take steps to minimize it; under no circumstances let any rope come in contact with an exhaust muffler or any other hot object. The strength of a used rope can be determined by testing, but the rope is destroyed in the process so the ability to determine the retirement point before it fails in service is essential. That ability is based on a combination of education in rope use and construction along with good judgment and experience. Remember, you almost always get what you pay for in the form of performance and reliability.

The critical and melting temperatures for synthetic fibers are listed below:

TEMPERATURES	Critical	Melting
Dyneema®	150° F	297° F
Manila	180° F	350° F*
Polypropylene	250° F	330° F
Nylon	350° F	460° F
Polyester	350° F	480° F
Technora	450° F	900° F*

**While the term "melting" does not apply to these fibers, they do undergo extreme degradation at these temperatures: Technora and Manila char.*

ROPE INSPECTION CHECK LIST

Condition Discard Point

1. Original rope bulk reduced by abrasion:

- Double braid* cover by 50%
- Twelve-strand braid by 25%
- Eight-strand plait by 25%
- Three-strand by 10%

2. Fiber strands cut:

- Double braid* by three or more adjacent strands cut
- Twelve-strand braid by two or more adjacent strands cut
- Eight-strand plait by one or more adjacent strands cut
- Three-strand by one or more adjacent strands cut

*Refers to double braids that have both core and cover strength members.

3. Diameter inconsistency:

- Localized diameter reduction
- Flat areas
- Lumps and bumps in rope

4. Glossy or glazed fiber:

- Localized or extended areas

5. Inconsistency of texture:

- Localized or extended areas of stiffness

6. Discoloration:

- Localized or extended areas caused by chemical contamination

ORIGINAL BULK NEW ROPE



VOLUME REDUCTION

Rope displaying 25% strand volume reduction from abrasion – rope should be retired from service.

Note: Amount of volume reduction that indicates retirement depends on rope construction. Refer to “check list” at left.



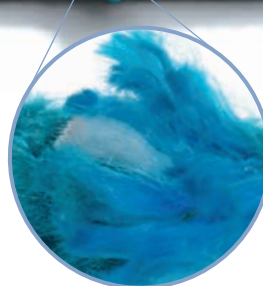
PULLED STRAND

Rope displays a snagged strand. If the strand can be worked back into the rope, no need to retire. If not, this indicates a retirement point.



CUT STRANDS

Rope displays two adjacent cut strands. This rope should either be retired or the cut section should be removed. If possible, re-splice.



MELTING OR GLAZING

Damage depicted below caused by excessive heat, which melted and fused the fibers. This area will be extremely stiff. Unlike fiber compression, melting damage cannot be mitigated by flexing the rope. Melted areas must be cut out and rope respliced or the rope must be retired.

