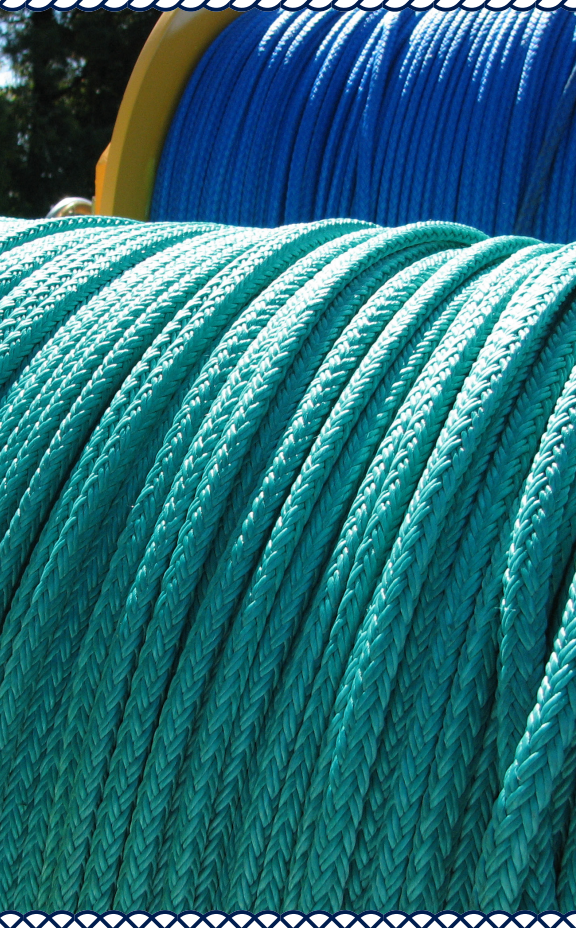
ROPE
INSPECTION GUIDE



YALE CORDAGE

ABOUT YALE CORDAGE

Yale Cordage began in 1950 with a belief in how synthetic material and high-quality braiding techniques could transform the cordage industry. Our continued commitment is to remain grounded in this objective - to provide innovative end-user solutions through superior approaches to the design, manufacture, and fabrication of synthetic rope and rope systems.

Rooted in applications engineering, our end-to-end approach allows us to deliver the best products and services to our customers. We are consistent early adopters of new fiber technologies that keep our products top-of-the-line. From our durable materials to our industry-recognized coating and wear resistance, Yale's expert engineering produces a superior product - from core to finish.

We provide exceptional customer service and products that work as hard as we do - up in space, down to the deep seafloor, and everywhere in between. A rope industry leader in expertise and innovation - Yale is passion for the pursuit of better performance.

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Rope Construction

ROPE CONSTRUCTION

IDENTIFY YOUR ROPE'S CONSTRUCTION

Single Braid

Yale's single braids expose their strength to abrasive attack from the day they are put into service. For that reason, regardless of fiber, they need to be inspected regularly, then downgraded, repaired or replaced to maintain their design factor.

Balanced Double Braid

Yale's balanced double braids depend equally on the integrity of the rope's core and sleeve elements. If either is compromised, the design factor is negated and the remaining overworked fibers will degrade more rapidly.

High Modulus Double Braid

Yale's high modulus double braids depend solely on the rope's core elements for their strength. The covers supply abrasion protection for the high-tech core fibers. Therefore, proper inspection must consider the condition inside the rope.

Parallel Core

Yale's parallel core ropes depend on their core's integrity to maintain breaking strength. Most damage to the outside of the line is not serious but should still be addressed to prevent further damage.

8-Strand Plaited

Yale's 8-strand ropes are similar to single braids, as all of their fibers are periodically exposed on the surface of the rope. As surface fibers are abraded, the rope loses weight and becomes weaker.

ROPE CONSTRUCTION

YALE CORDAGE PRODUCTS BY ROPE CONSTRUCTION

SINGLE BRAID	Aracom 100 Lugger Line Maxibraid PE-12 PolyPlus Shark Byte 12 Ultrex Vectrus Yalex
BALANCED DOUBLE BRAID	Double Esterlon Kernmaster Polydyne Portland Braid Tech-Kern Yalon
HIGH MODULUS DOUBLE BRAID	Aracom Miniline Aracom T Crystalyne Maxibraid Plus Ultrex Plus
PARALLEL CORE	Uniline Unitrex XS
8-STRAND PLAITED	Hy-Dee Brait Nylon Brait Oceanographer's Brait Unitrex XS-8 Shark Byte 8

Single Braid Inspection

SINGLE BRAID

PROTRUDING STRAND

Often, a strand will get snagged or pulled out from the rest of the rope. As long as the strand isn't broken, this is a repairable issue.

THE CAUSE

Protruding strands are generally caused by pulling or snagging on equipment or surfaces.

THE REPAIR

Work the strand back into the rope as soon as you notice it by carefully tugging on adjacent strands until the excess is distributed evenly. A protruding strand in service could easily snag or break, causing further complications.

SINGLE BRAID

ABRASION

Not all abrasion is harmful. When small surface fibers break on a rope, they create a fuzzy texture known as “mild abrasion.” This is normal and can even protect the rope from further wear. Extreme abrasion, though, should be monitored and addressed.

THE CAUSE

Excessive abrasion can be caused by repeated contact with sharp edges or rough surfaces. While you should expect mild abrasion as you break in your rope, abrasion that doesn’t stabilize after the first few uses might mean you’re losing strength. Inspect for excessive damage by looking closely at the inner and outer fibers. Powdered fiber is a sign of internal wear.

THE REPAIR

There isn’t a repair for abrasion, but you should still inspect for it. If the strength loss is minimal, go ahead and continue use. If the strength loss is moderate, consult Yale or retire the rope. If it’s excessive, always retire.

FUTURE PREVENTION

Always use slings when lifting, and avoid abrasive situations whenever possible, including rough surfaces and sharp edges. Keep your chocks, bits, winches, drums and other surfaces in good condition and free of burrs and rust. Make sure sheaves are the right size and are free to rotate. Don’t drag the rope over rough ground. Be sure to use clamps and similar devices with extreme caution.

SINGLE BRAID

MELTING OR GLAZING

When fibers are melted or fused, it's generally the result of rope abuse, and this type of damage can compromise strength. Look for visibly charred fibers or strands and stiffness that is unchanged by flexing.

THE CAUSE

Melting or glazing is generally caused by excessive load weights, exposure to heat or rapid descents/shock loading.

THE REPAIR

If possible, remove the affected section and re-splice with an end-for-end splice. Otherwise – or if you suspect the rope has experienced shock loading – retire the rope.

FUTURE PREVENTION

Avoid shock loads. Always work within the energy absorption range of your rope, and be sure you're using the right rope for the job. Shock loading sometimes happens by accident – for example, if a loaded rope jumps over a wrap of the winding spool. Using the winch line (instead of pole jacks) to pull pole butts can also result in shock loading.

SINGLE BRAID

CUT STRAND

When visually inspecting your rope, always look closely for any cut strands. Any cut strands will cause some loss of strength, and two or more close together may mean the rope needs to be retired. This particular rope should be discarded due to its heavy abrasion.

THE CAUSE

Cut strands could be caused by abrasion, sharp edges and surfaces, or cyclic tension wear.

THE REPAIR

If possible, remove the affected section and re-splice with an end-for-end splice. If re-splicing is not possible, retire the rope. As a general rule, 12-strand ropes should be retired when more than three broken strands are visible.

FUTURE PREVENTION

Always use slings when lifting, and avoid abrasive situations whenever possible, including rough surfaces and sharp edges. Keep your chocks, bits, winches, drums and other surfaces in good condition and free of burrs and rust. Make sure sheaves are the right size and are free to rotate. Don't drag the rope over rough ground. Be sure to use clamps and similar devices with extreme caution.

SINGLE BRAID

DIAMETER CHANGE

After use, it is normal for a rope to lose some of its diameter due to fiber abrasion. The appropriate repair is dependent on the level of reduction.

THE CAUSE

A diameter change is usually due to the loss of fiber through abrasion over time.

THE REPAIR

If the diameter is reduced by less than 10 percent, it is still able to remain in service. If the diameter reduction is 11—20 percent, downgrade the rope. Should the diameter reduction from new to used exceed 20 percent, retire the rope.

FUTURE PREVENTION

It is prudent to replace rope on a calendar schedule based on your original selection criteria.

NEW

USED

SINGLE BRAID

INCORRECT END-TO-END SPLICE

An incorrect end-to-end splice creates a disruption in the rope, to the extent that the rope's strength would be markedly reduced.

THE CAUSE

In this case, the user spliced the rope in the field without the benefit of proper splicing instructions, causing an incorrect end-to-end splice and significant disruption in the rope.

THE REPAIR

Re-splice the rope correctly.

Balanced Double Braid Inspection

BALANCED DOUBLE BRAID

PROTRUDING STRAND

Often, a strand will get snagged or pulled out from the rest of the rope. As long as the strand isn't broken, this is a repairable issue.

THE CAUSE

Protruding strands are generally caused by pulling or snagging on equipment or surfaces.

THE REPAIR

One to four strands spaced out by several feet can be removed and rewoven into the line with minimal impact on strength (less than 12 percent).

BALANCED DOUBLE BRAID

DEEPLY ABRADED SPOT

Not all abrasion is harmful. However, deeply abraded spots, with more than 50 percent of the strand affected, should be addressed.

THE CAUSE

Excessive abrasion can be caused by repeated contact with sharp edges or rough surfaces. Inspect for excessive damage by looking closely at the inner and outer fibers.

THE REPAIR

If you encounter a deeply abraded spot, where more than 50 percent of the strand is affected, you can re-splice the rope to repair it.

FUTURE PREVENTION

Always use slings when lifting, and avoid abrasive situations whenever possible, including rough surfaces and sharp edges. Keep your chocks, bits, winches, drums and other surfaces in good condition and free of burrs and rust. Make sure sheaves are the right size and are free to rotate. Don't drag the rope over rough ground. Be sure to use clamps and similar devices with extreme caution.

BALANCED DOUBLE BRAID

DISCONTINUITY IN ROPE DIAMETER

Discontinuity in rope diameter can indicate damage to the core of the rope.

THE CAUSE

Discontinuity in rope diameter is often caused by overloading or shock loads, resulting in broken internal strands.

THE REPAIR

Open the rope sleeve to remove and inspect the core. If the core is parted, you will need to retire the rope.

BALANCED DOUBLE BRAID

WORN-OUT EYE

Worn-out eyes can be expected after continued use and fatigue of fibers.

THE CAUSE

The working end may experience fiber fatigue, creating a worn-out eye.

THE REPAIR

To repair a worn-out eye, you'll want to shorten, re-splice and reverse the rope. Proceed by putting the unused end into service.

High Modulus Double Braid Inspection

HIGH MODULUS DOUBLE BRAID

FLAT SPOT INSIDE ROPE

A flat spot can indicate damage to the core of the rope.

THE CAUSE

Flat spots are often caused by overloading or shock loads, resulting in broken internal strands.

THE REPAIR

Open the rope sleeve to remove and inspect the core. If the core is parted, you will need to retire the rope.

HIGH MODULUS DOUBLE BRAID

BUMPS ON COVER

If you work with a winch, you'll often observe compression of your ropes. Characteristics include a visible sheen and stiffness that is reduced when you flex the rope.

THE CAUSE

Bumps can be caused by compression forces and usually have no impact on the rope's performance. A rope's fiber will sometimes mold itself to the contact surface under a radial load.

THE REPAIR

This rope can be returned to service. Simply flex the rope to remove the compression.

HIGH MODULUS DOUBLE BRAID

CUT STRAND

When visually inspecting your rope, always look closely for any cut strands. When working with a high modulus double braid, you only need to worry about cuts that might compromise the core.

THE CAUSE

Cut strands could be caused by abrasion, sharp edges and surfaces, or cyclic tension wear.

THE REPAIR

As long as the core remains covered, you can repair cut strands by whipping into place, without impact on the strength.

FUTURE PREVENTION

Always use slings when lifting, and avoid abrasive situations whenever possible, including rough surfaces and sharp edges. Keep your chocks, bits, winches, drums and other surfaces in good condition and free of burrs and rust. Make sure sheaves are the right size and are free to rotate. Don't drag the rope over rough ground. Be sure to use clamps and similar devices with extreme caution.

Parallel Core Inspection

PARALLEL CORE

PROTRUDING STRAND

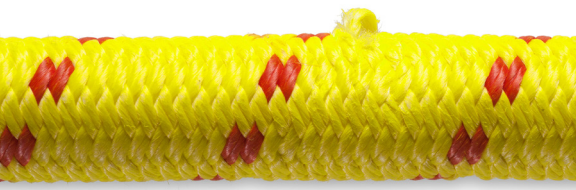
Often, a strand will get snagged or pulled out from the rest of the rope.

THE CAUSE

Protruding strands are generally caused by pulling or snagging on equipment or surfaces.

THE REPAIR

To repair a protruding strand on a parallel core rope, you'll need to cut off excess strand, execute a careful heat seal and whip with twine.



PARALLEL CORE

ABRASION

Not all abrasion is harmful. It's important to evaluate the level of abrasion to ensure proper repair.

THE CAUSE

Excessive abrasion can be caused by repeated contact with sharp edges or rough surfaces. While you should expect mild abrasion as you break in your rope, abrasion that doesn't stabilize after the first few uses might mean you're losing strength.

THE REPAIR

To repair an abraded spot, evaluate the depth of the abrasion. If the rubber jacket is not compromised, whip and return to service. If you notice deep abrasions through the rubber but not into the core, you can repair the rubber layer and then whip the area. Abrasions and cuts through the rubber layer and damaging the core should be cut out and repaired with a TechJoin.

FUTURE PREVENTION

Always use slings when lifting, and avoid abrasive situations whenever possible, including rough surfaces and sharp edges. Keep your chocks, bits, winches, drums and other surfaces in good condition and free of burrs and rust. Make sure sheaves are the right size and are free to rotate. Don't drag the rope over rough ground. Be sure to use clamps and similar devices with extreme caution.

See pictures on page 25.

PARALLEL CORE

Abraded spot

Deep abrasions through the rubber but not into the core

Deep abrasions through the rubber and damaging the core

PARALLEL CORE

ELECTRICAL DAMAGE

Should a rope come into contact with an energized line in such a way that a current enters the line, your rope will display surface damage indicative of electrical damage.

THE CAUSE

Electrical damage is caused by currents entering and exiting the line. The exit damage may appear hundreds or even thousands of feet from the entry damage. You may have to section the rope to see internal melting, an indication that the rope was acting as a conductor.

THE REPAIR

To repair a rope with electrical damage, you will have to cut out all affected areas and re-splice or use a TechJoin. If you cannot find any exit damage, break test or proof load areas adjacent to the entry to make sure the line has not been compromised.

FUTURE PREVENTION

Always have adequate protection for the underbuilds and avoid direct contact with an energized line.

8-Strand Plaited Inspection

8-STRAND PLAITED

ABRADED SPOT

Not all abrasion is harmful. When small surface fibers break on a rope, they create a fuzzy texture known as “mild abrasion.” This is normal and can even protect the rope from further wear. Extremely abraded spots should be addressed.

THE CAUSE

Excessive abrasion can be caused by repeated contact with sharp edges or rough surfaces. While you should expect mild abrasion as you break in your rope, abrasion that doesn’t stabilize after the first few uses might mean you’re losing strength. Inspect for excessive damage by looking closely at the inner and outer fibers.

THE REPAIR

If you encounter an abraded spot with excessive damage, you can cut out and re-splice the section.

FUTURE PREVENTION

Always use slings when lifting, and avoid abrasive situations whenever possible, including rough surfaces and sharp edges. Keep your chocks, bits, winches, drums and other surfaces in good condition and free of burrs and rust. Make sure sheaves are the right size and are free to rotate. Don’t drag the rope over rough ground. Be sure to use clamps and similar devices with extreme caution.

8-STRAND PLAITED

CUT STRAND

When visually inspecting your rope, always look closely for any cut strands. Any cut strands will cause some loss of strength, and two or more that are close together may mean the rope needs to be retired.

THE CAUSE

Cut strands could be caused by abrasion, sharp edges and surfaces, or cyclic tension wear.

THE REPAIR

If possible, remove the affected section and re-splice with an end-for-end splice. If re-splicing is not possible, retire the rope.

FUTURE PREVENTION

Always use slings when lifting, and avoid abrasive situations whenever possible, including rough surfaces and sharp edges. Keep your chocks, bits, winches, drums and other surfaces in good condition and free of burrs and rust. Make sure sheaves are the right size and are free to rotate. Don't drag the rope over rough ground. Be sure to use clamps and similar devices with extreme caution.

8-STRAND PLAITED

BRAIT LAY LENGTH CHANGE

Lay length change is normal over time, and a longer lay length in used rope can be seen due to repeated cyclic loading.

THE CAUSE

This permanent deformation is caused by repeated cyclic loading.

THE REPAIR

If permanent deformation results in a longer lay length in excess of 15 percent, retire the line.

NEW

USED

Contact

When in doubt, ask for help. We would be happy to help you understand the rope's life cycle in your application.

Contact:
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Disclaimer: This document is intended to be used for general rope inspection guidance and cannot cover all possible conditions, applications, products or use. For additional details, please reference the Cordage Institute Guideline 1401-15. When in doubt, do not use the rope.