Samson App

For the iPhone and iPad this handy app features:

- Inspection and retirement criteria
- Internal and external abrasion inspection information
- Splice Instructions

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THE STRONGEST NAME IN ROPE

LINE SELECTION GUIDE: USAGE AND RETIREMENT

samson®

THE STRONGEST NAME IN ROPE

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RECREATIONAL MARINE

Rope Handling & Usage

Use the Rope Properly

STRENGTH

When given a choice between ropes, select the strongest of any given size. A load of 200 pounds represents 2% of the strength of a rope with a breaking strength of 10,000 pounds. The same load represents 4% of the strength of a rope that has a breaking strength of 5,000 pounds. The weaker rope will have to work harder and as a result will have to be retired sooner.

Note carefully the quoted breaking strengths of the various Samson products. These are average breaking strengths. Published breaking strengths are determined by standard cordage testing and do not cover conditions such as sustained loads or shock loading. These strengths are attained under laboratory conditions. Remember also, that this is a breaking strength—not a recommended working load.

SHOCK LOADING

Working loads as described herein are not applicable when rope has been subjected to shock loading. Whenever a load is picked up, stopped, moved, or swung there is an increased force caused by the dynamic nature of the movement. The force increases as these actions occur more rapidly or suddenly, which is known as “shock loading.” Synthetic fibers have a memory and retain the effects of being overloaded or shock loaded. A rope that has undergone shock loading can fail at a later time even though it is loaded within the working load range.

Examples of applications where shock loading occurs include ropes used as a tow line, picking up a load on a slack line, or using rope to stop a falling object. In extreme cases, the force put on the rope may be two, three, or more times the normal load involved. Shock loading effects are greater on a low elongation rope such as polyester than on a high elongation rope such as nylon, and greater on a short rope than on a long one.

For example, the shock load on a winch line that occurs when a 5,000 pound object is lifted vertically with a sudden jerk may “weigh” 30,000 pounds under the dynamic force. If the winch line is rated in the 30,000 pound break strength range, it is very likely to break.

Where shock loads, sustained loads, or where life, limb, or valuable property is involved, it is recommended that an increased working load factor be used.

For dynamic loading applications that involve severe exposure conditions, or for recommendations on special applications, consult the manufacturer.

CONSTRUCTION AND ABRASION

It is important to choose the right rope construction for your application because it affects resistance to normal wear and abrasion. Braided ropes have a round, smooth construction that tends to flatten out somewhat on a bearing surface. This distributes the wear over a much greater area, as opposed to the crowns of a 3-strand or, to a lesser degree, an 8-strand rope.

WORKING LOADS

Working load factors vary in accordance with the different safety practices and policies of each user. However, when used under normal conditions, our general recommendation that is fairly well accepted in the industry, is a minimum 5:1 working load factor. Thus, your maximum workload should be approximately 1/5th, or 20%, of the quoted breaking strength. This factor provides greater safety and extends the service life of the ropes.

ROPE CLASS

All Samson ropes are categorized for splicing and testing purposes as a Class I or Class II ropes.

Class I ropes are produced with non high-modulus fibers that impart the strength and stretch characteristics to the rope, which have tenacities of 15 grams per denier (gpd) or less and a total stretch at break of 6% or greater. Class I ropes are produced with traditional fibers such as olefins (polypropylene or polyethylene), nylon, or polyester.

Class II ropes are produced with high-modulus fibers that impart the strength and stretch characteristics to the rope which have tenacities greater than 15 gpd and a total stretch at break of less than 6%. Typical Class II ropes are produced with HMPE (Dyneema®), HMPP (Innegra™-S), aramid (Technora®), LCP (Vectran®), or PBO (Zylon®).

Both Class I and Class II ropes can be produced in various rope constructions such as 3-strand, 8-strand, 8x3-strand, 12-strand, double braids, or core-dependent braids.

MINIMIZE TWIST IN THE LINE

A braided or plaited rope, being torque-free, can have twist induced by constant working on winches and capstans. If a twist develops, it can easily be removed by “counter-rotating” the rope when it is relaxed.

In braided ropes, as little twist as four turns per three feet (or per meter) introduced into the line can cause as much as 10 to 30% reduction of strength. Another way to help prevent twist is to preset the line. Once these ropes have been loaded, they do not return to their original dimensions. A rope that has been preset is less likely to accept permanent twist. Presetting should be performed only on new and unused rope, and with extreme caution. For lines in use that have not been preset, alternate wrap directions on the bitt to minimize twist each time the line is used

AVOID OVERHEATING

Heat can seriously affect the strength of synthetic ropes. When using rope where the temperature exceeds 250° (or if it is too hot to hold), consult the manufacturer for recommendations as to the size and type of rope for the proposed continuous heat-exposure conditions. When using ropes on a capstan or winch, care should be exercised to avoid surging while the capstan or winch head is rotating. The friction from the slippage causes localized overheating, which can melt or fuse synthetic fibers, resulting in severe loss of tensile strength.

KNOTS AND SPLICES

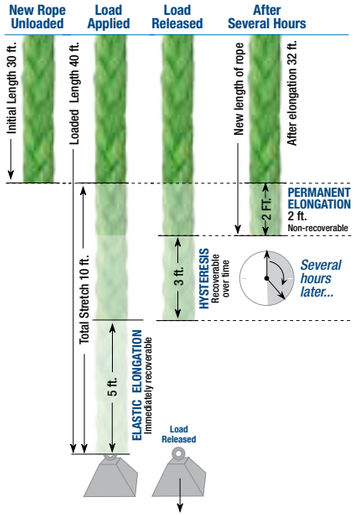
While it is true that a knot reduces rope strength, it is also true that a knot is a convenient way to accomplish rope attachment. The strength loss is a result of the tight bends that occur in the knot. With some knots, ropes can lose approximately 50% of their strength. However, this number can be higher or lower based on rope construction and fibers used. It is vital that the reduction in strength by the use of knots be taken into account when determining the size and strength of a rope to be used in an application. To avoid knot strength reduction, it is recommended that a rope be spliced according to the manufacturer’s instructions. Splice terminations are used in all our ropes to determine new and unused tensile strengths. Therefore, whenever possible, spliced terminations should be used to maximize the rope strength for new and used ropes.

Elongation (Stretch)

ELASTIC ELONGATION (EE)
Elastic elongation refers to the portion of stretch or extension of a rope that is immediately recoverable after the load on the rope is released. The rope's tendency to recover is a result of the fiber(s) rather than the rope construction. Each type of synthetic fiber inherently displays a unique degree of elasticity. Relatively speaking, high-performance fiber has extremely low elasticity as compared to nylon fiber.

ELASTIC HYSTERESIS
Elastic hysteresis refers to a recoverable portion of stretch or extension over a period of time after a load is released. In measuring elastic recovery, it is the portion that occurs immediately when a load is removed. However, a remaining small percentage of elastic recovery occurs gradually over a period of hours or days. Elastic hysteresis is measured in a length/time scale.

COMPONENTS OF STRETCH ON A LOADED ROPE



Published Elastic Elongation Data: All reported percentages are averages based on tests of new rope stabilized by being cycled 50 times at each stated percentage of its average break strength.

PERMANENT EXTENSION (PE) AFTER RELAXATION
Permanent extension after relaxation refers to the portion of extension that prevents the rope from returning to its original length due to construction deformation, such as compacting of braid and helical changes, and some plastic deformation of the yarn fibers.

PE WHILE WORKING
Permanent extension while working is the amount of extension that exists when stress is removed but no time is given for hysteretic recovery. It includes the nonrecoverable and hysteretic extension as one value and represents any increase in the length of a rope in a constant working situation, such as during repeated surges in towing or other similar cyclical operations. The percentage of PE over the working load range is generally in order of 4–6% for braided ropes and two to three times as much for plaited. However, it varies slightly with different fibers and rope constructions. In some applications, such as subsurface mooring or devices that demand precise depth location and measurement, allowances must be made for this factor.

CREEP
A material's slow deformation that occurs while under load over a long period of time. Creep is mostly nonreversible. For some synthetic ropes, permanent elongation and creep are mistaken for the same property and used interchangeably when in fact creep is only one of the mechanisms that can cause permanent elongation.

CONSTRUCTIONAL ELONGATION
The elongation of a loaded rope that results from compaction as the fibers and strands align and adjust.

SPLICE SETTING
The elongation of a spliced rope caused by the adjustment and settling of the strands in the splice.

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.*

Abrasion Inspection Procedures

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

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. (RIGHT)

Single Braids

CORRECTIVE ACTION FOR CONDITIONS BELOW:
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 *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

DISCOLORATION/DEGRADATION *Repair or retire*

WHAT
- > Fused fibers
- > Brittle fibers
- > Stiffness

CAUSE
- > Chemical contamination

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

INCONSISTENT DIAMETER *Repair or retire*

WHAT
- > Flat areas
- > Lumps and bumps

CAUSE
- > Shock loading
- > Broken internal strands

Double Braid vs. Core-Dependent

Double braid ropes consist of a cover or jacket braided over a separately braided core. Samson produces two types of double braided ropes: standard double braids and core-dependent double braids.

The strength of standard double braid ropes is shared between the cover and the core. Damage to the cover also usually affects the core and ultimately the strength of the rope.

In core-dependent double braids, the core is the strength member and carries the entire load. Damage to the cover of a core-dependent double braid may not compromise strength of the rope.

Inspection of both standard double braids and core-dependent double braids is essential to determining whether the rope can be repaired or if it needs to be retired.

CORRECTIVE ACTION FOR CONDITIONS BELOW:
If possible, remove affected section and re-splice with a standard end-for-end splice. If re-splicing is not possible, retire the rope.

Double Braids

CUT STRANDS
DOUBLE BRAID: *Repair or retire*
CORE-DEPENDENT: *May not affect strength*

WHAT
- > Three or more adjacent cut strands

CAUSE
- > Abrasion
- > Sharp edges and surfaces
- > Cyclic tension wear

REDUCED VOLUME
DOUBLE BRAID: *Repair or retire*
CORE-DEPENDENT: *May not affect strength*

WHAT
- > 50% volume reduction

CAUSE
- > Abrasion
- > Sharp edges and surfaces
- > Cyclic tension wear

DISCOLORATION/DEGRADATION *Repair or retire*

WHAT
- > Fused fibers
- > Brittle fibers
- > Stiffness

CAUSE
- > Chemical contamination

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

INCONSISTENT DIAMETER *Repair or retire*

WHAT
- > Flat areas
- > Lumps and bumps

CAUSE
- > Shock loading
- > Broken internal strands